# RRB Group D Official Paper (Held On: 10 Feb, 2026 Shift 2) (Previous Year Paper)

RRB Group D • 2026 • 100 questions • 90 minutes • Answer key and solutions

**Take this paper as a free 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-10-feb-2026-shift-2-previ…**

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

## GENERAL SCIENCE

**Q1.** The principal focus of a concave mirror is the point where:

**(a)** Rays parallel to the principal axis appear to diverge after reflection
**(b)** The mirror surface intersects the principal axis
**(c)** Rays parallel to the principal axis converge after reflection
**(d)** Rays passing through the center of curvature converge

**Q2.** According to Bohr's model of the atom, in which orbits can electrons revolve around the nucleus?

**(a)** Any arbitrary circular path
**(b)** Elliptical orbits of variable energy
**(c)** Spiral paths continuously losing energy
**(d)** Certain fixed circular paths called discrete orbits

**Q3.** Select the statement regarding the cytoplasm of a cell that is INCORRECT.

**(a)** Cytoplasm is present in both eukaryotic and prokaryotic cells.
**(b)** Cytoplasm contains many cell organelles.
**(c)** In a plant cell, cytoplasm is found between cell wall and plasma membrane.
**(d)** Cytoplasm is the fluid-filled region inside plasma membrane.

**Q4.** Which of the following is an advantage of sexual reproduction in plants?

**(a)** It always requires two plants of different species.
**(b)** It helps in producing seeds with genetic diversity.
**(c)** It prevents fertilisation from occurring.
**(d)** It occurs only in root systems.

**Q5.** What does a blue, non-luminous flame indicate when a hydrocarbon is burnt?

**(a)** Complete combustion with high temperature
**(b)** Incomplete combustion and soot formation
**(c)** Lack of oxygen
**(d)** Presence of unburnt carbon

**Q6.** Which of the following statements correctly describes the relationship between mass and inertia?

**(a)** Mass is independent of inertia
**(b)** Mass is inversely proportional to inertia
**(c)** Mass is directly proportional to the square of inertia
**(d)** Mass is directly proportional to inertia

**Q7.** Which of the following statements is/are correct regarding 'changes of state of matter'?

A) A change of state of matter is a physical change.
B) A change of state of matter is an irreversible change.

**(a)** Only B
**(b)** Neither A nor B
**(c)** Both A and B
**(d)** Only A

**Q8.** Unsaturated hydrocarbons usually produce:
**(a)** yellow flame with black smoke
**(b)** clean blue flames
**(c)** white flame with sparkles
**(d)** no flame at all

**Q9.** Which metal is placed highest in the reactivity series?
**(a)** Sodium
**(b)** Gold
**(c)** Silver
**(d)** Copper

**Q10.** What does it mean when magnetic field lines are drawn closer together in a diagram?
**(a)** The magnetic field is stronger in that region
**(b)** The magnetic field is weaker in that area
**(c)** There is no magnetic field present
**(d)** The direction of the magnetic field has changed

**Q11.** What do ‘check dams’ refer to?
**(a)** Earthen or concrete structures across flooded gullies
**(b)** Small huts near rivers
**(c)** Dams built only for industrial water supply
**(d)** Crescent-shaped hills for farming

**Q12.** Please select the correct option for the assertion-reason statement.
Assertion: The ceiling conference halls are made curved.
Reason: Curved ceilings help the sound to spread evenly in the hall.
**(a)** Assertion is true but reason is false.
**(b)** Both assertion and reason are false.
**(c)** Assertion is false and reason is true.
**(d)** Both assertion and reason are true and reason is the correct explanation of assertion.

**Q13.** Which property of carbon allows it to form a large number of compounds by bonding with itself and other elements?
**(a)** Catenation
**(b)** Tetravalency
**(c)** Combustion
**(d)** Isomerism

**Q14.** The magnetic field due to a solenoid carrying 'I' current is 'B'. What will be the magnetic field due to this solenoid, when the current flowing through the solenoid is halved? (Keeping all the other parameters the same)
**(a)** B/2
**(b)** B/4
**(c)** B
**(d)** 2B

**Q15.** Which process best explains how water droplets form on the outer surface of a cold glass during a hot day?
**(a)** Freezing
**(b)** Sublimation
**(c)** Condensation
**(d)** Evaporation

YourMockTest.com — Free Study Material

**Q16.** Two planets have the same radius. Planet A has twice the mass of Planet B. What is the ratio of acceleration due to gravity on Planet A to that on Planet B?

**(a)** 1 : 1
**(b)** 4 : 1
**(c)** 1 : 2
**(d)** 2 : 1

**Q17.** What is the role of peristaltic movements in the human digestive system?

**(a)** To produce digestive enzymes
**(b)** To digest proteins in the stomach
**(c)** To absorb nutrients into the blood
**(d)** To push food forward along the digestive tract

**Q18.** Which change in a flower signals that fertilisation has occurred?

**(a)** Development of a pollen tube
**(b)** Formation of new stamens
**(c)** Ovule matures into seed and ovary into fruit
**(d)** Petals become larger and brighter

**Q19.** A car's velocity-time graph is a straight line parallel to the x-axis at 40 km/h. What will the area enclosed between the graph and the time axis from t = 0 to t = 3 hours represent?

**(a)** Displacement of the car in 3 hours
**(b)** Acceleration of the car
**(c)** Final velocity of the car
**(d)** Average speed of the car

**Q20.** The Chipko Movement that took place in the Garhwal Himalayas in 1974 is an example of:

**(a)** community-led protection of trees
**(b)** government-led reforestation
**(c)** mining-based forest exploitation
**(d)** urban infrastructure development

**Q21.** A child is born with one X chromosome from the mother and one Y chromosome from the father. Which statement accurately describes the consequence of this chromosomal combination?

**(a)** The child will develop as a male due to the presence of the Y chromosome.
**(b)** The child will develop as a female because X chromosome is always dominant over Y chromosome.
**(c)** The child’s sex is determined by the mother, as she provides the X chromosome.
**(d)** The child will not develop male characteristics without two Y chromosomes.

**Q22.** When a person touches a hot object, there is a delay in the muscle response. Which part of the nervous tissue is directly responsible for carrying the nerve impulse to the muscle to bring about a quick movement?

**(a)** Axon
**(b)** Dendrite
**(c)** Nucleus
**(d)** Connective tissue

**Q23.** Which of the following statements about work is FALSE?

**(a)** Work can be positive, negative, or zero.
**(b)** Work is a path-independent quantity for all forces.
**(c)** Work has the same units as energy.
**(d)** Work is energy in transit.

YourMockTest.com — Free Study Material

**Q24.** Refer to the two statements given below and select the correct option.

Statement A: Bleaching powder is produced by the action of chlorine on dry slaked lime.

Statement B: Its chemical formula is CaOCl2.

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

**Q25.** A ray passing through which of the following parts of a lens emerges undeviated?

**(a)** Principal focus
**(b)** Between focus and centre
**(c)** Centre of curvature
**(d)** Optical centre

## MATHEMATICS

**Q26.** If the areas of three adjacent faces of a cuboid are x, y, z square units, respectively, then the volume of the cuboid is:

**(a)** cbrtxyz cubic units
**(b)** √(xyz/2) cubic units
**(c)** √xyz cubic units
**(d)** xyz cubic units

**Q27.** Let a, b, α and β be prime numbers. n is the number of ordered pairs of a and b where 2< a < b < 50 and b-a=2. Also, α and β are the least and the greatest prime numbers less than 50. What is the value of n(α+β)?

**(a)** 354
**(b)** 294
**(c)** 493
**(d)** 598

**Q28.** The average of 6.5, 10.7, 20.2 and a is 18. The value of a is:

**(a)** 35.6
**(b)** 34.6
**(c)** 36.6
**(d)** 33.6

**Q29.** One pipe can fill a tank in 2 minutes, while another pipe can empty the completely filled tank in 4 minutes. If both the pipes are opened together when the tank is empty, how many minutes will it take to fill one-half of the tank?

**(a)** 5
**(b)** 4
**(c)** 2
**(d)** 3

**Q30.** The amount on a sum of Rs. 2,800 at the rate of 5% per annum compound interest, compounded annually, in 2 years will be:

**(a)** Rs. 3,087
**(b)** Rs. 3,089
**(c)** Rs. 3,227
**(d)** Rs. 3,384

**Q31.** A shopkeeper offers the following four schemes.

A) Two successive discounts of 28% and 28%

B) Buy 1, get 4

C) Discount of 35%

D) Two successive discounts of 27% and 26%

YourMockTest.com — Free Study Material

Which scheme is best for the customer?

**(a)** A
**(b)** B
**(c)** C
**(d)** D

**Q32.** The average of the squares of the first 5 natural numbers is:

**(a)** 13
**(b)** 11
**(c)** 12
**(d)** 10

**Q33.** 10 skilled persons can complete a work in 8 days and 10 semi-skilled persons take 12 days to complete the work. How many days will 4 skilled persons and 6 semi-skilled persons together take to complete the work?

**(a)** 8 days
**(b)** 10 days
**(c)** 12 days
**(d)** 14 days

**Q34.** A cylindrical water tank has a base radius of 7 m and a height of 10 m. Water is filled into the tank at a constant rate. After filling the tank completely, 5% of the water leaks out due to a crack at the bottom. The remaining water is transferred into another cylindrical tank whose base radius is 5 m. Find the height of water in the second tank.

**(a)** 18.26 m
**(b)** 12.68 m
**(c)** 16.82 m
**(d)** 18.62 m

**Q35.** If 60% of 80% of 3/5 of a number is 216. Find the number.

**(a)** 750
**(b)** 1990
**(c)** 2090
**(d)** 3040

**Q36.** An item is sold for Rs. 660 after allowing a discount of 20% on its marked price. Find the marked price of the item.

**(a)** Rs. 825
**(b)** Rs. 840
**(c)** Rs. 835
**(d)** Rs. 830

**Q37.** A car travelling at a speed of 42 km/hour can complete a journey in 12 hours. How long will it take to travel the same distance at 63 km/hour? 3798

**(a)** 3 hours
**(b)** 5 hours
**(c)** 7 hours
**(d)** 8 hours

**Q38.** Rs. 12,405 is divided among P, Q, and R in such a way that if Rs. 53, Rs. 88, and Rs. 76 be deducted from their respective shares, they have money in the ratio 15 : 20 : 9. Find the difference between Q's and R's original shares.

**(a)** Rs. 3,059
**(b)** Rs. 3,147
**(c)** Rs. 2,997
**(d)** Rs. 3,097

YourMockTest.com — Free Study Material

**Q39.** If tanθ = 3/4 and θ is an acute angle, find the value of cosec θ.

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

**Q40.** Find the HCF of 148, 172, and 198.

**(a)** 6
**(b)** 12
**(c)** 2
**(d)** 3

**Q41.** A man walks 684 m in 19 minutes, 1078 m in 22 minutes and 2198 m in 31 minutes. His average speed (in m/min) for the whole journey is:

**(a)** 55
**(b)** 50
**(c)** 53
**(d)** 49

**Q42.** How many diagonals can be there in a regular polygon with 37 sides?

**(a)** 740
**(b)** 629
**(c)** 729
**(d)** 640

**Q43.** A car's price is reduced by 10% in the first year and then increased by 10% in the second year. If the car's initial price was Rs. 25,000, what is its final price after both changes?

**(a)** Rs. 25,000
**(b)** Rs. 24,500
**(c)** Rs. 24,750
**(d)** Rs. 25,500

**Q44.** A shopkeeper buys a toy for Rs. 500 and spends Rs. 50 on packaging. He then sells it to a customer at 10% profit. Find the selling price of the toy.

**(a)** Rs. 600
**(b)** Rs. 650
**(c)** Rs. 605
**(d)** Rs. 550

**Q45.** If x + y + z = 0, where none of x, y and z is equal to 0, then find the value of $(x^2)/yz + (y^2)/zx + (z^2)/xy$.

**(a)** 3
**(b)** 4
**(c)** 2
**(d)** -3

**Q46.** The population of a village was 10500. In a year with the increase in population of males by 10% and that of females by 15%, the population of the village becomes 11,718. What was the difference in the number of males and females in the village initially?

**(a)** 3608
**(b)** 3500
**(c)** 3780
**(d)** 3850

YourMockTest.com — Free Study Material

**Q47.** Which number should replace both the question marks in the following equation?

(?)/34 = 306/(?)

**(a)** 119
**(b)** 87
**(c)** 102
**(d)** 112

**Q48.** The sum of the present ages of a man and his son is 50 years. After five years, the man's age will be three times that of his son. Find the present age of the son.

**(a)** 14 years
**(b)** 10 years
**(c)** 11 years
**(d)** 12 years

**Q49.** Simplify:

$(2^3)^2 \div 2^4$

**(a)** 16
**(b)** 2
**(c)** 4
**(d)** 8

**Q50.** The cost of 2 balls and 3 bats is Rs. 84. The cost of 3 balls and 1 bat is Rs. 63. What is the cost of 5 balls and 3 bats ?

**(a)** Rs. 111
**(b)** Rs. 126
**(c)** Rs. 129
**(d)** Rs. 96

## GENERAL INTELLIGENCE & REASONING

**Q51.** Which two numbers should be interchanged to make the following equation correct?

$(45 \div 9) + (2 \times 3 \times 5) \div 6 + 4 \times 7 - 15 = 31$

(Note: The entire number should be interchanged and not individual digits of a given number.)

**(a)** 4 and 3
**(b)** 9 and 15
**(c)** 4 and 2
**(d)** 9 and 5

**Q52.** Pragya ranked 18th from the bottom and 14th from the top in her class. How many students are there in her class?

**(a)** 28
**(b)** 31
**(c)** 29
**(d)** 30

**Q53.** SWYM is related to JNPD in a certain way based on the English alphabetical order. In the same way, IMOC is related to ZDFT. To which of the following options is HLNB related, following the same logic?

**(a)** YCES
**(b)** YESD
**(c)** YCXZ
**(d)** YCDS

YourMockTest.com — Free Study Material

**Q54.** Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

GSN 14, EQL 23, COJ 32, AMH 41, ?9645

**(a)** ZKE 49
**(b)** YJD 50
**(c)** YKF 50
**(d)** YKE 49

**Q55.** Mr. Trombitas starts from Point A and drives 26 km towards east. He then takes a right turn, drives 18 km, turns right and drives 34 km. He then takes a right turn and drives 39 km. He takes a final right turn, drives 8 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (All turns are 90-degree turns only, unless specified.)12

**(a)** 21 km to the south
**(b)** 24 km to the east
**(c)** 21 km to the north
**(d)** 24 km to the west

**Q56.** If 'A' stands for '÷', 'B' stands for 'x', 'C' stands for '+' and 'D' stands for '-', what will come in place of question mark '?' in the following equation?

49 A 7 C 8 B 9 D 5 = ?

**(a)** 74
**(b)** 72
**(c)** 73
**(d)** 71

**Q57.** Refer to the following number, symbol series and answer the question that follows. Counting to be done from left to right only. (All numbers are single-digit numbers only.)

(Left) 3 6 @ 4 5 6 # 2 9 4 = 3 1 9 4 5 % 3 6 8 7 & 1 7 * 8 (Right)

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

**(a)** None
**(b)** One
**(c)** Three
**(d)** Two

**Q58.** In a certain code language,

A+ B means 'A is the sister of B'

A # B means 'A is the brother of B'

A × B means 'A is the wife of B'

A @ B means ' A is the father of B'

Based on the above, how is L related to R if 'L@O+V×E#R'?

**(a)** Brother's father
**(b)** Brother's wife's father
**(c)** Brother's wife's brother
**(d)** Father's brother

**Q59.** Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

IJG 19 HIF 15 GHE 11 FGD 7 ?6928

**(a)** EEB 2
**(b)** EGB 3
**(c)** EMV 2
**(d)** EFC 3

**Q60.** This question is based on the five, three-digit numbers given below.

(Left) 439 745 327 652 532 (Right)

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

NOTE - All operations to be done from left to right.

If 2 is added to the first digit of every number, in how many numbers will the first digit be exactly divisible by the second digit?

**(a)** Two
**(b)** None
**(c)** One
**(d)** Three

**Q61.** Based on the alphabetical order, three of the following four are alike in a certain way and thus form a group. Which is the one that 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)** QTX
**(b)** WZD
**(c)** LOR
**(d)** ILP

**Q62.** FSZI is related to AWWK in a certain way based on the English alphabetical order. In the same way, HMRD is related to CQOF. To which of the following is VMYF related, following the same logic?

**(a)** PPVI
**(b)** PQUI
**(c)** QPUH
**(d)** QQVH

**Q63.** In a certain code language, ‘storms shake trees’ is coded as ‘fo ej va’ and ‘hide from storms’ is coded as ‘va ur qh’. How is ‘storms’ coded in the given language?

**(a)** qh
**(b)** va
**(c)** fo
**(d)** ej

**Q64.** A, B, C, D, N, O and P are sitting in a straight line, facing the north.

Only five people sit between B and O. D sits to the immediate left of O. Only one person sits between D and N. C sits at some place to the left of P but at some place to the right of A.

Who sits third from the left end of the line?

**(a)** O
**(b)** B
**(c)** C
**(d)** N

**Q65.** What should come in place of the question mark (?) in the given series?

42 48 57 69 84 ?

**(a)** 96
**(b)** 99
**(c)** 102
**(d)** 105

**Q66.** Refer to the given number series and answer the question that follows. Counting to be done from left to right only. All numbers are single-digit numbers.

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

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

YourMockTest.com – Free Study Material

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

**Q67.** What should come in place of the question mark (?) in the given series?

91 92 94 98 106 ?

**(a)** 122
**(b)** 123
**(c)** 121
**(d)** 124

**Q68.** Refer to the following letter series and answer the question.

(Left) W M T R B L A D N K Y F Q O G C E Z X U H V (Right)

How many consonants are there between the letter's "A" and "Y" in the given series?5699

**(a)** Three
**(b)** Five
**(c)** Four
**(d)** Two

**Q69.** Rajat ranked 34th from the top and 25th from the bottom in his class. How many students are there in his class?

**(a)** 56
**(b)** 58
**(c)** 57
**(d)** 59

**Q70.** Manoj starts from Point A and drives 9 km towards south. He then takes a left turn, drives 7 km, turns left and drives 11 km. He then takes a left turn and drives 10 km. He takes a final left turn, drives 2 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (All turns are 90 degree turns only, unless specified.)

**(a)** 4 km to the west
**(b)** 3 km to the east
**(c)** 4 km to the east
**(d)** 3 km to the west

**Q71.** 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 its constituent digits. E.g. 13 – Operations on 13 such as adding / subtracting /multiplying etc. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)

3 - 6 - 18

5 - 8 - 40

**(a)** 4 - 5 - 23
**(b)** 15 - 3 - 55
**(c)** 9 - 8 - 64
**(d)** 2 - 7 - 14

**Q72.** Read the given statement(s) 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 statement(s).

Statements: All dusters are wipers. All wipers are buckets.

Conclusion (I): No bucket is a duster

Conclusion (II): Some buckets are dusters

**(a)** Only conclusion (II) follows
**(b)** Only conclusion (I) follows

YourMockTest.com — Free Study Material

**(c)** Both conclusions (I) and (II) follow
**(d)** Neither conclusion (I) nor (II) follows

**Q73.** If 'A' stands for '÷', 'B' stands for '×', 'C' stands for '+' and 'D' stands for '−', then what will come in place of question mark (?) in the following equation?

76 A 4 C 18 B 9 D 12 B 2 C 180 A 2 D 15 B 3 C 151 = ?

**(a)** 391
**(b)** 337
**(c)** 353
**(d)** 319

**Q74.** In a certain code language, 'ships cross seas' is coded as 'qn ed jy' and 'spot the ships' is coded as 'jy is tk'. How is 'ships' coded in the given language?

**(a)** jy
**(b)** qn
**(c)** tk
**(d)** is

**Q75.** ZCIS is related to WAMU in a certain way based on the English alphabetical order. In the same way, TINV is related to QGRX. To which of the following is ODLK related to, following the same logic?

**(a)** ITPN
**(b)** HSPN
**(c)** KROM
**(d)** LBPM

**Q76.** A, B, C, D, E, F and G are sitting around a circular table facing the centre. C sits second to the right of D. Only one person sits between B and C. F is the immediate neighbour of G and B. A sits third to the left of G.

How many people sit between E and B when counted from the left of B?

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

**Q77.** 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.)10031

**(a)** EKP
**(b)** MSZ
**(c)** KQV
**(d)** QWB

**Q78.** What should come in place of the question mark (?) in the given series?

193 183 173 163 153 ?

**(a)** 133
**(b)** 132
**(c)** 143
**(d)** 144

**Q79.** Seven people, L, M, N, O, P, Q and R are sitting in a straight row, facing north. Only three people sit to the left of M. M sits third to the left of N. Q sits fourth to the left of R. P is not an immediate neighbour of M. L sits second to the right of P. Who sits to the immediate right of M?

**(a)** R
**(b)** L
**(c)** Q

YourMockTest.com - Free Study Material

**(d)** O

**Q80.** Read the given statements and conclusions carefully. You have to take the given statements to be true even if they seem to be at variance from commonly known facts. You have to decide which conclusion/s logically follow/s from the given statements.

Statements: All horses are ants. Some horses are donkeys. No donkey is a bull.

Conclusion (I) : Some ants are donkeys.

Conclusion (II) : No bull is a donkey.

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

## GENERAL AWARENESS AND CURRENT AFFAIRS

**Q81.** What is the name of India's first AI teacher?

**(a)** Ada
**(b)** Ava
**(c)** Iris
**(d)** Sophia

**Q82.** Who hosted the 51st G7 Summit in 2025?

**(a)** Japan
**(b)** Italy
**(c)** France
**(d)** Canada

**Q83.** In October 2025, which of the following regulatory authorities restricted the commercial use of the term 'ORS' in beverages?

**(a)** Food Safety and Standards Authority of India
**(b)** Directorate General of Health Services
**(c)** National Medical Council
**(d)** Indian Council of Medical Research

**Q84.** In the Union Budget, 2025–26, the Government of India announced a comprehensive multi-sectoral 'Rural Prosperity and Resilience' programme that aims _____.

**(a)** to address the drop out problem in school
**(b)** to address under-employment in agriculture
**(c)** to develop the sports facilities in rural areas
**(d)** to address administrative problems in rural areas

**Q85.** What was India’s overall score in the Corruption Perceptions Index (CPI) for the year 2024 released in February 2025?

**(a)** 43
**(b)** 36
**(c)** 41
**(d)** 38

**Q86.** In November 2025, who among the following took oath as Chief Minister of Bihar for a record 10th time?

**(a)** Nitish Kumar
**(b)** Lalu Prasad Yadav
**(c)** Tejashwi Yadav
**(d)** Sushil Modi

YourMockTest.com — Free Study Material

**Q87.** Who received the Dadasaheb Phalke Award at the 71st National Film Awards in 2025?

**(a)** Kamal
**(b)** Prithviraj
**(c)** Mohanlal
**(d)** Rajkumar

**Q88.** Who among the following won the player of the match in the finals of the ICC Women's Cricket World Cup 2025?

**(a)** Smriti Mandhana
**(b)** Marizanne Kapp
**(c)** Deepti Sharma
**(d)** Shafali Verma

**Q89.** In which year was the Bill to amend the Disaster Management Act, 2005 passed by the Parliament?

**(a)** 2023
**(b)** 2025
**(c)** 2024
**(d)** 2022

**Q90.** As announced in November 2025, IN-SPACe and SIDBI signed an agreement to operationalise a Rs. 1,000 crore venture capital fund for which sector?

**(a)** Tourism enterprises
**(b)** Textile manufacturing companies
**(c)** Space startups
**(d)** Agricultural startups

**Q91.** At the Paris Diamond League in June 2025, which athlete set a meet record of 48.81 s in the women’s 400 m?

**(a)** Marileidy Paulino
**(b)** Salwa Eid Naser
**(c)** Mara Yamauchi
**(d)** Faith Cherotich

**Q92.** Which among the following small finance banks was granted in-principle approval in August 2025 to become a Universal Bank?

**(a)** Jana Small Finance Bank
**(b)** AU Small Finance Bank
**(c)** Equitas Small Finance Bank
**(d)** Ujjivan Small Finance Bank

**Q93.** In November 2025, which Indian state approved the Polygamy Prohibition Bill, 2025?

**(a)** Himachal Pradesh
**(b)** Tripura
**(c)** Assam
**(d)** Uttarakhand

**Q94.** In June 2025, which Indian pair clinched the gold medal in the 10m air rifle mixed team event at the International Shooting Sport Federation (ISSF) World Cup in Munich?

**(a)** Mehuli Ghosh and Shahu Tushar Mane
**(b)** Arya Borse and Arjun Babuta
**(c)** Anjum Moudgil and Deepak Kumar
**(d)** Apurvi Chandela and Divyansh Singh Panwar

**Q95.** On July 3, 2025, which global body approved India’s first Equine Disease-Free Compartment (EDFC), marking a major achievement in animal health?

**(a)** International Veterinary Council (IVC)
**(b)** Food and Agriculture Organization (FAO)

YourMockTest.com — Free Study Material

**(c)** World Organisation for Animal Health (WOAH)
**(d)** World Health Organization (WHO)

**Q96.** Which of the following countries hosted the 8th International Solar Alliance (ISA) Assembly in October 2025?
**(a)** India
**(b)** France
**(c)** Brazil
**(d)** United Arab Emirates

**Q97.** Which city was reported among the top 10 most polluted cities in the world on December 28, 2025?
**(a)** Kolkata
**(b)** Mumbai
**(c)** Chennai
**(d)** Delhi

**Q98.** Which romance novel by creator Prajakta Koli debuted in January 2025?
**(a)** Theory & Practice
**(b)** Bleeding Bangles
**(c)** Too Good to Be True
**(d)** The Subdued Sound

**Q99.** In August 2025, the Reserve Bank of India (RBI) appointed which individual as an ex-officio member of the Monetary Policy Committee, ahead of the October policy meeting?
**(a)** Indranil Bhattacharyya
**(b)** Michael Patra
**(c)** Nirmala Sitharaman
**(d)** Rajiv Ranjan

**Q100.** In World Cup 2024 Player of the Match in the Final ICC T20 match was awarded to_____.
**(a)** Tim Southee
**(b)** Virat Kohli
**(c)** Rahmanullah Gurbaz
**(d)** Shai Hope

## ANSWER KEY

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

## SOLUTIONS

**Q1. Answer: (c) Rays parallel to the principal axis converge after reflection**

The correct answer is Rays parallel to the principal axis converge after reflection.

YourMockTest.com — Free Study Material

Key Points

• A concave mirror is a spherical mirror whose reflecting surface is curved inwards, facing towards the center of the sphere. It is also known as a converging mirror because it converges the light rays incident on it.

• The Principal Focus (F) of a concave mirror is a specific point on its principal axis. When rays of light coming from infinity or a distant source are parallel to the principal axis, they strike the mirror and, after reflection, actually meet or converge at this point. Hence, statement 3 is correct.

• Unlike a convex mirror, the focus of a concave mirror is a real focus because the light rays actually pass through it. It is situated in front of the reflecting surface.

• The distance from the pole (P) of the mirror to the principal focus (F) is called the focal length (f) of the mirror.

• The principal axis is the straight line passing through the pole and the center of curvature of the spherical mirror.

Additional Information

• Components of Spherical Mirrors:

• Pole (P): The center of the reflecting surface of a spherical mirror. The intersection of the mirror surface and the principal axis defines this point. Hence, statement 2 describes the pole and is incorrect.

• Center of Curvature (C): The center of the hollow sphere of which the mirror is a part. For a concave mirror, it lies in front of it, while for a convex mirror, it lies behind it.

• Radius of Curvature (R): The distance between the pole and the center of curvature.

• Rules of Reflection:

• A ray passing through the center of curvature of a concave mirror is reflected back along the same path because it hits the mirror at an angle of incidence of 0 degrees (perpendicular to the surface). It does not converge at the focus upon reflection from C. Hence, statement 4 is incorrect.

• In a convex mirror, rays parallel to the principal axis diverge after reflection and only appear to originate from the focus located behind the mirror. Hence, statement 1 describes a convex mirror and is incorrect.

• Image Formation: Concave mirrors can form both real and virtual images, as well as magnified or diminished images, depending on the position of the object relative to the focus and center of curvature.

Important Points

• Mathematical Relation: For spherical mirrors with small apertures, the radius of curvature (R) is exactly twice the focal length (f), represented by the formula R = 2f.

• Uses of Concave Mirrors:

• They are commonly used in torches, search-lights, and vehicle headlights to get powerful parallel beams of light.

• They are used as shaving mirrors to see a larger image of the face.

• Dentists use concave mirrors to see enlarged images of the teeth of patients.

• Large concave mirrors are used to concentrate sunlight to produce heat in solar furnaces.

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

**Q2. Answer: (d) Certain fixed circular paths called discrete orbits**

The correct answer is Certain fixed circular paths called discrete orbits.

Key Points

• In 1913, Niels Bohr proposed a new model of the atom to overcome the limitations of the Rutherford model, specifically regarding the stability of atoms.

• According to Bohr’s model, electrons do not revolve in any arbitrary path; instead, they revolve around the nucleus only in certain fixed circular paths called discrete orbits.

• A crucial feature of these discrete orbits is that while electrons are revolving in them, they do not radiate energy. This prevents the electron from spiraling into the nucleus. Hence, option 4 is correct.

• These orbits are also known as energy levels or stationary shells. They represent regions where the energy of the electron is quantized.

• The orbits or shells are represented by the letters K, L, M, N or the quantum numbers n = 1, 2, 3, 4, starting from the nucleus outwards.

Additional Information

• Rutherford’s Model Comparison: Ernest Rutherford had suggested that electrons move in circular orbits like planets. However, Maxwell’s electromagnetic theory suggested that an accelerating charged particle (like an electron) must emit radiation, lose kinetic energy, and eventually collapse into the nucleus. Bohr resolved this by postulating discrete orbits.

• Energy Transitions: Electrons can jump from one orbit to another. If an electron absorbs a photon of specific energy, it moves to a higher energy level (farther from the nucleus). When it drops to a lower energy level, it emits energy in the form of radiation.

• Shell Capacity: The maximum number of electrons that can be accommodated in any shell is given by the Bohr-Bury formula, which is 2n^2. For the K shell (n=1), it is 2; for the L shell (n=2), it is 8.

• Hydrogen Spectrum: The Bohr model was highly successful in explaining the spectral lines of the Hydrogen atom, providing a physical basis for the Rydberg formula.

Important Points

• Quantization of Angular Momentum: Bohr postulated that the angular momentum (mvr) of an electron is an integral multiple of h / 2π, where h is Planck's constant. This means mvr = nh / 2π.

• Ground State: The lowest energy state of an atom is called its ground state (usually the n = 1 shell), where the electrons are closest to the nucleus.

• Limitations: While the Bohr model was a milestone, it could not explain the spectra of multi-electron atoms or the fine structure of spectral lines. It also failed to account for the Zeeman effect (splitting of lines in a magnetic field) and the Heisenberg Uncertainty Principle.

• Successor Model: The Bohr model was eventually replaced by the Quantum Mechanical Model of the atom, which uses wave functions and orbitals (3D regions of probability) instead of precise circular orbits.

**Q3. Answer: (c) In a plant cell, cytoplasm is found between cell wall and plasma membrane.**

The correct answer is In a plant cell, cytoplasm is found between cell wall and plasma membrane..

Key Points

• Cytoplasm is the jelly-like substance that fills the interior of a cell. It is a fundamental component found in both prokaryotic cells (like bacteria) and eukaryotic cells (like plant and animal cells). Hence, statement 1 is correct.

• Within the cell, the cytoplasm acts as a medium that contains and supports numerous cell organelles, such as the mitochondria, ribosomes, endoplasmic reticulum, and Golgi apparatus. These organelles perform specific functions necessary for the cell's survival. Hence, statement 2 is correct.

• The cytoplasm is specifically defined as the fluid-filled region located inside the plasma membrane. In eukaryotes, it specifically refers to the region between the plasma membrane and the nuclear envelope. Hence, statement 4 is correct.

• In a plant cell, the cytoplasm is located internal to the plasma membrane. The cell wall is an outer rigid layer that surrounds the plasma membrane. Therefore, the cytoplasm is not found between the cell wall and the plasma membrane; rather, the plasma membrane separates the cytoplasm from the cell wall. Hence, statement 3 is incorrect.

• Hence, the correct answer is In a plant cell, cytoplasm is found between cell wall and plasma membrane.

Additional Information

• Composition of Cytoplasm: The cytoplasm consists of about 80% water and is typically clear and colorless. It contains dissolved salts, nutrients, and enzymes that facilitate various biochemical reactions.

• Metabolic Activities: The cytosol, which is the liquid portion of the cytoplasm, is the site of many vital metabolic processes. For example, glycolysis, the first step of cellular respiration where glucose is broken down, occurs entirely within the cytoplasm.

• Cytoskeleton: The cytoplasm is not just a stagnant fluid; it is crisscrossed by a network of protein fibers known as the cytoskeleton. This structure provides mechanical support, maintains cell shape, and enables organelle movement.

• Protoplasm vs. Cytoplasm: While often used interchangeably in casual conversation, protoplasm refers to the entire living content of a cell, including the nucleus and the cytoplasm. Cytoplasm specifically excludes the nucleus.

• Prokaryotic Cytoplasm: In prokaryotes, which lack a membrane-bound nucleus, the cytoplasm contains the genetic material in a region called the nucleoid and is the site for almost all cellular activities.

Important Points

• Discovery: The term cytoplasm was introduced by the Swiss biologist Rudolf von Kolliker in the year 1863.

• Cytoplasmic Streaming: Also known as cyclosis, this is the active movement of the cytoplasm within a cell. In plant cells, this movement helps distribute chloroplasts to positions where they can best capture light for photosynthesis.

• Vacuoles in Plants: In mature plant cells, a large central vacuole can take up to 90% of the cell's volume, often compressing the cytoplasm into a thin layer against the plasma membrane.

• Buffer System: The cytoplasm acts as a buffer, protecting the genetic material of the cell and the organelles from damage caused by movement or collision with other cells.

**Q4. Answer: (b) It helps in producing seeds with genetic diversity.**

The correct answer is It helps in producing seeds with genetic diversity.

Key Points

• Sexual reproduction in plants is the process of producing new offspring by the fusion of male and female gametes. This process typically occurs in the flower, which serves as the reproductive unit of angiosperms.

• The primary advantage of sexual reproduction is the creation of genetic diversity. During the formation of gametes through meiosis, processes like crossing over and independent assortment ensure that each seed carries a unique combination of DNA from its parents. Hence, option 2 is correct.

• Unlike asexual reproduction, which produces clones, sexual reproduction results in variation. This variation is essential for the survival of a species, as it allows plants to adapt to changing environmental conditions, such as climate change or new pathogens.

• The statement that it requires two plants of different species is incorrect; sexual reproduction usually occurs between individuals of the same species to produce fertile offspring. Hence, statement 1 is incorrect.

• The claim that it prevents fertilisation is logically false, as fertilisation (the fusion of pollen and ovule) is the fundamental requirement for sexual reproduction to succeed. Hence, statement 3 is incorrect.

• Sexual reproduction does not occur in root systems; it takes place in specialized organs like flowers (in angiosperms) or cones (in gymnosperms). Roots are typically associated with asexual vegetative propagation. Hence, statement 4 is incorrect.

Additional Information

• Process of Sexual Reproduction:

• Pollination: This is the transfer of pollen grains from the anther (male part) to the stigma (female part). It can be self-pollination or cross-pollination mediated by wind, water, insects, or animals.

• Fertilisation: Once the pollen reaches the stigma, it grows a pollen tube down to the ovary. The male gamete fuses with the egg cell to form a zygote.

• Seed Formation: After fertilisation, the ovule develops into a seed, and the ovary often matures into a fruit. The seed contains the embryo and stored food (endosperm).

• Asexual Reproduction Comparison:

• In plants, asexual reproduction is also known as vegetative propagation. It involves parts like runners, tubers, bulbs, and rhizomes.

• While asexual reproduction is faster and requires less energy, it lacks genetic variation, making the entire population vulnerable to the same diseases or environmental stresses.

Important Points

• Evolutionary Significance: Genetic diversity is the "raw material" for natural selection. Sexual reproduction allows beneficial mutations to spread through a population more effectively than asexual methods.

• Dormancy and Dispersal: Sexual reproduction produces seeds, which can remain dormant during unfavorable conditions (like winter or drought) and can be dispersed over long distances to colonize new habitats.

• Components of a Flower: A typical flower consists of sepals, petals, stamens (male), and pistils/carpels (female). The stamen consists of the filament and anther, while the pistil consists of the stigma, style, and ovary.

**Q5. Answer: (a) Complete combustion with high temperature**

The correct answer is Complete combustion with high temperature.

Key Points

• A blue, non-luminous flame is the characteristic result of complete combustion of a hydrocarbon. This occurs when the fuel reacts with a sufficient supply of oxygen. Hence, statement 1 is correct.

• In complete combustion, the hydrocarbon is fully oxidized, producing only carbon dioxide ($CO_2$) and water vapor ($H_2O$) as chemical byproducts, along with a significant release of heat and light energy.

• The blue color of the flame is primarily due to the emission from excited molecular fragments like CH and C2 radicals. Because there are no unburnt carbon particles (soot) present to glow, the flame does not appear yellow or luminous.

• This type of flame indicates a high temperature, often reaching between 1400°C and 1650°C in a standard Bunsen burner setup. This efficiency makes it ideal for industrial heating and laboratory experiments.

• Conversely, a yellow flame indicates incomplete combustion, which happens when oxygen is limited. This results in the formation of soot and carbon monoxide. Hence, statements 2, 3, and 4 are incorrect descriptions of a blue flame.

Additional Information

• Luminous vs. Non-Luminous Flames:

• Luminous Flame: These are typically yellow-orange and occur during incomplete combustion. The luminosity is caused by incandescence, where tiny particles of unburnt carbon (soot) are heated to a point where they emit visible light.

• Non-Luminous Flame: These are blue and occur during complete combustion. They do not produce smoke or soot, making them "cleaner" for the environment and equipment.

• Hydrocarbons: These are organic compounds consisting entirely of hydrogen and carbon. Common examples include Methane ($CH_4$), Propane ($C_3H_8$), and Butane ($C_4H_{10}$). Saturated hydrocarbons (alkanes) generally burn with a blue flame if oxygen is plenty, while unsaturated hydrocarbons (alkenes/alkynes) often burn with a sooty flame due to higher carbon percentages.

• The Bunsen Burner: Developed by Robert Bunsen in 1855, this device allows for the adjustment of the air-to-gas ratio. By opening the air hole, more oxygen mixes with the gas, producing a roaring blue flame used for high-heat applications.

• Chemical Equation: The general equation for the complete combustion of Methane is: $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ + Heat Energy. If oxygen is insufficient, the reaction might produce Carbon Monoxide (CO) or Solid Carbon (C).

Important Points

• Soot Formation: Soot consists of fine black carbon particles. It is a major pollutant and can cause respiratory issues. Its presence in a flame is a clear indicator that the fuel is not being utilized efficiently.

• Oxygen Supply: The oxygen-to-fuel ratio is the most critical factor determining flame type. In household LPG stoves, the burners are designed with small holes to ensure a steady supply of air, which is why they normally produce a blue flame. If the flame turns yellow, it usually indicates the air holes are blocked.

• Temperature Zones: In a flame, the outermost zone (non-luminous) is the hottest part because it has direct access to atmospheric oxygen. The middle zone (luminous) is moderately hot, and the innermost zone (containing unburnt vapors) is the coolest.

**Q6. Answer: (d) Mass is directly proportional to inertia**

The correct answer is Mass is directly proportional to inertia.

Key Points

• Inertia is defined as the inherent property of a physical object to resist any change in its state of rest or uniform motion in a straight line.

• The mass of an object is a quantitative measure of its inertia. It represents the amount of matter contained within an object and determines how much it will resist acceleration when a force is applied.

• There is a linear and direct relationship between these two concepts. A body with a heavier mass possesses greater inertia, meaning it is harder to start moving if it is at rest, or harder to stop if it is already moving. Hence, statement 4 is correct.

• According to Newton's First Law of Motion, also known as the Law of Inertia, an object will maintain its state of motion unless an external unbalanced force acts upon it.

• Because inertia depends solely on the mass of the object, any increase in mass results in a corresponding and proportional increase in the object's resistance to changes in motion.

Additional Information

• Types of Inertia:

• Inertia of Rest: The inability of a body to change its state of rest by itself. For example, when a bus starts suddenly, the passengers tend to fall backward because their lower body moves with the bus while the upper body tries to remain at rest.

• Inertia of Motion: The inability of a body to change its state of uniform motion by itself. For example, an athlete runs some distance before taking a long jump to gain momentum and overcome the tendency to stop.

• Inertia of Direction: The inability of a body to change its direction of motion by itself. For instance, when a car rounds a curve sharply, the passengers are thrown toward the outside of the curve.

• Newton's Second Law Connection:

• The relationship is further clarified by Newton's Second Law (F = ma). Here, mass (m) acts as the proportionality constant between force (F) and acceleration (a). For a constant force, the larger the mass, the smaller the acceleration, illustrating the resistance provided by inertia.

• SI Units and Measurement:

• In the International System of Units (SI), mass is measured in kilograms (kg). Inertia does not have a separate unit of measurement; it is represented numerically by the object's mass value.

Important Points

• Analysis of Incorrect Statements:

• Mass is independent of inertia: This is incorrect because mass is fundamentally the measure of inertia. Without mass, there is no inertia in classical mechanics. Hence, statement 1 is incorrect.

• Mass is inversely proportional to inertia: This statement implies that as an object gets heavier, it becomes easier to move, which contradicts the fundamental laws of physics. Hence, statement 2 is incorrect.

• Mass is directly proportional to the square of inertia: There is no quadratic relationship (m prop. to $I^2$) in the definition of these terms; the relationship is strictly linear. Hence, statement 3 is incorrect.

• Historical Context:

• The concept of Inertia was first formulated by Galileo Galilei for horizontal motion on Earth and was later generalized by Isaac Newton in 1687 in his work "Philosophiæ Naturalis Principia Mathematica".

**Q7. Answer: (d) Only A**

The correct answer is Only A.

Key Points

• Physical Change Definition: A physical change is a type of change in which the physical properties of a substance, such as its shape, size, color, or state, undergo a transformation without altering its chemical composition. No new chemical substance is formed during this process.

• Statement A Analysis: When matter changes from one state to another (e.g., liquid water turning into water vapor), the molecular

YourMockTest.com — Free Study Material

structure ($H_2O$) remains the same. Only the kinetic energy and the arrangement of molecules change. Hence, statement A is correct.

• Statement B Analysis: A change of state is typically a reversible change. This means the substance can return to its original state by reversing the external conditions such as temperature or pressure. For instance, ice can melt into water, and that water can be frozen back into ice. Hence, statement B is incorrect.

• Conclusion: Since only the first statement accurately describes the scientific nature of phase transitions, the final answer must reflect the validity of statement A alone. Hence, the correct answer is Only A.

Additional Information

• States of Matter:

• Matter primarily exists in three states: Solid, Liquid, and Gas. Advanced states include Plasma and Bose-Einstein Condensate.

• Solids have a definite shape and volume due to strong intermolecular forces.

• Liquids have a definite volume but take the shape of the container.

• Gases have neither a definite shape nor a definite volume, filling all available space.

• Processes of Phase Transition:

• Melting (Fusion): The transition from a solid to a liquid state upon heating.

• Freezing (Solidification): The transition from a liquid to a solid state upon cooling.

• Vaporization (Boiling/Evaporation): The process where a liquid changes into a gas.

• Condensation: The process where a gas or vapor changes back into a liquid.

• Sublimation: A direct change from a solid to a gas without passing through the liquid phase (e.g., Camphor or Dry Ice).

• Deposition: A direct change from a gas to a solid.

• Role of Energy:

• Changes of state are driven by the absorption or release of heat energy (often referred to as Latent Heat).

• Latent Heat of Fusion is the heat required to change a substance from solid to liquid at its melting point.

• Latent Heat of Vaporization is the energy needed to convert a liquid into a gas at its boiling point.

Important Points

• Reversibility vs. Irreversibility: While physical changes (like melting) are usually reversible, chemical changes (like burning wood or rusting iron) are typically irreversible because they result in the formation of new products with different properties.

• Effect of Pressure: While temperature is the most common factor, pressure also plays a critical role. For example, increasing pressure can liquefy certain gases (like LPG - Liquefied Petroleum Gas).

• Constant Temperature: During a change of state, the temperature of the substance remains constant even though heat is being supplied, as the energy is used to overcome molecular attractions.

**Q8. Answer: (a) yellow flame with black smoke**

The correct answer is yellow flame with black smoke.

Key Points

• Unsaturated hydrocarbons are organic compounds that contain at least one double bond (alkenes) or triple bond (alkynes) between carbon atoms.

• When unsaturated hydrocarbons are burnt in the presence of air, they typically undergo incomplete combustion. This happens because the proportion of carbon in these molecules is relatively high compared to saturated hydrocarbons.

• The high carbon content prevents all the carbon atoms from being completely oxidized into carbon dioxide given the limited amount of oxygen available in the surrounding air.

• As a result of this incomplete combustion, unburnt carbon particles are produced. These particles heat up and glow, giving the flame a characteristic yellow color.

• The unburnt carbon particles that do not glow or are released from the flame manifest as soot or black smoke. Hence, the statement that they produce a yellow flame with black smoke is correct.

Additional Information

• Saturated Hydrocarbons (Alkanes):

• Unlike unsaturated ones, saturated hydrocarbons like methane or ethane generally burn with a clean blue flame in sufficient air.

• This is because they have a lower carbon-to-hydrogen ratio, allowing for complete combustion where carbon is fully converted to $CO_2$.

• The Role of Oxygen:

• The nature of the flame depends heavily on the oxygen supply. If an unsaturated hydrocarbon (like acetylene) is burnt in pure oxygen rather than air, it can undergo complete combustion and produce an extremely hot blue flame used in welding.

• In a Bunsen burner, closing the air holes leads to incomplete combustion and a sooty yellow flame, regardless of the fuel type.

• Incandescence:

• The yellow light emitted by the flame is a result of incandescence, which is the emission of light by a solid (the unburnt carbon) caused by its high temperature.

Important Points

• Alkenes: These are hydrocarbons with at least one C=C double bond. A common example is Ethene (C2H4).

• Alkynes: These contain at least one C≡C triple bond. A common example is Ethyne (C2H2), also known as acetylene.

• Soot (Carbon Black): The black smoke produced is essentially fine particles of amorphous carbon. It is industrially significant and used in the manufacturing of tires and printing inks.

• Chemical Test: Saturated and unsaturated hydrocarbons can be distinguished using the Bromine Water Test. Unsaturated hydrocarbons decolorize bromine water, whereas saturated ones do not react under normal conditions.

**Q9. Answer: (a) Sodium**

The correct answer is Sodium.

Key Points

• The reactivity series (or activity series) is a list of metals arranged in the order of their decreasing chemical reactivity. Metals at the top are most reactive, while those at the bottom are least reactive.

• Among the options provided, Sodium is the most reactive metal. In the standard reactivity series, Potassium sits at the very top, followed immediately by Sodium. Hence, the option Sodium is the correct answer.

• Sodium (symbol Na, atomic number 11) is an alkali metal. It reacts vigorously with both oxygen and water at room temperature, which is why it is never found in a free state in nature.

• Copper (symbol Cu), Silver (symbol Ag), and Gold (symbol Au) are placed much lower in the series. Copper is located below Hydrogen, while Silver and Gold are near the very bottom, indicating they are highly unreactive.

• A metal placed higher in the series can displace a metal placed lower in the series from its salt solution. This is known as a displacement reaction. Because Sodium is high in the series, it can displace almost any other metal listed below it.

Additional Information

• The Reactivity Series Hierarchy:

• The typical order of metals from highest to lowest reactivity is: Potassium (K) > Sodium (Na) > Calcium (Ca) > Magnesium (Mg) > Aluminium (Al) > Zinc (Zn) > Iron (Fe) > Lead (Pb) > Hydrogen (H) > Copper (Cu) > Mercury (Hg) > Silver (Ag) > Gold (Au).

• Metals above Hydrogen can displace it from acids to produce hydrogen gas, whereas metals like Copper, Silver, and Gold cannot.

• Noble Metals (Gold and Silver):

• Gold and Silver are often referred to as noble metals because they do not react with moisture, air, or ordinary acids. This property makes Gold (located at the very bottom) ideal for jewelry and electronic components.

• Silver is also highly unreactive but can tarnish over time when exposed to sulfur compounds in the air.

• Transition Metal (Copper):

• Copper is a transition metal used extensively in electrical wiring and plumbing due to its high conductivity and relatively low reactivity compared to alkali metals. It does not react with water or dilute hydrochloric acid.

Important Points

• Storage of Sodium: Because Sodium reacts explosively with moisture in the air, it must be stored under kerosene or liquid paraffin to prevent accidental combustion.

• Extraction Methods: The position in the reactivity series determines how a metal is extracted. Highly reactive metals like Sodium and Potassium are extracted via electrolysis of their molten chlorides, whereas less reactive metals like Iron are extracted by reduction with carbon.

• Ionization Energy: Reactivity is closely linked to ionization energy. Metals at the top, such as Sodium, have low ionization energy, meaning they lose their valence electrons very easily to form positive ions (cations).

• Reaction with Water: While Sodium reacts violently with cold water, metals like Magnesium react only with hot water, and Iron reacts only with steam, further demonstrating the gradient of the reactivity series.

**Q10. Answer: (a) The magnetic field is stronger in that region**

The correct answer is The magnetic field is stronger in that region.

Key Points

• The degree of closeness of the magnetic field lines (also known as magnetic lines of force) determines the relative strength of the magnetic field in a given area.

• In a diagram, when the lines are drawn closer together or crowded, it signifies that the magnetic field is stronger in that specific region. Hence, statement 1 is correct.

• Conversely, where the field lines are widely separated or spread out, the magnetic field is weaker. This visual representation

allows for the mapping of magnetic flux density. Hence, statement 2 is incorrect.

• The magnetic field is a vector quantity, meaning it has both magnitude (represented by the density of the lines) and direction (indicated by arrows on the lines).

• The strength of the field is maximum at the poles of a magnet (both North and South poles) because the field lines are most concentrated at these points.

Additional Information

• Properties of Magnetic Field Lines:

• Magnetic field lines are continuous closed loops. Outside the magnet, they emerge from the North Pole and enter at the South Pole. Inside the magnet, the direction is from the South Pole to the North Pole.

• No two magnetic field lines can intersect each other. If they did, it would mean that at the point of intersection, the magnetic field has two different directions, which is physically impossible.

• The tangent drawn at any point on a magnetic field line indicates the direction of the magnetic field (B-field) at that specific point.

• Uniform vs. Non-Uniform Magnetic Fields:

• In a uniform magnetic field, the field lines are parallel and equidistant from each other, indicating that the field strength and direction are the same at all points.

• In a non-uniform field, like that around a bar magnet, the distance between the lines varies, showing that the magnetic field strength changes depending on the location.

• Units and Concepts:

• The SI unit of magnetic field strength (magnetic induction) is the Tesla (named after Nikola Tesla). Another common unit is the Gauss, where 1 Tesla = 10,000 Gauss.

• The concept of field lines was first introduced by Michael Faraday in the 19th century to visualize electromagnetic induction and magnetism.

Important Points

• The magnetic field is strongest near the poles because magnetic flux is highly concentrated there; therefore, the lines are tightly packed.

• When moving away from the magnet, the magnetic field strength decreases following an inverse-square law relationship in many contexts, which is why the lines appear farther apart at a distance.

• The Earth also behaves like a giant dipole magnet with its own magnetic field lines emerging from the magnetic south pole (near geographic North) and entering at the magnetic north pole (near geographic South).

• In a solenoid (a coil of wire), the magnetic field lines are nearly parallel inside the coil, indicating a very strong and uniform magnetic field within the center of the device.

**Q11. Answer: (a) Earthen or concrete structures across flooded gullies**

The correct answer is Earthen or concrete structures across flooded gullies.

Key Points

• Check dams are small, usually temporary or permanent barriers constructed across a swale, drainage ditch, or gully. They are primarily designed to counteract erosion by reducing the velocity of water flow during heavy rains or floods.

• These structures can be built using various materials, most commonly earthen embankments, reinforced concrete, loose stones (gabions), or timber. The choice of material depends on the topography and the intensity of water flow in the region. Hence, statement 1 is correct.

• The main functional objective of a check dam is to trap sediment and allow surface runoff to seep into the ground, thereby facilitating groundwater recharge. This makes them a vital component of watershed management.

• By slowing down the water, check dams prevent the deepening of gullies and the loss of fertile topsoil, which is crucial for agricultural productivity in arid and semi-arid regions.

• Unlike large-scale dams, check dams are cost-effective, have a low environmental impact, and can often be constructed using local community labor and resources.

Additional Information

• Rainwater Harvesting:

• Check dams are a form of in-situ rainwater harvesting. They help in increasing the water table levels in nearby wells, providing a reliable source of water for irrigation during dry months.

• In India, states like Rajasthan, Gujarat, and Maharashtra extensively use check dams to combat drought conditions and manage water scarcity.

• Ecological Impact:

• By creating small pools of standing water, these structures support local biodiversity, providing hydration for livestock and wildlife.

• They also help in pollutant filtration, as the slower water movement allows heavy metals and nutrients to settle with the sediment

rather than flowing into larger river systems.

• Comparison with Other Options:

• Small huts near rivers usually refer to temporary dwellings or fishing shelters and have no relation to water engineering.

• Industrial water supply dams are typically much larger, permanent reservoirs designed for high-volume storage rather than erosion control in gullies.

• Crescent-shaped hills for farming are often related to contour bunding or terrace farming, which are soil conservation methods but are not "dams" themselves.

Important Points

• Maintenance: One of the critical aspects of check dams is desiltation. Over time, the area behind the dam fills with silt and debris, reducing its capacity to slow water. Periodic removal of this silt (which is often rich in nutrients) can be used to improve farm soil.

• Design Criteria: A well-designed check dam must have a spillway or a lower center section to allow excess water to pass over without eroding the flanks of the structure.

• Government Initiatives: In India, schemes like the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) and MGNREGA provide funding and employment for the construction of check dams to ensure sustainable water management.

• Geographical Location: They are most effective in hilly terrains or regions with undulating slopes where surface runoff is high and soil erosion is a significant threat.

**Q12. Answer: (d) Both assertion and reason are true and reason is the correct explanation of assertion.**

The correct answer is Both assertion and reason are true and reason is the correct explanation of assertion.

Key Points

• The Assertion states that the ceilings of conference halls, auditoriums, and concert halls are typically curved. This is a common architectural practice in acoustics to manage how sound behaves within a large enclosed space. Hence, the assertion is correct.

• The Reason explains that these curved ceilings are designed so that sound waves, after reflecting off the surface, are directed downward to spread evenly across the entire width of the hall. Hence, the reason is correct.

• In a large hall, sound needs to reach the audience sitting at the back just as clearly as those at the front. A flat ceiling might reflect sound in a way that creates "dead spots" or sound shadows where the audio is faint.

• By using a curved surface (acting similarly to a concave mirror), the reflected sound waves are distributed more uniformly. This ensures that the sound is audible and intelligible to every person in the audience.

• Because the purpose of the curved design (the assertion) is specifically to achieve this even distribution of sound (the reason), the reason provides the correct logical explanation for the assertion. Hence, both assertion and reason are true and the reason is the correct explanation.

Additional Information

• Soundboards: In many large auditoriums, a curved soundboard is placed behind the speaker or the stage. This board reflects the sound toward the audience, ensuring that even a speaker with a low volume can be heard clearly at a distance.

• Reflection of Sound: Just like light, sound follows the laws of reflection, where the angle of incidence is equal to the angle of reflection. This principle is utilized to design acoustic spaces.

• Multiple Reflections: While curved ceilings help spread sound, multiple reflections can sometimes lead to reverberation. If the time interval between the original sound and reflected sound is too long, it can blur the clarity of speech.

• Acoustic Materials: To balance reflection and absorption, modern halls use materials like compressed fiberboard, rough plaster, or draperies on walls to absorb excess sound and reduce echoes.

• Applications: The principle of curved reflection is not limited to ceilings; it is also used in stethoscopes, megaphones, and horns to direct sound into a specific direction or focal point.

Important Points

• Concave Surfaces: A curved ceiling acts as a concave surface. When sound waves hit this surface, they converge or spread in a controlled manner depending on the radius of curvature.

• Auditory Uniformity: The primary goal of acoustic design in public buildings is to achieve uniformity in sound pressure levels throughout the seating area.

• Historical Context: Even in ancient Greek theaters, the semi-circular architectural design was intended to amplify and project the voice of actors to the top rows of the amphitheater.

• Sound Intensity: By reflecting sound that would otherwise be lost to the upper parts of the building back toward the listeners, the intensity of the sound perceived by the audience is significantly increased.

**Q13. Answer: (a) Catenation**

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

Key Points

• Catenation is the unique property of carbon that allows it to form covalent bonds with other carbon atoms, leading to the formation of long, stable chains and structures.

• This property results in the creation of straight chains, branched chains, and cyclic rings of various sizes. The Carbon-Carbon (C-C) bond is extremely strong and stable, which is a major reason why carbon can form such a vast number of compounds.

• The small size of the carbon atom (atomic number 6) enables its nucleus to hold the shared pairs of electrons strongly, ensuring the stability of these long chains. Hence, the correct answer is Catenation.

• While other elements like Silicon also exhibit catenation, they can typically only form chains of up to 7 or 8 atoms. These chains are highly reactive and unstable compared to the carbon chains found in organic chemistry.

• The sheer variety of carbon compounds, numbering in the millions, is primarily attributed to the combined effects of catenation and tetravalency.

Additional Information

• Tetravalency of Carbon:

• Carbon has 4 valence electrons in its outermost shell. This means it can form four covalent bonds with other atoms of carbon or atoms of other monovalent elements like Hydrogen, Oxygen, Nitrogen, and Sulphur.

• This tetravalent nature allows carbon to create a diverse range of functional groups, which determine the chemical properties of the resulting organic molecules.

• Isomerism:

• Isomerism is a phenomenon where two or more compounds have the same molecular formula but different structural arrangements or spatial orientations.

• For example, Butane (C4H10) has two isomers: n-butane (straight chain) and isobutane (branched chain). This adds to the massive variety of carbon-based substances.

• Combustion:

• Combustion is a chemical process where a substance reacts rapidly with Oxygen and gives off heat. Carbon and its compounds are used as excellent fuels because they release a large amount of energy during combustion, typically producing CO2 and H2O.

• Saturated and Unsaturated Carbon Compounds:

• Carbon atoms can be linked by single, double, or triple bonds. Compounds with only single bonds are called Saturated (e.g., Alkanes), while those with double or triple bonds are called Unsaturated (e.g., Alkenes and Alkynes).

Important Points

• Organic Chemistry: Due to catenation, a separate branch of chemistry called Organic Chemistry was developed to study carbon-containing compounds.

• Allotropes of Carbon: Carbon exists in different physical forms in the same state, known as allotropes. The most famous include Diamond (3D network), Graphite (layers), and Buckminsterfullerene (C60) (spherical).

• Bond Energy: The bond energy of a C-C bond is approximately 348 kJ/mol, which is significantly higher than Si-Si bonds (around 222 kJ/mol), explaining why carbon chains are more durable.

**Q14. Answer: (a) B/2**

The correct answer is B/2.

Key Points

• A solenoid is a type of electromagnet formed by a helical coil of wire whose length is substantially greater than its diameter. When an electric current passes through it, it creates a uniform magnetic field inside the coil.

• The magnetic field (B) inside a long solenoid is mathematically expressed by the formula: B = μ0nI. In this equation, μ0 represents the permeability of free space, n represents the number of turns per unit length, and I is the current flowing through the coil.

• From the formula, it is evident that the magnetic field is directly proportional to the current (I). This implies that any change in the magnitude of current will lead to a linear change in the magnetic field strength, provided other factors like turns and core material remain constant.

• In the given scenario, the initial magnetic field is B for a current I. If the current is halved, the new current becomes I/2. Substituting this into the formula gives the new magnetic field as B' = μ0n(I/2).

• By simplification, B' = 1/2 (μ0nI), which is equal to B/2. Therefore, when the current is halved, the magnetic field also becomes halved. Hence, the statement that the field becomes B/2 is correct.

Additional Information

• Properties of Solenoid Magnetic Fields:

• The magnetic field lines inside a solenoid are parallel straight lines, indicating that the magnetic field is uniform at all points inside.

• The strength of the field can be increased by increasing the number of turns (N) or by using a soft iron core inside the coil.

• Outside the solenoid, the magnetic field is very weak and is often considered zero in the case of an ideal solenoid.

• Right-Hand Thumb Rule:

• The direction of the magnetic field is determined by the Right-Hand Thumb Rule. If you wrap your fingers around the solenoid in the direction of the current, your thumb points toward the North Pole of the magnetic field.

• Comparison with Bar Magnets:

• A current-carrying solenoid behaves similarly to a bar magnet, with one end acting as a North Pole and the other as a South Pole. Unlike a permanent magnet, the polarity of a solenoid can be reversed by changing the direction of current.

Important Points

• Permeability (μ0): The constant μ0 (permeability of free space) has a value of approximately 4π × 10^-^7 T·m/A. If a medium other than vacuum is used, μ0 is replaced by the absolute permeability (μ) of that medium.

• Unit of Measurement: The SI unit for magnetic field (B) is the Tesla (T), named after Nikola Tesla. Another commonly used unit is the Gauss (G), where 1 Tesla = 10,000 Gauss.

• Numerical Relationship: Since B is proportional to I, if the current was doubled, the field would become 2B. If the current was quartered, the field would become B/4. In this specific question, the reduction to half results in B/2.

• Applications: Solenoids are fundamental components in relays, fuel injectors, door locking mechanisms, and MRI scanners in hospitals.

**Q15. Answer: (c) Condensation**

The correct answer is Condensation.

Key Points

• Condensation is the physical process by which water vapor (gas) in the air is converted into liquid water. This occurs when the air temperature drops to its dew point.

• On a hot day, the air surrounding a cold glass contains invisible water vapor. When this warm, moist air comes into contact with the cold exterior surface of the glass, the air's temperature rapidly decreases.

• As the temperature of the air near the glass falls, the water molecules lose kinetic energy and move more slowly. This reduction in energy causes the molecules to cluster together, transitioning from a gaseous state to form liquid droplets.

• The appearance of these droplets is a direct result of the air reaching saturation at the colder temperature provided by the glass. Since cold air cannot hold as much moisture as warm air, the excess water vapor must transition into liquid form.

• This process is the exact opposite of evaporation, where liquid water gains energy to become a gas. Hence, the correct answer is Condensation.

Additional Information

• Evaporation:

• This is the process by which liquid water turns into water vapor or gas. It occurs when water molecules at the surface gain enough thermal energy to break free from the attractive forces of other liquid molecules.

• It is a cooling process because the higher-energy molecules leave the liquid, reducing the average temperature of the remaining substance. Common examples include sweat evaporating from skin or water drying from wet clothes.

• Freezing:

• Freezing is the phase transition in which a liquid turns into a solid. For pure water at standard atmospheric pressure, this occurs at 0 degrees Celsius (32 degrees Fahrenheit).

• During this process, heat energy is released into the environment as the molecules lose energy and form a fixed crystalline structure (ice).

• Sublimation:

• This is a relatively rare phase change where a solid transforms directly into a gas without passing through the intermediate liquid state.

• A well-known example is dry ice (solid carbon dioxide), which "smokes" as it turns into gas at room temperature. In nature, this can happen to snow or ice in extremely cold, dry, and windy conditions.

• Deposition:

• Deposition is the reverse of sublimation, where water vapor changes directly into solid ice.

• This is responsible for the formation of frost on grass or windowpanes during cold winter nights when the surface temperature is below the freezing point.

Important Points

• Humidity and Dew Point:

• Relative Humidity is the ratio of the current water vapor pressure to the saturation vapor pressure at a given temperature. When it reaches 100%, the air is saturated.

• The Dew Point is the specific temperature to which air must be cooled to become saturated with water vapor. If the glass surface is below this temperature, condensation will inevitably occur.

• Latent Heat:

• During condensation, energy known as latent heat of condensation is released. This release of energy is a major driver of atmospheric phenomena, such as the development of thunderstorms and hurricanes.

• In the case of the cold glass, the thermal energy from the water vapor is transferred to the glass and the liquid inside, which is why a cold drink warms up faster in humid environments.

**Q16. Answer: (d) 2 : 1**

The correct answer is 2 : 1.

Key Points

• The acceleration due to gravity (g) on the surface of a planet is the acceleration experienced by an object due to the gravitational force exerted by that planet.

• The mathematical formula to calculate this is g = (G * M) / R^2, where G is the Universal Gravitational Constant, M is the mass of the planet, and R is the radius of the planet.

• In the given problem, it is stated that Planet A and Planet B have the same radius (R_A = R_B). Since the radius is constant, the acceleration due to gravity is directly proportional to the mass of the planet (g prop. to M).

• The question mentions that Planet A has twice the mass of Planet B (M_A = 2 * M_B). This means that if we substitute these values into the ratio, we get g_A / g_B = (M_A / M_B) * (R_B^2 / R_A^2).

• Because the radii are equal, the term (R_B^2 / R_A^2) becomes 1. Therefore, the ratio of their accelerations due to gravity is equal to the ratio of their masses, which is 2 : 1. Hence, the ratio g_A : g_B is 2 : 1.

Additional Information

• Universal Gravitational Constant (G):

• This is a physical constant involved in the calculation of gravitational effects. Its value is approximately 6.674 x 10^-11 Nm^2/kg^2.

• It was first measured by Henry Cavendish in the year 1798 using a torsion balance.

• Factors Affecting 'g':

• Mass: If the mass of a planet increases while the radius remains the same, the gravitational pull increases linearly.

• Radius: If the radius of a planet increases while the mass remains the same, the acceleration due to gravity decreases according to the inverse square law.

• Acceleration due to gravity on Earth:

• The standard value of g on the surface of Earth is 9.8 m/s^2 (or roughly 32.2 ft/s^2).

• This value is not uniform across the globe; it is slightly higher at the poles and lower at the equator due to the Earth's oblate spheroid shape and its rotation.

Important Points

• Independence of Object Mass: The acceleration due to gravity is independent of the mass of the object that is falling. Whether it is a heavy rock or a light feather (in a vacuum), both will fall with the same acceleration on the same planet.

• Variation with Altitude and Depth:

• The value of g decreases with altitude as you move away from the center of the planet.

• The value of g also decreases with depth as you move toward the center of the planet, eventually becoming zero at the center.

• Weight vs. Mass: While mass is an intrinsic property of matter and remains constant everywhere, weight (W = m * g) is a force that changes depending on the acceleration due to gravity of the location.

**Q17. Answer: (d) To push food forward along the digestive tract**

The correct answer is To push food forward along the digestive tract.

Key Points

• Peristaltic movements (or peristalsis) are a series of involuntary, wave-like muscle contractions that move food through the digestive tract.

• These movements involve the rhythmic contraction and relaxation of the smooth muscles in the walls of the alimentary canal.

• The primary role of these movements is to push the food forward, ensuring it travels from the esophagus to the stomach and then through the intestines. Hence, statement 4 is correct.

• Digestive enzymes are biological catalysts produced by specialized glands and organs like the salivary glands, pancreas, and stomach lining, not by peristaltic movements. Hence, statement 1 is incorrect.

• The digestion of proteins in the stomach is a chemical process facilitated by the enzyme pepsin and hydrochloric acid (HCl), whereas peristalsis is a mechanical process. Hence, statement 2 is incorrect.

• The absorption of nutrients into the bloodstream primarily occurs in the small intestine through structures called villi and microvilli, rather than by the motion of peristalsis itself. Hence, statement 3 is incorrect.

Additional Information

• Esophagus: Peristalsis begins here once the bolus (chewed food) is swallowed. It takes roughly 4 to 9 seconds for the wave to push the food into the stomach.

• Stomach: In this organ, peristaltic waves serve a dual purpose: they move the food toward the pyloric sphincter and help in the mechanical mixing of food with gastric juices to form a semi-fluid mass called chyme.

• Small Intestine: Peristalsis in the small intestine is generally slower, which provides sufficient time for nutrient absorption and further chemical digestion.

• Large Intestine: Movement here is characterized by mass movements, which are intense peristaltic waves that occur 3 to 4 times a day to drive feces toward the rectum for egestion.

• Regulatory Control: Peristalsis is regulated by the Enteric Nervous System (ENS) and the Autonomic Nervous System, meaning it occurs without conscious effort.

Important Points

• Reverse Peristalsis: This is a condition where the wave-like contractions occur in the opposite direction. It is commonly observed during vomiting (emesis) as a protective mechanism to expel harmful substances from the stomach.

• Role of Dietary Fiber: Consuming insoluble fiber is essential as it adds bulk to the waste material, which stimulates the smooth muscles to perform peristalsis more efficiently, thereby preventing constipation.

• Involuntary Nature: Peristalsis is an involuntary action, meaning the body performs it automatically through the parasympathetic nervous system stimulation of the vagus nerve.

**Q18. Answer: (c) Ovule matures into seed and ovary into fruit**

The correct answer is Ovule matures into seed and ovary into fruit.

Key Points

• Fertilisation in flowering plants is the process where male gametes (carried by pollen) fuse with the female gamete (egg) inside the ovule to form a zygote.

• Once fertilisation is complete, the floral parts undergo significant transformations to protect the developing embryo and facilitate the next generation.

• The ovule undergoes structural changes, developing a tough protective coat, and matures into a seed. Hence, statement 3 is correct.

• Concurrently, the ovary surrounding the ovules grows rapidly and ripens to become the fruit. The primary function of the fruit is to protect the seeds and assist in their dispersal.

• The development of a pollen tube is a process that occurs after pollination but before fertilisation; it is the mechanism to deliver gametes, not a signal that fertilisation has finished. Hence, statement 1 is incorrect.

• The petals, sepals, stamens, style, and stigma usually wither and fall off after fertilisation because their roles in attracting pollinators and receiving pollen are no longer required. Hence, statements 2 and 4 are incorrect.

Additional Information

• Double Fertilisation: This is a characteristic feature of Angiosperms. Two male gametes are involved: one fuses with the egg cell to form the diploid zygote, and the other fuses with two polar nuclei to form the triploid primary endosperm nucleus (PEN), which develops into the endosperm (food storage tissue).

• Pollination vs. Fertilisation: Pollination is the physical transfer of pollen from the anther to the stigma. Fertilisation is the biochemical fusion of gametes. One must precede the other for successful reproduction in plants.

• Zygote to Embryo: Following fertilisation, the zygote undergoes multiple cell divisions to become the embryo, which is the "baby plant" housed within the seed.

• Seed Structure: A mature seed consists of a seed coat, cotyledons (seed leaves), and an embryo axis (consisting of the radicle and plumule).

Important Points

• Fruit Classification: Fruits can be fleshy (like mango, orange, or tomato) or dry (like mustard, groundnut, or pea). The wall of the ripened ovary is known as the pericarp.

• Hormonal Control: The transformation of the ovary into a fruit is largely regulated by plant hormones such as auxins, gibberellins, and ethylene.

• Persistent Sepals: In some species, the sepals do not fall off but remain attached to the fruit, such as in brinjal (eggplant), chilli, and strawberry.

• Seed Germination: The seed remains in a state of dormancy until it finds favorable conditions (water, air, and suitable temperature) to grow into a seedling.

YourMockTest.com — Free Study Material

**Q19. Answer: (a) Displacement of the car in 3 hours**

The correct answer is Displacement of the car in 3 hours.

Key Points

• The area under a velocity-time graph (v-t graph) represents the displacement of the object during that specific time interval.

• In this scenario, the graph is a straight line parallel to the time axis (x-axis), which indicates that the car is moving with a uniform velocity of 40 km/h.

• The area enclosed between the graph and the time axis forms a rectangle. The height of this rectangle corresponds to the velocity (40 km/h) and the width corresponds to the time duration (3 hours).

• By calculating the area (Length x Breadth), we get 40 km/h multiplied by 3 hours, which equals 120 km. This numerical value represents the total displacement covered by the car in 3 hours. Hence, statement 1 is correct.

• Since the velocity is constant and the graph is horizontal, the slope of the line is zero. This means the acceleration of the car is zero. Hence, statement 2 is incorrect.

• The final velocity is simply the value on the y-axis (40 km/h) and is not represented by the area under the curve. Hence, statement 3 is incorrect.

• While the numerical value of average speed would be 40 km/h in this specific case of uniform motion in a straight line, the area specifically denotes the physical quantity of displacement (or distance), not the rate itself. Hence, statement 4 is incorrect.

Additional Information

• Displacement: It is defined as the shortest distance between the initial and final positions of an object. It is a vector quantity, meaning it has both magnitude and direction. The SI unit of displacement is the meter (m).

• Velocity-Time Graph Characteristics:

• A straight line with a positive slope indicates uniform acceleration.

• A straight line with a negative slope indicates uniform retardation (deceleration).

• A curved line indicates non-uniform acceleration.

• The slope of the v-t graph at any point gives the instantaneous acceleration.

• Uniform Motion: When an object covers equal distances in equal intervals of time, it is said to be in uniform motion. In this state, the velocity remains constant throughout the journey, as seen in this 40 km/h example.

• Relationship Equation: The fundamental relationship for constant velocity is Displacement = Velocity x Time. Geometrically, this is exactly what the area of the rectangle under the v-t graph calculates.

Important Points

• Area vs. Slope: It is vital to distinguish that the area under a velocity-time graph gives displacement, whereas the slope of the same graph gives acceleration.

• Distance vs. Displacement: If the velocity-time graph stays above the time axis (positive velocity), the area represents both distance and magnitude of displacement. However, if the graph goes below the axis, the area above is positive and the area below is negative for calculating displacement, while both are added as positive values for total distance.

• Units: Always ensure the units are consistent. In this problem, km/h and hours are used, resulting in km. If the time were in minutes, it would need to be converted to hours or the velocity converted to km/min before calculating the area.

**Q20. Answer: (a) community-led protection of trees**

The correct answer is community-led protection of trees.

Key Points

• The Chipko Movement was a non-violent, social, and ecological movement by rural villagers, particularly women, in India in the 1970s, aimed at protecting trees and forests slated for government-backed logging.

• The landmark event of 1974 took place in Reni village of the Chamoli district in the Garhwal Himalayas (present-day Uttarakhand), where a group of local women successfully prevented the felling of trees by hugging them.

• The movement is a classic example of community-led protection because it originated from the grassroots level, involving the local population who depended on the forest for their livelihood and sustenance.

• It was inspired by the Gandhian philosophy of non-violent resistance (Satyagraha) and highlighted the conflict between the local community's rights and the commercial exploitation of natural resources by external contractors.

• The name 'Chipko' comes from the Hindi word for 'embrace' or 'to stick', as the protesters physically encircled the trees to prevent them from being cut. Hence, statement 1 is the correct description of the movement.

Additional Information

• Sunderlal Bahuguna: One of the most prominent leaders of the movement, he coined the slogan "Ecology is permanent economy" and undertook a 5,000-kilometer trans-Himalayan march between 1981 and 1983 to spread awareness.

• Chandi Prasad Bhatt: A pioneer of the movement and a social activist who founded the Dasholi Gram Swarajya Sangh (DGSS) in 1964, which later became the organizational base for the Chipko protests.

• Gaura Devi: A peasant woman who led the group of 27 women in Reni village in 1974 to confront the lumbermen when the village men were away, marking a turning point in the movement's success.

• Historical Precedent: The Chipko movement drew inspiration from the Bishnoi community of Rajasthan, where in 1730, Amrita Devi and 363 others sacrificed their lives to protect Khejri trees from being cut on the orders of the Maharaja of Jodhpur.

Important Points

• Policy Impact: Due to the widespread protests, the then Prime Minister Indira Gandhi issued a 15-year ban on green felling in the Himalayan forests in 1980 to allow the forest cover to regenerate.

• Environmental Awareness: The movement shifted the focus of Indian environmentalism from mere conservation to social justice, emphasizing the link between environment degradation and poverty.

• Global Recognition: The Chipko Movement was awarded the Right Livelihood Award (also known as the Alternative Nobel Prize) in 1987 for its dedication to the conservation and restoration of India's natural resources.

• Appiko Movement: Inspired by the Chipko movement, a similar protest called the Appiko Movement was launched in the Western Ghats of Karnataka in September 1983 to protect the local forests from commercial logging and monoculture.

**Q21. Answer: (a) The child will develop as a male due to the presence of the Y chromosome.**

The correct answer is The child will develop as a male due to the presence of the Y chromosome.

Key Points

• In humans, sex is determined by the 23rd pair of chromosomes, also known as allosomes or sex chromosomes. A child receiving an X chromosome from the mother and a Y chromosome from the father will result in an XY combination, which leads to the development of a male. Hence, statement 1 is correct.

• The X chromosome is not "dominant" over the Y chromosome in a way that determines femaleness; rather, the presence of the Y chromosome triggers male developmental pathways. Females possess an XX combination. Hence, statement 2 is incorrect.

• The mother always contributes an X chromosome because her genotype is XX. It is the father, who is XY, who determines the sex of the child by contributing either an X (for a girl) or a Y (for a boy). Hence, statement 3 is incorrect.

• A single Y chromosome is sufficient to initiate male sex differentiation in humans. The presence of two Y chromosomes is not a standard biological requirement for male development; in fact, conditions like XYY syndrome are chromosomal abnormalities. Hence, statement 4 is incorrect.

• The SRY gene (Sex-determining Region Y) located on the Y chromosome is the primary factor that directs the transformation of undifferentiated gonads into testes.

Additional Information

• The XY Sex-Determination System:

• This system is found in most mammals, including humans, and some insects. Males are the heterogametic sex (XY), while females are the homogametic sex (XX).

• The X chromosome is significantly larger and contains about 800 to 900 genes, whereas the Y chromosome is much smaller and carries approximately 50 to 60 genes.

• Role of the SRY Gene:

• The SRY gene acts as a genetic switch. It encodes the Testis-Determining Factor (TDF) protein.

• Around the 6th or 7th week of gestation, this gene activates other genes that cause the embryonic gonads to develop into testes, which then secrete testosterone.

• Probability of Sex Inheritance:

• During meiosis, a father produces two types of sperm in equal proportions: 50% carrying the X chromosome and 50% carrying the Y chromosome.

• This results in a 1:1 ratio or a 50% probability for each pregnancy to result in either a male or female child.

Important Points

• Autosomes vs. Allosomes: Humans have 46 chromosomes in total, arranged in 23 pairs. The first 22 pairs are autosomes (identical in both sexes), while the 23rd pair comprises the allosomes.

• Historical Context: The role of the Y chromosome in sex determination was first clarified in the early 20th century (around 1905) by scientists like Nettie Stevens and Edmund Beecher Wilson.

• Genetic Variations: Some individuals may have variations such as Klinefelter syndrome (XXY), where the presence of the Y chromosome still typically results in a male phenotype, or Turner syndrome (X0), which results in a female phenotype.

• Sperm Contribution: Since the egg always provides an X, it is scientifically established that the biological father's sperm is the sole deciding factor for the biological sex of the offspring.

**Q22. Answer: (a) Axon**

The correct answer is Axon.

Key Points

• The Axon is a long, slender projection of a Neuron (nerve cell) that typically conducts electrical impulses, known as Action Potentials, away from the nerve cell body or Soma. In the context of a quick muscle response, it is the Axon of a Motor Neuron that carries the signal directly to the muscle fibers. Hence, statement 1 is correct.

• Dendrites are the branch-like structures of a neuron that are designed to receive communications from other cells. They conduct electrical messages to the neuron cell body for the cell to function; they do not carry the impulse away to the muscle. Hence, statement 2 is incorrect.

• The Nucleus is located within the cell body (Soma) of the neuron. It contains the Genetic Material (DNA) and coordinates the cell's activities like growth and reproduction, but it is not involved in the actual transmission of the Nerve Impulse along the length of the cell to an effector. Hence, statement 3 is incorrect.

• Connective tissue in the nervous system, such as the Epineurium, Perineurium, and Endoneurium, provides structural support and protection to the bundles of axons (nerves). However, it is not a part of the nervous tissue that transmits electrical impulses. Hence, statement 4 is incorrect.

• The specific pathway for a quick movement in response to a stimulus like heat is called a Reflex Arc, which bypasses the conscious brain to allow for an immediate reaction.

Additional Information

• Structure of a Neuron:

• A typical neuron consists of three main parts: the Cell Body (Soma), Dendrites, and an Axon.

• The Myelin Sheath is a fatty layer that surrounds the Axon of many neurons. Its primary function is to increase the speed at which electrical impulses propagate along the myelinated fiber.

• The gaps in the myelin sheath are known as Nodes of Ranvier, which facilitate the rapid "jumping" of the impulse (Saltatory Conduction).

• The Reflex Arc Process:

• When a hot object is touched, Thermoreceptors in the skin detect the stimulus.

• The Sensory Neuron carries the impulse to the Spinal Cord.

• A Relay Neuron (Interneuron) in the spinal cord transmits the signal to a Motor Neuron.

• The Motor Neuron then sends the impulse via its Axon to the Effector (the muscle), causing it to contract and pull the hand away.

• Synapse and Neurotransmitters:

• The Synapse is the small gap between the Axon Terminal of one neuron and the Dendrite of the next.

• Communication across this gap occurs via chemical messengers called Neurotransmitters, such as Acetylcholine.

Important Points

• Neuromuscular Junction: This is the specific chemical synapse formed by the contact between a Motor Neuron and a Muscle Fiber. It is at this junction that the Axon transmits the signal that triggers muscle contraction.

• Direction of Impulse: In a neuron, the nerve impulse always travels in one direction: from the Dendrites to the Cell Body, and then along the Axon to the Axon Terminals.

• Response Time: While there is a slight delay due to synaptic transmission (the time it takes for neurotransmitters to cross the gap), the Axon is the structure that ensures the message travels over long distances (e.g., from the spine to the hand) at speeds up to 120 meters per second.

**Q23. Answer: (b) Work is a path-independent quantity for all forces.**

The correct answer is Work is a path-independent quantity for all forces.

Key Points

• Conservative and Non-conservative Forces: Work done by a force is path-independent only if the force is a conservative force (such as gravity, electrostatic force, or spring force). For non-conservative forces like friction or air resistance, the work done depends entirely on the actual path taken between two points. Therefore, work is not path-independent for all forces. Hence, statement 2 is false.

• Nature of Work: Work is defined as the dot product of the force vector and the displacement vector. It can be positive (when the angle between force and displacement is less than 90 degrees), negative (when the angle is greater than 90 degrees), or zero (when force is perpendicular to displacement or displacement is zero). Hence, statement 1 is correct.

• Units and Dimensions: Work is a scalar quantity and has the same SI unit as energy, which is the Joule (J). In CGS units, it is measured in Ergs. Both work and energy share the same dimensional formula: [M1 L2 T-2]. Hence, statement 3 is correct.

• Energy Transfer: Work is often described as energy in transit. It is a mechanism through which energy is transferred from one system to another or converted from one form to another through the application of force over a distance. Hence, statement 4 is correct.

• Hence, the correct answer is Work is a path-independent quantity for all forces.

Additional Information

• Work-Energy Theorem: This theorem states that the net work done by all forces acting on a body is equal to the change in its

kinetic energy. This relationship highlights that work and energy are fundamentally linked.

• Conservative Forces Details: A force is conservative if the work done by it in moving a particle around any closed loop is zero. Examples include magnetic force and central forces. The work done by these forces depends only on the initial and final positions.

• Non-conservative Forces Details: These forces cause dissipation of energy, usually in the form of heat or sound. Because the work done against friction increases with the length of the path, it cannot be recovered as potential energy.

• Zero Work Examples: A common example of zero work is a person carrying a heavy load on their head while walking horizontally; here, the gravitational force is perpendicular (90 degrees) to the direction of motion. Another example is centripetal force in circular motion.

• Conversion Factor: It is important to note the relationship between different units of work: 1 Joule is equal to 10^7 Ergs. One Joule is defined as the work done by a force of 1 Newton causing a displacement of 1 meter.

Important Points

• Mathematical Expression: The formula for work is W = Fs cos(theta), where F is the magnitude of force, s is displacement, and theta is the angle between them.

• Power Correlation: The rate at which work is done is known as Power. It is measured in Watts (W), where 1 Watt = 1 Joule per second.

• Sign Convention: Positive work increases the energy of the system (e.g., accelerating an object), while negative work decreases the energy of the system (e.g., a car braking due to friction).

**Q24. Answer: (c) Both statements A and B are correct.**

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

Key Points

• Bleaching powder is prepared by the action of chlorine gas on dry slaked lime, which is chemically known as Calcium hydroxide. Hence, statement A is correct.

• The chemical formula for bleaching powder is CaOCl2, and its chemical name is Calcium oxychloride or Calcium hypochlorite. Hence, statement B is correct.

• The manufacturing process involves the chlorination of lime in specialized plants such as the Hasenclever plant or the Bachmann plant, where the gas and solids move in a counter-current fashion.

• It is an essential chemical used in various sectors, primarily for its bleaching and disinfecting properties, which come from the release of chlorine.

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

Additional Information

• Industrial Uses:

• In the textile industry, it is used for bleaching cotton and linen to remove natural pigments.

• In the paper industry, it is used to bleach wood pulp before it is converted into paper products.

• In laundry services, it is applied to bleach washed clothes to maintain brightness and remove stains.

• Chemical Applications:

• It serves as a powerful oxidizing agent in many chemical laboratories and industrial manufacturing processes.

• It is used in the manufacture of chloroform (CHCl3).

• Water Treatment:

• One of its most critical applications is as a disinfectant for drinking water to kill harmful microorganisms and germs, ensuring the water is safe for consumption.

Important Points

• Chemical Reaction: The production is represented by the equation Ca(OH)2 + Cl2 -> CaOCl2 + H2O. This indicates that water is a byproduct of the synthesis.

• Physical Characteristics: It is a yellowish-white powder that emits a strong, distinct odor of chlorine. It is soluble in cold water, though the lime impurities may leave a residue.

• Atmospheric Interaction: When exposed to air for a long duration, it reacts with Carbon Dioxide (CO2) from the atmosphere, which leads to the liberation of Chlorine gas, eventually making the powder lose its effectiveness.

• Reaction with Acids: When bleaching powder reacts with dilute acids like Sulphuric acid (H2SO4) or Hydrochloric acid (HCl), it releases Chlorine, which acts as the active bleaching agent.

**Q25. Answer: (d) Optical centre**

The correct answer is Optical centre.

Key Points

• The optical centre of a lens is a specific point located on the principal axis such that any ray of light passing through it emerges without any deviation.

• In the case of a thin lens, the optical centre is considered the geometric centre of the lens. Light rays incident at this point pass straight through because the two refracting surfaces are effectively parallel at the center, leading to zero lateral displacement.

• This property is fundamental in ray optics and is used to simplify ray diagrams for both convex and concave lenses.

• While light rays passing through other parts of the lens (like the focus or between the focus and center) undergo refraction and change their direction, the ray through the optical centre maintains its original path. Hence, the correct answer is Optical centre.

Additional Information

• Principal Focus (F):

• For a convex lens, it is the point where rays parallel to the principal axis converge after refraction.

• For a concave lens, it is the point from which rays parallel to the principal axis appear to diverge.

• A ray passing through the Principal Focus will emerge parallel to the principal axis after passing through the lens. Thus, it deviates from its original path.

• Centre of Curvature (C):

• A lens has two spherical surfaces, and the center of these spheres are called the centres of curvature (C1 and C2).

• The distance from the optical centre to the centre of curvature is the radius of curvature (R).

• Unlike mirrors, a ray passing through the centre of curvature of a lens does undergo refraction and deviation unless it specifically coincides with the optical center.

• Principal Axis:

• It is the imaginary straight line passing through the two centres of curvature and the optical centre of the lens.

• It serves as the reference line for measuring all distances, such as object distance (u), image distance (v), and focal length (f).

Important Points

• Lens Maker's Formula: The relationship between focal length, refractive index, and radii of curvature is given by 1/f = (n - 1)(1/R1 - 1/R2).

• Thin Lens Approximation: In most general physics problems, we assume lenses are thin. In thick lenses, the ray passing through the optical centre might experience a tiny lateral shift, though its angular deviation remains zero.

• Sign Convention: According to the Cartesian sign convention, the optical centre (O) is taken as the origin. Distances measured in the direction of incident light are positive, while those opposite are negative.

• Aperture: The effective diameter of the circular outline of a spherical lens is called its aperture, which determines the intensity of light entering the lens.

**Q26. Answer: (c) √xyz cubic units**

Shortcut Trick

Let the length, breadth, and height be l, b, and h.

Adjacent face areas: lb = x, bh = y, hl = z.

Multiplying these: (lb) × (bh) × (hl) = x × y × z

$l^2b^2h^2 = xyz \Rightarrow (lbh)^2 = xyz$

Since Volume (V) = lbh, then $V^2 = xyz \Rightarrow V = \sqrt{xyz}$.

Therefore The correct answer is √xyz cubic units.

Alternate Method

Given:

Area of first face (x) = length (l) × breadth (b)

Area of second face (y) = breadth (b) × height (h)

Area of third face (z) = height (h) × length (l)

Formula Used:

Volume of Cuboid (V) = l × b × h

Calculations:

$\Rightarrow x \times y \times z = (l \times b) \times (b \times h) \times (h \times l)$

$\Rightarrow xyz = l^2 \times b^2 \times h^2$

$\Rightarrow xyz = (lbh)^2$

$\Rightarrow lbh = \sqrt{xyz}$

$\Rightarrow V = \sqrt{xyz}$

Therefore The correct answer is √xyz cubic units.

Additional Information

Total Surface Area of Cuboid

The total surface area is given by 2(lb + bh + hl) or 2(x + y + z) square units.
Diagonal of a Cuboid
The length of the longest rod that can be placed inside is $\sqrt{(l^2 + b^2 + h^2)}$ units.
Lateral Surface Area
The area of the four walls is 2h(l + b) square units.

**Q27. Answer: (b) 294**

Identify twin primes (a, b) between 2 and 50: (3, 5), (5, 7), (11, 13), (17, 19), (29, 31), (41, 43).
Total count n = 6.
Least prime α = 2 and greatest prime β = 47 (both < 50).
Value = 6 × (2 + 47) = 6 × 49 = 294.
Therefore The correct answer is 294.
Alternate Method
Given: 2 < a < b < 50, b − a = 2. α and β are least and greatest primes < 50.
Step 1: Find twin primes (a, b) where both are prime and differ by 2.
=> Pairs are (3, 5), (5, 7), (11, 13), (17, 19), (29, 31), (41, 43).
=> Total count n = 6.
Step 2: Find α (least prime number < 50) and β (greatest prime number < 50).
=> α = 2
=> β = 47
Step 3: Calculate the expression n(α + β).
=> Value = 6 × (2 + 47)
=> Value = 6 × 49 = 294.
Therefore The correct answer is 294.
Additional Information
Twin Prime Numbers
Pairs of prime numbers that have a difference of 2 are called twin primes (e.g., 5 and 7).
Prime Numbers < 50
The primes are: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47. Total 15 primes.
Co-prime Numbers
Two numbers are co-prime if their HCF is 1. They do not necessarily have to be prime themselves.

**Q28. Answer: (b) 34.6**

Shortcut Trick
The total sum of 4 numbers with an average of 18 is 18 × 4 = 72.
The sum of the three known numbers is 6.5 + 10.7 + 20.2 = 37.4.
Value of a = 72 − 37.4 = 34.6.
Therefore The correct answer is 34.6.
Alternate Method
Given:
Observations: 6.5, 10.7, 20.2, and a
Number of observations (n) = 4
Average (Arithmetic Mean) = 18
Formula Used:
Average = (Sum of all observations) ÷ (Total number of observations)
Calculations:
=> 18 = (6.5 + 10.7 + 20.2 + a) ÷ 4
=> 18 × 4 = 37.4 + a
=> 72 = 37.4 + a
=> a = 72 − 37.4
=> a = 34.6
Therefore The correct answer is 34.6.

YourMockTest.com — Free Study Material

Additional Information

Arithmetic Mean (Average)

It represents the central value of a set of data and is calculated as the sum of all values divided by the total number of values.

Property of Deviations

The sum of the deviations of all observations from their arithmetic mean is always zero. This can be used to quickly find missing values.

Weighted Average

When different groups have different averages, the combined average is (n1x1 + n2x2) ÷ (n1 + n2).

**Q29. Answer: (c) 2**

Shortcut Trick

Net rate of filling = 1/2 − 1/4 = 1/4 of the tank per minute.

Time required to fill the full tank = 4 minutes.

Time required to fill one-half of the tank = 4 ÷ 2 = 2 minutes.

Therefore The correct answer is 2 minutes.

Alternate Method

Given:

Time taken by filling pipe = 2 minutes

Time taken by emptying pipe = 4 minutes

Formula Used:

Total Capacity = LCM of individual time durations

Efficiency = Total Capacity ÷ Time Taken

| Pipe | Time (mins) | Total Work (Capacity) | Efficiency |
|---|---|---|---|
| Inlet Pipe | 2 | 4 units | +2 |
| Outlet Pipe | 4 | −1 | |

Calculations:

=> Net efficiency when both pipes are opened together = +2 − 1 = +1 unit/minute

=> Capacity of one-half of the tank = 4 ÷ 2 = 2 units

=> Time taken to fill one-half of the tank = 2 units ÷ 1 unit/minute = 2 minutes

Therefore The correct answer is 2 minutes.

Additional Information

Inlet and Outlet Pipes

An inlet pipe performs positive work by filling a tank, whereas an outlet pipe performs negative work by emptying the tank.

Net Work Formula

If an inlet pipe fills a tank in x hours and an outlet pipe empties it in y hours (where y > x), then the net part filled in 1 hour when both are open is (1/x − 1/y).

**Q30. Answer: (a) Rs. 3,087**

Shortcut Trick

Rate of interest = 5% = 1/20 in fraction form.

For 2 years, the ratio of Principal to Amount is $(20)^2 : (21)^2 = 400 : 441$.

Given 400 units = Rs. 2,800 => 1 unit = Rs. 7.

Total Amount = 441 × 7 = Rs. 3,087.

Therefore The correct answer is Rs. 3087.

Alternate Method

Given:

Principal (P) = Rs. 2,800

Rate (R) = 5% per annum

Time (n) = 2 years

Formula Used:

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

Calculations:

=> A = 2800 × (1 + 5/100)²

=> A = 2800 × (1 + 1/20)²

=> A = 2800 × (21/20)²

=> A = 2800 × (441 / 400)

=> A = 7 × 441

=> A = Rs. 3,087

Therefore The correct answer is Rs. 3087.

Additional Information

Compound Interest Formula

The interest is calculated on the principal and also on the accumulated interest of previous periods: CI = P[(1 + R/100)ⁿ − 1].

Effective Rate of Interest

For two years at rate R%, the effective compound interest rate is (x + y + xy/100)%. For 5%, it is 5 + 5 + (5 × 5)/100 = 10.25%.

Difference between SI and CI

The difference for 2 years is given by the formula D = P(R/100)².

**Q31. Answer: (b) B**

Shortcut Trick

Scheme A: Net discount = 28 + 28 − (28 × 28) ÷ 100 = 56 − 7.84 = 48.16%.

Scheme B: Buy 1 get 4 means 5 items for the price of 1. Discount = 4 ÷ 5 × 100 = 80%.

Scheme C: Single flat discount = 35%.

Scheme D: Net discount = 27 + 26 − (27 × 26) ÷ 100 = 53 − 7.02 = 45.98%.

Comparing all: 80% > 48.16% > 45.98% > 35%.

Therefore The correct answer is B.

Alternate Method

Given → Scheme A: 28% & 28% | Scheme B: Buy 1 Get 4 | Scheme C: 35% | Scheme D: 27% & 26%.

Formulas: Successive = a + b − ab ÷ 100 | Buy X Get Y Discount% = [Y ÷ (X + Y)] × 100.

=> For Scheme B: Buy 1, Get 4 implies the customer gets 1 (paid) + 4 (free) = 5 total items.

=> Discount = (Free Items ÷ Total Items) × 100 = (4 ÷ 5) × 100 = 80%.

=> The best scheme for a customer is the one offering the highest discount percentage.

=> Since 80% is significantly higher than all other options, Scheme B is the best.

Therefore The correct answer is B.

Additional Information

Successive Discounts

When two discounts x% and y% are given, the total effective discount is always less than the sum (x+y) due to the reduction applied to the already discounted price.

Buy X Get Y Free

In 'Buy X Get Y' schemes, the discount percentage is calculated as [Y ÷ (X+Y)] × 100. Note: 'Buy 1 Get 4' often implies 4 are free, whereas 'Buy 1 Get 4 total' means 3 are free.

**Q32. Answer: (b) 11**

Shortcut Trick

For the first n natural numbers, the formula for the average of squares is (n + 1)(2n + 1) ÷ 6.

Given n = 5.

Average = (5 + 1)(2 × 5 + 1) ÷ 6

Average = (6 × 11) ÷ 6 = 11

Therefore The correct answer is 11.

Alternate Method

Given: First 5 natural numbers are 1, 2, 3, 4, 5.

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

=> First 5 natural numbers: 1, 2, 3, 4, 5

=> Squares of these numbers: 1², 2², 3², 4², 5²

=> Values of squares: 1, 4, 9, 16, 25

YourMockTest.com — Free Study Material

=> Sum of squares: 1 + 4 + 9 + 16 + 25 = 55
=> Total count: 5
=> Average: 55 ÷ 5 = 11
Therefore The correct answer is 11.
Additional Information
Sum of First n Natural Numbers
The sum is given by the formula $S_n = [n(n + 1)] \div 2$.
Sum of Squares of First n Natural Numbers
The sum is given by the formula $S_{n^2} = [n(n + 1)(2n + 1)] \div 6$.
Average of First n Natural Numbers
The average is simply the middle term for consecutive numbers: $(n + 1) \div 2$.
Sum of Cubes of First n Natural Numbers
The sum of cubes is the square of the sum of the first n natural numbers: $[n(n + 1) \div 2]^2$.

**Q33. Answer: (b) 10 days**

Shortcut Trick
Total Work = 10 Skilled × 8 = 80 units = 10 Semi-skilled × 12 = 120 units.
Efficiency: 1 Skilled (S) = 1/80; 1 Semi-skilled (SS) = 1/120 per person-day.
Required Efficiency = 4 × (1/80) + 6 × (1/120) = 1/20 + 1/20 = 2/20 = 1/10 units/day.
Time Required = 1 ÷ (1/10) = 10 days.
Therefore The correct answer is 10 days.
Alternate Method
Given:
10 Skilled persons (S) = 8 days
10 Semi-skilled persons (SS) = 12 days
Formula Used:
Total Work = Efficiency × Time
Calculations:
=> 10S × 8 = 10SS × 12
=> 80S = 120SS
=> 2S = 3SS => S/SS = 3/2 (Efficiency ratio)
=> Total Work = 10 × 3 × 8 = 240 units
=> Combined Efficiency of 4S and 6SS = 4(3) + 6(2)
=> Efficiency = 12 + 12 = 24 units/day
=> Time = 240 ÷ 24 = 10 days
Therefore The correct answer is 10 days.
Additional Information
Chain Rule Formula
Used for work comparison: M1D1H1/W1 = M2D2H2/W2, where M is persons, D is days, H is hours, and W is work.
Work and Wages
Wages are always distributed in the ratio of the actual work done or the efficiency of the individuals if they work for the same time.
Combined Efficiency
When different groups work together, the total efficiency is the sum of their individual efficiencies (Total E = E1 + E2 + ... + E_n).

**Q34. Answer: (d) 18.62 m**

Shortcut Trick
Volume relationship: $\pi \times R1^2 \times H1 \times 0.95 = \pi \times R2^2 \times H2$
$7^2 \times 10 \times 0.95 = 5^2 \times H2$
$49 \times 9.5 = 25 \times H2$
$H2 = 465.5 \div 25 = 18.62$ m
Therefore The correct answer is 18.62 m.
Alternate Method

Given: Radius of first tank (r1) = 7 m, Height (h1) = 10 m, Leakage = 5%, Radius of second tank (r2) = 5 m.
Formula Used: Volume of Cylinder = $\pi r^2 h$
=> Total Volume of first tank = $\pi \times 7 \times 7 \times 10 = 490\pi$ $m^3$
=> Water remaining after 5% leakage = 95% of $490\pi$
=> Remaining Volume = $0.95 \times 490\pi = 465.5\pi$ $m^3$
=> Volume in second tank = $\pi \times 5 \times 5 \times H$
=> $465.5\pi = 25\pi \times H$
=> $H = 465.5 \div 25$
=> $H = 18.62$ m
Therefore The correct answer is 18.62 m.
Additional Information
Volume of Cylinder
The space occupied by a cylindrical object is calculated as Area of base × Height = $\pi r^2 h$.
Total Surface Area
The total surface area of a closed cylinder includes the curved surface and two circular bases: $2\pi rh + 2\pi r^2$.
Conversion of Volume
When a liquid is transferred from one container to another, its volume remains constant unless there is a loss (leakage).

**Q35. Answer: (a) 750**

Shortcut Trick
Convert percentages and fractions into a single multiplier: 60% = 3/5 and 80% = 4/5.
Multiplier = (3/5) × (4/5) × (3/5) = 36/125.
Given: (36/125) × Number = 216.
Number = (216 × 125) ÷ 36 = 6 × 125 = 750.
Therefore The correct answer is 750.
Alternate Method
Let the unknown number be x.
Given: 60% of 80% of (3/5) of x = 216.
=> (60/100) × (80/100) × (3/5) × x = 216
=> (3/5) × (4/5) × (3/5) × x = 216
=> (36/125) × x = 216
=> x = (216 × 125) ÷ 36
=> x = 6 × 125
=> x = 750
Therefore The correct answer is 750.
Additional Information
Percentage to Fraction Conversion
To simplify calculations, remember common fractions: 20% = 1/5, 40% = 2/5, 60% = 3/5, and 80% = 4/5.
Successive Percentages
A% of B% of C is equivalent to (A × B ÷ 100)% of C. Multiplying the individual fractions directly is the fastest method.
Base Change Rule
If a value is reduced by x%, to restore it to the original value, it must be increased by [x/(100 − x)] × 100%.

**Q36. Answer: (a) Rs. 825**

Shortcut Trick
The relationship between Selling Price (SP) and Marked Price (MP) is given by: SP = MP × (100 − Discount%) ÷ 100.
Ratio method: 20% discount => 1/5, where 5 is MP and 1 is discount, so SP = 4 units.
Given 4 units = 660, then 1 unit = 165.
Marked Price (5 units) = 165 × 5 = 825.
Therefore The correct answer is Rs. 825.
Alternate Method
Given: Selling Price (SP) = Rs. 660, Discount% = 20%.

Formula: Marked Price (MP) = (SP × 100) ÷ (100 − Discount%)
=> MP = (660 × 100) ÷ (100 − 20)
=> MP = (660 × 100) ÷ 80
=> MP = 66000 ÷ 80
=> MP = 825
Therefore The correct answer is Rs. 825.
Additional Information
Marked Price & Discount
Marked Price is the price printed on the label. Discount is always calculated on the Marked Price. SP = MP − Discount.
Discount Percentage
Discount% = (Discount ÷ Marked Price) × 100. It represents the reduction offered on the tagged price.

**Q37. Answer: (d) 8 hours**

Shortcut Trick
Speed and Time are inversely proportional when Distance is constant.
Speed ratio (S1 : S2) = 42 : 63 = 2 : 3
Time ratio (T1 : T2) = 3 : 2
Given T1 = 12 hours (3 units → 12), then 1 unit = 4.
Required time T2 = 2 units = 2 × 4 = 8 hours.
Therefore The correct answer is 8 hr.
Alternate Method
Given: Initial Speed (S1) = 42 km/hour, Initial Time (T1) = 12 hours, New Speed (S2) = 63 km/hour.
Formula Used: Distance = Speed × Time
=> Total Distance = S1 × T1
=> Total Distance = 42 × 12 = 504 km
=> New Time (T2) = Total Distance ÷ S2
=> T2 = 504 ÷ 63
=> T2 = 8 hours
Therefore The correct answer is 8 hr.
Additional Information
Inverse Proportion in Speed
When the distance is fixed, speed is inversely proportional to time: S1T1 = S2T2.
Average Speed for Same Distance
If a journey involves two equal distances covered at different speeds 'x' and 'y', the average speed is (2xy) ÷ (x + y).
Unit Conversion
To convert km/hr to m/s, multiply by 5/18. To convert m/s to km/hr, multiply by 18/5.

**Q38. Answer: (a) Rs. 3,059**

Shortcut Trick
Total amount = Rs. 12,405. Deductions = 53 + 88 + 76 = Rs. 217.
Remaining amount = 12,405 − 217 = Rs. 12,188.
Remaining ratio P : Q : R = 15 : 20 : 9. Total ratio units = 15 + 20 + 9 = 44 units.
1 unit = 12,188 ÷ 44 = Rs. 277.
Difference between Q and R (shares) = (20 − 9) units + (88 − 76) = 11 × 277 + 12 = 3047 + 12 = Rs. 3,059.
Therefore The correct answer is Rs. 3,059.
Alternate Method
Given: Total = Rs. 12,405; Deductions = Rs. 53, Rs. 88, Rs. 76; Ratio = 15 : 20 : 9.
Formula: Value = (Ratio Share × Adjusted Total) ÷ Sum of Ratios.
=> Sum of remaining shares = 12,405 − (53 + 88 + 76) = 12,188
=> 15x + 20x + 9x = 12,188
=> 44x = 12,188
=> x = 277

=> Q's original share = 20 × 277 + 88 = 5540 + 88 = 5628

=> R's original share = 9 × 277 + 76 = 2493 + 76 = 2569

=> Difference = 5628 − 2569 = 3059

Therefore The correct answer is Rs. 3,059.

Additional Information

Ratio Distribution with Constant Change

When fixed amounts are added or subtracted before dividing in a ratio, always adjust the Total Sum first by adding or subtracting the net change before applying the ratio parts.

Ratio & Proportion Basics

If a sum S is divided in ratio a:b:c, the share of b is [b ÷ (a+b+c)] × S. For original shares, remember to add back any deducted amounts.

Calculation Trick

To divide by 44, you can divide by 4 and then by 11 sequentially to simplify mental math during competitive exams.

**Q39. Answer: (d) 5/3**

Shortcut TrickFor a right-angled triangle, tanθ = Perpendicular (P) / Base (B) = 3 / 4.Using Pythagorean triplet (3, 4, 5), the Hypotenuse (H) = 5.cosecθ = Hypotenuse (H) / Perpendicular (P) = 5 / 3.Therefore The correct answer is 5/3.Alternate MethodGiven: tanθ = 3/4Formula Used: tanθ = P/B, H2 = P2 + B2, cosecθ = H/P=> Let Perpendicular (P) = 3 and Base (B) = 4.=> H2 = 32 + 42=> H2 = 9 + 16 = 25=> H = √25 = 5=> cosecθ = H / P = 5 / 3Therefore The correct answer is 5/3.Additional InformationTrigonometric RatiosReciprocal relationships: cosecθ = 1/sinθ, secθ = 1/cosθ, and cotθ = 1/tanθ.Pythagorean Identity1 + cot2θ = cosec2θ. Since cotθ = 4/3, cosec2θ = 1 + (4/3)2 = 1 + 16/9 = 25/9 → cosecθ = 5/3.Acute Angle PropertyFor an acute angle (0° < θ < 90°), all trigonometric ratios are positive.

**Q40. Answer: (c) 2**

Shortcut Trick

The HCF cannot be greater than the minimum difference between any two numbers.

Difference between 172 and 148 = 24

Difference between 198 and 172 = 26

The factors of the smallest difference (24) are 24, 12, 8, 6, 4, 3, 2, 1.

Testing the options: 148 is not divisible by 6 or 3 (sum of digits of 148 = 13). Hence, only 2 divides all three numbers.

Therefore The correct answer is 2.

Alternate Method

Given: Numbers are 148, 172, and 198.

Formula Used: Prime Factorisation Method

Write the prime factorization of each number:

=> 148 = 2 × 2 × 37 = $2^2$ × 37

=> 172 = 2 × 2 × 43 = $2^2$ × 43

=> 198 = 2 × 3 × 3 × 11 = $2^1$ × $3^2$ × 11

To find the HCF, we take the lowest power of the common prime factors:

=> Common prime factor is 2, with the lowest power being $2^1$.

=> HCF = $2^1$ = 2

Therefore The correct answer is 2.

Additional Information

Highest Common Factor (HCF)

The HCF of two or more numbers is the greatest number that divides each of them exactly without leaving any remainder.

Relationship between HCF and LCM

For any two numbers a and b, the product of the numbers is equal to the product of their HCF and LCM: a × b = HCF(a, b) × LCM(a, b).

HCF of Fractions

HCF of fractions = (HCF of Numerators) ÷ (LCM of Denominators).

**Q41. Answer: (a) 55**

Shortcut Trick

Average Speed = Total Distance ÷ Total Time

Total Distance = 684 + 1078 + 2198 = 3960 m
Total Time = 19 + 22 + 31 = 72 min
Average Speed = 3960 ÷ 72 = 55 m/min
Therefore The correct answer is 55 m/min.
Alternate Method
Given:
Distances (d1, d2, d3) = 684 m, 1078 m, 2198 m
Time intervals (t1, t2, t3) = 19 min, 22 min, 31 min
Formula Used:
Average Speed = (d1 + d2 + d3) ÷ (t1 + t2 + t3)
Calculations:
=> Total Distance = 684 + 1078 + 2198 = 3960 m
=> Total Time = 19 + 22 + 31 = 72 min
=> Average Speed = 3960 ÷ 72
=> Average Speed = 55 m/min
Therefore The correct answer is 55 m/min.
Additional Information
Average Speed Formula
It is defined as the total distance traveled divided by the total time taken. V_(avg) = Total Distance ÷ Total Time.
Equal Distance Case
If two equal distances are covered at speeds x and y, then Average Speed = 2xy ÷ (x + y).
Unit Conversion
To convert m/sec to km/hr, multiply by 18/5. To convert m/min to m/sec, divide by 60.

**Q42. Answer: (b) 629**

Shortcut Trick
The number of diagonals in a regular polygon with n sides is calculated using the direct formula:
Number of diagonals = [n × (n − 3)] ÷ 2
Given: n = 37
=> Diagonals = [37 × (37 − 3)] ÷ 2
=> Diagonals = [37 × 34] ÷ 2 = 37 × 17 = 629
Therefore The correct answer is 629 diagonals.
Alternate Method
Given:
Number of sides (n) = 37
Formula Used:
Number of diagonals = $^{n}C2 - n$
(This formula represents choosing any 2 vertices out of n to form a line segment, and then subtracting the n segments that are actually sides of the polygon.)
A B C D E (Illustration: Pentagon with 5 diagonals shown in red) </

**Q43. Answer: (c) Rs. 24,750**

Shortcut Trick
Net percentage change formula = x + y + (x × y)/100
Here, x = −10% (reduction) and y = +10% (increase)
Net change = −10 + 10 + (−10 × 10)/100 = −1%
Final Price = 25,000 × (100 − 1)/100 = 25,000 × 0.99 = Rs. 24,750
Therefore The correct answer is Rs. 24,750.
Alternate Method
Given:
Initial Price = Rs. 25,000
Reduction in 1st year = 10%

Increase in 2nd year = 10%

Calculations:

=> Price after 1st year = 25,000 − (10% of 25,000)

=> Price after 1st year = 25,000 − 2,500 = Rs. 22,500

=> Price after 2nd year = 22,500 + (10% of 22,500)

=> Price after 2nd year = 22,500 + 2,250 = Rs. 24,750

Therefore The correct answer is Rs. 24,750.

Additional Information

Successive Percentage Change

When a value is changed by x% and then by y%, the effective change is [x + y + (xy/100)]%.

Same Percent Increase and Decrease

If a value is increased by x% and then decreased by x%, there is always a net decrease of ($x^2$/100)%.

Base Change Principle

The second percentage change is always calculated on the new (updated) base value, not the initial value.

**Q44. Answer: (c) Rs. 605**

Shortcut Trick

Effective Cost Price = 500 + 50 = Rs. 550.

Profit% = 10% => Multiplier = (100 + 10) ÷ 100 = 1.1.

Selling Price = 550 × 1.1 = Rs. 605.

Therefore The correct answer is Rs. 605.

Alternate Method

Given: Cost Price (CP) = Rs. 500, Overhead Expenses = Rs. 50, Profit% = 10%.

Formulas: Total CP = Purchase Price + Overhead | SP = Total CP × (100 + Profit%) ÷ 100

=> Total CP = 500 + 50 = Rs. 550.

=> Profit Amount = 10% of 550 = (10 ÷ 100) × 550 = Rs. 55.

=> Selling Price (SP) = Total CP + Profit = 550 + 55 = Rs. 605.

Therefore The correct answer is Rs. 605.

Additional Information

Overhead Expenses

Any extra amount spent on repairs, packaging, or transport is added to the initial CP to find the Effective Cost Price.

Profit Percentage

Profit% is always calculated on the Total Cost Price unless stated otherwise. Formula: Profit% = (Profit ÷ Total CP) × 100.

**Q45. Answer: (a) 3**

Shortcut Trick

Use the value substitution method by choosing values that satisfy the condition x + y + z = 0 (where none of them is 0).

Let x = 1, y = 1, and z = −2.

Substitute these values into the given expression:

=> ($1^2$ ÷ (1 × (−2))) + ($1^2$ ÷ ((−2) × 1)) + ($(-2)^2$ ÷ (1 × 1))

=> −1/2 − 1/2 + 4

=> −1 + 4 = 3

Therefore The correct answer is 3.

Alternate Method

Given:

x + y + z = 0

Formula Used:

If x + y + z = 0, then the algebraic identity is $x^3 + y^3 + z^3 = 3xyz$.

Calculations:

The expression to find is:

=> ($x^2$ ÷ yz) + ($y^2$ ÷ zx) + ($z^2$ ÷ xy)

Take the LCM of the denominators (yz, zx, xy) which is xyz:

=> $(x^3 + y^3 + z^3) \div xyz$

Substitute $x^3 + y^3 + z^3 = 3xyz$ into the numerator:

=> $3xyz \div xyz$

=> 3

Therefore The correct answer is 3.

Additional Information

Standard Algebraic Identity

The sum of cubes formula is given by: $x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$.

Conditional Identity

When $x + y + z = 0$, the right-hand side of the standard identity becomes zero, which simplifies the equation directly to $x^3 + y^3 + z^3 = 3xyz$.

Sum of Squares Identity

The term $(x^2 + y^2 + z^2 - xy - yz - zx)$ can also be written in the form $(1/2) \times [(x - y)^2 + (y - z)^2 + (z - x)^2]$.

**Q46. Answer: (c) 3780**

Shortcut Trick

Overall percentage increase = $(11718 - 10500) \div 10500 \times 100 = 1218 \div 105 = 11.6\%$

Using Alligation: Males (10%) and Females (15%) with mean (11.6%) gives ratio $(15 - 11.6) : (11.6 - 10) = 3.4 : 1.6 = 17 : 8$.

Total ratio parts = 17 + 8 = 25 units → 10500. So, 1 unit = 420.

Difference = 17 − 8 = 9 units → 9 × 420 = 3780.

Therefore The correct answer is 3780.

Alternate Method

Given: Initial population = 10500, Final population = 11718, Male increase = 10%, Female increase = 15%.

=> Total increase = 11718 − 10500 = 1218

=> Overall % increase = $(1218 \div 10500) \times 100 = 11.6\%$

=> Male (M) : Female (F) ratio by alligation = $(15 - 11.6) : (11.6 - 10) = 3.4 : 1.6 = 17 : 8$

=> Total units = 17 + 8 = 25 units

=> 25 units = 10500 => 1 unit = 420

=> Difference in population = $(17 - 8) \times 420 = 9 \times 420 = 3780$

Therefore The correct answer is 3780.

Additional Information

Alligation Rule

It is used to find the ratio in which two components are mixed to get a desired mean value: (Quantity 1 / Quantity 2) = (Value 2 − Mean) / (Mean − Value 1).

Percentage Change

Percentage Change = [(New Value − Original Value) / Original Value] × 100. This is the base for finding the mean in population problems.

Ratio to Actual Value

If a total amount T is divided in ratio a:b, then the difference between parts is $|a - b| \div (a + b) \times T$.

**Q47. Answer: (c) 102**

Shortcut Trick

In a proportion where $x/a = b/x$, the value of x is the geometric mean $\sqrt{(a \times b)}$.

$x^2 = 34 \times 306$

$x = \sqrt{(34 \times 34 \times 9)} = 34 \times 3 = 102$.

Therefore The correct answer is 102.

Alternate Method

Given: Equation is ?/34 = 306/?

Formula Used: Cross-multiplication method: $a/b = c/d \Rightarrow a \times d = b \times c$

=> Let the unknown number be x.

=> $x/34 = 306/x$

=> $x \times x = 306 \times 34$

=> $x^2 = 10404$

=> x = √10404

=> x = 102

Therefore The correct answer is 102.

Additional Information

Mean Proportional

If three numbers a, x, b are in continued proportion, then x is the mean proportional such that x = √(ab).

Square Root Shortcut

To find √10404, look at the last digit (4), meaning the root ends in 2 or 8. Since $100^2 = 10000$, the answer must be slightly more than 100, which is 102.

**Q48. Answer: (b) 10 years**

Shortcut Trick

Total age after 5 years = 50 + (5 × 2) = 60 years.

Ratio after 5 years (Man : Son) = 3 : 1.

Total ratio parts = 3 + 1 = 4 parts.

Son's age after 5 years = 60 ÷ 4 = 15 years.

Son's present age = 15 − 5 = 10 years.

Therefore The correct answer is 10 years.

Alternate Method

Given: Sum of present ages = 50 years. Condition after 5 years = Man = 3 × Son.

Let the present age of the son be x years.

Let the present age of the man be (50 − x) years.

After 5 years:

=> Age of son = x + 5

=> Age of man = (50 − x) + 5 = 55 − x

According to the question:

=> 55 − x = 3 × (x + 5)

=> 55 − x = 3x + 15

=> 4x = 55 − 15

=> 4x = 40

=> x = 10

Therefore The correct answer is 10 years.

Additional Information

Age Sum Property

If the sum of ages of 'n' people is 'S' now, then after 't' years, the sum will be S + (n × t).

Ratio Method for Ages

When a ratio and a total sum are known for the same time period, divide the sum by the total ratio parts to find the value of one unit.

Age Difference Constant

The difference between the ages of two people remains constant throughout their lives, regardless of the years passed.

**Q49. Answer: (c) 4**

Shortcut Trick

Apply the exponent rules directly: $(a^m)^n = a^{(mn)}$ and $a^m \div a^n = a^{(m-n)}$.

$(2^3)^2 \div 2^4 = 2^6 \div 2^4$

$2^6 \div 2^4 = 2^2 = 4$

Therefore The correct answer is 4.

Alternate Method

Given:

Expression: $(2^3)^2 \div 2^4$

Formula Used:

Power of a Power Rule: $(a^m)^n = a^{(m \times n)}$

Quotient Rule for Exponents: $a^m \div a^n = a^{(m - n)}$

Calculations:

=> $(2^3)^2 \div 2^4$

=> $2^{(3 \times 2)} \div 2^4$

=> $2^6 \div 2^4$

=> $2^{(6-4)}$

=> $2^2$

=> 4

Therefore The correct answer is 4.

Additional Information

Product Rule for Exponents

When multiplying bases that are the same, add the exponents: $a^m \times a^n = a^{(m+n)}$.

Negative Exponent Rule

A negative exponent indicates taking the reciprocal of the base: $a^{(-m)} = 1 \div a^m$.

Zero Exponent Rule

Any non-zero base raised to the power of zero is exactly equal to one: $a^0 = 1$.

Power of a Product Rule

When a product is raised to a power, each factor is raised to that same power: $(a \times b)^m = a^m \times b^m$.

**Q50. Answer: (c) Rs. 129**

Shortcut Trick

Let the cost of one ball be B and one bat be T.

Given: 2B + 3T = 84 and 3B + 1T = 63.

To find 5B + 3T, we can observe that 5B + 3T = (2B + 3T) + 3B.

From the second equation, 3B = 63 − T. But solving for B: 3 × (3B + T) − (2B + 3T) = 3(63) − 84 => 7B = 105 => B = 15.

Substituting B in the goal: 5B + 3T = (2B + 3T) + 3B = 84 + 3(15) = 84 + 45 = 129.

Therefore The correct answer is Rs. 129.

Alternate Method

Given:

Cost of 2 balls + 3 bats = Rs. 84

Cost of 3 balls + 1 bat = Rs. 63

Formula Used:

System of linear equations: Let cost of ball = x and bat = y.

=> 2x + 3y = 84 ... (Equation 1)

=> 3x + y = 63 ... (Equation 2)

=> From (2), y = 63 − 3x

=> Substitute y in (1): 2x + 3(63 − 3x) = 84

=> 2x + 189 − 9x = 84

=> −7x = 84 − 189

=> −7x = −105 => x = 15

=> y = 63 − 3(15) = 63 − 45 = 18

=> Cost of 5 balls and 3 bats = 5x + 3y

=> (5 × 15) + (3 × 18) = 75 + 54 = 129

Therefore The correct answer is Rs. 129.

Additional Information

Linear Equations in Two Variables

Equations of the form ax + by = c, which can be solved using substitution, elimination, or cross-multiplication methods.

Elimination Method

Multiply equations by suitable constants so that the coefficients of one variable become equal, then add or subtract to eliminate it.

Unitary Method

Finding the value of a single unit (1 ball or 1 bat) first is often the most reliable way to calculate the cost of any combined set of items.

YourMockTest.com — Free Study Material

**Q51. Answer: (d) 9 and 5**

BODMAS Table:

Decoding the given information:

| Interchanged Numbers | 9 | 5 |
|---|---|---|
| New Position | 5 | 9 |

Now, replacing the numbers and using BODMAS Rule, we get:

=> (45 ÷ 5) + (2 × 3 × 9) ÷ 6 + 4 × 7 − 15 = 31

=> 9 + 9 + 28 − 15 = 31

=> 18 + 28 − 15 = 31

=> 46 − 15 = 31

=> 31 = 31

Hence, the correct option is "Option 4".

**Q52. Answer: (b) 31**

Given:

Rank from top = 14th

Rank from bottom = 18th.

Total number of students = 14 + 18 – 1 = 31.

So, there are 31 students in the class.

Hence, the correct answer is "Option 2".

**Q53. Answer: (a) YCES**

The logic followed here is:

For, SWYM → JNPD

For, IMOC → ZDFT

Now, applying the same pattern to HLNB:

So, HLNB → YCES

Hence, the correct answer is Option 1.

**Q54. Answer: (c) YKF 50**

The logic followed here is:

So, 'YKF 50' will replace the question mark in the given series.

Hence, the correct answer is "Option 3".

**Q55. Answer: (a) 21 km to the south**

The logic followed here is:

Given:

Mr. Trombitas drives 26 km East

He turns right → 18 km South

He turns right → 34 km West

He turns right → 39 km North

He turns right → 8 km East

So, To reach Point A, he must go 21 km South.

Hence, the correct answer is Option 1.

**Q56. Answer: (a) 74**

BODMAS Table:

Decoding the given information:

| Alphabet | A | B | C | D |
|---|---|---|---|---|
| Meaning | ÷ | × | • | − |

Now, replacing the sign from left to right using BODMAS Rule, we get:

YourMockTest.com — Free Study Material

=> 49 ÷ 7 + 8 × 9 − 5 = ?

=> 7 + 72 − 5 = ?

=> 79 − 5 = ?

=> 74

Hence, the correct option is "Option 1".

**Q57. Answer: (b) One**

Given: (Left) 3 6 @ 4 5 6 # 2 9 4 = 3 1 9 4 5 % 3 6 8 7 & 1 7 * 8 (Right)

Now,

We need to find symbols that are immediately preceded by an odd number and immediately followed by an even number.

So, Needed pattern is: Odd - Symbol - Even.

(Left) 3 6 @ 4 5 6 # 2 9 4 = 3 1 9 4 5 % 3 6 8 7 & 1 7 * 8 (Right)

Only one valid occurrence exists.

Hence, the correct answer is 'Option 2'.

**Q58. Answer: (b) Brother's wife's father**

Family Chart:

Decoding the Symbols:

| Symbol | • | # | × | @ |
|---|---|---|---|---|
| Meaning | Sister | Brother | Wife | Father |

Given: L @ O + V × E # R

It means: L is the father of O, O is the sister of V, V is the wife of E, and E is the brother of R.

Thus, L is R's brother's wife's father.

Hence, the correct answer is "Option 2".

**Q59. Answer: (d) EFC 3**

The logic followed here is:

So, 'EFC 3' will replace the question mark in the given series.

Hence, the correct answer is "Option 4".

**Q60. Answer: (c) One**

The logic followed here is:

Given numbers: 439, 745, 327, 652, 532

Logic: Add 2 to the first digit of each number and check whether the resulting first digit is exactly divisible by the second digit of that number.

| Number | First Digit | Second Digit | New First Digit (+2) | Divisible by Second Digit? |
|---|---|---|---|---|
| 439 | 4 | 3 | 6 | 6 ÷ 3 = 2 |
| 745 | 7 | 4 | 9 | 9 ÷ 4 |
| 327 | 3 | 2 | 5 | 5 ÷ 2 |
| 652 | 6 | 5 | 8 | 8 ÷ 5 |
| 532 | 5 | 3 | 7 | 7 ÷ 3 |

Valid number(s): 439

Hence, the correct answer is Option 3.

**Q61. Answer: (c) LOR**

The logic followed here is based on the alphabetical position pattern:

Option 1: QTX

Option 2: WZD

Option 3: LOR

Option 4: ILP

YourMockTest.com — Free Study Material

Thus, LOR does not follow the uniform pattern of +3, +4.
Hence, the odd one out is Option 3.

**Q62. Answer: (d) QQVH**

The logic followed here is:
For, FSZI → AWWK
For, HMRD → CQOF
Now, applying the same pattern to VMYF:
So, VMYF → QQVH
Hence, the correct answer is Option 4.

**Q63. Answer: (b) va**

Given:
“storms shake trees” → “fo ej va”
“hide from storms” → “va ur qh”
So, the code for storms = va
Hence, the correct answer is Option 2.

**Q64. Answer: (c) C**

Given: A, B, C, D, N, O and P are sitting in a straight line facing north.
Only five people sit between B and O.
D sits to the immediate left of O.
Only one person sits between D and N.
C sits at some place to the left of P but at some place to the right of A.
Now, the third from the left end is: C
Hence, the correct answer is "Option 3".

**Q65. Answer: (c) 102**

The logic followed here is:
thus, "102" will replace the question mark in the given series.
Hence, the correct option is "Option 3".

**Q66. Answer: (d) Two**

Given: 3 5 6 7 2 1 8 1 2 7 6 8 9 6 2 6 5 3 5 6 5 1 4 8 5 8 5 7 9 2
Now,
We need to find an even digit which is immediately preceded by a perfect square digit and immediately followed by an even digit.
Perfect square digits: 1, 4, 9
Even digits: 2, 4, 6, 8
So, Needed pattern is: Perfect Square - Even - Even.
(Left) 3 5 6 7 2 1 8 1 2 7 6 8 9 6 2 6 5 3 5 6 5 1 4 8 5 8 5 7 9 2 (Right)
In both cases, the middle even digit satisfies the condition.
Hence, the correct answer is 'Option 4'.

**Q67. Answer: (a) 122**

The logic followed here is:
thus, "122" will replace the question mark in the given series.
Hence, the correct option is "Option 1".

**Q68. Answer: (a) Three**

Given: (Left) W M T R B L A D N K Y F Q O G C E Z X U H V (Right)
Now, we identify the letters lying strictly between A and Y in the given series.
(Left) W M T R B L A D N K Y F Q O G C E Z X U H V (Right)
Letters between A and Y are: D, N, K

| Letter | Type |
|---|---|

| | |
|---|---|
| D | Consonant |
| N | Consonant |
| K | Consonant |

Total consonants between A and Y = 3

Hence, the correct answer is "Option 1".

**Q69. Answer: (b) 58**

Given:

Rajat's rank from the top = 34th, rank from the bottom = 25th.

Total number of students = 34 + 25 – 1 = 58.

So, there are 58 students in the class.

Hence, the correct answer is "Option 2".

**Q70. Answer: (b) 3 km to the east**

The logic followed here is:

Given:

Manoj drives 9 km South

He turns left → 7 km East

He turns left → 11 km North

He turns left → 10 km West

He turns left → 2 km South

So, To reach Point A, he must go 3 km East.

Hence, the correct answer is Option 2.

**Q71. Answer: (d) 2 - 7 - 14**

The logic followed here is:

Logic: Third Number = First Number × Second Number.

For,the set (3 - 6 - 18) →

3 × 6 = 18

For, the set (5 - 8 - 40) →

5 × 8 = 40

Now, checking the options using the same pattern:

Option 1) 4 - 5 - 23

=> 4 × 5 = 20 ≠ 23

Option 2) 15 - 3 - 55

=> 15 × 3 = 45 ≠ 55

Option 3) 9 - 8 - 64

=> 9 × 8 = 72 ≠ 64

Option 4) 2 - 7 - 14

=> 2 × 7 = 14

Hence, the correct answer is Option 4.

**Q72. Answer: (a) Only conclusion (II) follows**

Given Statements:

All dusters are wipers.

All wipers are buckets.

The least possible Venn diagram for the given statements is:

Conclusions:

I. No bucket is a duster → Does not follow (Since all dusters are inside buckets, there must be an overlap between buckets and dusters)

II. Some buckets are dusters → Follow (Because all dusters lie inside buckets, so at least some buckets are dusters)

So, only conclusion II follows.

YourMockTest.com — Free Study Material

Hence, the correct answer is "Option 1".

**Q73. Answer: (c) 353**

BODMAS Table:

Decoding the given information:

| Alphabet | A | B | C | D |
|---|---|---|---|---|
| Meaning | ÷ | × | • | − |

Now, replacing the sign from left to right using BODMAS Rule, we get:

=> 76 ÷ 4 + 18 × 9 − 12 × 2 + 180 ÷ 2 − 15 × 3 + 151 = ?

=> 19 + 162 − 24 + 90 − 45 + 151 = ?

=> (19 + 162 + 90 + 151) − (24 + 45) = ?

=> 422 − 69 = ?

=> 353

Hence, the correct option is "Option 3".

**Q74. Answer: (a) jy**

Given:

'ships cross seas' is coded as 'qn ed jy'

'spot the ships' is coded as 'jy is tk'

So, the code for ships = jy

Hence, the correct answer is Option 1.

**Q75. Answer: (d) LBPM**

The logic followed here is:

For, ZCIS → WAMU

For, TINV → QGRX

Now, applying the same pattern to ODLK:

So, ODLK → LBPM

Hence, the correct answer is Option 4.

**Q76. Answer: (c) Two**

Given: A, B, C, D, E, F and G are sitting around a circular table facing the centre.

C sits second to the right of D.

Only one person sits between B and C.

F is the immediate neighbour of G and B.

A sits third to the left of G.

Total people between E and B = 2

Hence, the correct answer is "Option 3".

**Q77. Answer: (b) MSZ**

The logic followed here is based on the alphabetical position pattern:

Option 1: EKP

Option 2: MSZ

Option 3: KQV

Option 4: QWB

Thus, MSZ does not follow the uniform pattern of +6, +5.

Hence, the odd one out is Option 2.

**Q78. Answer: (c) 143**

The logic followed here is:

thus, "143" will replace the question mark in the given series.

Hence, the correct option is "Option 1".

YourMockTest.com — Free Study Material

**Q79. Answer: (d) O**

Given: L, M, N, O, P, Q and R are sitting in a straight row, facing north.

Only three people sit to the left of M.

M sits third to the left of N.

Q sits fourth to the left of R.

P is not an immediate neighbour of M.

L sits second to the right of P.

Now, the person to the immediate right of M is: O

Hence, the correct answer is "Option 4".

**Q80. Answer: (c) Both conclusions (I) and (II) follow.**

Given Statements:

All horses are ants.

Some horses are donkeys.

No donkey is a bull.

The least possible Venn diagram for the given statements is:

Conclusions:

I. Some ants are donkeys → Follows (Since some horses are donkeys and all horses are ants, those donkey-horses must lie within ants)

II. No bull is a donkey → Follows (Given directly: No donkey is a bull, so the relationship is symmetric)

So, both conclusions I and II follow.

Hence, the correct answer is "Option 3".

**Q81. Answer: (c) Iris**

The correct answer is Iris.

Key Points

• Iris is recognized as India's first AI teacher, marking a significant milestone in the integration of Artificial Intelligence within the classroom environment.

• The AI teacher was officially unveiled at the KTCT Higher Secondary School located in Thiruvananthapuram, Kerala, in March 2024.

• Developed by Makerlabs Edutech, a startup based in Kochi, the robot is designed to enhance the learning experience by providing personalized and interactive content to students.

• It was developed as part of the Atal Tinkering Lab (ATL) project, which is a flagship initiative of the Atal Innovation Mission (AIM) under NITI Aayog to foster curiosity and innovation in schools.

• Iris is a humanoid robot that can speak three languages and is capable of answering complex questions across various subjects, acting as a versatile pedagogical tool.

• The robot features physical capabilities such as moving on wheels, shaking hands, and using gestures to make the interaction more engaging for young learners.

Additional Information

• Technological Foundation: Iris is powered by Generative AI technology, similar to ChatGPT, allowing it to process natural language and provide real-time responses to student queries.

• Makerlabs Edutech Private Limited: This is the Kochi-based educational technology firm responsible for the research, design, and assembly of Iris. They focus on creating AI-based solutions for modern education.

• Atal Innovation Mission (AIM): Launched by the Government of India, this mission aims to create an ecosystem of innovation and entrepreneurship. The Atal Tinkering Labs are dedicated workspaces where students (from Class 6 to Class 12) learn innovation skills and sculpt ideas through hands-on activities.

• National Education Policy (NEP) 2020: The introduction of AI teachers like Iris aligns with the goals of NEP 2020, which emphasizes the digital transformation of education and the use of technology to bridge the learning gap.

• Features and Design: The robot is draped in a traditional saree, designed to look familiar and approachable to Indian students. It includes a voice assistant and a processor that allows it to function as a standalone teaching entity.

Important Points

• Impact on Education: AI teachers like Iris are not intended to replace human teachers but to serve as teaching assistants that can provide 24/7 support, handle repetitive queries, and offer personalized learning paths for students with different learning speeds.

• Global Context: While Sophia (developed by Hanson Robotics in Hong Kong) is a world-famous social humanoid robot, Iris is

YourMockTest.com — Free Study Material

specifically customized for the Indian educational curriculum and classroom dynamics.

• Accessibility: By utilizing AI, schools in remote areas can gain access to high-quality information and interactive tutoring, helping to democratize education across India.

**Q82. Answer: (d) Canada**

The correct answer is Canada.

Key Points

• The 51st G7 Summit is scheduled to take place in 2025, and Canada will hold the presidency and host the event.

• The presidency of the Group of Seven (G7) rotates annually among its member nations, which include Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States.

• This summit follows the 50th G7 Summit, which was hosted by Italy in June 2024 in the region of Apulia.

• Canada last hosted the G7 summit in 2018 at La Malbaie, Quebec (the 44th summit), and previously in 2010 at Huntsville, Ontario.

• The host nation is responsible for setting the agenda, hosting the meetings, and determining which guest participants and international organizations will be invited.

Additional Information

• Origin and Evolution: The group originated from an ad hoc gathering of finance ministers in 1973. It was formally established as the G6 in 1975 by France, West Germany, Italy, Japan, the UK, and the USA. Canada joined in 1976, making it the G7.

• The G8 Era: Russia formally joined the group in 1998, making it the G8. However, Russia was suspended in 2014 following the annexation of Crimea, leading the group to return to its G7 format.

• The European Union: The European Union (EU) has been a non-enumerated member since 1977. It is represented by the President of the European Council and the President of the European Commission, though it does not host or hold the presidency.

• Core Objectives: The G7 serves as a forum for highly industrialized democracies to coordinate on global issues such as economic governance, international security, climate change, and health policy.

• Recent Hosts: Recent summits were held in Hiroshima, Japan (2023), Schloss Elmau, Germany (2022), and Carbis Bay, United Kingdom (2021).

Important Points

• Canadian Presidency 2025: As the host for the 51st summit, Prime Minister Justin Trudeau will lead the discussions. The 2025 summit is expected to focus on Artificial Intelligence (AI), clean energy transitions, and global trade stability.

• G7 vs G20: While the G7 consists of advanced economies, the G20 is a larger forum that includes emerging economies like India, Brazil, and China to address broader global financial stability.

• Member Data: Together, the G7 members represent approximately 30% to 45% of the global Gross Domestic Product (GDP) and about 10% of the world's population.

• Legal Status: The G7 is not an international organization in the legal sense; it has no permanent headquarters or legal charter. Its decisions are political commitments rather than legally binding treaties.

**Q83. Answer: (a) Food Safety and Standards Authority of India**

The correct answer is Food Safety and Standards Authority of India.

Key Points

• The Food Safety and Standards Authority of India (FSSAI) issued a strict directive in October 2025 to restrict the commercial use of the term 'ORS' (Oral Rehydration Salts) by food business operators for beverages that do not meet medical standards.

• The regulatory body observed that many companies were marketing sugary drinks and fruit juices under the name 'ORS', which could mislead consumers into believing these products are medicinal rehydration solutions. Hence, statement 1 is correct.

• According to the FSSAI, the term 'ORS' is a scientific terminology used specifically for a composition defined by the World Health Organization (WHO) or the Indian Pharmacopoeia for treating clinical dehydration.

• The authority mandated that only those products manufactured under a drug license and meeting the specific electrolyte composition can use the abbreviation 'ORS'.

• Any beverage that does not comply with these standards must be labeled as an 'Electrolyte Drink' or a 'Rehydration Beverage', and must carry a disclaimer that the product is not a medical ORS.

Additional Information

• Food Safety and Standards Authority of India (FSSAI):

• It was established under the Food Safety and Standards Act, 2006, which consolidated various older laws related to food safety in India.

• The organization operates under the administrative control of the Ministry of Health and Family Welfare, Government of India.

• Headquartered in New Delhi, its primary function is to lay down science-based standards for articles of food and to regulate their manufacture, storage, distribution, sale, and import.

• Oral Rehydration Salts (ORS):

• ORS is a mixture of Sodium Chloride (2.6g), Glucose (13.5g), Potassium Chloride (1.5g), and Trisodium Citrate (2.9g) when dissolved in 1 litre of water.

• It is used as a life-saving treatment for dehydration caused by diarrhea or cholera, specifically by replacing lost fluids and essential salts.

• Using fruit beverages labeled as 'ORS' during medical emergencies can be dangerous as they often contain high sugar levels, which may worsen certain types of diarrhea.

• Other Regulatory Bodies:

• Directorate General of Health Services (DGHS): It provides technical knowledge on medical and public health matters but does not directly regulate food labeling.

• Indian Council of Medical Research (ICMR): It is the apex body in India for the formulation, coordination, and promotion of biomedical research.

• National Medical Commission (NMC): This body regulates medical education and professionals in India, replacing the former Medical Council of India.

Important Points

• Mislabeling and Penalties: Under the FSS Act, misbranding or providing misleading information on food labels can attract heavy penalties and lead to the suspension of the FSSAI license.

• Consumer Awareness: The 2025 directive aims to protect vulnerable populations, especially children, by ensuring that parents do not confuse commercial sugary drinks with clinical rehydration therapy.

• WHO Guidelines: The WHO first recommended a standard ORS formula in 1975, and the osmolarity was further reduced in 2002 to improve efficacy.

**Q84. Answer: (b) to address under-employment in agriculture**

The correct answer is to address under-employment in agriculture.

Key Points

• The Union Budget 2025–26, presented by the Union Finance Minister Nirmala Sitharaman on February 1, 2025, introduced the 'Rural Prosperity and Resilience' programme as a cornerstone for rural development.

• The primary objective of this programme is to address under-employment in agriculture by facilitating the transition of the rural workforce into more productive and diverse economic activities. Hence, statement 2 is correct.

• It emphasizes multi-sectoral interventions, focusing on diversifying the rural economy beyond traditional crop cultivation into areas like food processing, animal husbandry, and rural entrepreneurship.

• The programme aims to build resilience against economic and climate-related shocks by promoting climate-resilient agriculture and enhancing the income-generating capacity of rural households.

• By addressing disguised unemployment (a form of under-employment prevalent in Indian farming), the government intends to optimize labour productivity and ensure sustainable livelihoods for the rural population.

• The initiative does not primarily focus on school dropout rates, sports infrastructure, or administrative reforms, though these may be addressed by other specific schemes like Samagra Shiksha or Khelo India. Hence, statements 1, 3, and 4 are incorrect.

Additional Information

• Budget 2025-26 Themes:

• The budget focuses on four major pillars: Garib (Poor), Mahila (Women), Yuva (Youth), and Annadata (Farmers), often referred to as the GYAN initiative.

• The 'Rural Prosperity and Resilience' programme aligns with the Annadata pillar to boost farm incomes and modernize the agrarian economy.

• Under-employment in India:

• Under-employment, particularly disguised unemployment, occurs when more people are engaged in an activity than are actually required. In India, nearly 45-47% of the workforce is dependent on agriculture, which contributes only about 15-18% to the GDP.

• The Rural Prosperity scheme seeks to bridge this gap by creating non-farm jobs in rural areas, such as in logistics, warehousing, and agri-tech startups.

• Components of Rural Resilience:

• Resilience involves the capacity of rural communities to withstand climate change impacts. The budget allocates funds for micro-irrigation, digital public infrastructure for agriculture, and natural farming.

• The National Cooperative Policy is also integrated to empower Primary Agricultural Credit Societies (PACS) for better credit flow to small farmers.

Important Points

• Economic Impact: By targeting under-employment, the government aims to increase the disposable income of rural families, which in turn boosts domestic consumption and fuels national economic growth.

• Focus on Women: A significant portion of the programme is expected to support Lakhpati Didis (women in Self-Help Groups) to engage in value-addition and small-scale industries within the rural sector.

• Date of Announcement: The scheme was officially proposed during the budget speech on 1st February 2025, marking a shift toward long-term structural reforms in the rural landscape.

• Multi-sectoral Approach: It integrates infrastructure development (roads and storage) with skill development to ensure that the rural population is equipped for new-age employment opportunities.

**Q85. Answer: (d) 38**

The correct answer is 38.

Key Points

• The Corruption Perceptions Index (CPI) for the year 2024 was released in February 2025 by the international non-governmental organization Transparency International.

• In this latest report, India recorded an overall score of 38 out of 100. This score represents the perceived level of public sector corruption in the country based on expert assessments and surveys.

• The CPI uses a scale of 0 to 100, where 0 signifies that a country is "highly corrupt" and 100 signifies that a country is "very clean." A score of 38 indicates that India continues to face significant challenges in institutional transparency and anti-corruption measures.

• Comparing the current data with previous years, India's score has seen a slight decline from the 2023 score, which was 39. In 2022, the score was 40, indicating a downward trend in perceived integrity over the last few cycles.

• The 2024 index evaluated a total of 180 countries and territories, providing a comprehensive global overview of corruption levels.

Additional Information

• Transparency International:

• It is a global movement working in over 100 countries to end the injustice of corruption.

• The organization was founded in May 1993 and is headquartered in Berlin, Germany.

• Its primary mission is to promote transparency, accountability, and integrity at all levels and in all sectors of society.

• Methodology of CPI:

• The CPI aggregates data from 13 different data sources from 12 independent institutions.

• These institutions include the World Bank, the World Economic Forum, and private risk and consulting companies.

• The index specifically focuses on public sector corruption, including bribery, diversion of public funds, and the ability of governments to contain corruption.

• Global Performance Trends:

• Consistently top-performing countries usually include Denmark, Finland, and New Zealand, often scoring above 85.

• Countries at the bottom of the index typically include Somalia, South Sudan, and Syria, often scoring below 15 due to prolonged conflict and weak governance.

Important Points

• India's Regional Standing:

• In the South Asian region, India's performance is often compared with its neighbors. While it generally scores better than Pakistan and Bangladesh, it lags significantly behind Bhutan, which consistently maintains a high score and rank.

• The 2024 report highlighted that stagnation or decline in scores for many G20 nations, including India, is a cause for concern regarding global economic stability.

• Impact of Scores:

• A low score in the CPI can negatively affect a country's Foreign Direct Investment (FDI) as investors prefer environments with high legal certainty and low corruption.

• The report often accompanies recommendations for governments to strengthen judicial independence and protect whistleblowers to improve their standing in future indices.

• The 2024 index emphasized the link between corruption and social inequality, noting that corruption often disproportionately affects the most vulnerable populations.

**Q86. Answer: (a) Nitish Kumar**

The correct answer is Nitish Kumar.

Key Points

• Nitish Kumar, the veteran leader of the Janata Dal (United) (JD-U), has created a historic record in Indian politics by taking the oath as the Chief Minister of Bihar for the 10th time in November 2025.

• His long political career is marked by his tenure as the head of various coalition governments in the state of Bihar, often pivoting between different political alliances to maintain stability and governance.

• Nitish Kumar first took the oath as Chief Minister in March 2000, although that initial government lasted for only seven days as he could not prove his majority on the floor of the house.

• Over the years, he has successfully led the National Democratic Alliance (NDA) and the Mahagathbandhan (Grand Alliance) at different times, earning him the reputation of a master of coalition politics.

• The oath of office and secrecy was administered by the Governor of Bihar at the Raj Bhavan located in Patna, the state capital.

Additional Information

• Lalu Prasad Yadav: He is the founding president of the Rashtriya Janata Dal (RJD) and served as the Chief Minister of Bihar from 1990 to 1997. He is a former Union Railway Minister (2004–2009) and remains a highly influential figure in Bihar politics.

• Tejashwi Yadav: The younger son of Lalu Prasad Yadav, he has served as the Deputy Chief Minister of Bihar. He is the current face of the RJD and leads the opposition or holds key portfolios during coalition governments with the JD(U).

• Sushil Kumar Modi: A senior leader of the Bharatiya Janata Party (BJP), he served as the Deputy Chief Minister of Bihar for the longest duration alongside Nitish Kumar. He played a crucial role in the GST Council and served as a member of both the Lok Sabha and Rajya Sabha.

• Bihar Legislative Assembly: The assembly consists of 243 seats. A party or coalition requires a minimum of 122 seats to form a majority government in the state.

• Article 164: As per the Constitution of India, the Chief Minister is appointed by the Governor, who also appoints other ministers on the advice of the Chief Minister. The council of ministers is collectively responsible to the Legislative Assembly of the State.

Important Points

• Sushasan Babu: Nitish Kumar is popularly known by this moniker, which translates to "Man of Good Governance," a title earned during his early years as Chief Minister for focusing on infrastructure, law and order, and women's empowerment.

• Previous Tenures: Before the 2025 oath, his 9th oath ceremony took place in January 2024 when he rejoined the NDA. His ability to navigate complex political landscapes has kept him at the center of Bihar's administration for over two decades.

• Union Ministry Experience: Before becoming a dominant figure in state politics, Nitish Kumar served as a Union Minister in the Atal Bihari Vajpayee cabinet, holding important portfolios such as Railways, Surface Transport, and Agriculture.

**Q87. Answer: (c) Mohanlal**

p>The correct answer is Mohanlal.

Key Points

• The legendary actor Mohanlal has been conferred with the prestigious Dadasaheb Phalke Award at the 71st National Film Awards in 2025.

• This award is recognized as the highest honor in the field of Indian cinema, presented annually for "outstanding contribution to the growth and development of Indian cinema."

• Mohanlal Viswanathan, popularly known as Mohanlal, is a prolific actor, producer, and playback singer who has predominantly worked in Malayalam cinema for over four decades.

• The selection was announced by the Ministry of Information and Broadcasting, highlighting his immense impact on Indian culture through more than 400 films across various languages including Tamil, Telugu, Hindi, and Kannada.

• The award acknowledges his versatility and mastery in performing diverse roles that have set benchmarks in the Indian film industry. Hence, the correct answer is Mohanlal.

Additional Information

• History of Dadasaheb Phalke Award:

• The award was instituted by the Government of India in 1969 to honor the memory of Dhundiraj Govind Phalke, popularly known as the Father of Indian Cinema.

• Dadasaheb Phalke directed India's first indigenous full-length feature film, Raja Harishchandra, in 1913.

• The first recipient of this award was the actress Devika Rani, known as the "First Lady of Indian Cinema," in 1969.

• Award Components:

• The recipient is honored with a Swarna Kamal (Golden Lotus) medallion, a shawl, and a cash prize of Rs. 15 lakh (revised recently).

• It is presented by the President of India during the National Film Awards ceremony held in New Delhi.

• Significance of the National Film Awards:

• Established in 1954, these awards are the most prominent film award ceremonies in India.

• They aim to encourage the production of films of aesthetic and technical excellence and social relevance, promoting the unity and integrity of the nation.

Important Points

• Mohanlal's Career Achievements:

• Before receiving the Phalke award, Mohanlal won five National Film Awards, including two for Best Actor for his performances in

Bharatham (1991) and Vanaprastham (1999).

• He was also honored with the Padma Shri in 2001 and the Padma Bhushan in 2019, India's fourth and third highest civilian honors respectively, for his contribution to the arts.

• He holds the honorary rank of Lieutenant Colonel in the Territorial Army of India, awarded in 2009.

• Recent Recipients:

• The award has recently been conferred upon other stalwarts such as Waheeda Rehman (2021) and Mithun Chakraborty (2023).

• The Directorate of Film Festivals, an organization under the Ministry of Information and Broadcasting, oversees the selection process involving a jury of eminent film personalities.

**Q88. Answer: (d) Shafali Verma**

The correct answer is Shafali Verma.

Key Points

• The ICC Women's Cricket World Cup 2025 final was held at the Narendra Modi Stadium in Ahmedabad, India.

• Shafali Verma was named the Player of the Match for her exceptional batting performance in the final against South Africa.

• She scored a match-defining 102 runs off 85 balls, which included 12 boundaries and 3 sixes, helping India set a formidable target.

• Her aggressive start at the top of the order allowed the Indian Women's Team to exert pressure on the opposition bowlers from the very first over. Hence, the correct answer is Shafali Verma.

• This victory marked India's first-ever title in the history of the ICC Women's ODI World Cup, ending a long wait for the silverware in the 50-over format.

Additional Information

• Smriti Mandhana:

• The elegant left-handed opener and vice-captain of the Indian team had a stellar tournament.

• She was awarded the Player of the Tournament for being the highest run-getter, accumulating over 520 runs across the event.

• In the final, she provided a solid opening partnership with Shafali Verma, scoring 48 runs.

• Marizanne Kapp:

• A world-class all-rounder from South Africa who was instrumental in her team's journey to the finals.

• In the final match, she contributed with 2 wickets and scored a fighting 42 runs, though it was not enough to secure a win for the Proteas Women.

• She remains one of the most experienced players in women's international cricket.

• Deepti Sharma:

• The spinning all-rounder played a crucial role in the bowling department during the final.

• She picked up 3 wickets for 35 runs in her 10-over quota, breaking the back of the South African middle order.

• Her off-break bowling and economical spells were a highlight for India throughout the 2025 World Cup.

Important Points

• Tournament Hosting: India hosted the 13th edition of the ICC Women's Cricket World Cup in September-October 2025.

• Venues: Matches were played across major cities including Bengaluru, Mumbai, and the final in Ahmedabad.

• Shafali Verma's Record: At the age of 21, Shafali Verma became one of the youngest players to score a century in a World Cup final, further cementing her status as a global cricketing star.

• Impact of WPL: The success of the Women's Premier League (WPL) was widely credited for the improved performance and temperament of the Indian players on the world stage.

**Q89. Answer: (c) 2024**

The correct answer is 2024.

Key Points

• The Disaster Management (Amendment) Bill, 2024 was introduced in the Lok Sabha on August 1, 2024, to update the nearly two-decade-old Disaster Management Act, 2005.

• The bill aims to bring greater clarity and convergence among the various authorities and committees working in the field of disaster management at National, State, and District levels.

• One of the primary features of the 2024 Bill is the creation of a National Disaster Database and State Disaster Databases to facilitate better planning and response during emergency situations.

• It proposes the establishment of Urban Disaster Management Authorities for state capitals and metropolitan cities having Municipal Corporations, recognizing the increasing risks of urban flooding and infrastructure failure.

• The bill empowers the National Disaster Management Authority (NDMA) and State Disaster Management Authorities (SDMAs) to prepare their respective Disaster Management Plans, a responsibility that was previously vested with the executive committees.

Hence, the correct answer is 2024.

Additional Information

• Disaster Management Act, 2005:

• This Act was enacted in December 2005 following the 2004 Tsunami to provide a legal framework for disaster response and mitigation in India.

• It mandated the creation of the NDMA, headed by the Prime Minister, and the SDMAs, headed by the Chief Ministers of respective states.

• The District Disaster Management Authorities (DDMAs) are co-chaired by the District Collector and the elected representative of the local authority.

• The National Disaster Response Force (NDRF):

• Established under Section 44 of the 2005 Act, the NDRF is a specialized multi-disciplinary force for disaster response.

• It currently consists of 16 battalions stationed across India to provide immediate relief during natural and man-made disasters.

• Modernizing the Legal Framework:

• The 2024 amendment seeks to address new-age challenges such as climate change, extreme weather events, and the need for digital integration in disaster monitoring.

• It also aims to provide statutory status to the National Crisis Management Committee (NCMC), which is the highest executive body for disaster coordination in the country.

Important Points

• Statutory Committees: The 2024 Bill seeks to formalize the High-Level Committee consisting of the Home Minister, Finance Minister, and Agriculture Minister to oversee financial aid from the National Disaster Response Fund.

• Penal Provisions: To ensure strict adherence to safety guidelines, the amendment includes provisions for penalties against individuals or entities that obstruct the functions of the authorities or fail to comply with emergency directions.

• State Disaster Response Force (SDRF): The amendment further encourages states to strengthen their SDRFs, ensuring a two-tier response system where state forces act as the first responders alongside local authorities.

• Finance and Budgeting: The Disaster Management Act manages the National Disaster Mitigation Fund and the National Disaster Response Fund, which are essential for recovery and reconstruction post-disaster.

**Q90. Answer: (c) Space startups**

The correct answer is Space startups.

Key Points

• The Indian National Space Promotion and Authorization Centre (IN-SPACe) and the Small Industries Development Bank of India (SIDBI) formally signed a Memorandum of Understanding (MoU) in November 2025 to operationalize a Rs. 1,000 crore venture capital fund.

• The primary objective of this fund is to provide critical financial support to space startups in India, enabling them to scale their operations and develop cutting-edge technologies. Hence, the correct answer is Space startups.

• The establishment of this Venture Capital (VC) fund follows a recommendation and approval process by the Union Cabinet, aimed at addressing the funding gap in the high-risk, capital-intensive space technology sector.

• Under this agreement, SIDBI will serve as the fund manager, utilizing its extensive experience in managing Alternative Investment Funds (AIFs) to identify and invest in promising space-tech enterprises.

• This initiative is part of a broader strategy to increase the private sector's contribution to India’s space economy, moving from a government-led model to a more collaborative ecosystem.

Additional Information

• IN-SPACe (Indian National Space Promotion and Authorization Centre):

• It is an autonomous nodal agency under the Department of Space (DoS), headquartered in Ahmedabad, Gujarat.

• Launched in June 2020, its mandate is to promote, authorize, and supervise the activities of Non-Governmental Entities (NGEs) in the space sector.

• It acts as a single-window interface between the Indian Space Research Organisation (ISRO) and private players to share infrastructure and expertise.

• SIDBI (Small Industries Development Bank of India):

• Established on April 2, 1990, under an Act of Parliament, it is the principal financial institution for the promotion and financing of MSMEs in India.

• Headquartered in Lucknow, Uttar Pradesh, it plays a vital role in managing various government-backed funds and credit guarantee schemes.

• By partnering with IN-SPACe, SIDBI brings institutional credibility and professional fund management to the space-tech domain.

• Indian Space Policy 2023:

• This policy was introduced to provide clarity on the roles of ISRO, NSIL, and IN-SPACe, officially encouraging private sector participation in end-to-end space activities.

• The policy aims to grow India's share in the global space economy from the current 2% to approximately 10% by the end of the decade.

Important Points

• Fund Deployment: The Rs. 1,000 crore fund is expected to be deployed over a period of 3 to 5 years, focusing on startups involved in satellite manufacturing, launch vehicle development, and ground segment operations.

• Strategic Significance: By fostering space startups, the Indian government intends to create a robust supply chain that can cater to both domestic requirements and international markets.

• Aatmanirbhar Bharat: This venture fund is a major step toward self-reliance in strategic technologies, reducing dependency on foreign space components and services.

• Job Creation: The growth of the space sector through these startups is anticipated to create thousands of high-skill employment opportunities in STEM fields across India.

**Q91. Answer: (a) Marileidy Paulino**

The correct answer is Marileidy Paulino.

Key Points

• The elite athlete Marileidy Paulino from the Dominican Republic set a new meet record in the women’s 400 m at the Paris Diamond League held in June 2025.

• She clocked a remarkable time of 48.81 seconds, demonstrating her continued dominance in the one-lap sprint on the global stage.

• The Meeting de Paris, part of the prestigious Wanda Diamond League circuit, saw Paulino outperform a world-class field to secure the top spot and the meet record.

• This performance solidified her ranking as one of the fastest women in the history of the 400-meter event, following her successful campaign at the 2024 Paris Olympics.

• The Diamond League is the premier annual series of outdoor track and field competitions, and setting a meet record in Paris is considered a significant achievement in the athletics calendar.

Additional Information

• Marileidy Paulino:

• She is the first female athlete from the Dominican Republic to win an individual Olympic gold medal, achieved at the Paris 2024 Games with an Olympic record time of 48.17 seconds.

• She also secured the World Championship title in Budapest in 2023.

• Diamond League Circuit:

• The Diamond League was established in 2010 to replace the IAAF Golden League.

• It consists of 15 meetings held across various countries, culminating in a final where athletes compete for the Diamond Trophy and prize money.

• The 400 m event requires athletes to maintain high speed while managing lactic acid buildup over a full lap of the 400-meter track.

• Analysis of Other Options:

• Salwa Eid Naser: A Bahraini sprinter who won the 2019 World Championship with the third-fastest time in history (48.14 s). She remains a top competitor but did not set the record mentioned in the 2025 Paris meet.

• Mara Yamauchi: A retired British long-distance runner. She is famous for her marathon performances, including a personal best of 2:23:12, and is not a 400 m sprinter.

• Faith Cherotich: A Kenyan athlete specializing in the 3000 m steeplechase. She won the bronze medal at the 2023 World Athletics Championships and the 2024 Olympics, making her irrelevant to the 400 m sprint record.

Important Points

• Venue: The Paris Diamond League is traditionally hosted at the Stade Charléty, known for its fast track surface which favors sprinters.

• Record Significance: A time of 48.81 seconds is exceptionally rare; historically, only a handful of women have consistently broken the 49-second barrier in the 400 m.

• Timing: The June 2025 timeframe is crucial as athletes prepare for the World Athletics Championships, using the Diamond League as a platform to test their form and speed.

• Global Rankings: Marileidy Paulino's victory earns her maximum points (8 points) in the Diamond League standings, helping her qualify for the season finale.

YourMockTest.com - Free Study Material

**Q92. Answer: (b) AU Small Finance Bank**

The correct answer is AU Small Finance Bank.

Key Points

• The Reserve Bank of India (RBI) received an application from AU Small Finance Bank in August 2024 for a transition from a Small Finance Bank (SFB) to a Universal Bank.

• This move followed the RBI's circular issued in April 2024, which laid down the eligibility criteria for SFBs to apply for a universal banking license under the "on-tap" licensing window.

• To be eligible for this transition, an SFB must have a minimum net worth of Rs. 1,000 crore, a satisfactory track record of performance for at least five years, and listed status on a stock exchange. Hence, the statement regarding AU SFB's transition is correct.

• The bank must also maintain Gross Non-Performing Assets (GNPA) and Net Non-Performing Assets (NNPA) of less than or equal to 3% and 1%, respectively, for the last two financial years.

• AU Small Finance Bank is currently the largest SFB in India by balance sheet size and was the first to formally apply under the new 2024 guidelines.

Additional Information

• Universal Bank:

• A Universal Bank is a financial institution that offers a wide range of financial services, including commercial banking, investment banking, and other financial services like insurance.

• Unlike SFBs, Universal Banks do not have a restrictive 75% Priority Sector Lending (PSL) target; instead, they follow the 40% PSL norm applicable to commercial banks.

• Transitioning to a Universal Bank allows an entity to diversify its loan portfolio and reduces the cost of funds by attracting more CASA (Current Account Savings Account) deposits.

• AU Small Finance Bank Background:

• The institution was originally founded as AU Rentors and Cashors in 1996 by Sanjay Agarwal in Jaipur, Rajasthan.

• It received the SFB license from the RBI in 2015 and commenced operations as a bank in April 2017.

• In April 2024, Fincare Small Finance Bank was successfully merged into AU Small Finance Bank, further strengthening its capital base and geographical reach.

• Small Finance Banks (SFBs):

• SFBs were established to further financial inclusion by providing basic banking activities to unserved and underserved sections, including small business units, small farmers, and micro and small industries.

• They are required to extend 75% of their Adjusted Net Bank Credit (ANBC) to the Priority Sector.

Important Points

• Regulatory Requirements for Transition:

• The RBI requires that the Chairman and Managing Director of the applying bank meet the "Fit and Proper" criteria.

• The bank must have a diversified loan portfolio and should not be concentrated in a single sector, which AU SFB has achieved through its presence in vehicle finance, MSME loans, and housing finance.

• As of 2024, other major SFBs like Equitas and Ujjivan have also expressed interest or are evaluating the transition to a universal banking license based on these regulatory milestones.

**Q93. Answer: (c) Assam**

The correct answer is Assam.

Key Points

• The Assam state cabinet, under the leadership of Chief Minister Himanta Biswa Sarma, approved the Polygamy Prohibition Bill, 2025 in November 2025 to legally ban the practice of multiple marriages.

• The bill defines polygamy as the act of a person marrying more than one spouse while the first spouse is still living and the marriage has not been legally dissolved. Hence, the statement regarding the bill's approval by Assam is correct.

• The legislation was drafted following the recommendations of a high-level committee headed by Justice (Retd) Rumi Phukan, which examined the legislative competence of the state to enact such a law.

• The primary objective of the Polygamy Prohibition Bill is to promote gender equality and protect the rights of women by ending a practice that often leads to social and economic exploitation.

• Before the final approval, the Assam government sought public feedback and received over 3,900 suggestions, with a vast majority expressing support for the ban.

Additional Information

• Uniform Civil Code (UCC) Connection:

• The Polygamy Prohibition Bill is often viewed as a stepping stone toward a Uniform Civil Code (UCC) in the state of Assam.

YourMockTest.com – Free Study Material

• Article 44 of the Constitution of India establishes the Directive Principle that the State shall endeavor to secure for its citizens a uniform set of civil laws.

• In February 2024, Uttarakhand became the first state in India to pass a comprehensive UCC bill that included the prohibition of polygamy.

• Legal Framework in India:

• The Hindu Marriage Act, 1955 already prohibits polygamy for Hindus, Jains, Buddhists, and Sikhs, making such marriages void and punishable.

• Provisions under the Bharatiya Nyaya Sanhita (BNS), which replaced the Indian Penal Code (IPC), contain sections related to bigamy (marrying again during the lifetime of a husband or wife).

• The Special Marriage Act, 1954 also mandates monogamy for any individual, regardless of religion, who chooses to register their marriage under this secular law.

Important Points

• Legislative Competence: Under the Seventh Schedule of the Constitution, "Marriage and Divorce" falls under the Concurrent List (List III), allowing both the Parliament and State Legislatures to make laws.

• Presidential Assent: Since the bill deals with personal laws that may overlap with central legislations, it typically requires the President's assent under Article 254(2) to become effective in the state.

• Social Impact: The Assam government emphasized that the law aims to eradicate social evils and ensure that women from all communities enjoy equal protection under the law, aligning with the principles of Sabka Saath, Sabka Vikas.

• Penalties: The Polygamy Prohibition Bill, 2025 includes stringent penalties and imprisonment for individuals found violating the monogamy mandate, ensuring the law acts as a strong deterrent.

**Q94. Answer: (b) Arya Borse and Arjun Babuta**

The correct answer is Arya Borse and Arjun Babuta.

Key Points

• The Indian shooting duo of Arya Borse and Arjun Babuta secured the gold medal in the 10m air rifle mixed team event at the ISSF World Cup held in Munich, Germany.

• The victory took place in June 2025, marking a significant achievement for Indian shooting on the international stage.

• In a high-pressure final, Arya Borse and Arjun Babuta demonstrated exceptional precision and mental fortitude to defeat their opponents and claim the top spot on the podium.

• This gold medal win is a testament to the rigorous training programs facilitated by the National Rifle Association of India (NRAI) and the Sports Authority of India (SAI).

• Arjun Babuta, a seasoned rifle shooter, and Arya Borse, an emerging talent, have further solidified India's reputation as a dominant force in 10m rifle shooting.

Additional Information

• International Shooting Sport Federation (ISSF):

• The ISSF is the governing body of the Olympic shooting events in rifle, pistol, and shotgun, and several non-Olympic shooting sport events.

• Headquartered in Munich, Germany, the federation was founded in 1907 and manages world championships and world cup series across the globe.

• 10m Air Rifle Mixed Team Event:

• This discipline features teams consisting of one male and one female shooter. It was introduced to the Olympic program during the Tokyo 2020 Games to promote gender equality in sports.

• Shooters use 4.5 mm (0.177 in) caliber air rifles to fire at a target at a distance of 10 meters.

• Arjun Babuta:

• He is a prominent Indian shooter who specializes in the 10m air rifle. He represented India at the Paris 2024 Olympics, where he narrowly missed a medal by finishing in 4th place.

• His consistent performance in ISSF World Cups has made him one of the highest-ranked shooters in the world.

• Venue - Munich, Germany:

• Munich is considered the "Mecca" of international shooting sports. The Olympic Shooting Range in Garching-Hochbrück is one of the largest and most advanced facilities in the world.

Important Points

• The success of the mixed team format is crucial for India as it provides multiple medal opportunities in major multisport events like the Asian Games and the Olympic Games.

• NRAI (National Rifle Association of India): Founded in 1951, it is the primary body responsible for the development of shooting sports in India. Its headquarters are located in New Delhi.

YourMockTest.com — Free Study Material

• Shooting has historically been one of India's most successful individual sports at the Olympics, with legends like Rajyavardhan Singh Rathore (Silver, 2004), Abhinav Bindra (Gold, 2008), Gagan Narang (Bronze, 2012), and Vijay Kumar (Silver, 2012).

• The win in June 2025 serves as a pivotal point for the 2028 Olympic cycle, showcasing the depth of talent in the Indian shooting contingent.

**Q95. Answer: (c) World Organisation for Animal Health (WOAH)**

The correct answer is World Organisation for Animal Health (WOAH).

Key Points

• The World Organisation for Animal Health (WOAH) officially approved India’s first Equine Disease-Free Compartment (EDFC) on July 3, 2025.

• The recognized EDFC is located at the Army Service Corps (ASC) Centre and College in Bengaluru, Karnataka.

• This approval signifies that the specific facility maintains a sub-population of horses with a distinct health status regarding specific diseases, protected by strict biosecurity management.

• The establishment of the EDFC was a collaborative effort involving the Department of Animal Husbandry and Dairying (DAHD), the Ministry of Fisheries, Animal Husbandry and Dairying, and the Indian Army.

• This recognition is a milestone for the equestrian sports sector in India, as it facilitates the seamless international movement of horses for global competitions like the Asian Games and the Olympics.

Additional Information

• World Organisation for Animal Health (WOAH):

• Formerly known as the Office International des Epizooties (OIE), it was established on January 25, 1924.

• It is an intergovernmental organization responsible for improving animal health worldwide and is headquartered in Paris, France.

• In May 2022, the organization adopted the common name WOAH to improve global brand recognition.

• It sets international standards for animal health and zoonoses, which are recognized by the World Trade Organization (WTO).

• Concept of Compartmentalization:

• Unlike Zoning, which defines an animal sub-population based on geographical boundaries, Compartmentalization defines it based on management practices and biosecurity protocols.

• It allows a country to continue international trade from a specific "compartment" even if the disease is present elsewhere in the country.

• The WOAH Terrestrial Animal Health Code provides the guidelines for establishing these compartments.

Important Points

• Significance for India:

• The EDFC status helps in overcoming SPS (Sanitary and Phytosanitary) barriers in international trade.

• It ensures that Indian horses can be exported or sent for international events without the lengthy and rigorous quarantine periods previously required due to the country's general disease status.

• Major equine diseases monitored for this status include Glanders, Equine Infectious Anaemia (EIA), Equine Influenza, and African Horse Sickness.

• Economic and Sporting Impact:

• India has a rich heritage in equestrian activities, and this certification will boost the stud farm industry and equine tourism.

• The Remount Veterinary Corps (RVC) of the Indian Army plays a pivotal role in maintaining the high standards of veterinary care and surveillance required for such international recognition.

**Q96. Answer: (a) India**

The correct answer is India.

Key Points

• The 8th Assembly of the International Solar Alliance (ISA) is scheduled to be hosted by India in October 2025.

• The Assembly is the supreme decision-making body of the ISA, where each Member Country is represented to deliberate on the progress of solar energy deployment and institutional matters.

• Traditionally, the ISA Assembly is held annually in New Delhi, India, which serves as the host nation and the permanent President of the alliance.

• During the 8th Assembly, delegates from over 100 member nations and signatory countries are expected to discuss various initiatives, including solar technology transfer, capacity building, and the mobilization of green finance.

• The Union Minister for New and Renewable Energy of India usually presides over the session as the President of the ISA Assembly, while France serves as the Co-President.

Additional Information

• International Solar Alliance (ISA):

• The ISA was conceived as a joint effort by India and France to mobilize efforts against climate change through the deployment of solar energy solutions.

• It was launched by Prime Minister Narendra Modi and the then-President of France, François Hollande, on 30 November 2015, during the United Nations Climate Change Conference (COP21) in Paris.

• The primary objective of the alliance is to work for efficient consumption of solar energy to reduce dependence on fossil fuels.

• Headquarters and Leadership:

• The Headquarters of the ISA is located in Gurugram, Haryana, India. It is the first international intergovernmental organization to be headquartered in India.

• The current Director General of the ISA is Dr. Ajay Mathur, who leads the secretariat in implementing the alliance's strategic plans.

• The "Towards 1000" Strategy:

• The ISA aims to mobilize 1,000 billion USD of investments in solar energy solutions by 2030.

• The goal includes delivering energy access to 1,000 million people using clean energy solutions and installing 1,000 GW of solar energy capacity.

Important Points

• Major Initiatives:

• One Sun One World One Grid (OSOWOG): This initiative aims to connect different regional grids through a common global grid that will be used to transfer solar power from one region to another.

• Global Solar Facility: It is a payment guarantee fund aimed at boosting solar investments in Africa and other underserved regions.

• SolarX Startup Challenge: An initiative to promote entrepreneurship and innovation in the solar sector across member countries.

• Membership Status:

• The ISA has recently seen an expansion in its membership, with countries like Panama, Chile, and Malta becoming full members.

• Any Member State of the United Nations can now join the ISA, following an amendment to the Framework Agreement in 2020 that opened membership to all UN members regardless of their geographical location relative to the Tropics.

**Q97. Answer: (d) Delhi**

The correct answer is Delhi.

Key Points

• Delhi, the capital city of India, frequently appears in global rankings of the most polluted cities, especially during the winter season.

• On December 28, 2025, global air quality monitoring platforms like IQAir and the World Air Quality Index reported that Delhi was among the top 10 most polluted cities in the world based on real-time PM2.5 concentrations.

• The Air Quality Index (AQI) in Delhi during late December often reaches the "Severe" or "Hazardous" category, frequently exceeding the 400 or 500 mark on the scale.

• While other Indian metropolitan cities like Mumbai and Kolkata have seen rising pollution levels, the geographical and climatic conditions of Delhi make its pollution significantly more persistent and dangerous during the winter months.

• The Particulate Matter (PM2.5) levels in Delhi during this period were recorded at levels many times higher than the safety limits prescribed by the World Health Organization (WHO).

Additional Information

• Sources of Pollution in Delhi:

• The primary contributors to Delhi's poor air quality include vehicular emissions, industrial discharge, and construction dust within the National Capital Region (NCR).

• Seasonal factors such as stubble burning (parali) in neighboring states like Punjab and Haryana significantly spike pollution levels between October and December.

• In late December, the use of biomass burning for heating and firecrackers during various festivals also adds to the toxic load.

• Meteorological Factors:

• Temperature Inversion: During winter, a layer of warm air traps cooler air near the ground. This prevents pollutants from dispersing, creating a smog layer over the city.

• Low wind speeds and high humidity further prevent the dilution of particulate matter, keeping the AQI high for extended periods.

• Impact of PM2.5:

• PM2.5 refers to atmospheric particulate matter that has a diameter of less than 2.5 micrometers.

• Because of their small size, these particles can penetrate deep into the lungs and enter the bloodstream, causing respiratory and cardiovascular diseases.

Important Points

• Graded Response Action Plan (GRAP): To combat severe pollution, the Commission for Air Quality Management (CAQM) implements GRAP in Delhi-NCR. This includes measures like banning diesel generators, stopping construction activities, and implementing the odd-even vehicle scheme when AQI crosses certain thresholds.

• National Clean Air Programme (NCAP): Launched in 2019, this Government of India initiative aims for a 20% to 30% reduction in PM2.5 and PM10 concentrations by 2024 (later extended to 2026) across 131 non-attainment cities.

• Central Pollution Control Board (CPCB): The CPCB is the statutory organization under the Ministry of Environment, Forest and Climate Change that monitors air quality across India and provides the official National Air Quality Index.

• WHO Air Quality Guidelines: The World Health Organization tightened its guidelines in 2021, stating that annual average concentrations of PM2.5 should not exceed 5 µg/m³. Most Indian cities, including Delhi, struggle to meet even the more relaxed national standards.

**Q98. Answer: (c) Too Good to Be True**

The correct answer is Too Good to Be True.

Key Points

• Prajakta Koli, the popular digital content creator known as MostlySane, officially released her debut romance novel titled Too Good to Be True in January 2025.

• The book was published by HarperCollins India and represents Koli's first foray into long-form fictional writing after years of storytelling through digital media.

• The plot centers around the character Avni, exploring the complexities of modern-day relationships, the evolution of love, and the challenges of self-discovery in a fast-paced world.

• The announcement of the book was made in 2023, creating significant anticipation among her millions of followers, with pre-orders opening in late 2024.

• The novel is categorized under Contemporary Romance and aims to resonate with young adults through its relatable narrative and emotional depth.

Additional Information

• Digital Career: Prajakta Koli started her YouTube channel, MostlySane, in 2015. She rose to fame with her relatable comedy sketches and observational humor, becoming one of India's most influential female creators.

• Acting Career: Koli is well-known for her role as Dimple Ahuja in the Netflix romantic drama series Mismatched, which premiered in 2020. The series is based on Sandhya Menon's novel "When Dimple Met Rishi."

• Film Debut: She made her Bollywood debut in 2022 with the film Jugjugg Jeeyo, produced by Dharma Productions, where she shared the screen with stars like Varun Dhawan and Anil Kapoor.

• Global Recognition: In 2023, she was appointed as the UNDP India Youth Climate Champion. In this capacity, she works to mobilize young people on issues like climate action and sustainability.

• Awards and Honors: She has been featured on Forbes' 30 Under 30 list and has represented India at various international forums, including the United Nations.

Important Points

• Literary Influence: Too Good to Be True reflects Koli's personal interest in the romance genre, a theme often mirrored in her acting roles in Mismatched.

• Marketing: The book launch was supported by an extensive digital marketing campaign, leveraging her Instagram and YouTube presence to reach a global audience.

• Themes: The novel emphasizes the difference between idealized love and realistic relationships, a common theme in contemporary young adult (YA) literature in India.

**Q99. Answer: (a) Indranil Bhattacharyya**

The correct answer is Indranil Bhattacharyya.

Key Points

• The Reserve Bank of India (RBI), in August 2025, announced the appointment of Indranil Bhattacharyya as an ex-officio member of the Monetary Policy Committee (MPC).

• Indranil Bhattacharyya currently serves as an Executive Director at the Reserve Bank of India.

• He was nominated by the Central Board of the RBI to replace Rajiv Ranjan, following the latter's transition or retirement from the role. Hence, the statement regarding the appointee is correct.

• This appointment was strategically timed ahead of the October policy meeting to ensure the committee reached its full legislative strength of six members for interest rate deliberations.

• The MPC is the statutory body responsible for determining the policy repo rate required to achieve the inflation target while keeping the objective of growth in mind.

Additional Information

• Monetary Policy Committee (MPC) Structure:

• The committee consists of six members: three from the RBI (including the Governor) and three external members appointed by the Central Government.

• The Governor of the RBI acts as the ex-officio Chairperson of the committee.

• The Deputy Governor in charge of monetary policy also serves as an ex-officio member.

• Legal Framework:

• The MPC was constituted under Section 45ZB of the amended Reserve Bank of India Act, 1934.

• The framework for the MPC was officially adopted in 2016 to bring more transparency and accountability to India's monetary policy decisions.

• Inflation Targeting:

• The Government of India, in consultation with the RBI, sets the inflation target once every five years.

• The current target is 4% Consumer Price Index (CPI) inflation, with an upper tolerance limit of 6% and a lower tolerance limit of 2%.

• Decision-making Process:

• Each member of the MPC has one vote. In the event of a tie, the RBI Governor has a casting vote.

• The quorum for the meeting of the MPC is four members.

Important Points

• Indranil Bhattacharyya: As an Executive Director, he represents the internal expertise of the RBI in the committee, focusing on economic research and policy strategy.

• Rajiv Ranjan: He previously served as the Executive Director and was the nominated ex-officio member before Indranil Bhattacharyya took over the responsibility in 2024/2025.

• Meeting Frequency: The MPC is required to meet at least four times a year, though it typically meets bi-monthly (six times a year) to review the macroeconomic situation.

• External Members: These members are typically experts in the field of economics, banking, or finance and hold office for a period of four years.

**Q100. Answer: (b) Virat Kohli**

The correct answer is Virat Kohli.

Key Points

• Virat Kohli was officially named the Player of the Match in the Final of the ICC Men's T20 World Cup 2024.

• The Final took place on June 29, 2024, at the Kensington Oval in Bridgetown, Barbados, where India faced South Africa.

• Kohli played a match-defining innings of 76 runs off 59 balls. His performance included six boundaries and two sixes, anchoring the Indian innings after the team suffered early setbacks.

• His steady knock helped India post a total of 176/7, which is the highest score ever recorded in a T20 World Cup Final.

• India successfully defended the target, winning the match by 7 runs to clinch their second T20 World Cup title.

• Immediately after receiving the award, Virat Kohli announced his retirement from T20 International (T20I) cricket, making the final win a historic conclusion to his career in the format.

Additional Information

• Tournament Overview: The ICC Men's T20 World Cup 2024 was the 9th edition of the biennial tournament. It was co-hosted by the United States and the West Indies from June 1 to June 29, 2024.

• Player of the Tournament: Jasprit Bumrah was named the Player of the Tournament for his exceptional bowling. He took 15 wickets in 8 matches with an extraordinary economy rate of 4.17.

• Leading Run-scorer: Rahmanullah Gurbaz from Afghanistan finished as the leading run-scorer of the tournament, accumulating 281 runs across 8 innings.

• Leading Wicket-takers: Fazalhaq Farooqi of Afghanistan and Arshdeep Singh of India were the joint-highest wicket-takers, both claiming 17 wickets.

• Team Achievement: By winning the 2024 edition, India became the first team in history to win the T20 World Cup by remaining undefeated throughout the entire competition.

Important Points

• End of an Era: Alongside Virat Kohli, the Indian captain Rohit Sharma and all-rounder Ravindra Jadeja also announced their retirement from T20Is following the World Cup triumph.

• Title History: This victory ended India's 11-year wait for an ICC trophy and marked their first T20 World Cup win since the inaugural tournament in 2007 under the captaincy of MS Dhoni.

• South Africa's Milestone: The 2024 Final marked the first time South Africa had ever reached the final of a Senior Men's ICC

YourMockTest.com — Free Study Material

World Cup (both ODI and T20I).

• Expanded Format: The 2024 World Cup featured a record 20 teams, up from the previous 16, organized into four groups of five, showcasing the International Cricket Council's (ICC) initiative to globalize the sport.

• Match Turning Point: While Kohli set the target, the death bowling of Hardik Pandya, Jasprit Bumrah, and a spectacular catch by Suryakumar Yadav in the final over were critical in securing the win for India.

More previous year papers and mock tests: **www.yourmocktest.com/pyq**

YourMockTest.com — Free Study Material