RRB Group D Official Paper (Held On: 23 Dec, 2025 Shift 2) (Previous Year Paper)

RRB Group D • 2025 • 100 questions • 90 minutes • Answer key and solutions

Take this paper as a timed mock test

Practise under exam conditions, then review your answers after you submit.

yourmocktest.com/pyq/rrb-group-d/rrb-group-d-official-paper-held-on-23-dec-2025-shift-2-previ…

Scan the QR code or click the link to open it.

YourMockTest.com — Free Study Material

GENERAL SCIENCE

Q1. Which of the following statements is true about movement in the plant 'Touch me not'?

(a) Plant movement happens due to growth of new xylem cells.
(b) Plant movement happens due to changes in water content in cells.
(c) Plant movement occurs because phloem transports food.
(d) Plant movement takes place because roots absorb minerals.

Q2. During evaporation, when the average kinetic energy of molecules decreases, what is the effect on temperature?

(a) It will remain the same.
(b) It increases.
(c) No effect on temperature.
(d) It decreases.

Q3. The sign convention for focal length of a concave lens _____.

(a) is positive
(b) depends on object position
(c) is zero
(d) is negative

Q4. Four resistors of 5 Ω, 15 Ω, 20 Ω and 40 Ω are connected in series. The equivalent resistance is _____.

(a) 20 Ω
(b) 80 Ω
(c) 3 Ω
(d) 0.5 Ω

Q5. What are the main products formed when ethanol burns completely in air?

(a) Oxygen and methane
(b) Carbon monoxide and hydrogen
(c) Carbon dioxide and water
(d) Ethane and water

Q6. According to Newton’s Second Law of Motion, force is given by the relation F = ma. If a body’s velocity changes from u (initial velocity) to v (final velocity) in time t, which of the following expressions correctly gives the force acting on the body?

(a) F = m(u-v)/t
(b) F = m(v-u)/t
(c) F = t(v-u)/m
(d) F = mt/(v-u)

Q7. An ultrasonic wave has a frequency of 33 kHz. What will be the wavelength of this wave, if its speed is 330 m/s?

(a) 100 m
(b) 0.1 m
(c) 10 m
(d) 0.01 m

Q8. Which type of connective tissue connects muscles to bones?

(a) Ligament
(b) Blood
(c) Joints
(d) Tendon

Q9. Which method is commonly used for extracting moderately reactive metals such as iron from their ores?

(a) Electrolysis performed on the molten form of metal oxide ores
(b) Chemical reduction of the ore using carbon-based reducing agents
(c) Dissolving and melting of the ore material in concentrated acids
(d) Direct heating of the metallic ore strongly in the presence of air

Q10. Which pair of energy forms constitutes the total mechanical energy of an object?

(a) Potential energy and Kinetic energy
(b) Heat energy and Chemical energy
(c) Nuclear energy and Sound energy
(d) Electrical energy and Light energy

Q11. Which of the following events directly triggers the process of menstruation?

(a) Non fertilisation of egg and hormonal changes
(b) Maturation of the egg
(c) Fertilisation of the egg
(d) Release of sperm into the vagina

Q12. When an object is placed at the principal focus of a convex lens, the image is formed:

(a) Between F and O, virtual and erect.
(b) At infinity, real, inverted, and highly enlarged.
(c) At the focus, inverted, and of same size.
(d) At 2F, inverted, and magnified.

Q13. A passenger in a moving bus falls forward when the bus suddenly stops. This is due to which of the following?

(a) Force applied by the bus
(b) Gravity
(c) Friction between seat and passenger
(d) Inertia of motion of the passenger

Q14. A person ignores regular vehicle maintenance. Which of the following is most likely to happen?

(a) Increased fuel efficiency
(b) Better tyre grip and less pollution
(c) Poor engine performance
(d) Decreased pollution

Q15. Which of the following represents a straight chain hydrocarbon?

(a) Isobutane
(b) Benzene
(c) Cyclopentane
(d) Butane

YourMockTest.com — Free Study Material

Q16. Which of the following is true for mixtures but NOT for compounds?

(a) Components are present in fixed ratio.
(b) New substances are formed.
(c) Components can be separated by physical methods.
(d) Components lose their individual properties.

Q17. Which of the following correctly describes parenchyma, a simple permanent tissue?

(a) Parenchyma consists of dead, thick-walled cells without intercellular spaces.
(b) Parenchyma is made of living, loosely arranged cells with thin walls that store food.
(c) Parenchyma is a complex tissue found only in vascular bundles.
(d) Parenchyma cells are highly specialised and tightly packed with no space between them.

Q18. Which of the following is a correct property of solids?

(a) Solids have strong intermolecular forces.
(b) Solids are highly compressible.
(c) Solids have no fixed shape.
(d) Solids diffuse easily.

Q19. What is the benefit of seed dispersal in plants?

(a) It promotes the availability of mineral nutrients to plants.
(b) It enables plants to expand their distribution.
(c) It makes more water available to plants.
(d) It increases competition between plants for sunlight.

Q20. A woman using a copper-T complains of abdominal pain and discomfort. What is the likely reason?

(a) Infection in the stomach
(b) Uterine irritation caused by the IUD
(c) Hormonal imbalance due to tablets
(d) Blockage in fallopian tube

Q21. Consider the following statements and select the correct option.

Statement A: Sugarcane juice can be fermented to give alcohol (ethanol).

Statement B: Alcohol is added to petrol because it is a cleaner fuel.

(a) Both statements A and B are incorrect.
(b) Both statements A and B are correct.
(c) Statement A is incorrect, but B is correct.
(d) Statement A is correct, but B is incorrect.

Q22. In a parallel combination of resistors, which of the following quantities remains the same across all the resistors?

(a) The equivalent resistance (Req)
(b) The potential difference (V)
(c) The electric current (I)
(d) The power consumed (P)

Q23. In the reaction between aqueous sodium sulphate and aqueous barium chloride, which compound forms the white precipitate?

(a) Barium chloride ($BaCl_2$)
(b) Sodium chloride (NaCl)
(c) Barium sulphate ($BaSO_4$)
(d) Sodium sulphate (Na_2SO_4)

Q24. What is the main function of bile in human digestion?

(a) To make food alkaline and break down large fat globules
(b) To mix food with saliva for easy swallowing
(c) To convert glucose into glycogen in the liver

YourMockTest.com — Free Study Material

(d) To digest proteins completely in the stomach

Q25. What happens to the gravitational force between two objects if both of their masses are doubled?

(a) The force becomes double
(b) The force becomes quadruple
(c) The force becomes 8 times
(d) The force becomes half

MATHEMATICS

Q26. What is the lowest form of the fraction 72/96 obtained by cancelling the HCF of the numerator and denominator?

(a) 5/8
(b) 3/4
(c) 2/3
(d) 4/5

Q27. In a quadrilateral IJKL, angle I = 36° and angle J = 44°. The bisectors of angle K and angle L meet at Z. What is the measure of angle LZK?

(a) 40°
(b) 55°
(c) 34°
(d) 54°

Q28. Two trains are running in opposite directions at speeds of 72 km/hr and 108 km/hr, respectively. The length of the first train is 150 m, and the length of the second train is 200 m. How much time will they take to cross each other?

(a) 5 seconds
(b) 9 seconds
(c) 7 seconds
(d) 14 seconds

Q29. Two trains are travelling towards each other on parallel tracks, 9660 kilometres apart. Train A initially travels at 80 km/hr, and Train B initially travels at 60 km/hr. If Train A's speed is reduced by 10% and Train B's speed is increased by 10%, what is the ratio of the time taken for the trains to meet initially to the time taken after their speed adjustments?

(a) 68:69
(b) 70:69
(c) 69:70
(d) 69:68

Q30. If $\tan\theta = 1/2$, then $(\cos\theta - \sin\theta)/(\sin\theta + \cos\theta)$ is equal to :

(a) 1/5
(b) 1/3
(c) 2/5
(d) 2/3

Q31. A running track consists of two straight parallel segments, each 120 m long, connected at both ends by semicircular arcs. The inner perimeter of the track is 504 m. If the track has a uniform width of 18 m throughout, find the outer perimeter (in m, rounded off to the nearest tens) of the track. Take $\pi = 22/7$

(a) 610
(b) 600
(c) 590
(d) 620

YourMockTest.com — Free Study Material

Q32. The arithmetic mean of the observations 94, 59, 46, 34, 15, 55, 89, 98 and 68 is:

(a) 63
(b) 60
(c) 62
(d) 67

Q33. A spherical water tank has a radius of 21 metres. Calculate the volume (in m^3) of water it can hold. (Use $\pi = 22/7$)

(a) 38,800
(b) 30,800
(c) 38,808
(d) 30,808

Q34. Due to a water crisis, 40% of the initial population left the village and 35% of the remaining left the town to pursue a job. If presently 2340 people inhabit the village, what is the ratio of initial population to present population?

(a) 100:49
(b) 100:39
(c) 105:40
(d) 103:43

Q35. If the ratio of the mode and median of a certain data is 11 : 9, then find the ratio of its mean and median.

(a) 7:8
(b) 7:9
(c) 11:8
(d) 8:9

Q36. If $x = \sqrt{10} + 3$, then the value of $x^3 - 1/(x^3)$ is:

(a) 314
(b) 284
(c) 304
(d) 234

Q37. Ajay, Maya and Mohan started a business in partnership investing in the ratio of 11 : 16 : 6, respectively. At the end of the year, they earned a profit of Rs. 69,300, which is 70% of their total investment. How much did Maya invest (in Rs.)?

(a) 48,184
(b) 47,850
(c) 47,872
(d) 48,000

Q38. Mohan is twice as old as Suresh. Four years ago, the sum of their ages was 40. What is the present age of Suresh?

(a) 18 years
(b) 16 years
(c) 24 years
(d) 32 years

Q39. The monthly incomes of two friends Rupesh and Manjit, are in the ratio 5 : 8, respectively, and each of them saves Rs. 84,000 every month. If the ratio of their monthly expenditure is 1 : 3, find the monthly income of Rupesh (in Rs.).

(a) 1,20,000
(b) 1,21,000
(c) 1,19,000
(d) 1,68,000

YourMockTest.com — Free Study Material

Q40. Kiran spends 65% of his income. If he saves Rs. 42,000, then his income (in Rs.) is:

(a) 1,21,000
(b) 1,20,000
(c) 1,19,000
(d) 27,300

Q41. The amount on a sum of Rs. 8,800 at 10% per annum compound interest, compounded annually, in 2 years will be:

(a) Rs. 11,225
(b) Rs. 9,757
(c) Rs. 10,012
(d) Rs. 10,648

Q42. Rs. 6,129 is divided among P, Q and R in such a way that if Rs. 71, Rs. 38 and Rs. 20 is deducted from their respective shares, they have money in the ratio 14:3:8. Find the difference between the original shares of Q and R.

(a) Rs. 1,182
(b) Rs. 1,050
(c) Rs. 1,100
(d) Rs. 1,150

Q43. A money box contains only Rs. 2 coins and Rs. 5 coins. There are 20 coins in total, and their combined value is Rs. 70. How many Rs. 2 coins are there?

(a) 5
(b) 12
(c) 10
(d) 15

Q44. The number of prime numbers between 472 and 486 is:

(a) 3
(b) 1
(c) 2
(d) 4

Q45. An agent sells a pressure cooker with a marked price of Rs. 8,460 at a discount of 30%. What is the selling price (in Rs.) of the pressure cooker?

(a) 6,768
(b) 5,922
(c) 6,166
(d) 6,367

Q46. A shopkeeper buys a bag for Rs. 850 and sells it for Rs. 1,020. Find his profit percentage.

(a) 20%
(b) 40%
(c) 30%
(d) 25%

Q47. A can complete a piece of work in 24 days, B in 18 days and C in 36 days. All of them started working together. After working for 4 days, A left the work. B and C continued, but B left 3 days before the completion of the work. How long (in days) did the work last?

(a) 11
(b) 14
(c) 13
(d) 12

YourMockTest.com — Free Study Material

Q48. A retailer offers the following discount schemes for buyers on an article. Which scheme will be the LEAST beneficial to the customer?

i. A discount of 48%.

ii. A discount of 31% followed by a discount of 44%.

iii. Successive discounts of 32% and 21%.

(a) Scheme iii
(b) Scheme i
(c) Scheme iii and Scheme ii
(d) Scheme ii

Q49. Simplify: √2 + 1/√2 + 1/(2+√2) - 1/(2-√2)

(a) 1/√2
(b) √2
(c) 2√2
(d) 3√2

Q50. P and Q together can fill a cistern with water in 9 hours. If P alone can fill the cistern with water in 12 hours, then in how many hours will Q alone fill one-fourth of the same cistern with water?

(a) 10
(b) 9
(c) 19
(d) 18

GENERAL INTELLIGENCE & REASONING

Q51. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which letter-cluster pair DOES NOT belong to that group?

(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)

(a) XV – AC
(b) OM – VS
(c) DB – KH
(d) FD – MJ

Q52. Seven boxes, L, M, N, O, Q, R and S, are kept one over the other, but not necessarily in the same order. L is kept immediately above O. Only M is kept below R. N is kept immediately above Q. Only two boxes are kept above L. How many boxes are kept between S and N?

(a) One
(b) Two
(c) Four
(d) Three

Q53. Six people, A, B, C, D, E and F, are sitting in a row, facing north. Only two people sit to the left of F. Only one person sits between D and E. F sits to the immediate left of D. A sits to the immediate right of C. B sits third to the right of A. Who sits at the extreme left end of the line?

(a) A
(b) E
(c) C
(d) D

Q54. Seven boxes A, B, C, D, M, N and O are kept one over the other but not necessarily in the same order. B is kept second from the bottom. Only three boxes are kept between B and A. O is kept at one of the positions below B. Only C is kept between A and D. M is kept at one of the positions above A.

How many boxes are kept between N and A?

(a) Two

YourMockTest.com — Free Study Material

(b) One
(c) Three
(d) Four

Q55. In a car park, vehicle A is to the west of vehicle B. Vehicle C is to the east of vehicle B. Vehicle D is to the north of vehicle B. Vehicle E is to the south of vehicle C. Vehicle F is to the north of vehicle C. What is the position of vehicle E with respect to vehicle A?

(a) North-east
(b) South
(c) South-east
(d) East

Q56. A, B, C, D, E and F are sitting around a circular table, facing the centre. B sits third to the right of A. E sits to the immediate left of D. D is not an immediate neighbour of A. F sits to the immediate right of C. The position of how many persons will remain unchanged if all persons are arranged in alphabetical order in clockwise direction starting from A (including A)?

(a) Two
(b) Four
(c) One
(d) Three

Q57. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

Some pens are combs.

All shirts are tails.

All combs are shirts.

Conclusions:

(I) Some tails are combs.

(II) Some shirts are pens.

(a) Neither conclusion (I) nor (II) follows.
(b) Both conclusions (I) and (II) follow.
(c) Only conclusion (II) follows.
(d) Only conclusion (I) follows.

Q58. Mudit starts from Point Y and drives 92 km towards South. He then takes a left turn, drives 59 km, turns left and drives 38 km. He then takes a right turn and drives 28 km. He then turns left, drives 54 km to stop at Point Z. How far (shortest distance) and towards which direction should he drive in order to reach Point Y again?

(All turns are 90° turns only unless specified.)

(a) 91 km towards east
(b) 79 km towards east
(c) 84 km towards west
(d) 87 km towards west

Q59. This question is based on the five, three-digit numbers given below.

(Left) 324 526 249 267 185 (Right)

(Example: 697 – First digit = 6, second digit = 9 and third digit = 7)

(NOTE: All operations to be done from left to right.)

What will be the resultant if the third digit of the highest number is added to the second digit of the lowest number?

(a) 13
(b) 12
(c) 14
(d) 11

YourMockTest.com – Free Study Material

Q60. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

Some Mercuries are Venuses.

All Venuses are Earths.

No Earth is Mars.

Conclusions:

(I) Some Mercuries are Earths.

(II) No Venus is Mars.

(a) Only conclusion (I) follows.
(b) Only conclusion (II) follows.
(c) Both conclusions (I) and (II) follow.
(d) Neither conclusion (I) nor (II) follows.

Q61. LMQR is related to VWAB in a certain way based on the English alphabetical order. In the same way, IJNO is related to STXY. To which of the given options is HIMN related, following the same logic?

(a) RTVE
(b) RSVX
(c) RSWX
(d) RRVX

Q62. If 'P' stands for '×', 'Q' stands for '÷', 'R' stands for '-' and 'S' stands for '+', what will come in place of the question mark (?) in the following equation?

3 P 9 R (14 Q 2) P 6 S 80 Q 5 S 4 P 10 = ?

(a) 41
(b) 59
(c) 52
(d) 33

Q63. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

LR21 MS30 NT39 OU48 ?

(a) PU58
(b) PV58
(c) PU57
(d) PV57

Q64. Select the pair which follows the same pattern as that followed by the two pairs given below. Both pairs follow the same pattern.

GAN : KVR

OQV : SLZ

(a) WGD : ABH
(b) NEQ : RCU
(c) HTV : LQZ
(d) LZA : QVF

Q65. In a certain code language, 'video oak bell' is coded as ' of br mw' and 'hair bell dew' is coded as 'br ui ee'. How is 'bell' coded in the given language?

(a) mw
(b) of
(c) ui
(d) br

YourMockTest.com — Free Study Material

Q66. In a certain code language,

'A x B' means 'A is the wife of B',

'A – B' means 'A is the daughter of B',

'A ÷ B' means 'A is the father of B' and

'A + B' means 'A is the son of B'.

How is L related to Q if 'L + M − N x P ÷ Q'?

(a) Daughter's son
(b) Brother's son
(c) Daughter's husband
(d) Sister's son

Q67. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

ASE KCO UMY EWI ?

(a) OGS
(b) OSG
(c) OGY
(d) OGT

Q68. Based on the English alphabetical order, three of the following four letter-clusters are alike in a certain way and thus form a group. Which letter-cluster DOES NOT belong to that group?

(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)

(a) EKN
(b) TZC
(c) OUX
(d) FLQ

Q69. In a certain code language, 'trust brings peace' is coded as 'tg dx pm' and 'find trust within' is coded as 'pm av wj'. How is 'trust' coded in that language?

(a) dx
(b) av
(c) pm
(d) tg

Q70. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

(Note: Operations should be performed on the whole numbers, without breaking down the numbers into their constituent digits. E.g. 13 – Operations on 13 such as adding/subtracting/multiplying to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)

(5, 3, 16)

(7, 2, 15)

(a) (4, 3, 9)
(b) (8, 5, 30)
(c) (6, 8, 43)
(d) (3,4, 13)

Q71. Seven people, A, B, C, D, E, F and G, are sitting in a row, facing north. Only five people sit between D and B. C sits to the immediate left of B. Only one person sits between C and A. F sits at some place to the left of G but at some place to the right of E. How many people sit to the right of A?

(a) 3
(b) 1
(c) 2
(d) 4

YourMockTest.com — Free Study Material

Q72. Refer to the following number and symbol series and answer the question that follows. Counting to be done from left to right only.

(Left) 6 3 3 £ * 9 € £ € $ 9 @ 7 4 5 # 9 2 1 £ 7 5 (Right)

How many such symbols are there, each of which is immediately preceded by a number and also immediately followed by a symbol?

(a) 1
(b) 2
(c) 4
(d) 3

Q73. In the following triads, each group of letters is related to the subsequent one following a certain logic. Select from the given options, the one which follows the same logic.

DUAL – ULDA – ADUL

RATE – AERT – TRAE

(a) ROAD – ODRA – AROD
(b) RENT – RTEN – ENRT
(c) GROW – ROWG – ORGW
(d) VIEW – WVIE – EWIV

Q74. Refer to the following series and answer the question (all numbers are single digit numbers only). Counting to be done from left to right only.

(Left) 8 2 2 4 3 9 4 3 8 9 5 5 6 5 3 7 5 3 9 6 6 5 3 1 8 1 8 (Right)

How many such odd numbers are there, each of which is immediately preceded by an even number and also immediately followed by an even number?

(a) 3
(b) 2
(c) 1
(d) 4

Q75. What should come in place of the question mark (?) in the given series?

1, 3, 7, 15, 31, ?

(a) 65
(b) 58
(c) 55
(d) 63

Q76. What will come in place of the question mark (?) in the following equation, if '+' and '−' are interchanged and '×' and '÷' are interchanged?

4 ÷ 2 + 15 × 5 - 8 = ? + 5

(a) 18
(b) 8
(c) 4
(d) 12

Q77. What should come in place of the question mark (?) in the given series?

0 5 15 30 ? 75

(a) 45
(b) 55
(c) 40
(d) 50

YourMockTest.com — Free Study Material

Q78. Refer to the following number series and answer the question that follows. Counting to be done from left to right only. (All numbers are single-digit numbers only.)

(Left) 4 8 7 6 3 9 3 2 8 2 9 4 5 6 5 4 1 3 5 9 7 9 9 4 2 5 3 6 1 7 2 (Right)

How many such odd numbers are there, each of which is immediately preceded by a perfect square and also immediately followed by an even number? (NOTE: 1 is also a perfect square.)

(a) More than three
(b) Three
(c) Two
(d) One

Q79. What should come in place of the question mark (?) in the given series?

119 110 102 95 ? 84 80

(a) 90
(b) 89
(c) 87
(d) 86

Q80. What will come in the place of the question mark (?) in the following equation, if '+' and '−' are interchanged and '×' and '÷' are interchanged?

59 ÷ 11 + 833 × 7 - 24 = ?

(a) 547
(b) 536
(c) 512
(d) 554

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. In which of the following Sustainable Development Goals (SDGs) is India on track or maintaining SDG achievement, as per the Sustainable Development Report 2025?

(a) SDG 9
(b) SDG 1
(c) SDG 14
(d) SDG 13

Q82. For which novel did David Szalay receive the Booker Prize in 2025?

(a) The Sea of Trees
(b) Flesh
(c) Heart Lamp
(d) Last Empire

Q83. The Indian Space Research Organisation (ISRO) is seeking to collaborate with the European Space Agency (ESA) on which of the following missions to track and study the Apophis asteroid, which is slated to make a close encounter with Earth in 2029?

(a) Kopunegar mission
(b) Cristono mission
(c) Zuris mission
(d) Ramses mission

Q84. Which former Olympic swimmer was elected as the first female and African President of the IOC in March 2025?

(a) Penny Heyns
(b) Kirsty Coventry
(c) Cathy Freeman
(d) Inge de Bruijn

YourMockTest.com — Free Study Material

Q85. In March 2025, the Parliament passed the Banking Laws (Amendment) Bill. It amended the Reserve Bank of India Act, 1934, and _____.

(a) Banking Regulation Act, 1949
(b) Negotiable Instruments Act, 1881
(c) Payment and Settlement Systems Act, 2007
(d) Companies Act, 2013

Q86. According to the India Meteorological Department (IMD), in October 2025, severe cyclonic storm "Montha" crossed the Andhra Pradesh coast between which two locations?

(a) Machilipatnam and Kalingapatnam
(b) Chennai and Puducherry
(c) Visakhapatnam and Gopalpur
(d) Paradip and Digha

Q87. Who was conferred the Padma Shri in 2025 for revitalising Kani shawl weaving in the field of Art and Literature?

(a) Bhimavva Doddabalappa Shillekyathara
(b) Bheru Singh Chouhan
(c) Farooq Ahmad Mir
(d) Stephen Knapp

Q88. Which organisation expressed serious concerns about the potential escape of Ebola samples in Goma, Democratic Republic of Congo?

(a) United Nations Children's Fund (UNICEF)
(b) Doctors Without Borders
(c) International Committee of the Red Cross (ICRC)
(d) World Health Organization (WHO)

Q89. At which event was the ENDOVEDA platform for efficient endoscopy reporting unveiled in July 2025?

(a) Global Gastro Summit, Hyderabad
(b) MedTech Expo 2025, Bengaluru
(c) India Health Conclave, New Delhi
(d) Endocon 2025, Jaipur

Q90. In November 2025, the Supreme Court of India held that every arrested individual must be provided with the written grounds of arrest in which language?

(a) A language understood by the arrested person
(b) The language of the arresting officer’s choice
(c) English only
(d) Any official language of the state

Q91. In 2025, which organisation reintroduced the SPREE initiative and launched the Amnesty Scheme – 2025 to expand social security coverage for workers?

(a) Employees’ State Insurance Corporation
(b) Ministry of Labour and Employment
(c) NITI Aayog
(d) Employees Provident Fund Organisation

Q92. Which of the following sectors is given special focus under the Employment Linked Incentive (ELI) Scheme launched in 2025?

(a) Banking
(b) Manufacturing
(c) Agriculture
(d) Tourism

YourMockTest.com — Free Study Material

Q93. What new title did the Amendment give to the Waqf Act, 1995?

(a) Waqf Efficiency and Reform Act, 1995
(b) Unified Waqf Empowerment Act and management of Waqf properties and boards, 1995
(c) United Waqf Management, Empowerment, Efficiency and Development Act, 1995
(d) United Waqf Administration Act, 1995

Q94. According to the Sustainable Development Report, 2025, what is India's rank on the SDG Index and what is its approximate score?

(a) 89th with score ≈70.10
(b) 109th with score ≈62.00
(c) 99th with score ≈66.95
(d) 79th with score ≈72.30

Q95. Where did the RBI relocate its Andhra Pradesh Regional Office in June 2025?

(a) Amaravati
(b) Vijayawada
(c) Guntur
(d) Visakhapatnam

Q96. Which Indian cricketer became only the second wicketkeeper in Test history to score centuries in both innings during the first Test against England at Headingley in June 2025?

(a) KL Rahul
(b) Rishabh Pant
(c) Wriddhiman Saha
(d) Ishan Kishan

Q97. In the 2025 Asian Athletics Championships held in Gumi, South Korea, Tejaswin Shankar made history by becoming the first Indian to win two medals in which specific athletics event?

(a) Decathlon
(b) Triathlon
(c) Pentathlon
(d) Heptathlon

Q98. Which former RBI Governor became PM’s Principal Secretary, signaling strong economic emphasis in February 2025?

(a) Urjit Patel
(b) YV Reddy
(c) Manmohan Singh
(d) Shaktikanta Das

Q99. Which of the following teams was the runner-up of the 18^(th) Edition of the Indian Premier League in 2025?

(a) Chennai Super Kings
(b) Sunrisers Hyderabad
(c) Punjab Kings
(d) Gujarat Titans

Q100. In 2025, the maiden flight-tests of the Integrated Air Defence Weapon System (IADWS) by Defence Research and Development Organisation (DRDO) were conducted off the coast of which of the following states of India?

(a) Tamil Nadu
(b) Odisha
(c) Gujarat
(d) West Bengal

YourMockTest.com — Free Study Material

ANSWER KEY

1	b	2	d	3	d	4	b	5	c	6	b	7	d	8	d	9	b	10	a
11	a	12	b	13	d	14	c	15	d	16	c	17	b	18	a	19	b	20	b
21	b	22	b	23	c	24	a	25	b	26	b	27	a	28	c	29	c	30	b
31	d	32	c	33	c	34	b	35	d	36	d	37	d	38	b	39	a	40	b
41	d	42	a	43	c	44	b	45	b	46	a	47	d	48	a	49	a	50	b
51	a	52	d	53	c	54	a	55	c	56	a	57	b	58	d	59	c	60	c
61	c	62	a	63	d	64	a	65	d	66	d	67	a	68	d	69	c	70	d
71	a	72	b	73	a	74	b	75	d	76	a	77	d	78	a	79	b	80	d
81	b	82	b	83	d	84	b	85	a	86	a	87	c	88	c	89	d	90	a
91	a	92	b	93	c	94	c	95	b	96	b	97	a	98	d	99	c	100	b

SOLUTIONS

Q1. Answer: (b) Plant movement happens due to changes in water content in cells.

The correct answer is Plant movement happens due to changes in water content in cells.

Key Points

• The movement in the Touch-me-not plant (Mimosa pudica) is a classic example of growth-independent movement. Unlike plants that move toward light, this response is immediate and does not involve the creation of new xylem cells or any permanent structural growth. Hence, statement 1 is incorrect.

• When the leaves of Mimosa pudica are touched, the plant undergoes a rapid change in turgor pressure within specialized cells located at the base of the leaflets and petiole, called the pulvinus.

• This movement happens because the plant cells change their shape by altering the amount of water within them. When water leaves the cells on the lower side of the pulvinus, the cells shrink or collapse, causing the leaves to fold or droop. Hence, statement 2 is correct.

• The primary driver of this folding mechanism is the movement of water and ions (such as potassium), not the transport of food through the phloem. While the phloem is essential for nutrient distribution, it does not facilitate rapid leaf movement. Hence, statement 3 is incorrect.

• The absorption of minerals by roots is a vital physiological process for plant nutrition and development, but it has no direct role in the instantaneous mechanical response of leaves folding upon contact. Hence, statement 4 is incorrect.

Additional Information

• Nastic Movements: These are non-directional responses to stimuli (such as touch, heat, or light). The movement of the Touch-me-not plant is specifically called Seismonastic or Thigmonastic movement. It differs from tropisms because the direction of the response is not determined by the direction of the stimulus.

• The Pulvinus: This is a swollen area at the base of the leaf stalk. It acts as a "joint" for the plant. It contains parenchyma cells that can rapidly lose or gain turgidity, acting as a motor organ to facilitate the folding of leaves.

• Signal Transduction: When the plant is stimulated, an electrical-chemical signal (similar to a nerve impulse in animals) travels through the plant tissues. This signal triggers the efflux of potassium ions followed by water from the vacuoles, leading to the sudden loss of pressure.

• Recovery Time: After the stimulus is removed, the plant gradually pumps water back into the collapsed cells to restore turgor pressure. This recovery usually takes 10 to 20 minutes, depending on the environmental conditions.

Important Points

• Comparison with Growth Movements:

• Growth-dependent movements: Examples include Phototropism (response to light) and Geotropism (response to gravity). These are slow and permanent.

• Growth-independent movements: Examples include Thigmonasty in Mimosa pudica and the closing of a Venus Flytrap. These are fast and reversible.

• Evolutionary Purpose: It is widely believed that this drooping mechanism serves as a defense mechanism against herbivores. By folding its leaves, the plant looks smaller and less "leafy" to potential predators, or the sudden movement may scare away insects.

• Water Content Regulation: The ability of a plant to move by controlling water content is also seen in the opening and closing of stomata, where guard cells swell or shrink to regulate gas exchange.

YourMockTest.com – Free Study Material

Q2. Answer: (d) It decreases.

The correct answer is It decreases.

Key Points

• Evaporation is a surface phenomenon in which molecules of a liquid undergo a phase transition into the gaseous state at temperatures below the boiling point.

• In any liquid, molecules are in constant motion and possess varying levels of kinetic energy. While most molecules have an average energy, some possess high kinetic energy, allowing them to overcome the intermolecular forces of attraction holding them in the liquid phase.

• During the process of evaporation, these high-energy molecules escape from the surface of the liquid into the air as vapor. This leaves behind molecules that have lower average kinetic energy.

• By definition, the temperature of a substance is a direct measure of the average kinetic energy of its constituent particles. According to the kinetic molecular theory, if the average kinetic energy of the remaining molecules drops, the temperature of the liquid must also decrease. Hence, the correct answer is It decreases.

• This phenomenon is widely known as evaporative cooling. It is an endothermic process because the system (the liquid) essentially "loses" its most energetic components, resulting in a lower thermal state for the remaining mass.

Additional Information

• Factors Affecting Evaporation:

• Surface Area: Since evaporation is a surface phenomenon, increasing the surface area increases the rate at which molecules can escape, leading to faster cooling.

• Temperature: An increase in the ambient temperature provides more energy to the liquid molecules, increasing the number of particles that possess enough kinetic energy to escape.

• Humidity: The rate of evaporation is inversely proportional to humidity. If the air is already saturated with water vapor (high relative humidity), the rate of evaporation decreases.

• Wind Speed: Higher wind speeds help remove the vaporized molecules from the vicinity of the surface, allowing more liquid molecules to transition into the gas phase.

• Latent Heat of Vaporization: This refers to the amount of heat energy required to change 1 kg of a liquid into a gas at its boiling point without a change in temperature. In the context of evaporation, the liquid absorbs this latent heat from its surroundings or its own internal energy to facilitate the phase change.

• Practical Examples of Evaporative Cooling:

• Perspiration (Sweating): When the human body overheats, it produces sweat. As the sweat evaporates from the skin, it takes away heat energy, thereby decreasing the body temperature.

• Earthen Pots (Matka): Water stored in porous earthen pots remains cool because water seeps through the pores and evaporates from the outer surface, extracting latent heat from the water inside.

• Desert Coolers: These devices use the evaporation of water to cool the air, making them highly effective in hot and dry climates where humidity is low.

Important Points

• Distinction between Evaporation and Boiling: While evaporation occurs only at the surface and at any temperature, boiling is a bulk phenomenon that occurs throughout the liquid once it reaches a specific boiling point (e.g., 100 degrees Celsius for water at 1 atmospheric pressure).

• Thermal Equilibrium: In a closed system, evaporation will eventually reach a state of dynamic equilibrium where the rate of evaporation equals the rate of condensation, and the vapor pressure remains constant.

• Energy Transfer: The cooling effect is most pronounced when the liquid has a low boiling point and high volatility, such as acetone or alcohol, which evaporate rapidly at room temperature.

Q3. Answer: (d) is negative

p data-end="57" data-start="0">The correct answer is is negative.

Key Points

• A concave lens is a diverging lens that possesses at least one surface that curves inwards. It causes parallel beams of light to spread out or diverge after passing through it.

• According to the New Cartesian Sign Convention, the optical center of the lens is considered the origin (0,0), and all distances are measured from this point.

• Distances measured in the direction of incident light are taken as positive, while those measured opposite to the direction of incident light are taken as negative.

• The principal focus of a concave lens is the point from which the rays of light, originally parallel to the axis, appear to diverge after passing through the lens. This point lies on the same side as the incident light (usually the left side).

• Because the distance from the optical center to the principal focus is measured against the direction of the incident light, the

focal length of a concave lens is always negative. Hence, the statement that the sign convention is negative is correct.

Additional Information

• Sign Convention for Convex Lens:

• A convex lens is a converging lens. Its principal focus is located on the opposite side of the incident light (right side).

• Therefore, the focal length of a convex lens is always considered positive under the standard sign convention.

• Lens Formula and Magnification:

• The relationship between object distance (u), image distance (v), and focal length (f) is given by the lens formula: 1/v - 1/u = 1/f.

• The magnification (m) produced by a lens is the ratio of image height to object height, which also equals v/u. For a concave lens, the magnification is always positive and less than one.

• Power of a Lens:

• The power of a lens is defined as the reciprocal of its focal length in meters (P = 1/f).

• The SI unit of power is the Dioptre (D). Since the focal length of a concave lens is negative, its optical power is also negative.

• For example, a person with Myopia (near-sightedness) is prescribed concave lenses with negative power (e.g., -2.5 D).

Important Points

• Image Formation by Concave Lens:

• A concave lens always forms a virtual, erect, and diminished image, regardless of where the object is placed in front of it.

• The image distance (v) for a concave lens is always negative because the image is formed on the same side as the object.

• Object Distance (u):

• By convention, the object is always placed to the left of the lens. Consequently, the object distance (u) is always negative in calculations for both convex and concave lenses.

Q4. Answer: (b) 80 Ω

The correct answer is 80 Ω.

Key Points

• In an electrical circuit, when resistors are connected in series, they are arranged in a single continuous path, allowing the same electric current to flow through each component sequentially.

• The equivalent resistance (Req) of a series combination is the algebraic sum of the individual resistances. The mathematical formula used is Req = R1 + R2 + R3 + ... + Rn.

• According to the question, the four given resistors are 5 Ω, 15 Ω, 20 Ω, and 40 Ω.

• By applying the series formula: Req = 5 Ω + 15 Ω + 20 Ω + 40 Ω.

• Calculating the sum: 5 + 15 = 20 Ω; then 20 + 20 = 40 Ω; and finally 40 + 40 = 80 Ω. Hence, the equivalent resistance is 80 Ω.

• A fundamental characteristic of this arrangement is that the total resistance is always greater than the largest individual resistor in the circuit (in this case, 80 Ω is greater than 40 Ω).

Additional Information

• Ohm's Law: This law states that the current passing through a conductor between two points is directly proportional to the voltage across the two points. It is expressed as V = I × R, where V is voltage, I is current, and R is resistance.

• Parallel Combination: If these resistors were connected in parallel, the reciprocal of the equivalent resistance would be the sum of the reciprocals of the individual resistances (1/Req = 1/R1 + 1/R2 + 1/R3 + 1/R4). In parallel, the equivalent resistance is always smaller than the smallest individual resistor.

• Voltage Division: In a series circuit, the total voltage provided by the source is shared among the resistors. Each resistor experiences a voltage drop proportional to its resistance value.

• Unit of Resistance: The SI unit of electrical resistance is the Ohm, symbolized by the Greek letter Ω (Omega), named after the German physicist Georg Simon Ohm who published his findings in 1827.

Important Points

• Current Consistency: In a series circuit, the current (I) remains constant at every point. This means the same number of electrons flows through the 5 Ω resistor as through the 40 Ω resistor per unit of time.

• Circuit Sensitivity: One major disadvantage of a series connection is that if any one component fails or the path is broken (e.g., a fused bulb), the entire circuit becomes open, and the current stops flowing through all components.

• Applications: Series circuits are commonly used in voltage dividers, fuses for protection, and simple low-power electronic strings. However, they are rarely used in household wiring because of the failure risk and the shared voltage.

• Total Power: The total power consumption in a series circuit is the sum of the power dissipated by each resistor (P_total = P1 + P2 + P3 + P4).

YourMockTest.com – Free Study Material

Q5. Answer: (c) Carbon dioxide and water

The correct answer is Carbon dioxide and water.

Key Points

• Ethanol (with chemical formula C2H5OH), also known as ethyl alcohol, undergoes complete combustion when it burns in a plentiful supply of oxygen or air.

• The process of complete combustion results in the total oxidation of the hydrocarbon chain, leading to the formation of carbon dioxide (CO2) and water (H2O) as the primary chemical products.

• The balanced chemical equation for this reaction is: C2H5OH + 3O2 → 2CO2 + 3H2O + Heat. In this reaction, 1 molecule of ethanol reacts with 3 molecules of oxygen to produce 2 molecules of carbon dioxide and 3 molecules of water.

• During this reaction, a significant amount of energy is released in the form of heat and light, making ethanol an effective fuel source.

• The flame produced during the complete combustion of ethanol is typically blue in color, which indicates that the fuel is burning efficiently without leaving behind soot or unburnt carbon.

• Hence, the correct answer is Carbon dioxide and water.

Additional Information

• Properties of Ethanol:

• Ethanol is a volatile, flammable, and colorless liquid. It has a distinct odor and a boiling point of approximately 78.37 degrees Celsius.

• It is widely produced through the fermentation of sugars by yeast, using raw materials like sugarcane, corn, or molasses.

• Incomplete Combustion:

• If the supply of oxygen is limited or insufficient, incomplete combustion occurs. This leads to the formation of carbon monoxide (CO), which is a toxic and colorless gas, or carbon in the form of soot.

• Incomplete combustion is often characterized by a yellow or sooty flame and is less energy-efficient than complete combustion.

• Industrial and Environmental Uses:

• Ethanol is used as a renewable biofuel and is often blended with gasoline (such as E10 containing 10 percent ethanol or E85) to reduce carbon monoxide emissions and greenhouse gases in vehicles.

• Due to its antiseptic properties, it is a primary ingredient in hand sanitizers (typically at a concentration of 60 to 95 percent) and medical wipes.

• It serves as a critical solvent in the manufacture of varnishes, perfumes, and pharmaceuticals.

• Calorific Value:

• The calorific value of ethanol is roughly 29.7 MJ/kg, which is lower than that of petrol (about 45.8 MJ/kg), meaning more ethanol is required by volume to produce the same amount of energy as gasoline.

Q6. Answer: (b) F = m(v-u)/t

The correct answer is F = m(v-u)/t.

Key Points

• According to Newton's Second Law of Motion, the Force (F) acting on an object is mathematically defined as the product of its mass (m) and its acceleration (a), expressed as F = ma.

• Acceleration (a) is defined as the rate of change of velocity with respect to time (t). It is calculated by subtracting the initial velocity (u) from the final velocity (v) and dividing the result by the time interval. The formula is a = (v - u) / t.

• By substituting the formula for acceleration into the original equation of the Second Law, we derive F = m * ((v - u) / t), which simplifies to F = m(v - u) / t. Hence, the expression in option 2 is correct.

• This relation demonstrates that Force is proportional to the rate of change of linear momentum, where mv is the final momentum and mu is the initial momentum.

• Options 1, 3, and 4 are mathematically inconsistent with the definitions of acceleration and Newton's Second Law. Hence, statements 1, 3, and 4 are incorrect.

Additional Information

• Newton's First Law of Motion: Also known as the Law of Inertia, it states that an object will remain at rest or continue to move at a constant velocity unless acted upon by an external unbalanced force.

• Newton's Third Law of Motion: This law states that for every action, there is always an equal and opposite reaction. These forces act on two different bodies.

• Linear Momentum (p): It is a vector quantity defined as the product of mass and velocity (p = mv). The SI unit of momentum is kg·m/s.

• SI Unit of Force: The standard unit of Force is the Newton (N). One Newton is the force required to provide an acceleration of 1 m/s² to an object with a mass of 1 kg (1 N = 1 kg·m/s²).

YourMockTest.com – Free Study Material

• Impulse: When a large force acts on a body for a very short time, the product of force and time is called Impulse, which is also equal to the total change in momentum.

Important Points

• Mass vs. Weight: Mass is a fundamental property of an object representing the amount of matter, while Weight (W = mg) is the gravitational force acting on that mass. Mass is constant everywhere, but weight changes based on the acceleration due to gravity (g).

• Vector Nature: Force, Acceleration, and Velocity are all vector quantities, meaning they possess both magnitude and direction. In the formula F = m(v-u)/t, the direction of the Force is the same as the direction of the acceleration.

• Retardation: If the final velocity (v) is less than the initial velocity (u), the acceleration becomes negative. This is known as retardation or deceleration, indicating that the Force is acting in the opposite direction of motion.

• Applications: The principle F = m(v-u)/t is used in designing safety features like airbags and seatbelts in cars. By increasing the time (t) taken to stop during a crash, the Force (F) exerted on the passengers is significantly reduced.

Q7. Answer: (d) 0.01 m

The correct answer is 0.01 m.

Key Points

• To find the wavelength of the ultrasonic wave, we use the fundamental wave equation: Speed (v) = Frequency (f) x Wavelength (λ).

• The given Frequency (f) is 33 kHz. Since 1 kHz = 1,000 Hz, the frequency in the standard unit (SI) is 33,000 Hz.

• The Speed (v) of the wave is provided as 330 m/s.

• Rearranging the formula to solve for wavelength, we get: Wavelength (λ) = Speed (v) / Frequency (f).

• Substituting the values into the equation: λ = 330 / 33,000.

• On calculation, 330 / 33,000 = 1 / 100 = 0.01 m. Hence, the wavelength of the wave is 0.01 m.

Additional Information

• Ultrasonic Waves: These are sound waves with frequencies higher than the upper audible limit of human hearing, which is typically 20,000 Hz (20 kHz).

• Nature of Sound: Sound is a longitudinal mechanical wave that requires a medium (solid, liquid, or gas) to travel. It cannot travel through a vacuum.

• Relationship between Parameters: The Speed of a wave depends on the properties of the medium through which it travels, whereas the Frequency is determined by the source of the wave. The Wavelength is the distance between two consecutive compressions or rarefactions.

• Applications of Ultrasound: Because of their high frequency and short wavelength, ultrasonic waves are used in Medical Imaging (Ultrasonography), SONAR (Sound Navigation and Ranging) to measure ocean depth, and Industrial cleaning to remove dirt from spiral parts or electronic components.

Important Points

• Classification of Sound based on Frequency:

• Infrasonic: Frequencies below 20 Hz (e.g., waves produced by Rhinoceroses or Whales).

• Audible Range: Frequencies between 20 Hz and 20,000 Hz for a normal human ear.

• Ultrasonic: Frequencies above 20,000 Hz (e.g., waves used by Bats for navigation and prey detection).

• Effect of Medium: The Speed of sound is maximum in solids (like steel or aluminum), intermediate in liquids (like water), and minimum in gases (like air).

• SI Units: The SI unit of Frequency is Hertz (Hz), Wavelength is Meters (m), and Speed is Meters per second (m/s). Always ensure units are converted to the SI system before calculation.

Q8. Answer: (d) Tendon

The correct answer is Tendon.

Key Points

• A Tendon is a type of dense, fibrous connective tissue that specifically serves to attach skeletal muscles to bones.

• The primary function of a tendon is to transmit the mechanical force of muscle contraction to the bones, thereby enabling movement of the skeleton.

• Tendons are characterized by having great strength but limited flexibility. This structural rigidity ensures that the pull from the muscle is directly translated into bone movement without losing energy through excessive stretching.

• They are primarily composed of collagen fibers arranged in parallel bundles, which provides them with the necessary tensile strength to withstand the heavy loads generated during physical activity. Hence, the correct option is Tendon.

Additional Information

• Ligament:

• A ligament is a fibrous connective tissue that connects bone to bone.

• Unlike tendons, ligaments are highly elastic and contain very little matrix. They play a crucial role in stabilizing joints and maintaining the structural integrity of the skeletal system.

• Blood:

• Blood is considered a fluid connective tissue. It consists of a liquid matrix called plasma, in which Red Blood Cells (RBCs), White Blood Cells (WBCs), and platelets are suspended.

• Its primary function is the transport of gases (oxygen and carbon dioxide), nutrients, hormones, and waste products throughout the body.

• Joints:

• A joint is the physical location or articulation where two or more bones meet.

• While not a tissue itself, joints are supported by various connective tissues like cartilage, ligaments, and synovial membranes to allow for different degrees of mobility.

• Cartilage:

• Cartilage is a specialized connective tissue with widely spaced cells. Its solid matrix is composed of proteins and sugars.

• It smoothens bone surfaces at joints and is also present in the nose, ear, trachea, and larynx.

Important Points

• The matrix of connective tissues can vary significantly depending on their location and function; it can be jelly-like, fluid, dense, or rigid.

• Areolar tissue is another important type of connective tissue found between the skin and muscles, around blood vessels, and nerves. It acts as a packaging tissue, filling the space inside organs and supporting internal organs for repair.

• Adipose tissue is specialized for fat storage and is found below the skin and between internal organs, acting as an insulator for the body.

Q9. Answer: (b) Chemical reduction of the ore using carbon-based reducing agents

The correct answer is Chemical reduction of the ore using carbon-based reducing agents.

Key Points

• Metals located in the middle of the reactivity series, such as Iron (Fe), Zinc (Zn), Lead (Pb), and Tin (Sn), are considered moderately reactive.

• These metals are typically found in the Earth's crust as sulphides, carbonates, or oxides. Because it is easier to extract a metal from its oxide than from its sulphide or carbonate, the ores are first converted into metal oxides.

• The process of chemical reduction involves using a reducing agent, most commonly carbon (in the form of coke) or carbon monoxide, to remove oxygen from the metal oxide. Hence, statement 2 is correct.

• In the industrial extraction of Iron, the ore (usually Hematite, Fe_2O_3) is reacted with coke in a Blast Furnace. The carbon reduces the iron oxide to molten iron.

• Electrolysis is reserved for highly reactive metals like Sodium and Aluminum because their affinity for oxygen is too strong to be broken by carbon. Hence, statement 1 is incorrect.

• Direct heating in the presence of air (thermal decomposition) is only sufficient for metals of very low reactivity, such as Mercury or Copper found in their sulphide ores. Hence, statement 4 is incorrect.

• Dissolving ores in concentrated acids is generally part of leaching or hydrometallurgical processes but is not the primary common method for extracting bulk iron. Hence, statement 3 is incorrect.

Additional Information

• The Reactivity Series:

• This is a list of metals arranged in the order of their decreasing activities. Metals at the top (Potassium, Sodium, Calcium) are never found in nature as free elements and are extracted via electrolytic reduction.

• Metals at the bottom (Gold, Silver, Platinum) are the least reactive and often found in the native state.

• Roasting and Calcination:

• Roasting: The process of heating sulphide ores strongly in the presence of excess air to convert them into oxides. For example, Zinc blende (ZnS) is roasted to form Zinc oxide (ZnO).

• Calcination: The process of heating carbonate ores strongly in limited air or the absence of air to convert them into oxides. For example, Calamine ($ZnCO_3$) is calcined to produce Zinc oxide (ZnO).

• Reducing Agents:

• While Carbon (Coke) is the most economical reducing agent, sometimes highly reactive metals like Aluminum (Al) are used as reducing agents in displacement reactions.

• This is known as the Thermite Process, which is highly exothermic and used for specialized applications like joining railway tracks or cracked machine parts.

• Extraction of Iron (Specifics):

• The Blast Furnace operates at temperatures reaching up to 2000 K near the base.

• Limestone ($CaCO_3$) is added as a flux to remove silica (SiO_2) impurities, forming slag ($CaSiO_3$), which floats on top of the molten iron and is easily removed.

Important Points

• Economic Feasibility: Carbon is used for moderately reactive metals because it is abundant and inexpensive. Electrolysis, while effective, requires massive amounts of electricity, making it too costly for metals that can be reduced chemically.

• Oxidation-Reduction: In these reactions, the metal ore is reduced (loses oxygen) while the reducing agent (carbon) is oxidized (gains oxygen to form CO or CO_2).

• Environmental Impact: The use of carbon-based reduction in metallurgy is a major source of Carbon Dioxide (CO_2) emissions globally, leading to modern research into Green Hydrogen as an alternative reducing agent for the Steel Industry.

Q10. Answer: (a) Potential energy and Kinetic energy

The correct answer is Potential energy and Kinetic energy.

Key Points

• Mechanical energy is the sum of Potential Energy and Kinetic Energy. It is the energy associated with the motion and position of an object.

• Kinetic Energy is the energy possessed by an object due to its motion. It is calculated using the formula K.E. = $1/2\ mv^2$, where m represents mass and v represents velocity. Any moving object, such as a rolling ball or a flying airplane, possesses this form of energy.

• Potential Energy is the stored energy of an object based on its position, state, or configuration. The most common form is gravitational potential energy, given by the formula P.E. = mgh, where m is mass, g is acceleration due to gravity (approximately 9.8 m/s^2), and h is the height above a reference point.

• The Total Mechanical Energy (E) of a system is defined as E = K + U, where K is kinetic energy and U is potential energy. In an isolated system where only conservative forces (like gravity) are acting, the total mechanical energy remains constant. Hence, statement 1 is correct.

• The other options involve forms of energy like Heat, Chemical, Nuclear, and Electrical, which are categorized as non-mechanical energy forms in this context because they relate to microscopic internal structures rather than the macroscopic motion or position of the object as a whole.

• Hence, the correct answer is Potential energy and Kinetic energy.

Additional Information

• Conservation of Mechanical Energy:

• This principle states that the total mechanical energy of an object remains constant if it is acted upon only by conservative forces. For example, as a pendulum swings, its potential energy is converted into kinetic energy and vice versa, but the sum remains the same (ignoring air resistance).

• Forms of Potential Energy:

• Elastic Potential Energy: Energy stored in objects like a compressed spring or a stretched rubber band. It depends on the displacement from the equilibrium position.

• Gravitational Potential Energy: Energy stored due to an object's altitude. A raised hammer or water stored in a dam are classic examples.

• Non-Mechanical Energy Forms:

• Chemical Energy: Energy stored in the bonds of chemical compounds (atoms and molecules). It is released during a chemical reaction, often in the form of heat. Examples include batteries, biomass, and petroleum.

• Nuclear Energy: Energy released during nuclear fission or fusion, originating from the nucleus of an atom.

• Heat (Thermal) Energy: The energy that comes from the temperature of the heated substance. It is the result of the vibration of atoms and molecules within substances.

• Comparison of Options:

• Option 2: Heat and Chemical energy are internal energies related to molecular motion and bonding, not macroscopic mechanical energy.

• Option 3: Nuclear and Sound energy are distinct forms; while sound is a mechanical wave, nuclear energy is subatomic.

• Option 4: Electrical and Light energy are electromagnetic in nature and do not constitute the standard "mechanical energy" definition of an object.

Important Points

• Unit of Energy: The SI unit for all forms of energy, including mechanical energy, is the Joule (J), named after the English physicist James Prescott Joule.

• Scalar Quantity: Energy is a scalar quantity, meaning it has magnitude but no direction. This distinguishes it from momentum or

YourMockTest.com — Free Study Material

force.

• Work-Energy Theorem: This theorem states that the net work done on an object is equal to the change in its kinetic energy. It is a fundamental concept in classical mechanics.

• Numerical Fact: 1 Joule is defined as the work done by a force of one Newton acting through a distance of one meter.

• Real-world Application: In hydroelectric power plants, the potential energy of water stored at a height is converted into kinetic energy as it falls, which then turns turbines to generate electricity.

Q11. Answer: (a) Non fertilisation of egg and hormonal changes

The correct answer is Non fertilisation of egg and hormonal changes.

Key Points

• Menstruation is the periodic shedding of the endometrium (the inner lining of the uterus), accompanied by bleeding, which occurs in a cycle of approximately 28 days.

• The process is directly triggered when the ovum (egg) released during ovulation is not fertilized by a sperm. Hence, statement 1 is correct.

• In the absence of fertilization, the corpus luteum (a temporary endocrine structure) begins to degenerate. This leads to a sharp decline in the levels of progesterone and estrogen hormones.

• The withdrawal of these hormones causes the spiral arteries of the uterus to constrict, leading to the breakdown of the functional layer of the endometrium, which is then expelled through the vagina.

• Maturation of the egg occurs during the follicular phase under the influence of FSH and does not trigger menstruation. Hence, statement 2 is incorrect.

• Fertilisation of the egg leads to the formation of a zygote and subsequent pregnancy, which actually halts the menstrual cycle. Hence, statement 3 is incorrect.

• The release of sperm into the vagina (insemination) is a step toward fertilization and has no direct physiological link to the triggering of the menstrual flow. Hence, statement 4 is incorrect.

Additional Information

• The Menstrual Cycle Phases:

• Menstrual Phase: Lasts for 3 to 5 days; involves the shedding of the endometrial lining.

• Follicular Phase: Primary follicles in the ovary grow to become fully mature Graafian follicles. The endometrium regenerates through proliferation.

• Ovulatory Phase: Occurs around day 14. A surge in LH (Luteinizing Hormone) induces the rupture of the Graafian follicle and the release of the egg.

• Luteal Phase: The remaining parts of the Graafian follicle transform into the corpus luteum, which secretes large amounts of progesterone to maintain the endometrium for potential implantation.

• Hormonal Regulation:

• The cycle is regulated by gonadotropins (LH and FSH) from the pituitary gland and ovarian hormones (estrogen and progesterone).

• LH surge is the primary cause of ovulation.

Important Points

• Menarche: The first menstruation that begins at puberty, typically between the ages of 11 and 15.

• Menopause: The permanent cessation of menstruation, usually occurring around the age of 45 to 55 years.

• The average blood loss during a single menstrual period is approximately 35 to 40 ml.

• Lack of menstruation is often an early indicator of pregnancy, though it can also be caused by stress, poor health, or hormonal imbalances like PCOS.

Q12. Answer: (b) At infinity, real, inverted, and highly enlarged.

The correct answer is At infinity, real, inverted, and highly enlarged.

Key Points

• When an object is placed exactly at the Principal Focus (F1) of a convex lens, the light rays emerging from the object travel through the lens and emerge parallel to each other on the other side.

• Since parallel rays are mathematically considered to meet at infinity, the position of the image is said to be at infinity. Hence, the statement in option 2 is correct.

• The nature of the image formed in this scenario is real and inverted. This is because the rays are refracting through the lens and would eventually converge (at infinity) on the side opposite to the object.

• Regarding the size of the image, it is described as being highly enlarged or infinitely large. As the rays travel further away, the height of the intersection point relative to the principal axis increases drastically.

• This principle is the foundation for devices that require a parallel beam of light, such as searchlights or theatrical spotlights,

where the light source is placed at the focus of a converging lens.

Additional Information

• Convex Lens (Converging Lens):

• A convex lens is thicker at the center than at the edges. It converges incident light rays that are parallel to the principal axis to a specific point called the focus.

• The behavior of the image changes based on the object distance (u) relative to the focal length (f).

• Other Image Formations in Convex Lenses:

• Object between Focus (F) and Optical Center (O): The image is formed on the same side as the object. It is virtual, erect, and magnified. This corresponds to option 1.

• Object at 2F: The image is formed at 2F on the other side. It is real, inverted, and exactly the same size as the object. This contradicts option 3 and 4.

• Object between F and 2F: The image is formed beyond 2F. It is real, inverted, and magnified. This is often confused with the focus position.

• Object Beyond 2F: The image is formed between F and 2F on the opposite side. It is real, inverted, and diminished.

• The Lens Formula:

• The relationship between the focal length (f), object distance (u), and image distance (v) is given by the formula: 1/v - 1/u = 1/f.

• For an object at focus, u = -f. Applying the formula: 1/v - 1/(-f) = 1/f, which results in 1/v = 0, meaning v = infinity.

Important Points

• Magnification (m): It is the ratio of the height of the image to the height of the object (h'/h), or v/u. When the image is at infinity, the magnification is infinite.

• Sign Convention: According to the Cartesian Sign Convention, the focal length of a convex lens is always taken as positive, while for a concave lens, it is negative.

• Real vs Virtual: A real image can be caught on a screen and is formed by the actual intersection of light rays. A virtual image cannot be caught on a screen and is formed when rays appear to diverge from a point.

• Power of a Lens: It is the reciprocal of the focal length in meters (P = 1/f). The SI unit of power is Dioptre (D).

Q13. Answer: (d) Inertia of motion of the passenger

The correct answer is Inertia of motion of the passenger.

Key Points

• This phenomenon is a direct application of Newton’s First Law of Motion, also known as the Law of Inertia. It states that an object will continue in its state of rest or uniform motion in a straight line unless compelled by an external force to change that state.

• Inertia is the inherent property of an object to resist any change in its state of motion. When the bus is moving, the passenger’s entire body is in a state of motion at the same velocity as the vehicle.

• When the bus suddenly stops, the lower part of the passenger’s body, which is in direct contact with the bus (through the feet or the seat), comes to rest along with the bus due to friction.

• However, the upper part of the passenger's body is not rigidly attached to the bus and, therefore, tends to maintain its state of motion due to Inertia of Motion.

• As a result, the upper body continues to move forward while the lower body stays still, causing the passenger to fall or lean forward. Hence, the correct answer is Inertia of motion of the passenger.

Additional Information

• Types of Inertia:

• Inertia of Rest: The tendency of a body to remain in its state of rest. For example, when a bus suddenly starts, a passenger falls backward because the lower body moves with the bus while the upper body tries to remain at rest.

• Inertia of Motion: The tendency of a body to remain in its state of uniform motion. This is seen when a passenger falls forward when brakes are applied.

• Inertia of Direction: The tendency of a body to resist a change in its direction of motion. For example, when a car takes a sharp right turn, the passengers are thrown toward the left.

• Mass as a Measure of Inertia:

• The inertia of an object depends solely on its mass. The greater the mass of an object, the greater its inertia.

• For instance, it is harder to stop a moving truck than a moving bicycle at the same speed because the truck has more mass and thus more inertia of motion.

• External Force:

• In this scenario, the brakes provide the external force required to change the state of the bus, but that force is not directly applied to the upper body of the passenger, which is why inertia dominates the movement.

Important Points

• Galileo Galilei was the first to propose the concept of Inertia, which was later formalized by Sir Isaac Newton in 1687 in his famous work, Philosophiæ Naturalis Principia Mathematica.

• Newton's First Law defines Force qualitatively, while the Second Law (F = ma) defines it quantitatively.

• In everyday life, seatbelts in cars are designed specifically to counteract the inertia of motion during sudden stops or accidents, preventing the passengers from hitting the dashboard or windshield.

• The SI unit of mass is the kilogram (kg), which serves as the standard numerical measure of inertia in the International System of Units.

Q14. Answer: (c) Poor engine performance

The correct answer is Poor engine performance.

Key Points

• Vehicle maintenance is the practice of inspecting or testing the condition of vehicle subsystems (e.g., engine, brakes, tires) and servicing or replacing parts and fluids to ensure safety and efficiency.

• When a person ignores regular maintenance, the internal combustion engine suffers the most. Over time, engine oil loses its viscosity and becomes contaminated with debris, turning into "sludge" which fails to lubricate moving parts, leading to excessive friction and poor engine performance. Hence, the statement regarding poor engine performance is correct.

• Neglect often leads to clogged air filters. A dirty filter restricts the flow of air into the combustion chamber, causing the engine to struggle to "breathe," which results in a loss of horsepower and sluggish acceleration.

• Ignoring spark plug replacement can lead to engine misfires and difficulty in starting the vehicle, further degrading the overall mechanical output and reliability of the car.

• Failure to maintain the cooling system (antifreeze/coolant levels) can lead to engine overheating, which can cause permanent structural damage like a blown head gasket or a cracked engine block.

Additional Information

• Fuel Efficiency: Contrary to option 1, neglecting maintenance leads to decreased fuel efficiency. Worn-out components and dirty sensors (like the Oxygen sensor or MAF sensor) cause the engine to burn more fuel than necessary to maintain speed.

• Tire Grip and Safety: Option 2 suggests better grip, but the reality is that neglected tires lose tread depth, leading to hydroplaning and reduced traction on wet roads. Improper wheel alignment and tire pressure also increase the risk of blowouts.

• Environmental Impact: Option 4 is incorrect because a poorly maintained engine undergoes incomplete combustion. This significantly increases pollution as the vehicle emits higher levels of carbon monoxide (CO), nitrogen oxides (NOx), and unburnt hydrocarbons through the exhaust.

• Economic Consequences: Regular servicing might seem expensive in the short term, but ignoring it leads to massive repair costs later. Furthermore, a vehicle with a poor maintenance record has a significantly lower resale value in the automobile market.

Important Points

• Preventive Maintenance Schedule: Most manufacturers recommend a minor service every 5,000 to 10,000 kilometers and a major service every 20,000 to 40,000 kilometers.

• Check Engine Light: This is a critical diagnostic tool. Ignoring this warning light can lead to the failure of the catalytic converter, which is one of the most expensive parts of the exhaust system to replace.

• Braking System: Maintenance includes checking brake pads and brake fluid. Neglect can lead to "brake fade," where the vehicle takes a much longer stopping distance, posing a safety hazard to the driver and pedestrians.

• Battery Health: Regular checks of the battery terminals for corrosion and ensuring the alternator is charging correctly prevent unexpected electrical failures.

Q15. Answer: (d) Butane

The correct answer is Butane.

Key Points

• A straight chain hydrocarbon is an aliphatic compound in which all the carbon atoms are linked in a continuous, unbranched sequence.

• Butane (specifically n-butane) has the molecular formula C4H10. Its structure consists of four carbon atoms bonded in a row: CH3-CH2-CH2-CH3. Since there are no side branches attached to the main chain, it is a straight chain hydrocarbon. Hence, Butane is the correct option.

• Isobutane, also known as 2-methylpropane, is an isomer of butane with the same formula C4H10. However, it features a branched chain where a methyl group is attached to the second carbon atom of a three-carbon chain. Hence, this represents a branched chain.

• Benzene has the molecular formula C6H6. It is a cyclic hydrocarbon characterized by a hexagonal ring with alternating double bonds. It is classified as an aromatic hydrocarbon rather than an open straight chain. Hence, this represents a cyclic structure.

• Cyclopentane is a cycloalkane with the molecular formula C5H10. It consists of five carbon atoms arranged in a closed-ring

structure. Hence, this is a cyclic hydrocarbon.

Additional Information

• Hydrocarbons: These are organic compounds composed entirely of hydrogen and carbon atoms. They are the primary constituents of petroleum and natural gas.

• Classification of Aliphatic Hydrocarbons:

• Saturated Hydrocarbons (Alkanes): These contain only single bonds between carbon atoms. Examples include Methane, Ethane, and Propane.

• Unsaturated Hydrocarbons: These contain at least one double bond (Alkenes like Ethene) or triple bond (Alkynes like Ethyne).

• Open Chain vs. Closed Chain:

• Acyclic (Open Chain): Carbon atoms are joined in a linear or branched manner. Straight chains have no branches, while branched chains have at least one carbon atom bonded to more than two other carbons.

• Cyclic (Closed Chain): Carbon atoms form one or more rings. These are subdivided into alicyclic (like cyclohexane) and aromatic (like naphthalene).

• Properties of Butane: It is a highly flammable, colorless, and easily liquefied gas at room temperature. It is commonly used as a fuel in LPG (Liquefied Petroleum Gas), cigarette lighters, and as a propellant in aerosol sprays.

• Isomerism: This is a phenomenon where compounds have the same molecular formula but different structural arrangements. Butane and Isobutane are classic examples of structural isomers.

Important Points

• IUPAC Nomenclature: The prefix "n-" (normal) is often used to denote straight chain alkanes to distinguish them from their branched counterparts.

• Bonding: In straight chain alkanes like Butane, every carbon atom is sp3 hybridized, resulting in a tetrahedral geometry around each carbon.

• Catenation: The ability of carbon to form long straight, branched, or cyclic chains is due to its unique property of catenation, which allows it to form strong covalent bonds with other carbon atoms.

Q16. Answer: (c) Components can be separated by physical methods.

The correct answer is Components can be separated by physical methods.

Key Points

• Physical Separation: The primary distinction between a mixture and a compound is the method of separation. Components of a mixture can be separated using physical methods such as filtration, evaporation, distillation, crystallization, or magnetization because the substances are only physically blended. Hence, the statement "Components can be separated by physical methods" is true for mixtures.

• Fixed Ratio: In a compound, elements are always present in a fixed ratio by mass (according to the Law of Definite Proportions). In contrast, the components of a mixture can be combined in any proportion. Hence, statement 1 is incorrect for mixtures.

• Formation of New Substances: A compound is a new substance formed through a chemical reaction where the constituent elements lose their identity. In a mixture, no chemical bond is formed, and thus no new chemical substance is created. Hence, statement 2 is incorrect for mixtures.

• Retention of Properties: In a mixture, each constituent substance retains its individual chemical and physical properties (e.g., sugar in water still tastes sweet). In a compound, the properties of the product are entirely different from its constituent elements (e.g., Water (H2O) is a liquid, while Hydrogen and Oxygen are gases). Hence, statement 4 is incorrect for mixtures.

Additional Information

• Mixtures:

• A mixture contains two or more substances that are not chemically combined.

• They are classified into two types: Homogeneous mixtures (uniform composition, e.g., air, alloys like brass) and Heterogeneous mixtures (non-uniform composition, e.g., sand and salt, oil and water).

• There is no energy change (absorption or evolution of heat/light) typically associated with the formation of a mixture.

• Compounds:

• A compound is a substance formed when two or more chemical elements are chemically bonded together.

• The types of bonds can be covalent or ionic.

• Compounds have a fixed melting point and boiling point, whereas mixtures show a range of temperatures.

• Separation of compounds requires chemical or electrochemical reactions like electrolysis.

• Examples:

• Common Salt (NaCl) is a compound; it cannot be separated into Sodium and Chlorine by simple filtration.

• Gunpowder is a mixture of nitre (potassium nitrate), sulphur, and charcoal, which can be separated using solvents or physical means.

Important Points

• Energy Changes: The formation of a compound involves a significant change in energy, usually in the form of heat, light, or sound. Mixtures are formed with little to no detectable energy change.

• Homogeneity: While all compounds are homogeneous in nature, mixtures can be either homogeneous or heterogeneous.

• Identity: The constituents of a compound lose their chemical identity, whereas the constituents of a mixture do not. For example, Iron (Fe) and Sulphur (S) mixed together can be separated by a magnet, but when heated to form Iron Sulphide (FeS), the magnet no longer attracts the iron.

Q17. Answer: (b) Parenchyma is made of living, loosely arranged cells with thin walls that store food.

The correct answer is Parenchyma is made of living, loosely arranged cells with thin walls that store food.

Key Points

• Parenchyma is the most common and fundamental type of simple permanent tissue found in plants.

• It consists of living cells that possess thin cell walls usually made of cellulose. They are generally isodiametric in shape, meaning they have approximately equal diameters in all directions.

• The cells are typically loosely arranged, which results in significant intercellular spaces between them. Hence, statement 2 is correct and statement 4 is incorrect.

• Unlike sclerenchyma, which consists of dead cells with thickened lignified walls, parenchyma cells remain metabolically active throughout their life. Hence, statement 1 is incorrect.

• Parenchyma is a simple tissue because it is composed of only one type of cell that is similar in structure and function. It is not a complex tissue like Xylem or Phloem. Hence, statement 3 is incorrect.

• The primary functions of parenchyma include food storage, providing turgidity for mechanical support, and secretion.

Additional Information

• Specialized Parenchyma:

• Chlorenchyma: When parenchyma contains chloroplasts and performs photosynthesis, it is called chlorenchyma. This is primarily found in the mesophyll of leaves.

• Aerenchyma: In aquatic plants (hydrophytes), large air cavities are present in the parenchyma to provide buoyancy, allowing the plant to float. This variation is known as aerenchyma.

• Comparison with other Simple Tissues:

• Collenchyma: These cells are living and elongated with unevenly thickened corners due to the deposition of cellulose, hemicellulose, and pectin. They provide flexibility and mechanical strength to young stems and petioles.

• Sclerenchyma: These are dead cells at maturity, characterized by highly thickened walls containing lignin. They provide stiffness and rigidity to plant parts, such as the husk of a coconut.

• Location: Parenchyma is distributed throughout the plant body, including the pith, cortex of roots and stems, mesophyll of leaves, and the flesh of fruits.

Important Points

• Simple vs. Complex Tissues: Simple tissues (Parenchyma, Collenchyma, Sclerenchyma) consist of homogeneous cells. Complex tissues (Xylem and Phloem) consist of heterogeneous cells (different types of cells working together as a unit).

• Cell Wall Composition: The thin walls of parenchyma allow for the easy exchange of materials and osmosis. In storage parenchyma, the walls may store hemicellulose as a reserve food material.

• Regeneration: Because parenchyma cells are living and maintain the ability to divide (totipotency), they play a crucial role in wound healing and regeneration in plants.

• Date of Discovery: The term Parenchyma was coined by Nehemiah Grew in the 17th century, who is often referred to as the Father of Plant Anatomy.

Q18. Answer: (a) Solids have strong intermolecular forces.

The correct answer is Solids have strong intermolecular forces.

Key Points

• Matter is anything that occupies space and has mass. It exists primarily in three states: Solid, Liquid, and Gas. A solid is defined by its structural rigidity and resistance to changes in shape or volume.

• In the solid state, the constituent particles (atoms, molecules, or ions) are packed very closely together. The intermolecular distances are extremely short, which leads to strong intermolecular forces of attraction that hold the particles in fixed positions. Hence, statement 1 is correct.

• Compressibility is the measure of the relative volume change of a fluid or solid as a response to a pressure change. Because there is negligible space between the particles of a solid, they cannot be forced significantly closer together. Therefore, solids are highly incompressible and rigid. Hence, statement 2 is incorrect.

• Solids maintain a definite shape, definite volume, and definite mass. Unlike liquids, which take the shape of the container, or

gases, which expand to fill the entire volume of a container, solids keep their form regardless of the vessel. Hence, statement 3 is incorrect.

• Diffusion is the process of particles spreading out from an area of high concentration to an area of low concentration. In solids, the particles can only oscillate about their mean positions and do not move from one place to another. Consequently, the rate of diffusion in solids is extremely low or negligible compared to liquids and gases. Hence, statement 4 is incorrect.

Additional Information

• Classification of Solids:

• Crystalline Solids: These possess a regular and repeating three-dimensional arrangement of particles throughout the crystal. They have sharp melting points and are considered true solids. Examples include Diamond, Graphite, and Sodium Chloride (NaCl).

• Amorphous Solids: These consist of particles arranged in an irregular or short-range order. They do not have sharp melting points and soften over a range of temperatures. They are often called pseudo-solids or super-cooled liquids. Examples include Glass, Rubber, and Plastic.

• Intermolecular Forces: These include London dispersion forces, dipole-dipole interactions, and hydrogen bonding. In solids, these forces are strong enough to overcome the thermal energy that would otherwise cause particles to move apart.

• Density: Generally, solids have a higher density than liquids and gases because the particles are tightly packed. A notable exception is ice, which is less dense than liquid water due to its open-cage hexagonal structure.

Important Points

• Kinetic Molecular Theory: This theory explains that the kinetic energy of particles in a solid is very low. Since the energy is insufficient to break the intermolecular bonds, the particles remain locked in a specific lattice structure.

• Effect of Temperature: When a solid is heated, its thermal energy increases, causing the particles to vibrate more violently. Eventually, at the melting point, the thermal energy overcomes the strong intermolecular forces, and the solid transitions into a liquid state (fusion).

• Isotropy and Anisotropy: Crystalline solids are anisotropic, meaning physical properties like electrical resistance or refractive index show different values when measured along different directions. In contrast, amorphous solids are isotropic, showing identical properties in all directions.

• Volume and Pressure: Unlike gases, where the volume is highly dependent on pressure (Boyle's Law), the volume of a solid remains virtually constant under ordinary changes in pressure.

Q19. Answer: (b) It enables plants to expand their distribution.

The correct answer is It enables plants to expand their distribution.

Key Points

• Seed dispersal is the biological process by which seeds are carried away from the parent plant to different locations for germination.

• The most significant benefit of this process is that it allows plant species to colonize new areas and expand their distribution across various geographical regions. Hence, the correct answer is option 2.

• It plays a crucial role in preventing overcrowding in a single area, which ensures that young seedlings do not have to struggle for survival in the shadow of the parent plant.

• By spreading seeds to distant locations, plants reduce competition for limited resources such as sunlight, water, and soil nutrients between the parent and the offspring. Hence, statement 4 is incorrect.

• Seed dispersal does not directly increase the mineral nutrients or water availability in the soil; rather, it helps the plant find locations where these resources are not already being depleted by the parent plant. Hence, statements 1 and 3 are incorrect.

Additional Information

• Modes of Seed Dispersal:

• Anemochory (Wind Dispersal): Plants produce lightweight seeds or seeds with wing-like structures or hairs. Examples include Dandelion, Maple, and Drumstick seeds which are carried over long distances by air currents.

• Hydrochory (Water Dispersal): Many aquatic plants or those growing near water bodies, such as Coconuts, develop fibrous or spongy outer coats that enable them to float and travel through rivers or oceans.

• Zoochory (Animal Dispersal): Seeds may have hooks or spines (like Xanthium and Urena) that attach to the fur of animals or clothing of humans. Alternatively, animals consume fleshy fruits (like Mango or Guava) and pass the seeds out in their droppings at a new location.

• Autochory (Explosive Action): Some plants have pods that dry up and burst open with a sudden jerk, throwing the seeds far from the mother plant. This is commonly seen in Balsam, Castor, and Pea plants.

• Ecological Significance:

• Survival Rate: Dispersal increases the probability of survival as it minimizes the risk of all offspring being destroyed by a single localized event like a pest attack or a small-scale environmental change.

• Genetic Diversity: It helps in maintaining genetic flow within a population by allowing plants to grow in diverse environments,

which is essential for the evolutionary adaptation of the species.

• Forest Regeneration: Natural seed dispersal is the primary mechanism for reforestation and the maintenance of biodiversity in natural ecosystems.

Q20. Answer: (b) Uterine irritation caused by the IUD

The correct answer is Uterine irritation caused by the IUD.

Key Points

• The Copper-T is a type of Intrauterine Device (IUD) that is inserted into the uterus to prevent pregnancy. Because it is a foreign object, the body may react to its presence, leading to uterine irritation and subsequent abdominal discomfort.

• When an IUD is inserted, it can cause the uterine muscles to contract or cramp as they adjust to the device. This physical irritation of the endometrium (uterine lining) is the most common cause of localized pain. Hence, statement 2 is correct.

• Infection in the stomach is usually caused by bacteria or viruses ingested through food or water and is physiologically unrelated to the placement of a contraceptive device in the reproductive tract. Hence, statement 1 is incorrect.

• Copper-T is a non-hormonal contraceptive method. It works through the release of copper ions rather than chemicals like estrogen or progesterone found in tablets; therefore, it does not cause hormonal imbalance associated with oral pills. Hence, statement 3 is incorrect.

• While certain infections (like PID) can lead to complications, a blockage in the fallopian tube is generally a cause of infertility and does not typically manifest as immediate abdominal discomfort specifically triggered by the presence of a Copper-T. Hence, statement 4 is incorrect.

Additional Information

• Mechanism of Copper-T:

• The Copper-T releases copper ions into the uterine cavity, which act as a spermicide. This environment is toxic to sperm, preventing fertilization by inhibiting sperm motility.

• It also causes a local inflammatory response in the uterus, which prevents a fertilized egg from implanting in the uterine wall.

• Types of IUDs:

• Non-Hormonal IUDs: Includes the Copper-T (CuT-380A), which can remain effective for up to 10 years.

• Hormonal IUDs: Devices like Mirena or Levonorgestrel-releasing systems (LNG-IUS) release progestin to thicken cervical mucus and thin the uterine lining.

• Side Effects:

• Common side effects of the Copper-T include menorrhagia (heavy menstrual bleeding) and dysmenorrhea (painful periods), especially during the first 3 to 6 months after insertion.

• Pelvic Inflammatory Disease (PID) is a rare risk, usually occurring shortly after insertion if bacteria are introduced into the reproductive tract.

• Application and Usage:

• IUDs are classified as Long-Acting Reversible Contraceptives (LARC). They are highly effective with a failure rate of less than 1%.

• The insertion must be performed by a trained healthcare professional or doctor to ensure the device is placed correctly within the fundus of the uterus.

Important Points

• Ideal Candidates: IUDs are often recommended for women who desire long-term birth control and want to avoid daily tablets or hormonal side effects.

• Post-Insertion Care: Patients are advised to check the IUD strings regularly to ensure the device has not been expelled, which occurs in about 2% to 10% of users.

• Contraindications: Women with unexplained vaginal bleeding, uterine fibroids that distort the cavity, or active pelvic infections should avoid using a Copper-T.

Q21. Answer: (b) Both statements A and B are correct.

The correct answer is Both statements A and B are correct.

Key Points

• Statement A: Sugarcane juice is a primary feedstock for the production of ethanol through a biological process known as fermentation. In this process, the sucrose present in the juice is converted into ethyl alcohol (C2H5OH) and carbon dioxide by the action of enzymes like invertase and zymase provided by yeast (Saccharomyces cerevisiae). Hence, statement A is correct.

• Statement B: Ethanol is an oxygenated fuel, meaning it contains 35% oxygen by weight. When blended with petrol, this extra oxygen facilitates more complete combustion of the fuel in the engine, which significantly reduces the emission of harmful pollutants such as carbon monoxide (CO) and unburnt hydrocarbons. This makes it a cleaner fuel alternative compared to 100% fossil-based gasoline. Hence, statement B is correct.

YourMockTest.com – Free Study Material

• The Government of India promotes this blending under the Ethanol Blended Petrol (EBP) Programme to reduce environmental pollution and decrease the country's dependence on crude oil imports.

• The use of bio-ethanol derived from agricultural sources like sugarcane, corn, and broken rice helps in carbon sequestration, as the carbon dioxide released during combustion is roughly equal to the amount absorbed by the plants during growth, making it a renewable energy source.

• Hence, the correct answer is both statements A and B are correct.

Additional Information

• National Policy on Biofuels: The Government of India notified the National Policy on Biofuels in 2018. This policy categorizes biofuels into "Basic Biofuels" (First Generation (1G) bioethanol & biodiesel) and "Advanced Biofuels" (Second Generation (2G) ethanol, Third Generation (3G) biofuels, etc.).

• Blending Targets: Initially, the target for 20% ethanol blending (E20) in petrol was set for the year 2030. However, the government later advanced this target to the 2025-26 period due to successful implementation and increased production capacity.

• Economic Impact: Increased use of ethanol benefits sugarcane farmers by providing them with an alternative market for their produce, especially during years of surplus production, thereby ensuring timely payment of dues by sugar mills.

• Chemical Properties: Ethanol is a colorless, flammable liquid with a boiling point of 78.37 degrees Celsius. It is miscible with water and most organic solvents, making it highly versatile for industrial use beyond just fuel.

Important Points

• Feedstock Diversity: Apart from sugarcane juice, ethanol is also produced from B-heavy molasses, C-heavy molasses, and damaged food grains like wheat and maize to ensure year-round availability.

• Engine Compatibility: While low-level blends like E5 and E10 can be used in most existing vehicles without modification, higher blends like E20 require material compatibility changes in the fuel system to prevent corrosion and degradation of rubber parts.

• Environmental Benefits: Studies indicate that E20 blending can reduce carbon monoxide emissions by approximately 30-50% in two-wheelers and 20% in four-wheelers compared to unblended petrol.

Q22. Answer: (b) The potential difference (V)

The correct answer is The potential difference (V).

Key Points

• In a parallel combination of resistors, the potential difference (V) remains the same across every individual resistor. This occurs because all resistors are connected directly across the same two nodes or points of the circuit. Hence, the statement regarding potential difference is correct.

• The total electric current (I) in a parallel circuit is the sum of the currents flowing through each branch. If the resistances are different, the current through each resistor will also be different. Hence, the statement regarding electric current is incorrect.

• The equivalent resistance (Req) of the combination is calculated using the reciprocal formula: 1/Req = 1/R1 + 1/R2 + ... + 1/Rn. The Req is always smaller than the smallest individual resistance in the group. Hence, the statement regarding equivalent resistance is incorrect.

• The power consumed (P) by each resistor depends on its resistance value. Since $P = V^2/R$ and V is constant, the resistor with the least resistance will consume the most power. Hence, the statement regarding power consumed is incorrect.

• According to Ohm's Law, which is V = IR, the current through each branch in a parallel circuit is inversely proportional to its resistance.

Additional Information

• Series Combination: Unlike parallel circuits, in a series combination, the electric current (I) remains the same through all resistors, while the potential difference (V) is distributed across them based on their resistance values.

• Household Wiring: Most domestic electrical circuits are connected in parallel. This ensures that every appliance receives the standard voltage (e.g., 220V in India) and can be turned on or off independently without affecting other devices.

• Circuit Reliability: In a parallel circuit, if one resistor or appliance fails or the path is broken, the current can still flow through the other parallel branches, allowing the rest of the system to function.

• Total Current Calculation: The total current I leaving the voltage source is equal to V / Req. This total current splits into different paths (I1, I2, etc.) and recombines before returning to the source.

• Applications: Parallel combinations are used in power grids, car headlights, and computer hardware to maintain constant operating voltages across multiple components.

Important Points

• Potential Difference (V): Measured in Volts (V) using a voltmeter, which is always connected in parallel to the component.

• Electric Current (I): Measured in Amperes (A) using an ammeter, which is always connected in series within a branch.

• Resistance (R): Measured in Ohms (Ω). In parallel, adding more resistors decreases the total equivalent resistance of the circuit.

• Short Circuit: If a branch with zero resistance is connected in parallel with other resistors, all the current will flow through that branch, effectively bypassing the others.

Q23. Answer: (c) Barium sulphate (BaSO4)

The correct answer is Barium sulphate (BaSO4).

Key Points

• The reaction between aqueous Sodium sulphate (Na2SO4) and aqueous Barium chloride (BaCl2) is a prominent example of a double displacement reaction.

• When these two colorless solutions are mixed, a chemical change occurs where the barium ions (Ba2+) and sulphate ions (SO4 2-) combine.

• The result of this combination is the formation of Barium sulphate (BaSO4), which is a white insoluble solid.

• Because Barium sulphate cannot dissolve in water, it emerges from the solution as a white precipitate, making the mixture appear cloudy or milky.

• The remaining sodium ions (Na+) and chloride ions (Cl-) stay in the solution to form Sodium chloride (NaCl), which remains in the aqueous state.

Additional Information

• Chemical Equation:

• The balanced molecular equation for this specific reaction is: Na2SO4 (aq) + BaCl2 (aq) → BaSO4 (s) + 2NaCl (aq).

• The (s) symbol next to Barium sulphate indicates its solid state, characterizing it as the precipitate formed during the process.

• Precipitation Reaction:

• A precipitation reaction is defined as a chemical reaction occurring in an aqueous solution where two ionic bonds combine to form an insoluble salt.

• These reactions are essential in qualitative inorganic analysis to identify the presence of specific ions in a sample.

• Double Displacement Concept:

• In a double displacement reaction, also known as a metathesis reaction, the cations and anions of two different compounds switch places to form two entirely new compounds.

• For this reaction, the sodium switches from sulphate to chloride, and the barium switches from chloride to sulphate.

• Properties of Barium Sulphate:

• Barium sulphate is a crystalline solid that is odorless and insoluble in water.

• Due to its high density and radio-opaque nature (ability to block X-rays), it is widely used in the medical field as a contrast agent for imaging the gastrointestinal tract.

• It is also utilized in the paint industry as a filler and in oil well drilling fluids to increase the density of the mud.

• Ionic Equation:

• The net ionic equation focuses only on the species that change state: Ba2+ (aq) + SO4 2- (aq) → BaSO4 (s).

• The sodium and chloride ions are considered spectator ions because they remain in the same aqueous state before and after the reaction.

Q24. Answer: (a) To make food alkaline and break down large fat globules

The correct answer is To make food alkaline and break down large fat globules.

Key Points

• Bile is a unique digestive fluid produced by the liver and stored in the gallbladder. Its primary role in the digestive system is to prepare fats for chemical digestion by enzymes.

• One of the main functions of bile is to neutralize the acidity of the food coming from the stomach. The stomach secretes hydrochloric acid (HCl), making the food mass (chyme) highly acidic. However, pancreatic enzymes and intestinal enzymes require an alkaline medium (pH around 7.0 to 8.0) to function effectively. Bile provides this alkaline environment in the small intestine. Hence, statement 1 is correct.

• Another vital function is the emulsification of fats. Fats are present in the food as large, insoluble globules that are difficult for the enzyme lipase to act upon. Bile salts break these large fat globules into significantly smaller droplets, increasing the total surface area for enzymatic action. Hence, statement 1 is correct.

• Bile does not contain any digestive enzymes, unlike saliva or gastric juice, but it acts as a critical detergent-like agent that facilitates the breakdown and subsequent absorption of lipids.

• The process of mixing food with saliva for easy swallowing is a function of the mouth (buccal cavity) and the salivary glands, not bile. Hence, statement 2 is incorrect.

• The conversion of glucose into glycogen is a metabolic function of the liver known as glycogenesis, but it is not a direct function of bile in the digestive tract. Hence, statement 3 is incorrect.

• The digestion of proteins begins in the stomach through the action of pepsin and is completed in the small intestine by trypsin and peptidases; bile does not digest proteins. Hence, statement 4 is incorrect.

Additional Information

YourMockTest.com — Free Study Material

• Composition of Bile:

• Bile is composed of water (about 97%), bile salts (such as sodium glycocholate and sodium taurocholate), bile pigments, cholesterol, and phospholipids.

• The primary bile pigments are bilirubin (yellow) and biliverdin (green), which are waste products derived from the breakdown of hemoglobin in worn-out red blood cells (RBCs).

• The Role of the Gallbladder:

• The gallbladder is a small, pear-shaped sac located under the liver. It does not produce bile but concentrates and stores it until needed.

• When fatty food enters the duodenum (the first part of the small intestine), the hormone cholecystokinin (CCK) is released, stimulating the gallbladder to contract and release bile through the common bile duct.

• Absorption of Vitamins:

• Bile is essential for the absorption of fat-soluble vitamins, which include Vitamin A, Vitamin D, Vitamin E, and Vitamin K. Without proper bile secretion, the body cannot effectively utilize these nutrients.

• Waste Excretion:

• Bile also serves as a route for the body to excrete waste products, such as excess cholesterol and bilirubin, which are eventually eliminated from the body via feces.

Important Points

• Liver: It is the largest gland in the human body, weighing about 1.2 to 1.5 kg in an adult. It performs over 500 functions, including detoxification, protein synthesis, and bile production.

• Emulsification: This physical process is similar to how soap breaks up grease. By creating a suspension of tiny fat droplets, bile ensures that lipase enzymes can work at a high catalytic rate.

• Clinical Correlation: If the bile duct is blocked (e.g., by gallstones), bile pigments can enter the bloodstream, leading to a condition called jaundice, characterized by the yellowing of the skin and eyes.

Q25. Answer: (b) The force becomes quadruple

The correct answer is The force becomes quadruple.

Key Points

• According to Newton's Law of Universal Gravitation, the force of attraction between two objects is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers.

• The mathematical formula for gravitational force is F = G * (m1 * m2) / r^2, where F is the gravitational force, G is the Universal Gravitational Constant, m1 and m2 are the masses of the two objects, and r is the distance between them.

• If the masses of both objects are doubled, the new masses become 2m1 and 2m2. The new force F' can be calculated as F' = G * (2m1 * 2m2) / r^2.

• By simplifying the expression, we get F' = 4 * [G * (m1 * m2) / r^2], which means the new force is exactly 4 times the original force. Hence, the statement that the force becomes four times greater is correct.

• This relationship demonstrates that gravity is highly sensitive to changes in mass; since it is a product relationship, doubling both components results in a quadruple effect (2 multiplied by 2).

Additional Information

• Universal Gravitational Constant (G):

• The value of G was first experimentally determined by Henry Cavendish in 1798.

• The accepted value of G is approximately 6.674 x 10^-11 N m^2/kg^2. It is a scalar quantity and remains constant throughout the universe.

• Inverse Square Law:

• The gravitational force follows the inverse square law with respect to distance.

• If the distance between two objects is doubled, the gravitational force becomes one-fourth (1/4) of its original value.

• If the distance is halved, the force increases by four times.

• Mass vs. Weight:

• Mass is an intrinsic property of an object and does not change regardless of location. It is measured in kilograms (kg).

• Weight is the gravitational force exerted on an object by a celestial body (like Earth). It is a vector quantity measured in Newtons (N) and changes based on the acceleration due to gravity (g) at a specific location.

Important Points

• Nature of Gravitational Force: It is the weakest of the four fundamental forces of nature (the others being electromagnetic, strong nuclear, and weak nuclear forces), yet it dominates the macro-scale of the universe.

• Central Force: Gravity is a central force, meaning it acts along the line joining the centers of the two masses.

• Universal Application: This law applies to all objects with mass, from subatomic particles to galaxies. It explains the orbits of

YourMockTest.com – Free Study Material

planets, the tides in the oceans, and the formation of stars.

• Vector Addition: When multiple objects are present, the net gravitational force on an object is the vector sum of the individual forces exerted by all other objects, a principle known as superposition.

Q26. Answer: (b) 3/4

Shortcut Trick

Identify the Highest Common Factor (HCF) of 72 and 96.

72 = 24 × 3 and 96 = 24 × 4.

HCF = 24.

Divide numerator and denominator by 24 → 3/4.

Therefore The correct answer is 3/4.

Alternate Method

Given: Fraction = 72/96

Formula Used: Lowest form = (Numerator ÷ HCF) / (Denominator ÷ HCF)

=> Prime factors of 72 = 2 × 2 × 2 × 3 × 3

=> Prime factors of 96 = 2 × 2 × 2 × 2 × 2 × 3

=> HCF = 2 × 2 × 2 × 3 = 24

=> Lowest form = (72 ÷ 24) / (96 ÷ 24)

=> Lowest form = 3/4

Therefore The correct answer is 3/4.

Additional Information

HCF (Highest Common Factor)

The largest positive integer that divides each of the integers without a remainder.

Simplest Form of a Fraction

A fraction is in its simplest form (or lowest terms) if its numerator and denominator are coprime, meaning their HCF is 1.

Equivalent Fractions

Fractions that have the same value even though they look different, obtained by multiplying or dividing both parts by the same non-zero number.

Q27. Answer: (a) 40°

Shortcut Trick

For any quadrilateral, the angle formed by the bisectors of two adjacent angles is equal to half the sum of the other two angles.

angle LZK = (angle I + angle J) ÷ 2

angle LZK = (36° + 44°) ÷ 2

angle LZK = 80° ÷ 2 = 40°

Therefore The correct answer is 40°.

Alternate Method

Given:

In quadrilateral IJKL:

angle I = 36°

angle J = 44°

The bisectors of angle K and angle L meet at Z.

Formula Used:

1. Sum of all interior angles of a quadrilateral = 360°

2. Sum of all angles of a triangle = 180°

Calculations:

In quadrilateral IJKL:

=> angle I + angle J + angle K + angle L = 360°

=> 36° + 44° + angle K + angle L = 360°

=> 80° + angle K + angle L = 360°

=> angle K + angle L = 360° − 80°

=> angle K + angle L = 280°

Dividing both sides by 2:

=> (angle K + angle L) ÷ 2 = 280° ÷ 2

=> angle K/2 + angle L/2 = 140°

Since KZ and LZ are angle bisectors of angle K and angle L respectively:

=> angle ZKL = angle K/2 and angle ZLK = angle L/2

=> angle ZKL + angle ZLK = 140°

In triangle LZK:

=> angle LZK + angle ZKL + angle ZLK = 180°

=> angle LZK + 140° = 180°

=> angle LZK = 180° − 140°

=> angle LZK = 40°

Option Analysis:

=> Option (1) 40° is the correct measure of angle LZK as calculated above.

=> Option (2) 55° is incorrect because it does not satisfy the angle sum property of ΔLZK where the sum of the half-angles must be 140°.

=> Option (3) 34° is incorrect because it would require the sum of the other two angles of the quadrilateral to be 68°, which contradicts the given sum of 80°.

=> Option (4) 54° is incorrect because it does not match the derived relation angle LZK = (angle I + angle J) ÷ 2.

Therefore The correct answer is 40°.

Additional Information

Angle Bisector Theorem in Quadrilaterals

The angle formed by the bisectors of two adjacent angles of a quadrilateral is always equal to half the sum of the remaining two angles. For adjacent angles A and B, the angle between their bisectors is (angle C + angle D) ÷ 2.

Sum of Interior Angles of a Polygon

The sum of the interior angles of any n-sided polygon is given by the formula (n − 2) × 180°. For a quadrilateral (n = 4), the sum is (4 − 2) × 180° = 360°.

Q28. Answer: (c) 7 seconds

Shortcut Trick

Relative Speed in opposite direction = 72 + 108 = 180 kmph.

Conversion to m/s = 180 × (5/18) = 50 m/s.

Total Distance to cover = Length1 + Length2 = 150 + 200 = 350 m.

Time Taken = Total Distance ÷ Relative Speed = 350 ÷ 50 = 7 sec.

Therefore The correct answer is 7 sec.

Alternate Method

Given:

Speed of Train 1 (S1) = 72 km/hr

Speed of Train 2 (S2) = 108 km/hr

Length of Train 1 (L1) = 150 m

Length of Train 2 (L2) = 200 m

Formula Used:

Time = (Total Length) ÷ (Relative Speed)

Relative Speed (Opposite) = S1 + S2

Calculations:

=> Total distance = 150 + 200 = 350 m

=> Relative Speed = 72 + 108 = 180 km/hr

=> Relative Speed in m/s = 180 × (5/18) = 50 m/s

=> Time taken = 350 ÷ 50

=> Time taken = 7 sec

Therefore The correct answer is 7 sec.

Additional Information

Relative Speed Concepts

When two objects move in opposite directions, relative speed is the sum of their speeds (S1 + S2). When they move in the same direction, relative speed is the difference (S1 − S2).

YourMockTest.com — Free Study Material

Speed Conversion

To convert km/hr to m/s, multiply by 5/18. To convert m/s to km/hr, multiply by 18/5.

Total Distance for Crossing

When a train crosses another train or a bridge, the total distance is always the sum of their lengths, regardless of the direction of movement.

Q29. Answer: (c) 69:70

Shortcut Trick

Initial Relative Speed = 80 + 60 = 140 km/hr.

New Speed of A = 80 − 10% of 80 = 72 km/hr.

New Speed of B = 60 + 10% of 60 = 66 km/hr.

New Relative Speed = 72 + 66 = 138 km/hr.

Since Time prop. to 1/Speed for constant distance: Ratio = 138 : 140 = 69 : 70.

Therefore The correct answer is 69:70.

Alternate Method

Given: Distance = 9660 km, Speed A = 80 km/hr, Speed B = 60 km/hr.

Formula: Time = Distance ÷ Relative Speed (Towards each other = S1 + S2).

=> Initial Relative Speed (V1) = 80 + 60 = 140 km/hr.

=> Initial Time (T1) = 9660 ÷ 140 = 69 hours.

=> New Speed A = 80 × 0.9 = 72 km/hr.

=> New Speed B = 60 × 1.1 = 66 km/hr.

=> New Relative Speed (V2) = 72 + 66 = 138 km/hr.

=> New Time (T2) = 9660 ÷ 138 = 70 hours.

=> Ratio T1 : T2 = 69 : 70.

Therefore The correct answer is 69:70.

Additional Information

Relative Speed Concept

When two objects move toward each other, relative speed is the sum of individual speeds. When they move in the same direction, it is the difference.

Inverse Proportion Rule

For a fixed distance, time is inversely proportional to speed (T1/T2 = V2/V1), allowing ratios to be solved without using the actual distance.

Q30. Answer: (b) 1/3

Shortcut Trick

Divide the numerator and denominator of the given expression by cos θ.

Expression = (1 − tan θ) ÷ (tan θ + 1)

Substitute tan θ = 1/2 → (1 − 1/2) ÷ (1/2 + 1) = (1/2) ÷ (3/2) = 1/3

Therefore The correct answer is 1/3.

Alternate Method

Given: tan θ = 1/2 (Perpendicular/Base)

Formula Used: sin θ = P/H and cos θ = B/H; H = √(P² + B²)

=> Let Perpendicular (P) = 1 and Base (B) = 2

=> Hypotenuse (H) = √(1² + 2²) = √5

=> sin θ = 1/√5 and cos θ = 2/√5

=> Expression = ((2/√5) − (1/√5)) ÷ ((1/√5) + (2/√5))

=> Expression = (1/√5) ÷ (3/√5) = 1/3

Therefore The correct answer is 1/3.

Additional Information

Trigonometric Ratios

tan θ = sin θ / cos θ. Always check if dividing by cos θ or sin θ simplifies the expression directly.

Pythagorean Identity

$\sin^2\theta + \cos^2\theta = 1$. This can be used to find cos θ if sin θ is known and vice versa.

YourMockTest.com — Free Study Material

Componendo and Dividendo

If a/b = c/d, then (a+b)/(a-b) = (c+d)/(c-d). Useful for expressions involving (cos+sin)/(cos-sin).

Q31. Answer: (d) 620

Shortcut Trick

The difference between the outer perimeter and inner perimeter of a track with uniform width depends only on the width of the curves.

Difference = 2 × π × width = 2 × (22/7) × 18 = 792/7 ≈ 113.14 m.

Outer Perimeter = Inner Perimeter + Difference = 504 + 113.14 = 617.14 m.

Rounding 617.14 m to the nearest tens gives 620 m.

Therefore The correct answer is 620 m.

Alternate Method

Given: Straight segment length (L) = 120 m, Track width (w) = 18 m, Inner perimeter = 504 m, π = 22/7.

The inner perimeter of the track consists of two straight segments and two semicircular arcs:

=> Inner Perimeter = 2 × L + 2 × π × r

=> 504 = 2(120) + 2 × (22/7) × r

=> 504 = 240 + (44/7)r

=> 264 = (44/7)r

=> r = (264 × 7) ÷ 44 = 6 × 7 = 42 m

The outer radius (R) is the sum of the inner radius and the track width:

=> R = r + width = 42 + 18 = 60 m

Now, calculate the outer perimeter using the outer radius:

=> Outer Perimeter = 2 × L + 2 × π × R

=> Outer Perimeter = 2(120) + 2 × (22/7) × 60

=> Outer Perimeter = 240 + 2640 ÷ 7

=> Outer Perimeter = 240 + 377.14 ≈ 617.14 m

Rounding to the nearest tens:

=> 617.14 m → 620 m

Therefore The correct answer is 620 m.

Additional Information

Track Perimeter Formula

For a stadium-shaped track, Perimeter = 2 × Length + 2 × π × Radius. The distance between the straight lines is the diameter (2r).

Area of a Track

Area = (Outer Area − Inner Area) = 2 × L × w + π($R^2 - r^2$), where L is the straight length and w is the width.

Nearest Tens Rounding Rule

If the last digit is 5 or greater, round up to the next ten (e.g., 617 becomes 620). If less than 5, round down.

Q32. Answer: (c) 62

Shortcut Trick

Assume a base value for the Mean, let it be 60.

Calculate deviations from 60: (+34, −1, −14, −26, −45, −5, +29, +38, +8).

Net sum of deviations = 34 − 1 − 14 − 26 − 45 − 5 + 29 + 38 + 8 = +18.

Correct Mean = Assumed Mean + (Net Deviation ÷ Total Observations) = 60 + (18 ÷ 9) = 60 + 2 = 62.

Therefore The correct answer is 62.

Alternate Method

Given: Observations = 94, 59, 46, 34, 15, 55, 89, 98, 68

Formula Used: Arithmetic Mean = (Sum of all observations) ÷ (Total number of observations)

Calculations:

=> Total sum = 94 + 59 + 46 + 34 + 15 + 55 + 89 + 98 + 68

=> Total sum = 558

=> Total number of observations (n) = 9

=> Arithmetic Mean = 558 ÷ 9

=> Mean = 62

Therefore The correct answer is 62.

Additional Information

Properties of Arithmetic Mean

The sum of deviations of items from their arithmetic mean is always zero. ∑(x − x) = 0.

Weighted Arithmetic Mean

When different weights (w) are assigned to observations (x), the mean is calculated as ∑wx ÷ ∑w.

Effect of Change of Origin and Scale

If each observation is increased or decreased by a constant 'k', the mean also increases or decreases by 'k'. If multiplied by 'k', the mean is also multiplied by 'k'.

Q33. Answer: (c) 38,808

Shortcut Trick

Volume of a sphere = 4/3 × π × r^3

Since the formula uses π (22/7), the volume must be a multiple of 11.

Check 38,808: (3 + 8 + 8) − (8 + 0) = 19 − 8 = 11 (Divisible by 11).

Also, since r = 21, the answer must be a multiple of 9.

Sum of digits: 3 + 8 + 8 + 0 + 8 = 27 (Divisible by 9).

Therefore The correct answer is 38,808 m^3.

Alternate Method

Given:

Radius of the spherical tank (r) = 21 m

Value of π = 22/7

Formula Used:

Volume of a sphere = (4/3) × π × r^3

Calculations:

=> Volume = (4/3) × (22/7) × 21 × 21 × 21

=> Volume = (4/3) × (22/7) × 9261

=> Volume = (88/21) × 9261

=> Volume = 88 × 441

=> Volume = 38,808 m^3

Therefore The correct answer is 38,808 m^3.

Additional Information

Surface Area of Sphere

The total surface area of a sphere is calculated using the formula 4 × π × r^2.

Volume of Hemisphere

The volume of a hemisphere is exactly half that of a sphere: (2/3) × π × r^3.

Total Surface Area of Hemisphere

For a solid hemisphere, the total surface area (TSA) is 3 × π × r^2.

Q34. Answer: (b) 100:39

Shortcut Trick

Successive reduction formula: Present Population = Initial Population × (100 − 40)% × (100 − 35)%

Initial : Present = 100 : (60/100 × 65)

Ratio = 100 : (0.6 × 65) = 100 : 39

Therefore The correct answer is 100:39.

Alternate Method

Given: First reduction = 40%, Second reduction = 35% of remaining, Present Population = 2340.

=> Let Initial Population be 100 units.

=> After 40% left, Remaining population = 100 − 40 = 60 units.

=> 35% of 60 left for jobs = 0.35 × 60 = 21 units.

=> Present Population = 60 − 21 = 39 units.

=> Ratio of Initial to Present = 100 : 39.
=> Check with given value: 39 units = 2340 => 1 unit = 60. Initial = 100 × 60 = 6000. Ratio = 6000 : 2340 = 100 : 39.
Therefore The correct answer is 100:39.
Additional Information
Successive Percentage Change
When a value is changed by x% and then by y%, the net change is [x + y + (xy/100)]%.
Population Depreciation Formula
Final Value = Initial Value × (1 − r1/100) × (1 − r2/100), where r is the rate of decrease.

Q35. Answer: (d) 8:9

Shortcut Trick
Use the Empirical Relationship: 2 × Mean = 3 × Median − Mode.
Substitute the ratio parts directly: Median = 9 and Mode = 11.
2 × Mean = 3(9) − 11 => 2 × Mean = 27 − 11 = 16.
Mean = 8.
The required ratio Mean : Median = 8 : 9.
Therefore The correct answer is 8:9.
Alternate Method
Given:
Ratio of Mode and Median = 11 : 9
Formula Used:
Empirical Formula: Mode = 3 × Median − 2 × Mean
Calculations:
=> Let Mode = 11x and Median = 9x.
=> According to the formula: 11x = 3(9x) − 2(Mean)
=> 11x = 27x − 2(Mean)
=> 2(Mean) = 27x − 11x
=> 2(Mean) = 16x
=> Mean = 8x
=> Ratio of Mean and Median = 8x : 9x
=> Mean : Median = 8 : 9
Therefore The correct answer is 8:9.
Additional Information
Empirical Relationship
For a moderately skewed distribution, the relationship is given by: Mean − Mode = 3 × (Mean − Median).
Symmetrical Distribution
In a perfectly symmetrical distribution (Normal Distribution), the Mean, Median, and Mode are all equal (Mean = Median = Mode).
Central Tendency Usage
Mean is sensitive to outliers; Median is the middle value used for skewed data; Mode represents the most frequent value.

Q36. Answer: (d) 234

Shortcut Trick
Given x = √10 + 3, then its reciprocal 1/x = √10 − 3.
Calculate the difference: k = x − 1/x = (√10 + 3) − (√10 − 3) = 6.
Use the shortcut formula: $x^3 - 1/x^3 = k^3 + 3k$.
Substitute $k = 6$: $x^3 - 1/x^3 = 6^3 + 3(6) = 216 + 18 = 234$.
Therefore The correct answer is 234.
Alternate Method
Given: x = √10 + 3
Formula Used: $x^3 - 1/x^3 = (x - 1/x)^3 + 3(x - 1/x)$
=> x = √10 + 3
=> 1/x = 1 / (√10 + 3)

=> Rationalizing the denominator: $1/x = (\sqrt{10} - 3) / [(\sqrt{10} + 3)(\sqrt{10} - 3)]$

=> $1/x = (\sqrt{10} - 3) / (10 - 9) = \sqrt{10} - 3$

=> $x - 1/x = (\sqrt{10} + 3) - (\sqrt{10} - 3) = 6$

=> $x^3 - 1/x^3 = (x - 1/x)^3 + 3 \times x \times (1/x) \times (x - 1/x)$

=> $x^3 - 1/x^3 = 6^3 + 3 \times 6$

=> $x^3 - 1/x^3 = 216 + 18 = 234$

Therefore The correct answer is 234.

Additional Information

Reciprocal Conjugate Rule

If $x = \sqrt{a} + \sqrt{b}$ and $a - b = 1$, then $1/x = \sqrt{a} - \sqrt{b}$. This simplifies calculation of $x \pm 1/x$.

Cube Algebraic Identities

$x^3 - 1/x^3 = (x - 1/x)^3 + 3(x - 1/x)$ and $x^3 + 1/x^3 = (x + 1/x)^3 - 3(x + 1/x)$.

Square Relation

$x^2 + 1/x^2 = (x - 1/x)^2 + 2 = (x + 1/x)^2 - 2$.

Q37. Answer: (d) 48,000

Shortcut Trick

Total ratio parts = 11 + 16 + 6 = 33.

Profit = 70% of Total Investment = Rs. 69,300.

Total Investment = (69,300 ÷ 70) × 100 = Rs. 99,000.

Unitary value = 99,000 ÷ 33 = Rs. 3,000 per ratio part.

Maya's investment = 16 ratio parts × Rs. 3,000 = Rs. 48,000.

Therefore The correct answer is Rs. 48,000.

Alternate Method

Given → Investment ratio = 11 : 16 : 6 | Total Profit = Rs. 69,300 | Profit % = 70% of Investment.

Formulas: Investment = (Profit ÷ Profit %) × 100 | Individual Investment = (Individual Ratio ÷ Total Ratio) × Total Investment.

=> Let investments be 11x, 16x, and 6x. Total investment = 33x.

=> 70% of 33x = 69,300.

=> 0.70 × 33x = 69,300.

=> 23.1x = 69,300.

=> x = 69,300 ÷ 23.1 = 3,000.

=> Maya investment = 16x = 16 × 3,000 = 48,000.

Therefore The correct answer is Rs. 48,000.

Additional Information

Partnership Profit Distribution

In a partnership, if the time period is constant, the profit is distributed in the direct ratio of the capital invested.

Capital Calculation from Profit %

If profit is given as a percentage of investment, then Total Investment = (Profit Amount × 100) ÷ Profit %.

Q38. Answer: (b) 16 years

Shortcut Trick

Sum of ages 4 years ago = 40 years

Present sum = 40 + (2 × 4) = 48 years

Ratio of Mohan : Suresh = 2 : 1

Suresh's present age = 48 × (1 / 3) = 16 years

Therefore The correct answer is 16 years.

Alternate Method

Given:

Present age of Suresh = x

Present age of Mohan = 2x

Calculations:

=> Age of Suresh 4 years ago = x − 4

=> Age of Mohan 4 years ago = 2x − 4

=> (2x − 4) + (x − 4) = 40

=> 3x − 8 = 40

=> 3x = 48

=> x = 16

Therefore The correct answer is 16 years.

Additional Information

Age Ratio Problems

When comparing ages at different points in time, the difference between ages of two people always remains constant regardless of the number of years passed.

Sum of Ages Shift

If there are 'n' people, the sum of their ages increases by n × t after 't' years and decreases by the same amount for 't' years ago.

Q39. Answer: (a) 1,20,000

Shortcut Trick

Incomes ratio = 5 : 8 | Expenditure ratio = 1 : 3

Since savings are equal (Rs. 84,000), make the difference between ratio parts equal.

Difference (5, 8) = 3 and (1, 3) = 2. Multiply Income by 2 and Expenditure by 3.

New Income ratio = 10 : 16 | New Expenditure ratio = 3 : 9

Savings (Income − Exp) = 10 − 3 = 7 units. Given 7 units = Rs. 84,000 → 1 unit = Rs. 12,000.

Rupesh income = 10 units = 10 × Rs. 12,000 = Rs. 1,20,000.

Therefore The correct answer is Rs. 1,20,000.

Alternate Method

Given: Ratio of income of Rupesh and Manjit = 5 : 8. Monthly saving of each = Rs. 84,000. Ratio of expenditure = 1 : 3.

Formula: Income − Savings = Expenditure

=> Let the incomes be 5x and 8x.

=> According to the question: (5x − 84,000) ÷ (8x − 84,000) = 1 ÷ 3

=> 3 × (5x − 84,000) = 1 × (8x − 84,000)

=> 15x − 2,52,000 = 8x − 84,000

=> 15x − 8x = 2,52,000 − 84,000

=> 7x = 1,68,000

=> x = 24,000

=> Monthly income of Rupesh = 5x = 5 × 24,000 = Rs. 1,20,000

Therefore The correct answer is Rs. 1,20,000.

Additional Information

Income-Expenditure Relation

Income = Expenditure + Savings. This is the fundamental equation for all financial ratio problems.

Proportionality in Ratios

When a constant value is added to or subtracted from both terms of a ratio, the new terms are found by equalizing the difference between the ratio parts.

Cross-Multiplication Method

For a : b and c : d with a constant change k, use |(a × d) − (b × c)| units = |k × (c − d)| to solve for 1 unit directly.

Q40. Answer: (b) 1,20,000

Shortcut Trick

Savings % = 100% − Expenditure % = 100% − 65% = 35%.

As per the question, 35% of Income = Rs. 42,000.

Total Income (100%) = (42,000 ÷ 35) × 100.

=> 1,200 × 100 = Rs. 1,20,000.

Therefore The correct answer is Rs. 1,20,000.

Alternate Method

Given:

Expenditure = 65% of Income

YourMockTest.com — Free Study Material

Total Savings = Rs. 42,000

Formula Used:

Income = Expenditure + Savings

Calculations:

Let the total income be 100 units.

=> Expenditure = 65 units

=> Savings = 100 − 65 = 35 units

=> 35 units = Rs. 42,000

=> 1 unit = 42,000 ÷ 35 = Rs. 1,200

=> 100 units = 1,200 × 100 = Rs. 1,20,000

Therefore The correct answer is Rs. 1,20,000.

Additional Information

Percentage Change in Income

If income increases by x% and expenditure increases by y%, the change in savings depends on the initial ratio of income to expenditure.

Base Value Concept

In problems involving income and expenditure, Total Income is always considered as the base value (100%) unless specified otherwise.

Savings Ratio

Savings to Income ratio = (100 − Expenditure %)/100. For this case, the ratio is 35/100 or 7/20.

Q41. Answer: (d) Rs. 10,648

Shortcut Trick

Net percentage change for 10% compound interest for 2 years = 10 + 10 + (10 × 10)/100 = 21%.

Total Amount = (100 + 21)% of Principal.

Amount = 121% of 8,800 = 1.21 × 8,800 = Rs. 10,648.

Therefore The correct answer is Rs. 10,648.

Alternate Method

Given:

Principal (P) = Rs. 8,800

Rate (R) = 10% per annum

Time (n) = 2 years

Formula Used:

Amount (A) = $P(1 + R/100)^n$

Calculations:

=> $A = 8,800 \times (1 + 10/100)^2$

=> $A = 8,800 \times (110/100) \times (110/100)$

=> $A = 8,800 \times (1.1) \times (1.1)$

=> $A = 8,800 \times 1.21$

=> $A = 88 \times 121$

=> A = Rs. 10,648

Therefore The correct answer is Rs. 10,648.

Additional Information

Compound Interest Calculation

Compound Interest is calculated as CI = Amount − Principal. In this case, CI = 10,648 − 8,800 = Rs. 1,848.

Successive Percentage Rule

For two successive changes of a% and b%, the effective change is [a + b + (ab/100)]%.

Compounding Frequency

If compounded half-yearly, the rate becomes R/2 and the time becomes 2n. If quarterly, the rate becomes R/4 and time becomes 4n.

YourMockTest.com — Free Study Material

Q42. Answer: (a) Rs. 1,182

Shortcut Trick

Total deduction = 71 + 38 + 20 = Rs. 129.

Remaining Total Sum = 6,129 − 129 = Rs. 6,000.

Sum of Ratio parts = 14 + 3 + 8 = 25 units.

Difference between Q and R shares (after deduction) = 8 − 3 = 5 units.

Difference in original shares = (6,000 ÷ 25) × 5 + (Difference of deductions) = 240 × 5 + (38 − 20) = 1,200 − 18 = Rs. 1,182.

Therefore The correct answer is Rs. 1,182.

Alternate Method

Given: Total sum = Rs. 6,129; Deductions for P, Q, R are Rs. 71, Rs. 38, Rs. 20; Ratio after deduction = 14 : 3 : 8.

=> Total Amount after deduction = 6,129 − (71 + 38 + 20) = Rs. 6,000

=> Let shares be 14x, 3x, and 8x.

=> 14x + 3x + 8x = 6,000 => 25x = 6,000

=> x = 6,000 ÷ 25 = 240

=> Original share of Q = 3x + 38 = 3(240) + 38 = 720 + 38 = Rs. 758

=> Original share of R = 8x + 20 = 8(240) + 20 = 1,920 + 20 = Rs. 1,940

=> Difference = 1,940 − 758 = Rs. 1,182

Therefore The correct answer is Rs. 1,182.

Additional Information

Ratio and Proportion Basics

If a sum S is divided in ratio a:b:c, the share of b is [b ÷ (a+b+c)] × S.

Deduction Principle

When fixed amounts are subtracted from various shares, the total sum is reduced by the sum of those subtractions before applying the ratio.

Difference calculation

Difference between (A+k1) and (B+k2) is (A−B) + (k1−k2).

Q43. Answer: (c) 10

Shortcut Trick

Assume all 20 coins are Rs. 5 coins: Total value = 20 × 5 = Rs. 100.

Difference from actual value = 100 − 70 = Rs. 30.

Difference between Rs. 5 and Rs. 2 coin values = 5 − 2 = Rs. 3.

Number of Rs. 2 coins = Total difference ÷ Value difference = 30 ÷ 3 = 10.

Therefore The correct answer is 10 coins.

Alternate Method

Given: Total coins = 20, Total value = Rs. 70.

Formula: Let number of Rs. 2 coins be x and Rs. 5 coins be (20 − x).

=> 2x + 5(20 − x) = 70

=> 2x + 100 − 5x = 70

=> −3x = 70 − 100

=> −3x = −30

=> x = 10

Therefore The correct answer is 10 coins.

Additional Information

Alligation Cross Method

Used to find the ratio of two quantities when their individual values and average value are known. Ratio = (High − Mean) : (Mean − Low).

Linear Equations in Two Variables

Problems involving two types of items can be solved using x + y = Total and ax + by = Value.

Assumption Method

By assuming all items belong to one category, the discrepancy in the total value directly helps find the quantity of the other category.

Q44. Answer: (b) 1

Shortcut Trick

Check odd numbers between 472 and 486: 473, 475, 477, 479, 481, 483, 485.

Eliminate non-primes: 473 (11×43), 475 (ends in 5), 477 (sum 18, div by 9), 481 (13×37), 483 (sum 15, div by 3), 485 (ends in 5).

Only 479 is not divisible by any prime up to √486 ≈ 22.

Therefore The correct answer is 1.

Alternate Method

Given: Range of numbers from 472 to 486.

Method: Listing and checking divisibility for numbers in the range.

=> Even numbers (474, 476, 478, 480, 482, 484) are not prime.

=> 473 ÷ 11 = 43 (Not prime)

=> 475 is divisible by 5 (Not prime)

=> 477: Sum of digits = 4+7+7 = 18, divisible by 3 and 9 (Not prime)

=> 479: Not divisible by 2, 3, 5, 7, 11, 13, 17, 19 (Prime)

=> 481 ÷ 13 = 37 (Not prime)

=> 483: Sum of digits = 4+8+3 = 15, divisible by 3 (Not prime)

=> 485 is divisible by 5 (Not prime)

=> Total prime numbers found = 1 (which is 479).

Therefore The correct answer is 1.

Additional Information

Prime Number Definition

A prime number is a natural number greater than 1 that has no positive divisors other than 1 and itself.

Primality Test

To check if n is prime, test divisibility by all primes less than or equal to √n.

Divisibility Rule of 11

A number is divisible by 11 if the difference between the sum of digits at odd places and even places is 0 or a multiple of 11.

Q45. Answer: (b) 5,922

Shortcut Trick

SP = MP × (100 − Discount%) ÷ 100

SP = 8,460 × (100 − 30) ÷ 100

SP = 8,460 × 0.70 = 5,922

Therefore The correct answer is Rs. 5,922.

Alternate Method

Given: Marked Price (MP) = Rs. 8,460 and Discount Percentage = 30%.

Formulas: Discount = (Discount% ÷ 100) × MP | SP = MP − Discount.

=> Calculate Discount amount = (30 ÷ 100) × 8,460.

=> Discount = 0.3 × 8,460 = Rs. 2,538.

=> Calculate Selling Price (SP) = 8,460 − 2,538.

=> SP = Rs. 5,922.

Therefore The correct answer is Rs. 5,922.

Additional Information

Marked Price & Discount

The Marked Price (MP) is the price printed on the label. Discount is always calculated on the MP to reach the Selling Price.

Net Selling Price

If the discount is d%, then SP = MP × (100 − d)/100.

Q46. Answer: (a) 20%

Shortcut Trick

Ratio of Cost Price (CP) to Selling Price (SP) = 850 : 1,020.

Dividing by 170: CP : SP = 5 : 6.

Profit = 6 − 5 = 1 unit.

Profit% = (1 ÷ 5) × 100 = 20%.

Therefore The correct answer is 20%.

Alternate Method

Given → CP = Rs. 850, SP = Rs. 1,020.

Formulas: Profit = SP − CP | Profit% = (Profit ÷ CP) × 100.

=> Profit = 1,020 − 850 = Rs. 170.

=> Profit% = (170 ÷ 850) × 100.

=> Profit% = (1 ÷ 5) × 100 = 20%.

Therefore The correct answer is 20%.

Additional Information

Profit and Loss Basics

Profit occurs when SP > CP. Loss occurs when CP > SP. Formula: Loss% = (Loss ÷ CP) × 100.

Selling Price Calculation

SP = CP × (100 + P%) ÷ 100 or SP = CP × (100 − L%) ÷ 100.

Q47. Answer: (d) 12

Shortcut Trick

Total Work (LCM of 24, 18, 36) = 72 units.

Efficiencies: A = 3, B = 4, C = 2.

A works for 4 days and leaves: 72 − (3 × 4) = 60 units remaining.

B leaves 3 days before completion, so add B's work for 3 days to the total: 60 + (4 × 3) = 72 units.

Time taken by B and C to finish this adjusted work = 72 ÷ (4 + 2) = 12 days.

Therefore The correct answer is 12 days.

Alternate Method

Person	Days	Total Work	Efficiency
A	24	72	3
B	18	4	
C	36	2	

Let the total time for the work be x days.

=> A worked for 4 days, B worked for (x − 3) days, and C worked for x days.

=> Work done by A + Work done by B + Work done by C = 72

=> (3 × 4) + 4(x − 3) + 2x = 72

=> 12 + 4x − 12 + 2x = 72

=> 6x = 72

=> x = 12

Therefore The correct answer is 12 days.

Additional Information

Leaving Before Completion Shortcut

If a person leaves n days before completion, add their n days' work to the total work and divide by the combined efficiency of the remaining workers.

Total Work and Efficiency

Total Work is always assumed as the LCM of individual days. Efficiency = Total Work ÷ Individual Time.

Work & Wages

Wages are distributed in the ratio of the actual work done by each person, not just their efficiencies.

Q48. Answer: (a) Scheme iii

Shortcut Trick

Scheme i net discount = 48%.

Scheme ii (31% and 44%) is clearly higher than 48% as the first discount alone is 31% and the total will exceed 48% (Approx 31 + 44 − 13.6 = 61.36%).

Scheme iii (32% and 21%) net = 32 + 21 − (32 × 21 ÷ 100) = 53 − 6.72 = 46.28%.

YourMockTest.com — Free Study Material

Comparing 48%, 61.36%, and 46.28%, the least discount is 46.28%.

For a customer, the least beneficial scheme is the one offering the lowest discount percentage.

Therefore The correct answer is Scheme iii.

Alternate Method

Formula: Successive Discount = a + b − (a × b ÷ 100)%

=> Scheme i: Discount = 48%.

=> Scheme ii: a = 31, b = 44. Net = 31 + 44 − (31 × 44 ÷ 100) = 75 − 13.64 = 61.36%.

=> Scheme iii: a = 32, b = 21. Net = 32 + 21 − (32 × 21 ÷ 100) = 53 − 6.72 = 46.28%.

=> Comparing all schemes: 61.36% (Best) > 48% > 46.28% (Worst).

=> Least beneficial to customer = lowest discount = Scheme iii.

Therefore The correct answer is Scheme iii.

Additional Information

Customer vs Retailer Benefit

For a customer, the maximum discount percentage is the most beneficial. For a retailer, the minimum discount percentage is the most beneficial.

Successive Discounts Formula

Total Discount % for two successive discounts x% and y% = [x + y − (xy ÷ 100)]%.

Q49. Answer: (a) 1/√2

Shortcut Trick

Use identity: $1/(a+b) - 1/(a-b) = -2b/(a^2 - b^2)$

=> Here a = 2, b = √2

=> $1/(2+\sqrt{2}) - 1/(2-\sqrt{2}) = -2\sqrt{2}/(4-2) = -\sqrt{2}$

Now expression = $\sqrt{2} + 1/\sqrt{2} - \sqrt{2}$

=> = $1/\sqrt{2}$

Therefore Answer = $1/\sqrt{2}$

Alternate Method

Given:

$\sqrt{2} + 1/\sqrt{2} + 1/(2+\sqrt{2}) - 1/(2-\sqrt{2})$

Concept Used:

Rationalization and BODMAS rule

Calculation:

=> Rationalize $1/(2+\sqrt{2})$: $(2-\sqrt{2})/(4-2) = (2-\sqrt{2})/2$

=> Rationalize $1/(2-\sqrt{2})$: $(2+\sqrt{2})/(4-2) = (2+\sqrt{2})/2$

=> Expression = $\sqrt{2} + 1/\sqrt{2} + (2-\sqrt{2})/2 - (2+\sqrt{2})/2$

=> = $\sqrt{2} + 1/\sqrt{2} + [2-\sqrt{2} - 2 - \sqrt{2}]/2$

=> = $\sqrt{2} + 1/\sqrt{2} + (-2\sqrt{2})/2$

=> = $\sqrt{2} + 1/\sqrt{2} - \sqrt{2}$

=> = $1/\sqrt{2}$

Therefore The correct answer is $1/\sqrt{2}$.

Additional Information

Rationalization

Multiply numerator and denominator by conjugate to remove root from denominator.

Conjugate Identity

$(a + b)(a - b) = a^2 - b^2$

Simplification Tip

Combine similar radical terms to reduce expression quickly.

Q50. Answer: (b) 9

Shortcut Trick

Combined efficiency of P and Q = 1/9

Efficiency of P alone = 1/12

Efficiency of Q alone = 1/9 − 1/12 = (4 − 3)/36 = 1/36

Time for Q to fill 1/4th cistern = (1/4) ÷ (1/36) = 36 ÷ 4 = 9 hours

Therefore The correct answer is 9 hours.

Alternate Method

Person	Days	Total Work	Efficiency
P + Q	9	36 units	4
P	12	3	

Given: Time taken by (P+Q) = 9 hours, Time taken by P = 12 hours.

Formula Used: Total Work = LCM of time; Efficiency = Total Work ÷ Time.

=> Total capacity of cistern = LCM(9, 12) = 36 units.

=> Efficiency of (P + Q) = 36 ÷ 9 = 4 units/hour.

=> Efficiency of P = 36 ÷ 12 = 3 units/hour.

=> Efficiency of Q = Efficiency of (P + Q) − Efficiency of P = 4 − 3 = 1 unit/hour.

=> Work to be done = 1/4 of Total Work = 1/4 × 36 = 9 units.

=> Time taken by Q = 9 units ÷ 1 unit/hour = 9 hours.

Therefore The correct answer is 9 hours.

Additional Information

Pipes & Cisterns Efficiency

The rate of work done by a pipe is its efficiency. If a pipe fills a tank in 'x' hours, its 1-hour work is 1/x of the tank capacity.

Inlet and Outlet Pipes

Inlet pipes (filling) are considered to have positive efficiency, while outlet pipes (emptying/leakage) are considered to have negative efficiency.

Combined Work Formula

If pipe A fills in x hours and pipe B in y hours, they fill together in (x × y)/(x + y) hours.

Q51. Answer: (a) XV – AC

Logic followed here is:

In each pair, the relationship between the first and second letter-clusters is based on the positional values of the letters. Specifically, the first letter of the first cluster is increased by 7 to get the first letter of the second cluster, and the second letter of the first cluster is increased by 6 to get the second letter of the second cluster.

(1) XV – AC →

For (2) OM – VS →

For (3) DB – KH →

For (4) FD – MJ →

Therefore, the letter-cluster pair that does not belong to the group is XV – AC.

Hence, the correct answer is "Option 1".

Q52. Answer: (d) Three

Given:

L is kept immediately above O.

Only M is kept below R. → M is at the bottom and R is just above M.

N is kept immediately above Q.

Only two boxes are kept above L. → L is at 3rd position from the top.

Position	Box
1	N
2	Q
3	L
4	O
5	S

YourMockTest.com – Free Study Material

6	R
7	M

N is at position 1.
S is at position 5.
Boxes between them:
Q, L, O
Total = 3 boxes
Hence, the correct answer is Option 4 — Three.

Q53. Answer: (c) C

Given:
Six people A, B, C, D, E and F are sitting in a row facing north.
Only two people sit to the left of F.
Only one person sits between D and E.
F sits to the immediate left of D.
A sits to the immediate right of C.
B sits third to the right of A.
The person sitting at the extreme left end is C.
Hence, the correct answer is Option 3.

Q54. Answer: (a) Two

Given:
B is kept second from the bottom.
Only three boxes are kept between B and A.
O is kept at one of the positions below B.
Only C is kept between A and D.
M is kept at one of the positions above A.
Final Arrangement:

Position	Box
1	M
2	A
3	C
4	D
5	N
6	B
7	O

Find boxes between N and A
A is at position 2.
N is at position 5.
Boxes between them:
C and D
Total = 2 boxes
Hence, the correct answer is Option 1 — Two.

Q55. Answer: (c) South-east

Given:
Vehicle A is to the west of vehicle B.
Vehicle C is to the east of vehicle B.
Vehicle D is to the north of vehicle B.

YourMockTest.com — Free Study Material

Vehicle E is to the south of vehicle C.

Vehicle F is to the north of vehicle C.

Find position of E with respect to A

From A to E:

• Move towards East

• Then move towards South

So, E is in the South-east direction with respect to A.

Hence, the correct answer is Option 3 — South-east.

Q56. Answer: (a) Two

Given:

A, B, C, D, E and F are sitting around a circular table facing the centre.

B sits third to the right of A.

E sits to the immediate left of D.

D is not an immediate neighbour of A.

F sits to the immediate right of C.

Original Arrangement (Clockwise from A)

A → F → C → B → D → E

Alphabetical Arrangement (Clockwise from A)

A → B → C → D → E → F

Compare Positions

Position	Original	Alphabetical	Same?
1	A	A	Yes
2	F	B	No
3	C	C	Yes
4	B	D	No
5	D	E	No
6	E	F	No

Only A and C remain in the same positions.

Hence, the correct answer is Option 1 — Two.

Q57. Answer: (b) Both conclusions (I) and (II) follow.

Given Statements:

Some pens are combs.

All shirts are tails.

All combs are shirts.

Logical Flow:

Checking Conclusions:

(I) Some tails are combs: Follows (because all combs are shirts and all shirts are tails. So combs are definitely tails. Hence, some tails are combs.)

(II) Some shirts are pens: Follows (because some pens are combs and all combs are shirts. Therefore, those pens are also shirts. Hence, some shirts are pens.)

Therefore, both conclusions (I) and (II) follow.

Hence, the correct answer is Both conclusions (I) and (II) follow.

Q58. Answer: (d) 87 km towards west

Given:

Mudit starts from Point Y and:

Drives 92 km towards South

Takes a left turn and drives 59 km

YourMockTest.com — Free Study Material

Takes a left turn and drives 38 km

Takes a right turn and drives 28 km

Takes a left turn and drives 54 km to reach Point Z

Net Movement Calculation

North-South:

• South = 92 km

• North = 38 + 54 = 92 km

Vertical movement cancels out.

East-West:

• East = 59 + 28 = 87 km

So Point Z is 87 km East of Point Y.

To reach Point Y again

Mudit must move 87 km towards West.

Hence, the correct answer is Option 4 — 87 km towards West.

Q59. Answer: (c) 14

Given Numbers:

324, 526, 249, 267, 185

Step 1: Find the highest and lowest numbers

Highest number = 526

Lowest number = 185

Step 2: Find required digits

For 526:

Third digit of highest number = 6

For 185:

Second digit of lowest number = 8

Step 3: Add the digits

6 + 8 = 14

Hence, the correct answer is "Option 4".

Q60. Answer: (c) Both conclusions (I) and (II) follow.

Given Statements:

Some Mercuries are Venuses.

All Venuses are Earths.

No Earth is Mars.

Logical Flow:

Checking Conclusions:

(I) Some Mercuries are Earths: Follows (because some Mercuries are Venuses and all Venuses are Earths. Therefore, those Mercuries are also Earths.)

(II) No Venus is Mars: Follows (because all Venuses are Earths and no Earth is Mars. Therefore, no Venus can be Mars.)

Therefore, both conclusions (I) and (II) follow.

Hence, the correct answer is Both conclusions (I) and (II) follow.

Q61. Answer: (c) RSWX

Logic followed here is:

Each letter in the first group is shifted forward by 10 positions in the English alphabetical series to obtain the corresponding letter of the second group.

For LMQR is related to VWAB →

IJNO is related to STXY →

The pattern observed is: Every letter is shifted by +10.

Similarly, let's find the code for HIMN:

Therefore, 'HIMN' is related to 'RSWX'.

Hence, the correct answer is "Option 3".

YourMockTest.com — Free Study Material

Q62. Answer: (a) 41

The conversion table for letters to operators is as follows:

P	Q	R	S
×	÷	•	•

Applying the logic to the given equation:

3 P 9 R (14 Q 2) P 6 S 80 Q 5 S 4 P 10 = ?

Substitute the symbols into the equation:

3 × 9 - (14 ÷ 2) × 6 + 80 ÷ 5 + 4 × 10

=> 27 - 7 × 6 + 16 + 40 = ?

=> 27 - 42 + 56 = ?

=> 83 - 42 = ?

=> 41 = ?

Therefore, the value that will come in place of the question mark is 41.

Hence, the correct answer is "Option 1".

Q63. Answer: (d) PV57

Given Series: LR21 MS30 NT39 OU48 ?

The pattern followed here is:

Therefore According to the pattern followed here PV57 will replace the (?) mark.

Hence, the correct answer is "Option 4".

Q64. Answer: (a) WGD : ABH

Logic followed here is:

Each letter in the first word is shifted by a constant numerical value to obtain the corresponding letter in the second word of the pair.

GAN is related to KVR →

OQV is related to SLZ →

Similarly,

Option 1) WGD : ABH:

Therefore, the pair 'WGD : ABH' follows the same pattern.

Hence, the correct answer is "Option 1".

Q65. Answer: (d) br

Given:

‘video oak bell’ is coded as ‘of br mw’

‘hair bell dew’ is coded as ‘br ui ee’

Therefore, ‘bell’ is coded as ‘br’.

Hence, the correct answer is Option 4 — br.

Q66. Answer: (d) Sister's son

Given:

Symbol	Meaning
A x B	A is the wife of B
A – B	A is the daughter of B
A ÷ B	A is the father of B
A + B	A is the son of B

Expression:

L + M – N x P ÷ Q: L is the son of M. M is the daughter of N. Nis the wife of P. P is the father of Q.

Find relation of L to Q

M is Q’s sister.

L is M’s son.
Therefore, L is Q’s sister’s son.
Hence, the correct answer is Option 4 — Sister's son.

Q67. Answer: (a) OGS

Given Series : ASE KCO UMY EWI ?
The pattern followed here is:
Therefore According to the pattern followed OGS will replace the (?) mark.
Hence, the correct answer is "Option 1".

Q68. Answer: (d) FLQ

Logic followed here is:
The difference between the positional values of consecutive letters in the clusters is analyzed.
1) EKN →
2) TZC →
3) OUX →
4) FLQ →
Therefore, the letter-cluster 'FLQ' does not belong to the group.
Hence, the correct answer is "Option 4".

Q69. Answer: (c) pm

Given:
‘trust brings peace’ is coded as ‘tg dx pm’
‘find trust within’ is coded as ‘pm av wj’
Therefore, ‘trust’ is coded as ‘pm’.
Hence, the correct answer is Option 3 — pm.

Q70. Answer: (d) (3,4, 13)

Logic followed here is: The third number is obtained by multiplying the first and second numbers and then adding 1 to the product.
For
(5, 3, 16) →
Calculation = (5 × 3) + 1 = 15 + 1 = 16
(7, 2, 15) →
Calculation = (7 × 2) + 1 = 14 + 1 = 15
Similarly, Option 4) (3, 4, 13):
Calculation = (3 × 4) + 1 = 12 + 1 = 13
Therefore, the set that follows the same logic is (3, 4, 13).
Hence, the correct answer is "Option 4".

Q71. Answer: (a) 3

Logic followed here is:
According to the given information, seven people are sitting in a row facing
Only five people sit between D and B.
C sits to the immediate left of B.
Only one person sits between C and A.
F sits at some place to the left of G but at some place to the right of E.
To the right of A are: G, C, and B.
Number of people = 3
Therefore, the number of people sitting to the right of A is 3.
Hence, the correct answer is "Option 1".

Q72. Answer: (b) 2

Given Series:
(Left) 6 3 3 £ * 9 € £ € $ 9 @ 7 4 5 # 9 2 1 £ 7 5 (Right)

YourMockTest.com — Free Study Material

Required pattern: Number → Symbol → Symbol

Checking the series:

6 3 3 £ * 9 9 € £ € $ 9 @ 7 4 5 # 9 2 1 £ 7 5

Symbols satisfying the condition:

→ £ in (3 £ *)

→ € in (9 € £)

Therefore, there are 2 such symbols.

Hence, the correct answer is Option 2.

Q73. Answer: (a) ROAD – ODRA – AROD

Logic followed here is: The second and third words in each triad are formed by rearranging the letters of the first word based on specific positional changes.

For DUAL – ULDA – ADUL →

Word 2 (ULDA) = Positions (2, 4, 1, 3) of Word 1.

Word 3 (ADUL) = Positions (3, 1, 2, 4) of Word 1.

For RATE – AERT – TRAE →

Word 2 (AERT) = Positions (2, 4, 1, 3) of Word 1.

Word 3 (TRAE) = Positions (3, 1, 2, 4) of Word 1.

Similarly, Option 1) ROAD – ODRA – AROD:

Word 2 (Positions 2, 4, 1, 3) = O, D, R, A → ODRA

Word 3 (Positions 3, 1, 2, 4) = A, R, O, D → AROD

Therefore, the triad 'ROAD – ODRA – AROD' follows the same logic.

Hence, the correct answer is "Option 1".

Q74. Answer: (b) 2

Given Series:

(Left) 8 2 2 4 3 9 4 3 8 9 5 5 6 5 3 7 5 3 9 6 6 5 3 1 8 1 8 (Right)

Required pattern: Even → Odd → Even

Checking the series:

(Left) 8 2 2 4 3 9 4 3 8 9 5 5 6 5 3 7 5 3 9 6 6 5 3 1 8 1 8 (Right)

Odd numbers satisfying the condition:

→ 3 in (4 3 8)

→ 1 in (8 1 8)

Therefore, there are 2 such odd numbers.

Hence, the correct answer is Option 2.

Q75. Answer: (d) 63

Given Series: 1, 3, 7, 15, 31, ?

The pattern followed here is:

Therefore According to the logic followed here 63 will replace the (?) mark.

Hence, the correct answer is "Option 4".

Q76. Answer: (a) 18

Given Equation:

4 ÷ 2 + 15 × 5 - 8 = ? + 5 →

÷	•	×	•
×	•	÷	•

Applying the interchange to the entire equation:

Equation becomes: 4 × 2 - 15 ÷ 5 + 8 = ? - 5

Applying BODMAS rule:

=> (4 × 2) - (15 ÷ 5) + 8 = ? - 5

=> 8 - 3 + 8 = ? - 5

YourMockTest.com — Free Study Material

=> 16 - 3 = ? - 5

=> 13 = ? - 5

=> ? = 18

Therefore, the code for '?' is 18.

Hence, the correct answer is "Option 1".

Q77. Answer: (d) 50

Given series : 0 5 15 30 ? 75

The logic applied here is:

Therefore According to the logic followed here 50 will replace the (?) mark.

Hence, the correct answer is "Option 4".

Q78. Answer: (a) More than three

Given Series:

(Left) 4 8 7 6 3 9 3 2 8 2 9 4 5 6 5 4 1 3 5 9 7 9 9 4 2 5 3 6 1 7 2 (Right)

Required pattern: Perfect Square → Odd → Even

Perfect square numbers: 1, 4, 9

Checking the series:

(Left) 4 8 7 6 3 9 3 2 8 2 9 4 5 6 5 4 1 3 5 9 7 9 9 4 2 5 3 6 1 7 2 (Right)

Odd numbers satisfying the condition:

→ 3 in (9 3 2)

→ 5 in (4 5 6)

→ 9 in (9 9 4)

→ 7 in (1 7 2)

Total such odd numbers = 4

Hence, the correct answer is Option 1.

Q79. Answer: (b) 89

Given Series: 119 110 102 95 ? 84 80

The logic followed here is:

Therefore According to the logic followed here 89 will replace the (?) mark.

Hence, the correct answer is "Option 2".

Q80. Answer: (d) 554

Given Equation:

59 ÷ 11 + 833 × 7 - 24 = ? →

÷	•	×	•
×	•	÷	•

After interchanging the signs, the new equation is: 59 × 11 - 833 ÷ 7 + 24

Solving using BODMAS rule:

=> (59 × 11) - (833 ÷ 7) + 24 = ?

=> 649 - (833 ÷ 7) + 24 = ?

=> 649 - 119 + 24 = ?

=> 674 - 119 = ?

=> 554 = ?

Therefore, the code for the question mark is 554.

Hence, the correct answer is "Option 4".

Q81. Answer: (b) SDG 1

The correct answer is SDG 1.

Key Points

• According to the Sustainable Development Report 2025, India has shown significant progress in SDG 1, which stands for No Poverty. This goal aims to end poverty in all its forms everywhere by the year 2030. Hence, option 2 is correct.

YourMockTest.com — Free Study Material

• India is categorized as being on track or maintaining SDG achievement for this specific goal, largely due to robust Direct Benefit Transfer (DBT) mechanisms and extensive social safety nets.

• While progress varies across other goals, SDG 1 reflects the impact of schemes like the PM Garib Kalyan Anna Yojana and the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) in reducing extreme financial vulnerability.

• In contrast, SDG 9 (Industry, Innovation, and Infrastructure) shows moderate improvement but faces structural challenges in full achievement. Hence, option 1 is incorrect.

• SDG 13 (Climate Action) and SDG 14 (Life Below Water) continue to face significant or major challenges, with progress often stagnating due to environmental pressures and global climate shifts. Hence, options 3 and 4 are incorrect.

Additional Information

• Sustainable Development Goals (SDGs):

• The SDGs were adopted by all United Nations Member States in 2015 as a universal call to action to end poverty, protect the planet, and ensure peace and prosperity by 2030.

• There are 17 Goals and 169 Targets that are integrated and recognize that action in one area will affect outcomes in others.

• SDG 1 - No Poverty:

• This goal targets the eradication of extreme poverty for all people everywhere, currently measured as people living on less than $2.15 a day.

• It also focuses on implementing social protection systems and ensuring equal rights to economic resources.

• Sustainable Development Report (SDR):

• The SDR is published annually by the Sustainable Development Solutions Network (SDSN). It provides a global assessment of countries' progress towards the SDGs.

• The report includes the SDG Index and Dashboards, which use a traffic light system (Green, Yellow, Orange, Red) to visualize progress and remaining gaps.

• NITI Aayog and SDGs in India:

• In India, NITI Aayog is the nodal agency for monitoring SDG implementation. It releases the SDG India Index, which ranks States and Union Territories based on their performance.

• The Multidimensional Poverty Index (MPI) released by NITI Aayog has previously highlighted that millions of Indians have moved out of multidimensional poverty between 2015-16 and 2019-21.

• Other SDGs mentioned:

• SDG 9: Focuses on building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation.

• SDG 13: Urges immediate action to combat climate change and its impacts.

• SDG 14: Aims to conserve and sustainably use the oceans, seas, and marine resources.

Q82. Answer: (b) Flesh

The correct answer is Flesh.

Key Points

• David Szalay is a highly acclaimed British-Canadian novelist known for his distinct narrative structure and focus on the mundane yet profound aspects of human life.

• In 2025, his novel titled Flesh was awarded the prestigious Booker Prize, recognizing it as the best work of long-form fiction published in the United Kingdom and Ireland that year.

• The novel Flesh explores intricate themes of physical existence, mortality, and the sensory experiences that define the human condition. It was lauded by the judging panel for its visceral prose and emotional resonance.

• Prior to this win, David Szalay gained significant international attention when his work All That Man Is was shortlisted for the Booker Prize in 2016.

• The other options provided, such as The Sea of Trees, Heart Lamp, and Last Empire, are fictional titles or distractors in this context and did not receive the award in 2025. Hence, the correct answer is Flesh.

Additional Information

• The Booker Prize:

• Established in 1969, it was originally known as the Booker–McConnell Prize. It is one of the world's leading literary awards, bringing global recognition to the winning author.

• The prize is open to writers of any nationality, provided their novel is written in English and published in the UK or Ireland.

• The winner receives a cash prize of £50,000, while each of the shortlisted authors receives £2,500 and a specially bound edition of their book.

• About David Szalay:

• Born in Montreal, Canada, in 1974, he moved to the United Kingdom during his childhood and was educated at Oxford

University.

• His debut novel, London and the South-East, was published in 2008 and won the Betty Trask Award and the Geoffrey Faber Memorial Prize.

• He is celebrated for his "composite novels" or short story cycles that function as a single thematic unit, a technique prominently seen in his 2016 work.

• Literary Impact:

• Winning the Booker Prize often results in the "Booker Effect," where the winning title sees a massive increase in international sales and translation rights deals across the globe.

• The selection process involves a panel of five judges, typically consisting of critics, writers, academics, and notable public figures, who read over 150 novels to decide the winner.

Q83. Answer: (d) Ramses mission

The correct answer is Ramses mission.

Key Points

• The Indian Space Research Organisation (ISRO) has expressed its intent to join the European Space Agency (ESA) for the Ramses mission to study the asteroid Apophis.

• Ramses stands for Rapid Apophis Mission for Space Safety, a specialized mission designed to rendezvous with the asteroid before its close encounter with Earth in 2029.

• ISRO Chairman S. Somanath officially stated during a workshop on Planetary Defense that India is looking to collaborate by potentially providing scientific instruments or technical support for the mission.

• The mission aims to observe the changes in the asteroid's physical characteristics and orbital trajectory as it is subjected to the gravitational pull of Earth.

• This collaboration is part of a global effort to enhance Planetary Defense capabilities, ensuring that space agencies are prepared for potential Near-Earth Object (NEO) impacts in the future.

Additional Information

• About Asteroid Apophis:

• Scientifically known as 99942 Apophis, it was first discovered in 2004 and was initially considered a significant threat to Earth.

• The asteroid is approximately 340 to 375 meters in diameter, making it larger than nearly 90% of other near-Earth asteroids.

• On April 13, 2029, it is expected to pass within 32,000 kilometers of Earth’s surface, which is closer than the orbits of geostationary satellites.

• Other Missions to Apophis:

• NASA is also participating in the study of this asteroid through its OSIRIS-APEX mission (formerly OSIRIS-REx).

• While OSIRIS-APEX will reach the asteroid shortly after its close flyby, the ESA-led Ramses mission aims to be there before the encounter to witness the transition.

Important Points

• Scientific Significance: The flyby is a once-in-a-millennium opportunity for scientists to observe how an asteroid's rotation and surface structure (including potential "asteroid quakes") change due to tidal forces from a planet.

• Planetary Defense: The data gathered from the Ramses mission will be crucial for Planetary Defense strategies, helping scientists understand how to deflect or mitigate the impact of hazardous asteroids in the future.

• ISRO's Growing Role: India’s interest in the Ramses mission marks a significant expansion of ISRO's footprint in deep-space exploration and international scientific diplomacy beyond lunar and martian missions.

• ESA's Timeline: The ESA must launch the Ramses spacecraft by early 2028 to ensure it arrives at Apophis in time for the April 2029 event.

Q84. Answer: (b) Kirsty Coventry

The correct answer is Kirsty Coventry.

Key Points

• Kirsty Coventry, a legendary swimmer from Zimbabwe, was elected as the President of the International Olympic Committee (IOC) in March 2025.

• Her election is a landmark event in sporting history, as she became the first woman and the first individual from the African continent to lead the organization since its founding in 1894.

• She succeeded Thomas Bach, who served as the IOC President for 12 years from 2013 to 2025.

• Coventry is one of the most decorated Olympians in history, having won a total of 7 Olympic medals (including 2 Gold, 4 Silver, and 1 Bronze) across the 2004 Athens and 2008 Beijing Olympic Games.

• Before ascending to the presidency, she held significant administrative roles, including serving as Zimbabwe's Minister of Sport, Arts, and Recreation and the Chair of the IOC Athletes' Commission from 2018 to 2021.

• The election took place during the 143rd IOC Session held in Ancient Olympia, Greece, where she secured the majority of votes against other prominent candidates.

Additional Information

• International Olympic Committee (IOC):

• The IOC is a non-governmental sports organization based in Lausanne, Switzerland.

• It is the supreme authority of the Olympic Movement and is responsible for the supervision and administration of the Summer and Winter Olympic Games.

• The Olympic Charter governs the organization, outlining the rules and guidelines for the Games and the conduct of the committee members.

• Kirsty Coventry's Athletic Career:

• Known as Africa's "Golden Girl," she is the most successful African Olympian in the history of swimming.

• She competed in five consecutive Olympic Games, starting from Sydney 2000 to Rio 2016.

• Her primary events were the 100m and 200m backstroke, as well as individual medley events.

• Other Options Overview:

• Penny Heyns: A former South African swimmer who made history at the 1996 Atlanta Olympics by winning gold in both the 100m and 200m breaststroke.

• Cathy Freeman: An Australian former sprinter who specialized in the 400 meters and famously won the gold medal at the 2000 Sydney Olympics.

• Inge de Bruijn: A Dutch former competitive swimmer and four-time Olympic champion who held multiple world records in the early 2000s.

Important Points

• Historical Context: Since 1894, the IOC has had eight presidents, all of whom were men, and seven of whom were from Europe (with the exception of Avery Brundage from the USA).

• Presidential Term: Under the current Olympic Charter, the president is elected by secret ballot for an initial term of eight years, with the possibility of being re-elected for a second term of four years.

• Diversity and Inclusion: Coventry's presidency is seen as a pivotal shift toward gender equality and global representation within the highest echelons of international sports governance.

• Vision: During her campaign, she emphasized transparency, the protection of clean athletes, and increasing the accessibility of sports in developing nations.

Q85. Answer: (a) Banking Regulation Act, 1949

The correct answer is Banking Regulation Act, 1949.

Key Points

• The Banking Laws (Amendment) Bill was introduced to amend several key legislations governing the financial sector in India, primarily the Reserve Bank of India Act, 1934 and the Banking Regulation Act, 1949.

• One of the most significant changes introduced by the bill is the provision for multiple nominations. Previously, depositors could only nominate one individual per account; the new amendment allows for up to four nominees, including the provision for successive and simultaneous nominations.

• The bill proposes to change the reporting dates for banks. Instead of the current system of reporting based on alternate Fridays, banks will now report their regulatory compliance data (like CRR and SLR) on the 15th and the last day of every month.

• The Banking Regulation Act, 1949 is being amended to increase the maximum tenure of directors (other than the chairman or full-time director) in cooperative banks from the current 8 years to 10 years.

• The amendment also redefines "substantial interest" for directorships. The threshold for what constitutes a substantial interest is being increased from the previous limit of Rs 5 lakhs to Rs 2 crores, reflecting modern economic scales. Hence, the correct answer is Banking Regulation Act, 1949.

Additional Information

• Banking Regulation Act, 1949:

• This is a landmark legislation in India that provides a framework for the supervision and regulation of all banking firms.

• It grants the Reserve Bank of India (RBI) the power to license banks, regulate shareholding, and conduct inspections to ensure the stability of the financial system.

• In 2020, the act was further amended to bring cooperative banks under the direct supervision of the RBI to protect depositors' interests.

• Reserve Bank of India (RBI) Act, 1934:

• This act established the RBI as the Central Bank of India, which commenced operations on April 1, 1935.

• It outlines the RBI's functions, including the issuance of currency notes and the management of the country's monetary policy.

• Negotiable Instruments Act, 1881:

• This law governs promissory notes, bills of exchange, and cheques. It defines the legalities behind the transfer of these instruments and the penalties for cheque bouncing under Section 138.

• Payment and Settlement Systems Act, 2007:

• This act provides for the regulation and supervision of payment systems in India, designating the RBI as the authority for all electronic payments, UPI, and card settlements.

Important Points

• Impact on Public Sector Banks: The bill also amends the Banking Companies (Acquisition and Transfer of Undertakings) Acts of 1970 and 1980 to give more autonomy to the boards of Public Sector Banks (PSBs).

• Unclaimed Deposits: By allowing up to four nominees, the government aims to reduce the volume of unclaimed deposits in the banking system, which has been a growing concern for the Ministry of Finance and the RBI.

• Governance in Cooperatives: The extension of director tenure to 10 years is intended to align the governance of cooperative banks with that of other corporate entities, ensuring continuity and professional management.

Q86. Answer: (a) Machilipatnam and Kalingapatnam

The correct answer is Machilipatnam and Kalingapatnam.

Key Points

• The India Meteorological Department (IMD) monitored the development of a deep depression in the Bay of Bengal, which intensified into the severe cyclonic storm named "Montha" in October 2025.

• The storm made its official landfall along the Andhra Pradesh coast, specifically crossing the shoreline between the administrative and geographical landmarks of Machilipatnam and Kalingapatnam. Hence, the correct answer is Machilipatnam and Kalingapatnam.

• During the landfall process, the wind speeds associated with Montha were recorded at significant levels, categorizing it as a Severe Cyclonic Storm under the standard IMD classification scales.

• The impact area spanned several coastal districts, where the IMD issued Red Alerts to facilitate the evacuation of residents from low-lying areas to cyclone shelters.

• The timing of the storm in October aligns with the peak post-monsoon cyclone season in the North Indian Ocean, which typically sees high-intensity weather systems.

Additional Information

• Cyclone Classification: The India Meteorological Department (IMD) classifies tropical disturbances based on Maximum Sustained Surface Wind Speed (MSW). A Severe Cyclonic Storm features wind speeds between 48 to 63 knots (approx. 89 to 117 kmph).

• Geographic Focus:

• Machilipatnam: Located in the Krishna district of Andhra Pradesh, it is a historic port town often prone to storm surges.

• Kalingapatnam: Situated in the Srikakulam district, it marks a significant point on the northern coast of the state where several historical cyclones have made landfall.

• Naming Conventions: The name "Montha" was selected from the list provided by the WMO/ESCAP member nations. This naming system ensures clear communication between disaster management agencies and the general public.

• Vulnerability of Andhra Pradesh: The state possesses a coastline of about 974 km. Due to the funneling effect of the Bay of Bengal, it is one of the most cyclone-prone regions in India, particularly during the October to December period.

Important Points

• Disaster Management: The National Disaster Response Force (NDRF) and the State Disaster Response Force (SDRF) are the primary agencies responsible for search and rescue operations during such events.

• Storm Surge: Cyclones like Montha often cause a storm surge, which is an abnormal rise of water over and above the predicted astronomical tides, leading to coastal inundation.

• Impact on Agriculture: October is a critical month for the Kharif crop harvest in Andhra Pradesh; therefore, severe storms like Montha can cause extensive damage to paddy and horticulture crops.

• Role of Technology: Modern forecasting uses Satellite Imagery (such as INSAT-3DR) and Doppler Weather Radars located along the coast to provide real-time tracking of the storm's eye and intensity.

Q87. Answer: (c) Farooq Ahmad Mir

The correct answer is Farooq Ahmad Mir.

Key Points

• Farooq Ahmad Mir has been honored with the Padma Shri award in 2025 for his exceptional contribution to the field of Art, specifically for his work in revitalizing the traditional Kani shawl weaving.

• He hails from the Budgam district in the Union Territory of Jammu & Kashmir, a region renowned for its rich heritage in textile

arts.

• The Kani shawl is one of the oldest and most intricate handicrafts of Kashmir, involving a specialized weaving technique that uses small wooden eyeless needles called ‘Kanis’ instead of a traditional shuttle.

• Farooq Ahmad Mir is credited with preventing this ancient art form from becoming extinct by training hundreds of local artisans and ensuring the preservation of the Talim (the coded script used for weaving patterns).

• His efforts have not only preserved a cultural legacy but also provided sustainable livelihoods to numerous families in the Kashmir Valley, bringing international recognition back to this Mughal-era craft.

Additional Information

• Kani Shawl Weaving:

• The word 'Kani' refers to the small wooden sticks made from forest wood that are used to weave the intricate floral and paisley designs.

• Unlike other shawls where the design is embroidered after weaving, in Kani shawls, the design is woven directly into the fabric using Pashmina wool.

• A single Kani shawl can take anywhere from six months to two years to complete, depending on the complexity of the pattern.

• The craft was granted a Geographical Indication (GI) tag in 2008, which provides legal protection and ensures the authenticity of shawls produced in the Kanihama area of Jammu & Kashmir.

• Padma Awards 2025:

• The Padma Awards are among the highest civilian honors in India, announced annually on the eve of Republic Day (January 26).

• The awards are given in three categories: Padma Vibhushan (for exceptional and distinguished service), Padma Bhushan (distinguished service of high order), and Padma Shri (distinguished service).

• The 2025 list includes several "unsung heroes" from across India who have made significant impacts in Art, Social Work, Literature, Science, and Sports.

Important Points

• Technical Aspects of the Craft:

• The weaving process is guided by the Talim, a written code that instructs the weaver on the number of threads and colors to be used for every single stitch.

• Historically, these shawls were highly prized by Mughal Emperors like Akbar, who was a great patron of Kashmiri textiles.

• The Pashmina wool used in these shawls is sourced from the Changthangi goat found in the high-altitude regions of Ladakh.

• Other Options Context:

• Bhimavva Doddabalappa Shillekyathara is often associated with folk arts like Dollu Kunitha from Karnataka.

• Stephen Knapp was an American artist known for his light paintings (light dispensed through glass), highlighting the international reach of the Art category in the Padma awards during certain years.

Q88. Answer: (c) International Committee of the Red Cross (ICRC)

The correct answer is International Committee of the Red Cross (ICRC).

Key Points

• The International Committee of the Red Cross (ICRC) issued a grave warning in February 2024 regarding the security of biological research facilities in the Democratic Republic of Congo (DRC).

• The organization highlighted the risk of Ebola virus samples escaping from a laboratory in Goma due to the escalating conflict between the M23 rebel group and the Congolese armed forces (FARDC).

• The specific facility at risk is the National Institute of Biomedical Research (INRB) branch in Goma, which stores samples of highly contagious and deadly pathogens for diagnostic and research purposes.

• The ICRC emphasized that any damage to the laboratory's infrastructure or loss of power for cooling systems could lead to a secondary humanitarian disaster in the form of a biological outbreak.

• This concern was raised as fighting reached the outskirts of Goma, a city of over 2 million people, where the density of the population would make containing an infectious disease extremely difficult.

Additional Information

• Ebola Virus Disease (EVD):

• EVD is a severe illness often characterized by hemorrhagic fever, with a case fatality rate ranging from 25% to 90% in past outbreaks.

• The virus was first discovered in 1976 near the Ebola River in the DRC (formerly Zaire).

• Transmission occurs through direct contact with the blood, secretions, organs, or other bodily fluids of infected people or animals.

• The City of Goma:

• Goma is the capital of the North Kivu province in eastern DRC, located on the border with Rwanda.

• It is a strategic humanitarian and economic hub, but it is also geographically vulnerable, situated near the active Nyiragongo volcano and within a zone of chronic armed conflict.

• International Committee of the Red Cross (ICRC):

• Established in 1863 and based in Geneva, Switzerland, the ICRC is a neutral and independent organization.

• Its mandate stems essentially from the Geneva Conventions of 1949 to protect and assist victims of armed conflict and internal violence.

• M23 Movement:

• The March 23 Movement is a rebel group primarily composed of ethnic Tutsis that has been active in eastern DRC since 2012.

• Their resurgence in 2021 and 2022 has led to the displacement of nearly one million people and created a massive humanitarian crisis in the Great Lakes region.

Important Points

• International Humanitarian Law (IHL): The ICRC uses IHL to advocate for the protection of medical and scientific facilities during war, stressing that such buildings must not be targeted or used for military purposes.

• The Role of INRB: The National Institute of Biomedical Research (founded in 1974) is led by the world-renowned virologist Dr. Jean-Jacques Muyembe, who was part of the team that discovered the Ebola virus.

• Past Outbreaks: The DRC has faced over 14 Ebola outbreaks since 1976. The 10th outbreak (2018–2020) in North Kivu and Ituri was the second-largest in history, causing over 2,200 deaths, and was significantly hampered by local militia violence.

• Biological Security: The escape of pathogens in conflict zones is a rare but catastrophic risk that requires "dual-use" facilities to have stringent security protocols even during active shelling.

Q89. Answer: (d) Endocon 2025, Jaipur

The correct answer is Endocon 2025, Jaipur.

Key Points

• ENDOVEDA is an advanced digital platform designed to revolutionize endoscopy reporting by making it more efficient, standardized, and data-driven for medical professionals.

• The platform was officially unveiled in July 2025 during Endocon 2025, a premier national conference held in Jaipur, Rajasthan.

• The primary objective of ENDOVEDA is to automate and streamline the documentation process for gastrointestinal (GI) procedures, which historically required significant manual effort and time.

• It utilizes Artificial Intelligence (AI) and Natural Language Processing (NLP) to help gastroenterologists generate reports that are accurate and compliant with global medical standards.

• The launch at Endocon 2025 highlights the increasing role of indigenous MedTech solutions in improving healthcare delivery within India.

Additional Information

• Endocon Conference:

• Endocon is the flagship annual event of the Society of Gastrointestinal Endoscopy of India (SGEI).

• The conference serves as a platform for doctors, researchers, and medical technology companies to showcase the latest innovations in minimally invasive surgery and diagnostic imaging.

• The 2025 edition in Jaipur focused heavily on "The Future of AI in Endoscopy," aiming to reduce diagnostic errors and improve patient outcomes.

• Endoscopy Reporting Challenges:

• Manual reporting in high-volume hospitals often leads to burnout and inconsistent data entry among medical practitioners.

• Standardized reporting tools like ENDOVEDA ensure that critical findings, such as polyps, ulcers, or malignancies, are documented using uniform terminology, which is essential for follow-up care.

• Digital Health Integration:

• The development of such platforms aligns with the Ayushman Bharat Digital Mission (ABDM), which aims to create a seamless digital health ecosystem across India.

• By converting procedural findings into structured digital records, these platforms facilitate easier sharing of patient history between different healthcare providers.

• Society of Gastrointestinal Endoscopy of India (SGEI):

• Established in 1982, the SGEI is a professional body dedicated to the advancement of endoscopic practices in the country.

• It plays a vital role in training young clinicians and setting the ethical and technical guidelines for gastroenterology in India.

Important Points

• Location: The choice of Jaipur as the venue for Endocon 2025 underscores the city's growth as a major medical hub in North India, capable of hosting large-scale international health conclaves.

• Technological Features: ENDOVEDA likely features cloud-based storage, allowing doctors to access endoscopy videos and reports remotely, which is a significant step toward tele-medicine.

• Market Impact: The introduction of such specialized software-as-a-service (SaaS) models in the Indian healthcare market is expected to lower the administrative costs for private clinics and government hospitals alike.

• Date: The unveiling in July 2025 marks a significant milestone in the post-pandemic acceleration of digital health adoption in the South Asian region.

Q90. Answer: (a) A language understood by the arrested person

The correct answer is A language understood by the arrested person.

Key Points

• The Supreme Court of India, in its ruling in November 2025, emphasized that the grounds of arrest must be communicated to an individual in a language they understand to ensure the protection of their fundamental rights.

• This mandate is rooted in Article 22(1) of the Constitution of India, which stipulates that every person who is arrested shall not be detained in custody without being informed, as soon as may be, of the grounds for such arrest.

• The court clarified that merely providing the written grounds of arrest in a language alien to the accused (such as English or Hindi if the person only knows a regional language) does not fulfill the constitutional requirement of "informed" communication.

• Providing the grounds in an understandable language is critical so that the arrested person can seek legal advice, move for bail, or challenge the legality of the arrest effectively.

• If the investigating agency fails to provide the written grounds in a language known to the accused, the arrest can be declared illegal and void ab initio by the judiciary.

Additional Information

• Article 22 of the Indian Constitution:

• This article provides protection against arrest and detention in certain cases. It mandates that the arrested person must be produced before a Magistrate within a period of 24 hours of such arrest, excluding the time necessary for the journey.

• It also guarantees the right to consult and be defended by a legal practitioner of their choice.

• The Pankaj Bansal Case Precedent:

• The Supreme Court previously established in the Pankaj Bansal v. Union of India (2023) case that the Enforcement Directorate (ED) must furnish the grounds of arrest in writing to the accused at the time of arrest.

• The November 2025 ruling further expanded this by adding the linguistic accessibility requirement to the written mandate.

• Bharatiya Nagarik Suraksha Sanhita (BNSS):

• Under the new criminal laws (which replaced the CrPC), specific provisions like Section 35 and Section 47 deal with the rights of arrested persons and the duty of the police officer to inform the accused about the offence and grounds.

• Role of the Investigating Agency:

• Agencies such as the ED, CBI, or State Police are now legally obligated to ensure translation services if the accused is not proficient in the official language of the state or the court's language.

Important Points

• Communication vs. Intimation: The judiciary distinguishes between merely "intimating" (telling) and "communicating" (ensuring understanding). Effective communication is only possible when the medium (language) is mutually understood.

• Legal Aid: If an accused cannot understand the grounds of arrest, they cannot accurately brief their lawyer, which hampers the fair trial process guaranteed under Article 21 of the Constitution.

• Procedural Safeguards: These rulings serve as safeguards against arbitrary arrests and ensure that the due process of law is followed by every law enforcement agency in India.

Q91. Answer: (a) Employees’ State Insurance Corporation

The correct answer is Employees’ State Insurance Corporation.

Key Points

• The Employees’ State Insurance Corporation (ESIC) reintroduced the SPREE (Scheme for Promoting Registration of Employers and Employees) initiative in early 2025 to enhance formal employment registration.

• Alongside this, the corporation launched the Amnesty Scheme – 2025, which is specifically designed to provide a one-time window for employers to regularize their records and pay outstanding contributions.

• The Amnesty Scheme – 2025 offers relief to establishments by waiving or reducing the interest and legal damages typically levied on the late payment of ESI contributions.

• The primary goal of the SPREE 2025 initiative is to bring uncovered workers, especially those in newly notified geographical areas and smaller industrial units, under the social security net of the ESI Act, 1948.

• These measures are expected to significantly increase the number of Insured Persons (IPs), ensuring they receive health and cash benefits provided by the Government of India.

Additional Information

• Employees' State Insurance Corporation (ESIC):

• It is a statutory body functioning under the administrative control of the Ministry of Labour and Employment, Government of India.

• It was established under the Employees' State Insurance Act, 1948, which was the first major legislation on social security for workers in independent India.

• The ESI Scheme is a self-financing health insurance scheme that provides medical benefits to workers and their dependents, along with cash benefits during sickness, maternity, and temporary or permanent disablement.

• Coverage and Contributions:

• The scheme currently applies to factories and other establishments like shops, hotels, and cinemas employing 10 or more persons (in some states, the limit is 20).

• The existing wage ceiling for coverage is Rs. 21,000 per month, while for Persons with Disabilities (PWD), the limit is Rs. 25,000 per month.

• The contribution rate is 4% of the wages, comprising 3.25% from the employer and 0.75% from the employee.

• Geographical Reach:

• As of 2024, the ESI Scheme has been implemented in all states and Union Territories of India, covering over 600 districts.

Important Points

• The SPREE 2025 initiative focuses on "Ease of Doing Business" by simplifying the registration process for start-ups and small businesses through the Shram Suvidha Portal.

• The Amnesty Scheme – 2025 acts as a mechanism to reduce the massive backlog of litigation and recovery notices pending at various ESIC regional offices.

• Workers registered under these initiatives receive a unique Pehchan Card, which allows them to access medical facilities at any ESIC hospital or dispensary across the country.

• By reintroducing these schemes in 2025, the ESIC aims to achieve the vision of "Universal Social Security" for the entire workforce in the organized sector.

Q92. Answer: (b) Manufacturing

The correct answer is Manufacturing.

Key Points

• The Employment Linked Incentive (ELI) Scheme was a major highlight of the Union Budget 2024-25, presented by Finance Minister Nirmala Sitharaman. The scheme is part of the Prime Minister's Package for Education, Employment, and Skilling, with an aim to create 4.1 crore jobs over five years.

• Among the three sub-schemes introduced, Scheme B specifically focuses on the Manufacturing sector. This scheme is designed to incentivize the hiring of first-time employees in manufacturing industries to boost the nation's industrial output and workforce.

• Under Scheme B, the government provides an incentive directly related to the EPFO (Employees' Provident Fund Organisation) contributions for both the employee and the employer during the first four years of employment.

• This initiative targets those entering the Manufacturing sector with a monthly salary of up to Rs. 1 lakh. It is expected to benefit 30 lakh youth entering the manufacturing workforce and their employers.

• The core objective of focusing on Manufacturing is to utilize the labor-intensive nature of the sector to absorb the growing youth population and align with the Make in India initiative. Hence, the correct answer is Manufacturing.

Additional Information

• Scheme A - First Timers:

• This scheme targets first-time employees in all formal sectors.

• It provides a one-month wage (up to Rs. 15,000) to newly joined employees in three installments.

• The eligibility is restricted to those whose monthly salary does not exceed Rs. 1 lakh, and the benefit is credited directly to the EPFO account.

• Scheme C - Support to Employers:

• This scheme is an employer-centric incentive focusing on additional employment across all sectors.

• The Government of India will reimburse employers up to Rs. 3,000 per month for two years towards their EPFO contribution for each additional employee hired.

• It aims to incentivize the creation of 50 lakh additional jobs by reducing the financial burden on corporate entities and MSMEs.

• EPFO (Employees' Provident Fund Organisation):

• The EPFO is a statutory body under the Ministry of Labour and Employment, established by the Employees' Provident Funds and Miscellaneous Provisions Act, 1952.

• It serves as the primary vehicle for implementing the ELI schemes, as the incentives are disbursed based on social security contributions.

• The organization manages provident funds, pensions, and insurance for the organized workforce in India.

• Budgetary Outlay and Scope:

• The Union Government has allocated a total outlay of Rs. 2 lakh crore for the Prime Minister's Package, which includes the ELI schemes and skilling programs.

• The package also includes the internship scheme where 1 crore youth will gain experience in top 500 companies over five years with a monthly stipend of Rs. 5,000.

Important Points

• Manufacturing Sector Growth: By providing specific incentives like Scheme B, the government intends to increase the share of Manufacturing in the GDP and address the "jobless growth" concern.

• Formalization of Workforce: A key feature of the ELI scheme is that it only applies to EPFO-registered entities, thereby encouraging the formalization of the Indian economy.

• Eligibility Criteria: While the schemes are inclusive, they prioritize youth and first-time entrants to the labor market, ensuring that fresh graduates and trainees find immediate placement in industrial sectors.

Q93. Answer: (c) United Waqf Management, Empowerment, Efficiency and Development Act, 1995

The correct answer is United Waqf Management, Empowerment, Efficiency and Development Act, 1995.

Key Points

• The Waqf (Amendment) Bill, 2024 was introduced in the Lok Sabha on August 8, 2024, by the Union Minister of Minority Affairs, Kiren Rijiju.

• One of the most significant changes proposed in the bill is the renaming of the Waqf Act, 1995 to the United Waqf Management, Empowerment, Efficiency and Development Act, 1995. Hence, the correct answer is United Waqf Management, Empowerment, Efficiency and Development Act, 1995.

• The bill seeks to amend the existing 1995 Act to address issues related to the powers of Waqf Boards, registration of properties, and the overall transparency of the administration.

• The amendment aims to ensure better management and efficiency in the utilization of Waqf properties for the intended charitable and religious purposes.

• It introduces a more inclusive structure for the Central Waqf Council and State Waqf Boards, ensuring the representation of women and non-Muslims in these bodies.

Additional Information

• Waqf Properties in India:

• A Waqf is a permanent dedication of movable or immovable property for purposes recognized by Muslim Law as pious, religious, or charitable.

• India has the largest landholding under Waqf in the world after the military and railways, with approximately 8.7 lakh properties spread across 9.4 lakh acres.

• Role of the District Collector:

• The 2024 Amendment Bill proposes to give the District Collector the authority to determine whether a property is Waqf property or government land.

• In the previous framework, the Waqf Board had the power to decide the status of a property under Section 40 of the 1995 Act, a provision the new bill seeks to omit.

• Inclusive Composition:

• The bill mandates that the Central Waqf Council and State Waqf Boards must include two women members.

• It also allows for the appointment of two non-Muslim members to the State Waqf Boards to enhance administrative diversity.

• Digitization and Transparency:

• The amendment emphasizes the mandatory registration of Waqf properties through a centralized portal to prevent encroachment and facilitate digitization of records.

• It introduces stricter auditing requirements by the Comptroller and Auditor General (CAG) or designated officers to ensure financial accountability.

Important Points

• Legislative History: The original Waqf Act was passed in 1954, which was later replaced by the Waqf Act, 1995. Significant amendments were previously made in 2013 to strengthen the Waqf Tribunals and the powers of the Waqf Boards.

• Waqf-alal-aulad: The 2024 Bill clarifies provisions regarding Waqf-alal-aulad (Waqf for the benefit of the donor's family), ensuring that it does not lead to the deprivation of inheritance rights for legal heirs, including women.

• Joint Parliamentary Committee (JPC): Following its introduction in August 2024, the bill was referred to a Joint Parliamentary Committee for detailed scrutiny due to concerns raised by various stakeholders regarding the autonomy of religious institutions.

Q94. Answer: (c) 99th with score ≈66.95

The correct answer is 99th with score ≈66.95.

Key Points

• According to the Sustainable Development Report 2025, India has secured the 99th rank globally. This ranking reflects the country's cumulative progress toward the 17 Sustainable Development Goals (SDGs) established by the United Nations.

• India’s overall index score is approximately 66.95. This score is a measure of the total progress towards achieving all 17 SDGs, where a score of 100 indicates that all targets have been fully met.

• The Sustainable Development Report (SDR) is an annual global assessment published by the Sustainable Development Solutions Network (SDSN). It provides a comprehensive report card on the progress of UN Member States.

• India has shown notable improvements in several areas, particularly in Goal 1 (No Poverty) and Goal 12 (Responsible Consumption and Production). These advancements contribute to the overall score of 66.95.

• The report indicates that while India is making steady progress, it faces significant challenges in achieving Goal 2 (Zero Hunger), Goal 5 (Gender Equality), and Goal 9 (Industry, Innovation, and Infrastructure). Hence, the correct answer is 99th with score ≈66.95.

Additional Information

• The 2030 Agenda for Sustainable Development:

• The SDGs were adopted by all 193 United Nations Member States in 2015. The agenda serves as a universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity by the year 2030.

• The 17 goals are integrated, recognizing that action in one area will affect outcomes in others, and that development must balance social, economic, and environmental sustainability.

• Global Leaders and Performers:

• European countries consistently dominate the top of the index. In recent reports, countries like Finland, Sweden, and Denmark have held the top three positions, often scoring above 85.

• Finland has been ranked as the number one country in the world for several consecutive years due to its high performance in education, social safety nets, and environmental protections.

• SDG Monitoring in India:

• At the national level, the NITI Aayog is the nodal agency responsible for monitoring the progress of SDGs in India.

• The SDG India Index, published by NITI Aayog, classifies states and union territories into four categories based on their score: Aspirant (0–49), Performer (50–64), Front Runner (65–99), and Achiever (100).

• States like Kerala, Tamil Nadu, and Himachal Pradesh have historically been high performers in the domestic index.

Important Points

• Key Challenges for India:

• One of the most persistent hurdles for India is Goal 3 (Good Health and Well-being), specifically relating to maternal mortality and child nutrition.

• Goal 13 (Climate Action) is another critical area where India, as a developing nation, must balance rapid industrialization with its Net Zero commitment by 2070, as announced at COP26 in Glasgow.

• The Role of Data:

• The Sustainable Development Report utilizes data from official sources like the World Bank, WHO, and ILO, as well as non-traditional data sources to fill gaps in reporting.

• The report also features the International Spillover Index, which assesses how countries' actions—such as trade, security, and pollution—impact the ability of other countries to achieve their SDGs.

Q95. Answer: (b) Vijayawada

The correct answer is Vijayawada.

Key Points

• The Reserve Bank of India (RBI) officially relocated its Andhra Pradesh Regional Office to Vijayawada in June 2025.

• Prior to this relocation, the regional operations for Andhra Pradesh were primarily managed from the Hyderabad regional office, which had been serving as the joint hub since the state bifurcation in 2014.

• The shifting of the office to Vijayawada is a strategic move to ensure better administrative efficiency and to bring central banking services closer to the state's administration and its residents.

• The Vijayawada office is tasked with overseeing banking regulation, currency management, and financial operations specifically tailored to the economic landscape of Andhra Pradesh.

• This move aligns with the broader requirement of establishing independent state-level administrative infrastructure following the conclusion of the 10-year joint capital agreement for Hyderabad.

Additional Information

• State Bifurcation Context:

• Under the Andhra Pradesh Reorganisation Act, 2014, the state was divided into Telangana and the residual state of Andhra Pradesh.

• While Amaravati was designated as the capital, many essential services and financial regulatory bodies continued to operate from Hyderabad during the transition period.

• Role of RBI Regional Offices:

• The Reserve Bank of India operates multiple regional offices across the country, usually located in state capitals, to manage monetary policy implementation at the local level.

• These offices house departments such as the Issue Department, which manages the circulation of banknotes and coins, and the Banking Department, which acts as a banker to the Government.

• Vijayawada's Significance:

• Vijayawada, located in the NTR district, is considered the commercial capital of Andhra Pradesh due to its high density of trade, commerce, and logistics activities.

• Its central location and connectivity make it a preferred administrative choice for financial institutions like the RBI.

Important Points

• The Reserve Bank of India was established on April 1, 1935, in accordance with the provisions of the Reserve Bank of India Act, 1934.

• It was originally established in Calcutta (now Kolkata) but was permanently moved to Mumbai in 1937.

• The RBI acts as the lender of last resort and is responsible for maintaining price stability while keeping the objective of growth in mind.

• Currently, the RBI has 31 regional offices and sub-offices spread across India, ensuring a wide-reaching financial inclusion and regulatory framework.

Q96. Answer: (b) Rishabh Pant

The correct answer is Rishabh Pant.

Key Points

• Rishabh Pant etched his name in cricket history during the first Test against England at Headingley in June 2025 by scoring centuries in both innings of the match.

• By achieving this feat, he became only the second wicketkeeper in the entire history of Test cricket to record twin centuries in a single match.

• The first wicketkeeper to accomplish this rare milestone was Andy Flower of Zimbabwe, who scored 142 and 199 not out against South Africa in the year 2001.

• Pant's aggressive batting style and ability to counter-attack were on full display at the Leeds venue, helping India secure a dominant position in the opening game of the series.

• This achievement further solidifies his reputation as one of the greatest match-winners in the modern era of the longest format of the game.

Additional Information

• Rishabh Pant:

• Born on October 4, 1997, in Roorkee, Uttarakhand, he is a left-handed wicketkeeper-batsman for the Indian Cricket Team.

• He was the vice-captain of the India U-19 team for the 2016 Under-19 Cricket World Cup.

• In Test cricket, he holds the record for being the first Indian wicketkeeper to score centuries in England, Australia, and South Africa.

• Twin Centuries in Tests:

• Scoring a century in both innings of a Test match is a rare occurrence, and doing so while performing the physically exhausting duties of wicketkeeping for five days is exceptionally difficult.

• While several specialist batsmen like Sunil Gavaskar, Ricky Ponting, and Kumar Sangakkara have achieved this multiple times, it remains a "holy grail" for keepers.

• Venue - Headingley:

• Located in Leeds, West Yorkshire, Headingley Cricket Ground has been the home of Yorkshire County Cricket Club since 1891.

• The ground is famous for the 1981 Ashes 'Botham's Test' and Ben Stokes' miraculous chase in 2019.

• Opponent - England:

• The India-England Test rivalry is one of the most celebrated in cricket, often played for the Pataudi Trophy in England and the Anthony de Mello Trophy in India.

Important Points

• Statistical Significance: Before June 2025, no Indian wicketkeeper had ever scored two centuries in the same Test match, with

the previous best aggregate scores held by Budhi Kunderan and MS Dhoni.

• World Test Championship (WTC): This performance was crucial for India's standing in the ICC World Test Championship cycle for 2023-2025, where every match point is vital for qualification for the final.

• Technical Mastery: Scoring back-to-back hundreds in English conditions requires immense discipline against the moving ball, a trait Rishabh Pant developed significantly over his career since his debut in 2018.

Q97. Answer: (a) Decathlon

The correct answer is Decathlon.

Key Points

• Tejaswin Shankar created history at the 2025 Asian Athletics Championships by clinching a silver medal in the Decathlon event.

• This feat made him the first Indian athlete to win two medals in the Decathlon discipline at the Asian Athletics Championships. He had previously won his first silver medal in the same event during the 2023 edition held in Bangkok, Thailand.

• The 2025 edition of the championships was hosted in Gumi, South Korea, from May 27 to May 31, 2025.

• Shankar demonstrated exceptional consistency across ten different track and field disciplines over two days to secure his podium finish, reinforcing his position as one of Asia's premier multi-event athletes.

• His transition from being a High Jump specialist to a successful Decathlete has been a significant milestone for Indian Athletics, showcasing versatility and endurance.

Additional Information

• Tejaswin Shankar's Career Profile:

• He holds the Indian National Record in High Jump with a mark of 2.29 metres, set in April 2018.

• In the 2022 Commonwealth Games held in Birmingham, he won a bronze medal in the High Jump, which was India's first-ever medal in that specific discipline at the CWG.

• He won a silver medal in the Decathlon at the 2022 Asian Games (held in 2023) in Hangzhou, China, with a score of 7666 points.

• The Decathlon Event:

• A Decathlon is a combined event in athletics consisting of ten events. Day 1 includes the 100m sprint, long jump, shot put, high jump, and 400m run.

• Day 2 features the 110m hurdles, discus throw, pole vault, javelin throw, and the 1500m run.

• Performance is judged on a points system based on the World Athletics scoring tables rather than just the final position in each individual race or throw.

• Asian Athletics Championships:

• It is a biennial event organized by the Asian Athletics Association (AAA). The 2025 championships in Gumi marked the 26th edition of the tournament.

• India has historically performed well in these championships, with athletes like Neeraj Chopra, Hima Das, and Tajinderpal Singh Toor previously bringing home gold medals.

Important Points

• Historical Context: Before Tejaswin Shankar, India had seen success in Decathlon through athletes like Vijay Singh Chauhan, who won gold at the 1974 Asian Games, but Shankar is the first to achieve multiple medals at the Asian Athletics Championships specifically.

• Global Rankings: Shankar's performances in the Decathlon have propelled him into the top tier of Asian athletes, making him a strong contender for international qualification in multi-sport events.

• Comparison with Other Events: Unlike the Heptathlon (which consists of 7 events and is the standard combined event for women) or the Pentathlon (which consists of 5 events), the Decathlon is considered the ultimate test of an athlete's all-around capability.

Q98. Answer: (d) Shaktikanta Das

The correct answer is Shaktikanta Das.

Key Points

• Shaktikanta Das, the former Governor of the Reserve Bank of India (RBI), was appointed as the Principal Secretary to the Prime Minister in February 2025.

• This high-profile appointment signaled a major shift toward a strong economic emphasis within the Prime Minister's Office (PMO), leveraging his extensive experience in fiscal policy and monetary management.

• He is a retired IAS officer of the 1980 batch from the Tamil Nadu cadre, having served in various capacities in both the state and central governments.

• As the Principal Secretary, his role involves managing the administrative operations of the PMO, coordinating policy matters across various Ministries, and advising the Prime Minister on macroeconomic stability and governance reforms.

• His transition from the RBI to the PMO is seen as a strategic move to navigate India through evolving global economic challenges and to ensure sustainable growth. Hence, the correct answer is Shaktikanta Das.

Additional Information

• Tenure at the Reserve Bank of India:

• Shaktikanta Das took charge as the 25th Governor of the RBI on December 12, 2018.

• He was instrumental in steering the Indian economy through the COVID-19 pandemic and played a crucial role in maintaining financial stability during periods of global inflation.

• Under his leadership, the RBI focused on digital payments, fintech innovation, and robust monetary policy frameworks.

• Career as a Bureaucrat:

• Before his RBI tenure, he served as the Economic Affairs Secretary, Revenue Secretary, and Fertilizer Secretary to the Government of India.

• He was a key member of the team that handled the demonetization drive in 2016 and the implementation of the Goods and Services Tax (GST).

• He also represented India as the G20 Sherpa at international summits, showcasing his expertise in economic diplomacy.

• International Recognition:

• In 2023, Shaktikanta Das was awarded the 'Governor of the Year' award by Central Banking, an international economic journal.

• He was only the second RBI Governor to receive this honor, after Raghuram Rajan in 2015.

Important Points

• Comparison with other options:

• Urjit Patel: Served as the 24th Governor of the RBI (2016-2018). He later joined the Asian Infrastructure Investment Bank (AIIB) as a Vice President.

• Y.V. Reddy: Served as the 21st Governor of the RBI (2003-2008) and chaired the 14th Finance Commission.

• Manmohan Singh: Served as the 15th Governor of the RBI (1982-1985) and later became the Prime Minister of India (2004-2014). However, he did not hold the Principal Secretary post in 2025.

• The Role of Principal Secretary to the PM:

• This post is considered one of the most powerful civil service positions in India.

• The Principal Secretary acts as the link between the Prime Minister and the Cabinet Secretary, ensuring the execution of government policies and executive orders.

• Historical holders of this position include notable figures like P.K. Mishra and Nripendra Misra.

Q99. Answer: (c) Punjab Kings

The correct answer is Punjab Kings.

Key Points

• The 18th Edition of the Indian Premier League (IPL) was conducted in the year 2025, featuring a total of ten franchise teams competing for the prestigious trophy.

• Punjab Kings (PBKS) emerged as the runner-up of the 2025 season after a highly competitive final match. Hence, the correct answer is Punjab Kings.

• Chennai Super Kings (Option 1) has historically been one of the most successful teams in the league with multiple titles, but they did not finish as the runner-up in the 18th edition. Hence, statement 1 is incorrect.

• Sunrisers Hyderabad (Option 2), who were the runners-up in the 2024 (17th) edition, did not secure the second position in 2025. Hence, statement 2 is incorrect.

• Gujarat Titans (Option 4), the franchise that entered the league in 2022 and won the title in its debut year, was not the runner-up in this specific 2025 season. Hence, statement 4 is incorrect.

• The IPL 2025 season continued the tradition of high-octane T20 cricket, organized by the Board of Control for Cricket in India (BCCI).

Additional Information

• Indian Premier League (IPL):

• The IPL is a professional Twenty20 cricket league, founded by the BCCI in 2007, with the inaugural season taking place in 2008.

• It is the most-attended cricket league in the world and ranks sixth by average attendance among all sports leagues.

• The league operates on a round-robin and playoff format, leading to a grand final to decide the champion.

• Punjab Kings (PBKS):

• The team is based in Mohali, Punjab, and was originally known as Kings XI Punjab before being rebranded in 2021.

• Their primary home ground is the Punjab Cricket Association IS Bindra Stadium in Mohali.

• Prior to the 2025 season, their best performance was in 2014, where they also finished as runners-up.

• Tournament Significance:

• The IPL provides a platform for young domestic players to showcase their talent alongside international stars.

• Major awards include the Orange Cap for the highest run-scorer and the Purple Cap for the highest wicket-taker of the season.

• The 18th edition in 2025 maintained the ten-team structure that was established in 2022 with the addition of Gujarat Titans and Lucknow Super Giants.

Important Points

• BCCI Governance: The Board of Control for Cricket in India is the national governing body for cricket in India, responsible for the scheduling and regulation of the IPL.

• Global Impact: The IPL has a massive brand value, estimated at over $10 billion, making it a "decacorn" in the sports industry.

• Venue Selection: While primarily hosted in India, the league has occasionally been held in countries like South Africa and the UAE due to general elections or safety concerns, though 2025 returned to the standard home-and-away format across Indian cities.

Q100. Answer: (b) Odisha

The correct answer is Odisha.

Key Points

• The maiden flight-tests of the Integrated Air Defence Weapon System (IADWS) were successfully conducted by the Defence Research and Development Organisation (DRDO) in 2025.

• The tests were carried out off the coast of Odisha, specifically from the Integrated Test Range (ITR) located at Chandipur.

• This IADWS is designed to provide a multi-layered air defence shield for high-value assets and metropolitan areas, such as New Delhi, against a variety of aerial threats including missiles, drones, and aircraft.

• The flight-test in 2025 aimed to validate the interception capabilities of the system at various altitudes and ranges, ensuring the seamless integration of radars, command and control units, and missile launchers.

• The successful trial marks a significant milestone in India's self-reliance (Atmanirbhar Bharat) in advanced missile technology and urban strategic defence.

Additional Information

• Integrated Air Defence Weapon System (IADWS):

• Commonly compared to the National Advanced Surface-to-Air Missile System (NASAMS-II), it incorporates advanced sensors and high-speed interceptors.

• It is intended to work in tandem with existing systems like the S-400 Triumf and the Ballistic Missile Defence (BMD) shield to create a comprehensive safety net over Indian airspace.

• Defence Research and Development Organisation (DRDO):

• DRDO was established in 1958 by merging the Technical Development Establishment (TDEs) and the Directorate of Technical Development & Production (DTDP).

• It operates under the Ministry of Defence, Government of India, with its headquarters in New Delhi.

• It is responsible for the development of critical defence technologies, including the Agni and Prithvi series of missiles.

• Integrated Test Range (ITR), Chandipur:

• Located in the Balasore district of Odisha, it is India's premier laboratory for the test and evaluation of rockets and missiles.

• The range provides a safe environment for long-range weapon testing over the Bay of Bengal.

• Another key facility in Odisha is Dr. APJ Abdul Kalam Island (formerly Wheeler Island), used for strategic missile launches.

Important Points

• Strategic Significance: The deployment of IADWS is crucial for protecting the National Capital Region (NCR) from potential aerial strikes or suicide drone attacks.

• Collaborative Effort: While developed by DRDO, the system involves contributions from Bharat Electronics Limited (BEL) and other private sector partners for manufacturing electronic components and radar modules.

• Modernization: This test is part of the broader Indian Air Force (IAF) modernization plan to phase out legacy Soviet-era air defence systems with indigenous technology.

More previous year papers and mock tests: **www.yourmocktest.com/pyq**