RRB ALP CBT-I 2024 Official Paper (Held On: 27 Nov, 2024 Shift 3) (Previous Year Paper)

RRB Group D • 2024 • 75 questions • 60 minutes • Answer key and solutions

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STAGE I (CBT I)

Q1. In this question, a statement is followed by two courses of action, numbered I and II. You must assume everything in the statement to be true and on the basis of the information given in the statement, decide which of the courses of action logically follow(s) for pursuing.

Statement:

Despite the teacher's several warnings, a student was caught cheating in the exam.

Courses of Action:

I. The student should be expelled from the exam, and his paper should be cancelled.

II. The teacher should leave the student with another warning.

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

Q2. How much venture capital fund would be set up for space economy in India as announced by the Finance Minister in the Annual Financial Statement 2024-25?

(a) Rs. 500 crore
(b) Rs. 1,500 crore
(c) Rs. 1,000 crore
(d) Rs. 700 crore

Q3. An object is placed at distance of 20cm in front of a concave mirror and it’s image is formed at a distance of 60cm on the same side as the object, the magnification produced by the mirror will be:

(a) +3
(b) -1/3
(c) +1/3
(d) -3

Q4. 1C Charge contains:

(a) 6 × 10^(19) electrons
(b) 6 × 10^(18) electrons
(c) 6 × 10^(17) electrons
(d) 6 × 10^(20) electrons

Q5. What sum will earn a simple interest of Rs. 480 in 3 years at 16% per year rate of interest?

(a) Rs. 600
(b) Rs. 1,000
(c) Rs. 1,200
(d) Rs. 800

Q6. IMOL is related to PTVS in a certain way based on the English alphabetical order. In the same way, FJLI is related to MQSP. To which of the following options is KOQN related, following the same logic?

(a) QUWT
(b) RVXU
(c) RUVX
(d) QUWX

Q7. A shopkeeper bought an article for Rs. 319.60. Approximately, at what price should he sell the article to make a 25% profit?

(a) Rs. 450
(b) Rs. 400
(c) Rs. 600
(d) Rs. 500

Q8. Refer to the following number and symbol series and answer the question that follows. Counting to be done from left to right only.

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

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

(a) Zero
(b) Two
(c) More than two
(d) One

Q9. Which of the following options should come in place of the question mark ('?') in the given series based on the English alphabetical order?

JFH,KGI,LHJ,MIK,?

(a) NJL
(b) JNL
(c) JLN
(d) NLJ

Q10. When a thick glass slab is placed over printed matter, they appear to be _ and this is due to ___of light.

(a) lowered; reflection
(b) lowered; refraction
(c) raised; refraction
(d) raised; reflection

Q11. What is the mode of reproduction used in the methods such as layering or grafting to grow many plants like sugarcane, roses, or grapes for agricultural purposes?

(a) Regeneration
(b) Fragmentation
(c) Spore formation
(d) Vegetative propagation

Q12. Sumit travelled 10 km 120 m by scooter, 1 km 970 m on foot and 15 km 850 m by bus. What is the total distance travelled by Sumit?

(a) 27 km 930 m
(b) 27 km 920 m
(c) 27 km 950 m
(d) 27 km 940 m

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Q13. Based on the English alphabetical order, three of the following four letter cluster pairs are alike in a certain way and thus form a group. Which pair does NOT belong to that group?

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

(a) YD - WD
(b) LN - QS
(c) TV - YA
(d) RT - WY

Q14. In 2024, what has been the main focus of the pavilions displayed at the India Art, Architecture, and Design Biennale?

(a) Interactive technology exhibits
(b) Indian film and photography
(c) Contemporary art and innovative designs
(d) Traditional crafts and modern architecture

Q15. Based on the English alphabetical order, three of the following four letter cluster pairs are alike in a certain way and thus form a group. Which pair does NOT belong to that group?

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

(a) LH - QM
(b) KF - MH
(c) QL - SN
(d) EZ - GB

Q16. When there are two parallel lines cut by a transversal, which of the following is true?

a) Corresponding angles are equal.

b) Alternate interior angles are supplementary.

c) Consecutive angles on the same side of the transversal are equal.

d) Alternate interior angles are equal?

(a) Only a
(b) b and c
(c) a and d
(d) Only b

Q17. A's salary is 20% less than B's salary. By what percentage is B's salary more than A's salary?

(a) 20%
(b) 17%
(c) 25%
(d) 15%

Q18. In a row of people, all facing north, Bunty is 8^(th) from the left end. Sneha is 15^(th) from the left end. Sneha is exactly between Bunty and Nupur. If Nupur is 7^(th) from the right end of the line, how many people are there in the row?

(a) 26
(b) 28
(c) 20
(d) 22

Q19. The value of (256)^(0.16) × (256)^(0.09) is:

(a) 64
(b) 256
(c) 16
(d) 4

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Q20. An article is marked at 50% above its cost price. If the marked price of the article is Rs. 1,500, then the cost price of the article is:

(a) Rs. 750
(b) Rs. 1,200
(c) Rs. 1,000
(d) Rs. 800

Q21. Who among the following was appointed as Minister of Health and Family Welfare in June 2024?

(a) Sarbananda Sonowal
(b) Shivraj Singh Chouhan
(c) Jagat Prakash Nadda
(d) Manohar Lal

Q22. Refer to the following number and symbol series and answer the question that follows. Counting to be done from left to right only.

(Lef) @ 6 8 $ 9 # 1 * £ 4 7 & 2 & % 3 Ω 5 (Right)

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

(a) One
(b) Two
(c) Zero
(d) More than two

Q23. 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 and decide which conclusion(s) logically follow(s) from the given statements.

Statements:

No horses are mirrors.

Some lizards are horses.

Conclusions:

(I) Some horses are not lizards.

(II) Some lizards are not mirrors.

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

Q24. If the perimeter of one face of a cube is 48 cm, then its volume is:

(a) 729 cm^3
(b) 1728 cm^3
(c) 512 cm^3
(d) 1024 cm^3

Q25. If sec 4A = cosec (3A - 50º), where 4A and 3A are acute angles, find the value of cosec (A + 25º).

(a) 0
(b) $1/\sqrt{2}$
(c) 1
(d) $\sqrt{2}$

Q26. What type of reaction takes place when calcium oxide reacts vigorously with water to produce slaked lime?

(a) Decomposition reaction
(b) Double displacement reaction
(c) Combination reaction
(d) Displacement reaction

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Q27. According to the 2024-25 Indian Union Budget, the Government has allocated increased funding towards schemes like 'Sambal' from Rs. 462 crore in the previous fiscal year to _____.

(a) Rs. 523 crore
(b) Rs. 453 crore
(c) Rs. 756 crore
(d) Rs. 629 crore

Q28. 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 and decide which conclusion(s) logically follow(s) from the given statements.

Statements:

Some snakes are lizards.

All roosters are lizards.

Conclusions:

(I) All lizards are roosters.

(II) No roosters are snakes.

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

Q29. If Rs. 2,400 is to be distributed between A and B in the ratio of 7 : 5, then the share of A is:

(a) Rs. 1,400
(b) Rs. 1,600
(c) Rs. 1,300
(d) Rs. 1,000

Q30. Which of the following is an example of a heterogeneous mixture?

(a) Sugar dissolved in water
(b) Copper sulphate powder dissolved in water
(c) Salt dissolved in water
(d) Oil dissolved in water

Q31. Which gas is passed through calcium hydroxide to form calcium carbonate and water?

(a) Helium gas
(b) Oxygen gas
(c) Carbon - dioxide gas
(d) Hydrogen gas

Q32. How many electrons does carbon typically share when bonding with another carbon atom or with atoms of other elements?

(a) 6
(b) 2
(c) 4
(d) 1

Q33. In a certain code language, ‘SOLVE’ is coded as ‘36598’, ‘STORE’ is coded as ‘39164’, and ‘WHOLE’ is coded as ‘27689’. What is the code for ‘V’ in the given code language?

(a) 9
(b) 5
(c) 8
(d) 3

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Q34. Anita starts from her house at Point A and walks 5 m towards South. She takes a right turn, walks 7 m, takes another right and walks 12 m and stops at point P. If a pole is placed 7 m towards East from where she stopped (Point P), how far (shortest distance) and in which direction will her house be from the pole? (All turns are 90 degrees turns only unless specified.)

(a) 12m towards the South
(b) 7m towards the East
(c) 7m towards the South
(d) 5m towards the North

Q35. Justify the given statement:

'Plants have low energy needs'.

(a) Plant bodies have a small proportion of dead cells in many tissues.
(b) As the plants use relatively fast transport systems.
(c) Because plants are autotropic organisms and prepare their own food.
(d) Energy needs differ between different body designs. Plants do not move and have a large proportion of dead cells in many tissues.

Q36. Which of the following options should come in place of the question mark ('?') in the given series based on the English alphabetical order?

TVX,SUW,RTV,QSU,?

(a) RPT
(b) PTR
(c) PRT
(d) RTP

Q37. CKQR is related to FITP in a certain way based on the English alphabetical order. In the same way, WERN is related to ZCUL. To which of the following options is BOLJ related, following the same logic?

(a) DNOK
(b) DMNJ
(c) EMOH
(d) FNNH

Q38. Who among the following is the author of the book 'I Have the Streets - A Kutty Cricket Story'?

(a) Ravichandran Ashwin
(b) Sachin Tendulkar
(c) Sourav Ganguly
(d) Kuldeep Yadav

Q39. If 'A' stands for '÷', 'B' stands for '×', 'C' stands for '+', and 'D' stands for '-', what will come in place of the question mark '?' in the following equation?

55 C 7 D 54 A 9 B 8 =?

(a) 14
(b) 24
(c) 34
(d) 41

Q40. What is the primary purpose of the Artara'24 Fine Arts Exhibition and Competition?

(a) To promote art tourism
(b) To conduct art workshops
(c) To sell artworks
(d) To discover and nurture emerging artistic talents

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Q41. In a certain code language, ‘GIRL’ is coded as ‘1539’ and ‘ROSE’ is coded as ‘6825’. What is the code for ‘R’ in the given code language?

(a) 5
(b) 8
(c) 6
(d) 3

Q42. Which gland secretes adrenaline?

(a) Thyroid gland
(b) Adrenal gland
(c) Pineal gland
(d) Pituitary gland

Q43. The average of 10 observations is 46. It was realised later that an observation was misread as 42 in place of 142. Find the correct average.

(a) 56
(b) 45
(c) 54
(d) 65

Q44. If 6 men and 8 boys can do a piece of work in 10 days while 26 men and 48 boys can do the same work in 2 days, then the time taken by 20 men for doing the same piece of work will be:

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

Q45. A, B, C, D, E and F are sitting around a circular table facing the centre. A sits second to the right of E. F is the immediate neighbour of D and E. C sits second to the left of B.

What is the position of F with respect to C?

(a) Third to the right
(b) Immediate right
(c) Second to the left
(d) Third to the left

Q46. Which of the following statements regarding an atom is correct?

(a) Atoms are not electrically neutral
(b) An atom does not contain any positive charge
(c) Atoms as a whole are electrically neutral
(d) Atoms are partially electrically neutral

Q47. A cubic wooden block of side 2 m is lying on a tabletop. If the mass of the wooden block is 10 kg, then the pressure exerted by the wooden block on the tabletop is: (consider g = 10 m/s²)

(a) 25 N m^-²
(b) 30 N m^-²
(c) 20 N m^-²
(d) 15 N m^-²

Q48. A 3-digit number is such that the units' digit, the tens' digit and the hundreds' digit are in the ratio 1 : 2 : 3. The sum of this number and the number obtained by writing its digits in reverse order is 1332. Find the number.

(a) 123
(b) 246
(c) 963
(d) 414

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Q49. Which of the following teams was the winner of the 10th season of Pro Kabaddi League?

(a) Pink Panthers
(b) Patna Pirates
(c) Puneri Paltan
(d) Haryana Steelers

Q50. Which of the following is the unit of acceleration?

(a) ms
(b) ms^2
(c) m/s^2
(d) m/s

Q51. Seven people, A, B, C, D, E, F and G are sitting in a row, facing north. Only two people sit to the right of C. Only two people sit between D and C. A sits to the immediate right of D. E sits to the immediate left of G. B sits second to the left of A.

How many people sit between B and F?

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

Q52. 5118 is divisible by:

(a) 6
(b) 7
(c) 8
(d) 5

Q53. The average of the first twelve multiples of 11 is:

(a) 70.5
(b) 69.5
(c) 68.5
(d) 71.5

Q54. What happens when we increase the temperature of solids?

(a) The kinetic energy of the particles will decrease.
(b) The shape of the solid will remain same.
(c) The kinetic energy of the particles will increase.
(d) No effect of temperature on solids.

Q55. The pattern of the magnetic field lines produced by a current carrying conductor:

(a) depends on the length of the conductor
(b) depends on the shape of the conductor
(c) is independent of anything related to the conductor
(d) depends on the thickness of the conductor

Q56. ____ has been awarded the title of India's Fastest Growing Sustainable Brand for 2023-24.

(a) Suzlon Energy
(b) Adani Green Energy
(c) Gruner Renewable Energy
(d) Tata Renewable Energy

Q57. If the radius of a sphere is increased by 50%, find the percent increase in the surface area.

(a) 125%
(b) 95%
(c) 100%

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(d) 115%

Q58. Under the NPS Vatsalya scheme, subsequent contribution of what minimum amount is required per annum with no maximum limit?

(a) Rs. 2,500
(b) Rs. 500
(c) Rs. 5,000
(d) Rs. 1,000

Q59. In 2024, the Royal Australian Air Force debuted its combat aircraft in India during Exercise Tarang Shakti at which location?

(a) Air Force Station, Pune
(b) Air Force Station, Gwalior
(c) Air Force Station, Agra
(d) Air Force Station, Jodhpur

Q60. Where does the following reaction take place in a cell? The breakdown of glucose, a six-carbon molecule, into a three-carbon molecule.

(a) In the mithochondria
(b) In the nucleus
(c) In the golgi apparatus
(d) In the cytoplasm

Q61. In the following number-pairs, the second number is obtained by applying certain mathematical operations to the first number. Which numbers should replace X and Y so that the pattern followed by the two numbers on the left side of :: is the same as that on the right side of ::?

(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.)

X : 523 :: 9 : Y

(a) X = 9, Y = 294
(b) X = 13, Y = 250
(c) X = 15, Y = 286
(d) X = 11, Y = 225

Q62. In a certain code language,

'A + B' means 'A is the mother of B',

'A − B' means 'A is the brother of B',

'A × B' means 'A is the wife of B' and

'A ÷ B' means 'A is the father of B'.

How is M related to T if 'M − N ÷ P + S × T'?

(a) Wife's mother's father's brother
(b) Wife's father's brother
(c) Wife's mother's mother's father
(d) Wife's father's father's brother

Q63. What is the product of (x + a) and (x + b)?

(a) x2 + (a - b)x + ab
(b) x2 + (a + b)x - ab
(c) x2 + (a - b)x - ab
(d) x2 + (a + b)x + ab

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Q64. Which of the following options should come in place of the question mark (?) in the given series?

14 15 18 23 30 ?

(a) 37
(b) 39
(c) 40
(d) 41

Q65. A train travelling at a speed of 45 km/h crosses a pole in 24 sec. What is the length of the train?

(a) 125m
(b) 300m
(c) 30m
(d) 1.5m

Q66. In the following number-pairs, the second number is obtained by applying certain mathematical operations to the first number. Which numbers should replace X and Y so that the pattern followed by the two numbers on the left side of :: is the same as that on the right side of ::?

(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.)

X : 711 :: 146 : Y

(a) X = 218, Y = 456
(b) X = 252, Y = 393
(c) X = 237, Y = 418
(d) X = 269, Y = 379

Q67. What is used to make drinking water free from germs?

(a) Washing soda
(b) Sodium hydroxide
(c) Baking soda
(d) Bleaching powder

Q68. Which of the following controls bladder pressure?

(a) Kidneys
(b) Heart
(c) Nervous system
(d) Blood Pressure

Q69. Refer to the following number and symbol series and answer the question that follows. Counting to be done from left to right only.

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

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

(a) One
(b) More than two
(c) Two
(d) Zero

Q70. The monthly income of a person is Rs. 13,500, and his monthly expenditure is Rs. 9,000. Approximately what percentage of his monthly income does he save monthly?

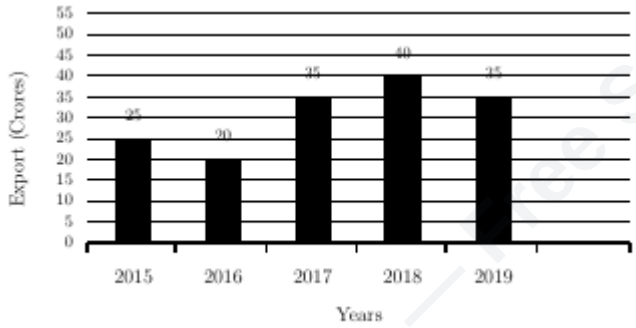
(a) 21%
(b) 25%
(c) 28.57%
(d) 33.33%

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Q71. Study the following graph and answer the given question.

The following bar graph shows annual exports (in crore) of a company during the period 2015 to 2019.

What is the average export (in crore) of the year 2016 and 2018?



(a) 30
(b) 70
(c) 90
(d) 60

Q72. Identify one example of change taking place at puberty that can signify sexual maturation.

(a) Mood swings
(b) Behaving differently
(c) New hair-growth patterns
(d) Increase in height

Q73. The sum of the ages of a mother, son and daughter is 70 years. If the mother is thrice as old as her son, and the daughter is 5 years older than her brother, how old is the mother?

(a) 35 years
(b) 45 years
(c) 39 years
(d) 42 years

Q74. A body of mass m is taken from the ground to a height h, the gravitational potential energy of the body will be:

Acceleration due to gravity is g.

(a) mgh
(b) mg/h
(c) m×h
(d) m×g

Q75. If A means +, B means −, C means ×, D means ÷, then what will come in place of the question mark (?) in the following equation?

10 B 27 D 9 A 4 C 3 = ?

(a) 20
(b) 17
(c) 19
(d) 18

ANSWER KEY

1	a	2	c	3	d	4	b	5	b	6	b	7	b	8	d	9	a	10	c
11	d	12	d	13	a	14	c	15	a	16	c	17	c	18	b	19	d	20	c
21	c	22	b	23	c	24	b	25	d	26	c	27	d	28	c	29	a	30	d
31	c	32	c	33	b	34	c	35	d	36	c	37	c	38	a	39	a	40	d
41	a	42	b	43	a	44	b	45	c	46	c	47	a	48	c	49	c	50	c

51	b	52	a	53	d	54	c	55	b	56	c	57	a	58	d	59	d	60	d
61	d	62	a	63	d	64	b	65	b	66	b	67	d	68	c	69	a	70	d
71	a	72	c	73	c	74	a	75	c										

SOLUTIONS

Q1. Answer: (a) Only I follows.

Given:

Statement: Despite the teacher's several warnings, a student was caught cheating in the exam.

Course of Action:

Courses of Action I: Expelling the student from the exam and cancelling their paper is a strict action but aligns with the need to uphold discipline and fairness in examinations. Since the

student ignored repeated warnings, a stronger action is justified. This course of action logically follows.

Courses of Action II: Giving the student another warning would be lenient and ineffective, as the student has already disregarded prior warnings. Repeating the same approach is

unlikely to change the behavior and fails to address the seriousness of the misconduct. This course of action does not logically follow.

So, Only I follows.

Hence, the correct answer is "Option 1".

Q2. Answer: (c) Rs. 1,000 crore

The correct answer is Rs. 1,000 crore

Key Points

• In the Annual Financial Statement for 2024-25, India's Finance Minister, Nirmala Sitharaman, announced the establishment of a Rs. 1,000 crore (approximately $119 million) venture capital fund aimed at bolstering the nation's space economy

• The fund is designed to stimulate growth in India's space sector, with an ambitious goal to expand the space economy by five times over the next decade.

• This initiative is expected to be a game-changer for startups and small businesses within the industry, providing much-needed capital to foster innovation and development.

• Complementing the venture fund, the government has liberalized foreign direct investment (FDI) policies, allowing up to 100% FDI in satellite manufacturing and easing regulations for launch vehicles.

• These reforms aim to attract global investors and enhance India's competitiveness in the international space market

Additional Information

• An annual financial statement (AFS) is a report that summarizes a company's financial performance over a year.

• It also provides details about a company's assets, liabilities, and financial results.

• It shows how a company used its resources over the course of a year.

• It's calculated for a fiscal year, which is usually from January 1 to December 31.

• Joint stock companies and limited liability companies must have their AFSs approved by an auditor.

• An AFS is also known as the Union Budget.

• It's presented to Parliament by the President of India.

• It's a statement of estimated receipts and expenditures for the government.

• It's divided into three parts: Consolidated Fund, Contingency Fund, and Public Account.

Q3. Answer: (d) -3

The correct answer is -3

Concept:

Concave Mirror:

• A concave mirror is a spherical mirror with a reflecting surface that curves inward.

• The magnification (m) produced by a mirror is the ratio of the height of the image (h_i) to the height of the object (h_o).

• m = h_i/h_o=-v/u

Calculation:

Given,

Object distance, u = -20 cm

Image distance, v = -60 cm

The magnification produced by the mirror is,

m = -v/u

=> m = -((-60)/(-20))

m = -3

Therefore The magnification produced by the mirror is -3.

Q4. Answer: (b) 6 × 10^(18) electrons

The correct answer is 6 × 10^(18)electrons.

Key Points

• 1 Coulomb (C) of charge is equivalent to the charge carried by approximately 6.242 × 10^(18) electrons.

• The elementary charge (e) of a single electron is approximately 1.602 × 10^(-19) C.

• The relationship between charge (Q) and the number of electrons (n) is given by Q = n × e.

• To find the number of electrons, we can rearrange the formula to n = Q / e.

• Using the given charge of 1C, n = 1C / 1.602 × 10^(-19)C/electron, which simplifies to approximately 6.242 × 10^(18) electrons.

Additional Information

• Electric Charge

• Electric charge is a fundamental property of matter that causes it to experience a force when placed in an electromagnetic field.

• There are two types of electric charges: positive and negative. Like charges repel each other, while opposite charges attract.

• Electrostatics

• Electrostatics is the study of electric charges at rest.

• It involves the study of forces, fields, and potentials arising from static charges.

• Coulomb's Law

• Coulomb's Law defines the force between two point charges.

• The force is directly proportional to the product of the magnitudes of the charges and inversely proportional to the square of the distance between them.

Q5. Answer: (b) Rs. 1,000

Shortcut Trick

Total Percentage Interest for 3 years = Rate × Time = 16% × 3 = 48%

Given that 48% of the Principal = Rs. 480

1% of the Principal = 480 ÷ 48 = 10

100% (Total Sum) = 10 × 100 = Rs. 1,000

Therefore The correct answer is Rs. 1,000.

Alternate Method

Given:

Simple Interest (SI) = Rs. 480

Time (T) = 3 years

Rate of Interest (R) = 16% per annum

Formula Used:

Simple Interest (SI) = (P × R × T) ÷ 100

Calculations:

=> 480 = (P × 16 × 3) ÷ 100

=> 480 = (P × 48) ÷ 100

=> P × 48 = 480 × 100

=> P = (480 × 100) ÷ 48

=> P = 10 × 100

=> P = 1,000

Therefore The correct answer is Rs. 1,000.

Additional Information

Simple Interest Concept

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Simple interest is calculated only on the initial principal amount. The formula is SI = (P × R × T) ÷ 100, where P is Principal, R is Rate, and T is Time.

Total Amount Formula

The total amount (A) after T years is the sum of the principal and the interest earned: A = P + SI = P × (1 + RT/100).

Rate and Time Relation

If the rate of interest is given per month, the time must also be in months, or both must be converted to an annual basis for calculation consistency.

Q6. Answer: (b) RVXU

The logic followed here is:

Logic: + 7 in the positional value of letters.

For, IMOL : PTVS

For, FJLI : MQSP

Similarly, KOQN : ?

Hence, the correct answer is "Option 2".

Q7. Answer: (b) Rs. 400

Shortcut Trick

Round off the Cost Price Rs. 319.60 to the nearest simple value, which is Rs. 320.

Profit percentage = 25% = 1/4 of the Cost Price.

Profit = 320 ÷ 4 = Rs. 80.

Selling Price = Cost Price + Profit = 320 + 80 = Rs. 400.

Therefore The correct answer is Rs. 400.

Alternate Method

Given:

Cost Price (CP) = Rs. 319.60

Profit Percentage = 25%

Formula Used:

Selling Price (SP) = CP × (100 + Profit %)/100

Calculations:

=> SP = 319.60 × (100 + 25)/100

=> SP = 319.60 × 125/100

=> SP = 319.60 × 5/4

=> SP = 79.90 × 5

=> SP = Rs. 399.50

=> Since the question asks for the approximate price, SP ≈ Rs. 400.

Therefore The correct answer is Rs. 400.

Additional Information

Cost Price (CP)

The price at which an article is purchased. Profit or loss is always calculated on this base value unless stated otherwise.

Selling Price (SP)

The price at which an article is sold. It is calculated as SP = CP + Profit or SP = CP − Loss.

Profit and Loss Percentage

Profit % = (Profit ÷ CP) × 100 and Loss % = (Loss ÷ CP) × 100. These percentages represent the gain or loss relative to the initial investment.

Q8. Answer: (d) One

Given series:

3 Ω 9 # 1 4 6 @ 8 $ 2 & % 7 & * £ 5

Condition to be checked:

Numbers which are immediately preceded by a number and also immediately followed by a symbol.

Number → Number → Symbol

Checking the given series:

3 Ω 9 # 1 4 6 @ 8 $ 2 & % 7 & * £ 5

Thus, there is one such pattern (4 6 @) that follows the above condition.

Hence, the correct answer "Option 4".

Mistake Points

Immediately preceded by means immediately before or to come just before.

Immediately followed by means immediately after or to come just after.

Q9. Answer: (a) NJL

The logic followed here is:

Logic: + 1 in the positional value of letters.

Hence, the correct answer is "Option 1".

Q10. Answer: (c) raised; refraction

The correct answer is raised; refraction.

Key Points

• When a thick glass slab is placed over printed matter, the printed matter appears to be raised due to the refraction of light.

• Refraction is the bending of light as it passes from one medium to another with different densities.

• As light enters the glass slab from the air, it slows down and bends towards the normal due to the higher density of glass compared to air.

• When the light exits the glass slab, it speeds up and bends away from the normal, making the printed matter appear raised.

• This phenomenon can be explained using the principles of optics, specifically Snell's Law, which describes the relationship between the angles of incidence and refraction.

Additional Information

• Reflection of Light

• Reflection is the bouncing back of light when it hits a surface that it cannot pass through.

• It follows the laws of reflection, where the angle of incidence equals the angle of reflection.

• Total Internal Reflection

• This occurs when light traveling from a denser to a rarer medium hits the boundary at an angle greater than the critical angle, causing it to reflect back entirely into the denser medium.

• This principle is used in optical fibers for efficient signal transmission.

• Dispersion of Light

• Dispersion is the splitting of white light into its constituent colors when it passes through a prism.

• This occurs because different colors of light have different wavelengths and refract by different amounts.

Q11. Answer: (d) Vegetative propagation

The correct answer is Vegetative propagation.

Key Points

• Vegetative propagation is a mode of asexual reproduction where new plants grow from parts of the parent plant, such as stems, roots, or leaves.

• This method is commonly used in agriculture to grow plants like sugarcane, roses, and grapes.

• Layering and grafting are techniques of vegetative propagation that help in producing plants with desired traits.

• Vegetative propagation ensures uniformity in the crops since the new plants are genetically identical to the parent plant.

• This method is advantageous for plants that do not produce viable seeds or have long seed dormancy periods.

Additional Information

• Regeneration

• Regeneration is a type of asexual reproduction where organisms can regrow certain parts of their bodies.

• This process is common in animals like starfish and lizards.

• Fragmentation

• Fragmentation is a form of asexual reproduction where an organism splits into fragments, each capable of growing into a new individual.

• This method is often observed in organisms like fungi, algae, and some plants.

• Spore Formation

• Spore formation is a reproductive strategy where organisms produce spores that can develop into new individuals.

• This method is common in bacteria, fungi, and some plants like ferns.

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Q12. Answer: (d) 27 km 940 m

Shortcut Trick

Total distance = (Sum of km) + (Sum of m)

Kilometers: 10 + 1 + 15 = 26 km

Meters: 120 + 970 + 850 = 1940 m = 1 km 940 m

Total = 26 km + 1 km 940 m = 27 km 940 m

Therefore The correct answer is 27 km 940 m.

Alternate Method

Given:

Distance covered by scooter = 10 km 120 m

Distance covered on foot = 1 km 970 m

Distance covered by bus = 15 km 850 m

Calculations:

=> Total Distance = (10 km 120 m) + (1 km 970 m) + (15 km 850 m)

=> Total Meters = 120 + 970 + 850 = 1940 m

=> Since 1000 m = 1 km, 1940 m = 1 km 940 m

=> Total Kilometers = 10 + 1 + 15 + 1 (carried over from meters) = 27 km

=> Total Distance = 27 km 940 m

Therefore The correct answer is 27 km 940 m.

Additional Information

Unit Conversion

1 kilometer (km) = 1000 meters (m). To convert km to m, multiply by 1000. To convert m to km, divide by 1000.

Addition of Mixed Units

When adding units like km and m, always add the smaller units first. If the sum of smaller units exceeds the conversion base (1000 for m), carry the extra over to the larger unit.

Average Speed Relation

Average Speed = Total Distance ÷ Total Time. This concept is often used in multi-segment journey problems.

Q13. Answer: (a) YD - WD

The logic followed here is:

option 1) YD - WD

option 2) LN - QS

option 3) TV - YA

option 4) RT - WY

Hence, the correct answer is "Option 1".

Q14. Answer: (c) Contemporary art and innovative designs

The correct answer is Contemporary art and innovative designs

Key Points

• In 2024, the India Art, Architecture, and Design Biennale placed its primary emphasis on contemporary art and innovative designs.

• This biennale served as a platform to showcase the evolving creativity and modern perspectives in India's art, architecture, and design landscapes.

• Contemporary Art:

• Exhibitions highlighted modern art forms that reflect current societal, cultural, and technological contexts.

• Artists explored themes like urbanization, globalization, and identity using innovative methods and mediums.

• Innovative Designs:

• Architects and designers showcased cutting-edge architectural projects, sustainable designs, and experimental installations.

• The biennale emphasized design thinking, encouraging creativity that integrates tradition with modernity.

Additional Information

• The 2024 India Art, Architecture, and Design Biennale (IAADB), held at the iconic Red Fort in New Delhi, celebrated India's dynamic evolution in the fields of art, architecture, and design.

• The event combined diverse creative fields, including fine arts, interior design, urban planning, and digital innovation.

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• Exhibitors included artists, designers, architects, and technologists working on projects that address global challenges like urbanization, climate change, and cultural preservation.

• Each pavilion was curated to present a unique perspective, blending tradition and innovation. Themes included modern interpretations of Indian temple architecture, indigenous craftsmanship, and cutting-edge design principles.

• Interactive exhibits and installations were used to engage audiences and offer immersive experiences.

Q15. Answer: (a) LH - QM

The logic followed here is:

Option 1) LH - QM

Option 2) KF - MH

Option 3) QL - SN

Option 4) EZ - GB

Hence, the correct answer is "Option 1".

Q16. Answer: (c) a and d

Shortcut Trick

In geometry, when two parallel lines are intersected by a transversal:

• Corresponding angles are always equal (Statement a is true).

• Alternate interior angles are always equal (Statement d is true, statement b is false).

• Consecutive (co-interior) angles sum to 180°, meaning they are supplementary, not equal (Statement c is false).

Therefore The correct answer is a and d.

Alternate Method

Given: Two parallel lines (m || n) and a transversal line (t).

Analyzing the pairs of angles from the diagram:

=> Corresponding Angles: Pairs like angle 1 and angle 5 or angle 2 and angle 6 are in the same relative position. By the Corresponding Angles Postulate, angle 1 = angle 5. Hence, statement (a) is true.

=> Alternate Interior Angles: Pairs like angle 4 and angle 6 or angle 3 and angle 5 are on opposite sides of the transversal and between the parallel lines. By the Alternate Interior Angles Theorem, angle 4 = angle 6. Hence, statement (d) is true.

=> Alternate Interior Angles (Supplementary check): Since angle 4 = angle 6, they are only supplementary if they are both 90°. In general, they are equal, not supplementary. Hence, statement (b) is false.

=> Consecutive Interior Angles: Pairs like angle 4 and angle 5 are on the same side. By the Consecutive Interior Angles Theorem, angle 4 + angle 5 = 180°. They are supplementary, not necessarily equal. Hence, statement (c) is false.

Therefore The correct answer is a and d.

Additional Information

Vertically Opposite Angles

When two lines intersect, the angles opposite each other at the vertex are always equal (e.g., angle 1 = angle 3 and angle 2 = angle 4).

Linear Pair of Angles

Angles that lie on a straight line and share a common arm are supplementary, meaning their sum is 180° (e.g., angle 1 + angle 2 = 180°).

Alternate Exterior Angles

Pairs of angles on opposite sides of the transversal and outside the parallel lines (e.g., angle 1 and angle 7) are always equal.

Q17. Answer: (c) 25%

Shortcut Trick

Use the direct reciprocal formula: If A is x% less than B, then B is more than A by [x / (100 − x)] × 100%.

Given x = 20%.

=> Required Percentage = [20 / (100 − 20)] × 100

=> [20 / 80] × 100 = 1/4 × 100 = 25%

Therefore The correct answer is 25%.

Alternate Method

Given: A's salary is 20% less than B's salary.

Let B's salary = 100 units.

=> A's salary = 100 − 20% of 100 = 80 units.

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Difference between their salaries = 100 − 80 = 20 units.

Percentage by which B's salary is more than A's salary is calculated using A as the base:

=> Percentage More = (Difference / A's Salary) × 100

=> Percentage More = (20 / 80) × 100

=> Percentage More = (1 / 4) × 100

=> Percentage More = 25%

Therefore The correct answer is 25%.

Additional Information

Base Value Property

In percentage comparisons, the value following the word 'than' or 'as compared to' always acts as the denominator (base).

Fractional Reciprocals

If a value is decreased by 1/n, to restore it to the original value, it must be increased by 1/(n − 1). Here, 20% = 1/5; so increase required is 1/(5 − 1) = 1/4 = 25%.

Percentage Change Formula

Percentage Change = [|Final Value − Initial Value| / Initial Value] × 100.

Q18. Answer: (b) 28

Given:

Bunty's rank from the left end = 8th

Sneha's rank from the left end = 15th

Sneha is exactly between Bunty and Nupur.

Nupur's rank from the right end = 7th

To find Nupur's rank from the left end:

Sneha's position is exactly between Bunty and Nupur, so the difference in their positions is equal on both sides of Sneha.

Sneha's rank from the left end - Bunty's rank from the left end = Nupur's rank from the left end - Sneha's rank from the left end

15 - 8 = Nupur's rank from the left end - 15

7 = Nupur's rank from the left end - 15

Nupur's rank from the left end = 22

Total number of people in the row = Nupur's rank from the left end + Nupur's rank from the right end - 1

22 + 7 - 1 = 28

Hence, the total number of people in the row is "28".

Q19. Answer: (d) 4

Given:

(256)^(0.16) × (256)^(0.09)

Formula used:

(a^m × aⁿ) = a^(m+n)

Calculation:

(256)^(0.16) × (256)^(0.09)

=> (256)^(0.16+0.09)

=> (256)^(0.25)

=> (256^(1/4))

=> 4

Therefore The value of (256)^(0.16) × (256)^(0.09) is 4.

Q20. Answer: (c) Rs. 1,000

Shortcut Trick

Markup = 50% = 1/2 of Cost Price.

Ratio of Cost Price (CP) to Marked Price (MP) = 2 : (2 + 1) = 2 : 3.

Given, 3 units (MP) = Rs. 1,500.

=> 1 unit = Rs. 500.

=> 2 units (CP) = 2 × 500 = Rs. 1,000.

Therefore The correct answer is Rs. 1,000.

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Alternate Method

Given:

→ Marked Price (MP) = Rs. 1,500

→ Markup Percentage = 50% above CP

Formula Used:

MP = CP × [1 + (Markup%/100)]

Calculations:

=> 1,500 = CP × [1 + (50/100)]

=> 1,500 = CP × (150/100)

=> 1,500 = CP × 1.5

=> CP = 1,500 ÷ 1.5

=> CP = 1,000

Therefore The correct answer is Rs. 1,000.

Additional Information

Markup and Marked Price

Marked Price is the price listed on the product. Markup Value = MP − CP. Markup % is always calculated on CP.

Discount Calculation

Discount is always calculated on the Marked Price. SP = MP × [1 − (Discount % / 100)].

Relation between CP and MP

CP / MP = (100 − Discount%) / (100 + Profit%). This formula is useful when both discount and profit are given.

Q21. Answer: (c) Jagat Prakash Nadda

The correct answer is J. P. Nadda

Key Points

• J. P. Nadda:

• J. P. Nadda served as the Minister of Health and Family Welfare in the Government of India.

• He was appointed to this position in November 2014 during the first term of Prime Minister Narendra Modi.

• During his tenure, he focused on various health initiatives and programs aimed at improving healthcare services in India.

• His contributions included the implementation of the National Health Policy 2017 and the launch of the Ayushman Bharat scheme, which aims to provide healthcare coverage to millions of people.

Additional Information

• Manohar Lal Khattar:

• He was sworn in as the 10th Chief Minister of Haryana on October 26, 2014.

• He is a member of the Bharatiya Janata Party (BJP).

• Khattar has been a prominent political figure in Haryana, known for his administrative skills and governance.

• Shivraj Singh Chouhan

• Shivraj Singh Chouhan is an Indian politician who is serving as the 32nd Minister of Agriculture and Farmers' Welfare and 23rd Minister of Rural Development since 11 June 2024

• Sarbananda Sonowal

• Sarbananda Sonowal is the Union ministry as the in-charge of Ports, Shipping and Waterways and the Ministry of Ayush.

• He replaced Mansukh L. Mandaviya (former Minister of State (Independent Charge) for Shipping) and Shripad Naik respectively (former Minister of State Independent Charge AYUSH).

• Sarbananda Sonowal served as Assam's chief minister between 2016 and 2021.

Q22. Answer: (b) Two

Given series:

@ 6 8 $ 9 # 1 * £ 4 7 & 2 & % 3 Ω 5

Condition to be checked:

Numbers which are immediately preceded by a number and also immediately followed by a symbol.

Number → Number → Symbol

Checking the given series:

@ 6 8 $ 9 # 1 * £ 4 7 & 2 & % 3 Ω 5

Thus there are two such patterns (6 8 $, 4 7 &) that follow the above condition.

Hence, the correct answer is "Option 2".

Mistake Points

Immediately preceded by means immediately before or to come just before.

Immediately followed by means immediately after or to come just after.

Q23. Answer: (c) Only conclusion (II) follows

Statements:

No horses are mirrors.

Some lizards are horses.

The least possible venn diagram of given statement is given:

Conclusions:

(I) Some horses are not lizards - False (Because, Some horses are lizards, it implies that no negative relation is given of lizards and horses, so it can be possible only).

(II) Some lizards are not mirrors - True (Because, No horses are mirrors and Some lizards are horses, it implies that the part of lizards in horses can never be mirrors).

Thus, Only conclusion (II) follows

Hence, the correct answer is "Option 3".

Q24. Answer: (b) 1728 cm^3

Shortcut Trick

In a cube, all faces are squares.

Side (a) = Perimeter ÷ 4 = 48 ÷ 4 = 12 cm

Volume = $(Side)^3 = 12^3$

Volume = 1728 cm^3

Therefore The correct answer is 1728 cm^3.

Alternate Method

Given:

Perimeter of one face = 48 cm

Formula Used:

Perimeter of a square face = 4 × a

Volume of a cube = a^3

where 'a' is the side of the cube.

Calculations:

=> 4 × a = 48

=> a = 48 ÷ 4

=> a = 12 cm

Now, calculate the Volume:

=> Volume = a × a × a

=> Volume = 12 × 12 × 12

=> Volume = 1728 cm^3

Therefore The correct answer is 1728 cm^3.

Additional Information

Total Surface Area of Cube

The total area of all six faces of the cube is given by the formula TSA = $6a^2$.

Lateral Surface Area (LSA)

The area of the four vertical faces (excluding top and bottom) is LSA = $4a^2$.

Diagonal of a Cube

The longest distance between two opposite corners of a cube is d = $a\sqrt{3}$.

Face Diagonal

The diagonal of a single square face of the cube is given by d_(face) = $a\sqrt{2}$.

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Q25. Answer: (d) √2

Shortcut Trick

For complementary trigonometric ratios like sec and cosec, the sum of their angles must be 90°.

Sum of angles: 4A + (3A − 50°) = 90°

7A = 140° => A = 20°

Required value: cosec (20° + 25°) = cosec 45° = √2

Therefore The correct answer is √2.

Alternate Method

Given: sec 4A = cosec (3A − 50°)

Formula Used: sec θ = cosec (90° − θ)

Calculations:

=> cosec (90° − 4A) = cosec (3A − 50°)

=> 90° − 4A = 3A − 50°

=> 90° + 50° = 3A + 4A

=> 140° = 7A

=> A = 20°

=> Now, cosec (A + 25°) = cosec (20° + 25°)

=> cosec 45° = √2

Therefore The correct answer is √2.

Additional Information

Complementary Angle Identities

For any acute angle θ, sin θ = cos(90° − θ), tan θ = cot(90° − θ), and sec θ = cosec(90° − θ).

Trigonometric Values of 45°

For 45°: sin 45° = 1/√2, cos 45° = 1/√2, tan 45° = 1, and cosec 45° = √2.

Acute Angle Definition

An angle is acute if its measure is strictly between 0° and 90°.

Q26. Answer: (c) Combination reaction

The correct answer is Combination reaction.

Key Points

• A combination reaction occurs when two or more substances combine to form a single product.

• When calcium oxide (CaO) reacts with water (H2O), it forms calcium hydroxide (Ca(OH)2), also known as slaked lime.

• The chemical equation for this reaction is: CaO + H2O → Ca(OH)2.

• This reaction is exothermic, meaning it releases a significant amount of heat.

• Combination reactions are also known as synthesis reactions because they involve the formation of a new compound from simpler substances.

Additional Information

• Decomposition reaction

• A decomposition reaction occurs when a single compound breaks down into two or more simpler substances.

• For example, the decomposition of water into hydrogen and oxygen gases: 2H2O → 2H2 + O2.

• Double displacement reaction

• In a double displacement reaction, the ions of two compounds exchange places in an aqueous solution to form two new compounds.

• An example is the reaction between sodium chloride and silver nitrate: NaCl + AgNO3 → NaNO3 + AgCl.

• Displacement reaction

• A displacement reaction occurs when an element reacts with a compound, displacing another element from it.

• For instance, when zinc reacts with hydrochloric acid: Zn + 2HCl → ZnCl2 + H2.

Q27. Answer: (d) Rs. 629 crore

The correct answer is Rs. 629 crore

Key Points

• The 2024-25 Indian Union Budget increased funding for schemes like Sambal.

• The Government has allocated increased funding towards schemes like 'Sambal' from Rs. 462 crore in the previous fiscal year to

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Rs. 629 crore

• The budget allocated Rs. 11,11,111 crore for infrastructure, which is 3.4% of GDP.

• The budget also allocated Rs. 1.5 lakh crore to states as long-term interest-free loans.

• The budget also allocated funds for flood management, landslides, and related projects in Assam, Himachal Pradesh, Uttarakhand, and Sikkim.

• The budget allocated funds for PM Vishwakarma, PM SVANidhi, National Livelihood Missions, and Stand-Up India.

Additional Information

• Department of Economic Affairs under the Ministry of Finance has been entrusted with the responsibility of preparation and presentation of the Union Budget to Parliament.

• It formulates and monitors the country's economic policies and programs having a bearing on domestic and international aspects of economic management.

• Headquarters - New Delhi

• Ministry - Ministry of Finance

• Finance Minister - Smt. Nirmala Sitharaman (As of July 2022)

• The Union Budget is also referred to as the Annual Financial Statement in Article 112 of the Constitution of India.

• It is the annual budget of the Republic of India.

Q28. Answer: (c) Neither conclusion (I) nor (II) follows.

The least possible Venn diagram for the given statements is:

Conclusions:

(I) All lizards are roosters → False (As, all roosters are lizards given. so it can be a possibility but not a definite statement)

(II) No roosters are snakes → False(As, there is no direct relation between roosters are snakes, So, it can be a possibility but not a definite statement)

Thus, Neither conclusion (I) nor (II) follows.

Hence, the correct answer is "Option 3".

Q29. Answer: (a) Rs. 1,400

Shortcut Trick

Total units in the ratio = 7 + 5 = 12 units.

12 units → Rs. 2,400

1 unit → Rs. 200

Share of A = 7 units × 200 = Rs. 1,400.

Therefore The correct answer is Rs. 1,400.

Alternate Method

Given:

Total amount to be distributed = Rs. 2,400

Ratio of distribution between A and B = 7 : 5

Formula used:

Share of a person = (Individual Ratio / Sum of Ratios) × Total Amount

Calculations:

=> Sum of ratio parts = 7 + 5 = 12

=> Share of A = (7 ÷ 12) × 2400

=> Share of A = 7 × (2400 ÷ 12)

=> Share of A = 7 × 200

=> Share of A = Rs. 1,400

Therefore The correct answer is Rs. 1,400.

Additional Information

Ratio Distribution

To divide a quantity W in the ratio a:b, the parts are [a/(a+b)] × W and [b/(a+b)] × W.

Direct Proportion

If two quantities are in a ratio, any increase in the total amount leads to a proportional increase in each individual share while keeping the ratio constant.

Simplifying Ratios

A ratio a : b can be multiplied or divided by the same non-zero number k to get an equivalent ratio ka : kb.

Q30. Answer: (d) Oil dissolved in water

The correct answer is Oil dissolved in water.

Key Points

• A heterogeneous mixture is one in which the components are not uniformly distributed, and different parts of the mixture have different properties.

• Oil and water do not mix uniformly; instead, they form separate layers, making it a heterogeneous mixture.

• In a heterogeneous mixture, the different components can usually be seen and separated physically.

• Other examples of heterogeneous mixtures include sand and water, and salad with different ingredients.

• Heterogeneous mixtures often have more than one phase, meaning they can have distinct regions with different properties.

Additional Information

• Homogeneous Mixtures

• These mixtures have a uniform composition throughout.

• Examples include sugar dissolved in water and salt dissolved in water.

• In homogeneous mixtures, the different components cannot be easily separated by physical means.

• Solutions

• A solution is a type of homogeneous mixture where one substance (solute) is dissolved in another substance (solvent).

• Examples include copper sulphate dissolved in water and sugar dissolved in water.

• Suspensions

• These are heterogeneous mixtures where solid particles are dispersed in a liquid but not dissolved.

• Over time, the solid particles may settle out of the liquid if left undisturbed.

• Examples include sand in water and flour in water.

Q31. Answer: (c) Carbon - dioxide gas

The correct answer is Carbon - dioxide gas.

Key Points

• Calcium hydroxide reacts with carbon dioxide to form calcium carbonate and water.

• The chemical equation for this reaction is: $Ca(OH)2 + CO2 \rightarrow CaCO3 + H2O$.

• This reaction is a common method for testing the presence of carbon dioxide gas.

• Calcium carbonate is formed as a white precipitate in the reaction.

• This reaction is utilized in various industrial processes, including the production of lime and cement.

Additional Information

• Helium gas

• Helium is an inert gas and does not react with calcium hydroxide.

• Oxygen gas

• Oxygen is essential for combustion and respiration but does not react with calcium hydroxide to form calcium carbonate.

• Hydrogen gas

• Hydrogen is a highly flammable gas and does not react with calcium hydroxide to produce calcium carbonate and water.

Q32. Answer: (c) 4

The correct answer is 4.

Key Points

• Carbon has four valence electrons in its outer shell.

• To achieve a full outer shell, carbon typically forms four covalent bonds.

• When bonding with another carbon atom or with other elements, carbon shares four electrons.

• This allows carbon to create a wide variety of compounds with different elements.

• The versatility of carbon in forming bonds is fundamental to organic chemistry and the structure of biological molecules.

Additional Information

• Covalent Bonds

• A covalent bond is formed when two atoms share one or more pairs of electrons.

• Covalent bonding is common in organic molecules where carbon atoms form stable bonds with other carbon atoms or different elements like hydrogen, oxygen, and nitrogen.

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• Valence Electrons
• Valence electrons are the outermost electrons of an atom and are involved in forming bonds.
• The number of valence electrons determines the bonding behavior of an element.
• Organic Chemistry
• Organic chemistry is the study of the structure, properties, composition, reactions, and synthesis of organic compounds containing carbon atoms.
• Carbon's ability to form stable bonds with many elements, including itself, makes it unique and essential for life.

Q33. Answer: (b) 5

Given code language:
In first code language letter 'S', 'O', 'L', and 'E' are common in other code language.
Thus, code for 'V' is 5.
Hence, the correct answer is "Option 2".

Q34. Answer: (c) 7m towards the South

According to given condition:
Anita starts from her house at Point A and walks 5 m towards South
She takes a right turn, walks 7 m, takes another right and walks 12 m and stops at point P,
If a pole is placed 7 m towards East from where she stopped (Point P)
Thus, Anita house is in 7m towards the South of the Pole.
Hence, the correct answer is "Option 3".

Q35. Answer: (d) Energy needs differ between different body designs. Plants do not move and have a large proportion of dead...

The correct answer is Energy needs differ between different body designs. Plants do not move and have a large proportion of dead cells in many tissues..
Key Points
• Plants have a large proportion of dead cells in many tissues, which do not require energy.
• Unlike animals, plants do not move from one place to another, reducing their energy needs.
• Energy needs differ between different body designs; the stationary nature of plants results in lower energy requirements.
• Dead cells in plants provide structural support without the need for energy.
• Plants primarily rely on sunlight for energy through photosynthesis, which is a relatively low-energy process compared to the metabolic activities of animals.
Additional Information
• Plant Transport Systems
• Plants have specialized transport systems like xylem and phloem to move water, nutrients, and food.
• Xylem transports water and minerals from roots to other parts of the plant.
• Phloem distributes the food prepared by leaves to different parts of the plant.
• Photosynthesis
• Plants use sunlight to convert carbon dioxide and water into glucose and oxygen.
• This process occurs in the chloroplasts of plant cells and is essential for the survival of plants.
• Autotrophic Organisms
• Plants are autotrophic, meaning they can produce their own food through photosynthesis.
• This reduces their dependency on other organisms for energy.

Q36. Answer: (c) PRT

The pattern followed here is:
Hence, the correct answer is "Option 3".

Q37. Answer: (c) EMOH

The logic followed here is:
CKQR is related to FITP
WERN is related to ZCUL
Similarly,

BOLJ is related to

Thus, EMOH is related to BOLJ.

Hence, the correct answer is "Option 3".

Q38. Answer: (a) Ravichandran Ashwin

The correct answer is Ravichandran Ashwin

Key Points

• R. Ashwin and Sidharth Monga are the authors of the book I Have the Streets: A Kutty Cricket Story.

• The book is a co-authored autobiography that provides a detailed look at the life of a cricketer before he became famous.

• The book is a biography of the life of a cricketer before he became famous.

• It covers topics such as health issues as a child, growing up in a cricket-mad gully, and how a champion sportsman views the world.

• The book also includes short profiles of the author's friends in street cricket.

• The book is published by Penguin Random House

Additional Information

• Ravichandran Ashwin is a former Indian cricketer who played as a right-arm off-spin bowler and lower-order batsman.

• He was born on September 17, 1986 in Chennai, Tamil Nadu.

• Achievements:

• Part of the Indian team that won the 2011 World Cup and the 2013 Champions Trophy

• One of the greatest match-winners in Test cricket history

• The highest-taking off-spin bowler in Tests

• The highest number of ten or more wicket hauls in a Test match among Indian bowlers

• Career:

• Made his first-class debut for Tamil Nadu in 2006

• Debuted in international cricket in 2010

• Played for Chennai Super Kings (CSK) in the Indian Premier League (IPL)

• Retired from international cricket after a 15-year career

Q39. Answer: (a) 14

Given Equation: 55 C 7 D 54 A 9 B 8 = ?

BODMAS Rule:

Decoding the given information:

Alphabet	A	B	C	D
Meaning	÷	×	•	–

Now replacing the signs from left to right using BODMAS Rule, we get:

=> 55 + 7 - 54 ÷ 9 × 8

=> 55 + 7 - 6 × 8

=> 55 + 7 - 48

=> 62 - 48

=> 14

Hence, the correct option is "Option 1".

Q40. Answer: (d) To discover and nurture emerging artistic talents

The correct answer is To discover and nurture emerging artistic talents

Key Points

• The Artara'24 Fine Arts Exhibition and Competition aims to discover and support emerging artists in India, especially those living in Dubai

• The event also provides a platform for artists to showcase their work, receive feedback, and connect with other creative people

• The event gives lesser-known artists, students, and art enthusiasts a chance to showcase their work

• It Allow visitors to experience different styles and mediums of art

Additional Information

• The Artara'24 Fine Arts Exhibition and Competition has made its mark in Dubai as a prestigious platform for discovering and

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nurturing emerging artistic talents from India.

• Held at the Al Jalila Cultural Center, a venue under the Dubai Cultural Center, the exhibition featured an impressive collection of over 250 pieces of art, each telling its own unique story and reflecting the diverse backgrounds and perspectives of the talented participants.

Q41. Answer: (a) 5

Given code language:

As, R is common in both the code language so, code for 'R' is 5.

Hence, the correct answer is "Option 1".

Q42. Answer: (b) Adrenal gland

The correct answer is Adrenal gland.

Key Points

• The adrenal glands are small, triangular-shaped glands located on top of each kidney.

• These glands produce a variety of hormones including adrenaline (epinephrine) and noradrenaline (norepinephrine).

• Adrenaline is a hormone released into the bloodstream in response to physical or mental stress.

• It plays a crucial role in the fight-or-flight response, increasing heart rate, expanding air passages, and redistributing blood to muscles.

• In addition to adrenaline, the adrenal glands also produce corticosteroids and aldosterone, which are vital for metabolism and blood pressure regulation.

Additional Information

• Thyroid gland

• The thyroid gland is located in the neck and produces hormones that regulate metabolism, growth, and development.

• The primary hormones produced by the thyroid are thyroxine (T4) and triiodothyronine (T3).

• Pineal gland

• The pineal gland is a small, pea-shaped gland in the brain responsible for producing melatonin.

• Melatonin is a hormone that regulates sleep-wake cycles and seasonal biological rhythms.

• Pituitary gland

• The pituitary gland is often referred to as the "master gland" because it controls several other hormone glands in the body.

• It produces hormones that regulate various physiological processes, including growth, reproduction, and metabolism.

Q43. Answer: (a) 56

Shortcut Trick

Net change in Sum = Correct value − Incorrect value = 142 − 42 = 100

Net change in Average = Net change in Sum ÷ Total observations = 100 ÷ 10 = 10

Correct Average = Initial Average + Increase = 46 + 10 = 56

Therefore The correct answer is 56.

Alternate Method

Given:

Total number of observations (n) = 10

Incorrect average = 46

Incorrect value = 42

Correct value = 142

Formula Used:

Average = Total Sum ÷ Number of observations

Calculations:

=> Incorrect Total Sum = 10 × 46 = 460

=> Correct Total Sum = Incorrect Sum − Incorrect Value + Correct Value

=> Correct Total Sum = 460 − 42 + 142

=> Correct Total Sum = 460 + 100 = 560

=> Correct Average = 560 ÷ 10 = 56

Therefore The correct answer is 56.

Additional Information

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Average Concept

The average represents the central value of a data set. If one value is replaced, the change in average is equal to the net difference divided by the total count.

Weighted Average

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

Successive Changes in Average

If every number in a set is increased by a constant k, the average of the set also increases by k.

Q44. Answer: (b) 5 days

Shortcut Trick

Equating total work: (6 men + 8 boys) × 10 = (26 men + 48 boys) × 2

=> 30M + 40B = 26M + 48B => 4M = 8B => 1 man = 2 boys

Convert all to men: 6M + 8B = 6M + 4M = 10 men

If 10 men do the work in 10 days, then 20 men (double efficiency) will take half the time.

Therefore Time taken = 10 ÷ 2 = 5 days.

Therefore The correct answer is 5 days.

Alternate Method

Let the efficiency of one man be 'm' and one boy be 'b'.

Person/Group	Days	Total Work	Efficiency
Group 1 (6m + 8b)	10	10	10 ÷ 10 = 1
Group 2 (26m + 48b)	2	10 ÷ 2 = 5	

=> 6m + 8b = 1 → (Equation 1)

=> 26m + 48b = 5 → (Equation 2)

To eliminate 'b', multiply (Equation 1) by 6: 36m + 48b = 6 → (Equation 3)

Subtracting (Equation 2) from (Equation 3):

=> (36m + 48b) − (26m + 48b) = 6 − 5

=> 10m = 1 => m = 1/10 (Efficiency of 1 man)

Efficiency of 20 men = 20 × m = 20 × (1/10) = 2 units/day

=> Time taken = Total Work ÷ Efficiency = 10 ÷ 2 = 5 days.

Therefore The correct answer is 5 days.

Additional Information

Man-Days Formula

The total work done is the product of efficiency, number of persons, and time: W = M × D × H × E.

Efficiency and Time Relationship

Efficiency is inversely proportional to time taken. If the number of workers is doubled, the time required to complete the same work is halved.

Group Work Comparison

When multiple types of workers (like men and boys) work together, always find the efficiency ratio between them to simplify the calculation.

Q45. Answer: (c) Second to the left

Given:

A, B, C, D, E and F are sitting around a circular table facing the centre.

A sits second to the right of E.

F is the immediate neighbour of D and E.

C sits second to the left of B.

Thus, F sit second to the left of C.

Hence, the correct answer is "Option 3".

Q46. Answer: (c) Atoms as a whole are electrically neutral

The correct answer is Atoms as a whole are electrically neutral.

Key Points

• An atom is composed of three primary subatomic particles: protons, neutrons, and electrons.
• Protons carry a positive charge, electrons carry a negative charge, and neutrons are neutral.
• The number of protons in the nucleus of an atom is equal to the number of electrons surrounding the nucleus, making the atom electrically neutral overall.
• The positive charges of protons are balanced by the negative charges of electrons.
• If an atom gains or loses electrons, it becomes an ion and is no longer electrically neutral.

Additional Information

• Protons
• Protons are positively charged subatomic particles found in the nucleus of an atom.
• The number of protons defines the element and its atomic number.
• Neutrons
• Neutrons are neutral subatomic particles also found in the nucleus of an atom.
• They contribute to the atomic mass but do not affect the atomic charge.
• Electrons
• Electrons are negatively charged subatomic particles that orbit the nucleus of an atom in electron shells.
• The arrangement of electrons determines the chemical properties and reactivity of the element.

Q47. Answer: (a) 25 N m^-²

The correct answer is 25 N m^-²

Concept:

Pressure:

• Pressure is defined as the force applied per unit area.
• Formula: P = F/A
• Here, Force (F) is the weight of the wooden block, which is the product of mass (m) and acceleration due to gravity (g).
• Weight (W) = m × g
• SI unit: Pascal (Pa) or N/m²
• Dimensional Formula: [M L^(-1) T^(-2)]

Calculation:

Given,

Side of the wooden block, s = 2 m

Mass of the wooden block, m = 10 kg

Acceleration due to gravity, g = 10 m/s²

Area of the base of the wooden block,

=> A = s × s

=> A = 2 m × 2 m = 4 m²

Weight of the wooden block,

=> W = m × g

=> W = 10 kg × 10 m/s² = 100 N

Pressure exerted by the wooden block on the tabletop,

=> P = WAWAWAWAWAWAWAWAWAWA

=> P = 100N4m²100N4m²100N4m²100N4m²100N4m²100N4m²100N4m²[Math Processing Error]100N4m²100N4m²100N4m²100N4m²

=> P = 25 N/m²

Therefore The correct answer is option 1, 25 N/m².

Q48. Answer: (c) 963

Shortcut Trick

Check options for the ratio of units' digit, tens' digit, and hundreds' digit as 1 : 2 : 3.

In 963: Units = 3, Tens = 6, Hundreds = 9. Ratio = 3 : 6 : 9 = 1 : 2 : 3 (Satisfied).

Verify sum with its reverse order: 963 + 369 = 1332.

The condition matches perfectly with the given sum.

Therefore The correct answer is 963.

Alternate Method

Given:

Ratio of digits (Units : Tens : Hundreds) = 1 : 2 : 3

Sum of number and its reversed number = 1332

Formula Used:

A 3-digit number with digits H, T, U is represented as 100H + 10T + U.

Calculations:

Let the units' digit be x, tens' digit be 2x, and hundreds' digit be 3x.

=> Original Number = 100(3x) + 10(2x) + x = 300x + 20x + x = 321x

=> Reversed Number = 100(x) + 10(2x) + 3x = 100x + 20x + 3x = 123x

=> Sum = 321x + 123x = 1332

=> 444x = 1332

=> x = 1332 ÷ 444 = 3

=> Hundreds' digit = 3 × 3 = 9

=> Tens' digit = 2 × 3 = 6

=> Units' digit = 1 × 3 = 3

=> The number is 963.

Therefore The correct answer is 963.

Additional Information

Place Value Expansion

Any n-digit number can be written as the sum of its digits multiplied by their respective powers of 10 (e.g., abc = 100a + 10b + c).

Sum of Reversed Numbers

For a 3-digit number abc, the sum of the number and its reverse cba is always 101(a + c) + 20b.

Digit Constraints

In any base-10 number, each digit must be an integer such that 0 ≤ digit ≤ 9, and the leading digit cannot be zero.

Q49. Answer: (c) Puneri Paltan

The correct answer is Puneri Paltan

Key Points

• The Puneri Paltan won the 10th season of the Pro Kabaddi League (PKL).

• The team beat the Haryana Steelers 28–25 in the final.

• The Puneri Paltan is a professional kabaddi team from Pune, Maharashtra.

• The Puneri Paltan's captain, Aslam Inamdar, was named the Most Valuable Player (MVP) of the season.

• The Puneri Paltan's Mohammadreza Chiyaneh scored the most tackle points in the season.

• The Dabang Delhi K.C.'s Ashu Malik was named the Best Raider of the Season

Additional Information

• Kabaddi is sport originated in India. The hindi meaning "Holding Hands"

• It is played between two teams consisting of 7 players in each team.

• Some important tournaments are: Pro Kabaddi League, Kabaddi world Cup, Asian Games, Southa Asian Games, Kabaddi masters, Federation Cup, Super Kabaddi League.

• The terms related to Kabaddi are: Raid, Defense, Scoring, Duration

• Pro Kabaddi League, also known as PKL, is an Indian professional Kabaddi league for men.

• It premiered in 2014 and airs on Star Sports.

• It is the most popular kabaddi league in the world and the second most watched sports league in India after the Indian Premier League.

Q50. Answer: (c) m/s²

The correct answer is m/s².

Key Points

• Acceleration is defined as the rate of change of velocity with respect to time.

• The SI unit of acceleration is meters per second squared (m/s²).

• It represents how quickly an object is speeding up or slowing down.

• Acceleration can be positive (speeding up) or negative (slowing down), also known as deceleration.

• In equations, acceleration is often denoted by the symbol 'a'.

Additional Information

• Velocity

• Velocity is the rate of change of displacement with respect to time.

• It is a vector quantity, having both magnitude and direction.

• The SI unit of velocity is meters per second (m/s).

• Force

• Force is an interaction that, when unopposed, will change the motion of an object.

• It is a vector quantity and is measured in newtons (N).

• Force is related to acceleration through Newton's second law of motion: F = ma.

• Displacement

• Displacement is the change in position of an object.

• It is a vector quantity, which means it has both magnitude and direction.

• The SI unit of displacement is meters (m).

Q51. Answer: (b) Two

Given: Seven people, A, B, C, D, E, F and G are sitting in a row, facing north.

Only two people sit to the right of C. Only two people sit between D and C.

A sits to the immediate right of D. B sits second to the left of A.

E sits to the immediate left of G.

Final arrangement,

Thus, Only two people sit between B and F.

Hence, the correct answer is "Option 2".

Q52. Answer: (a) 6

Shortcut Trick

A number is divisible by 6 if it is divisible by both 2 and 3.

Check for 2: The last digit is 8 (even), so it is divisible by 2.

Check for 3: Sum of digits = 5 + 1 + 1 + 8 = 15. Since 15 is divisible by 3, the number is divisible by 3.

Since 5118 is divisible by both 2 and 3, it is divisible by 6.

Therefore The correct answer is 6.

Alternate Method

Given Number: 5118

Method: Perform direct division or use divisibility rules for each option.

=> Divisibility by 5: Last digit must be 0 or 5. Here, last digit = 8. (Not divisible)

=> Divisibility by 8: Last three digits (118) must be divisible by 8. 118 ÷ 8 = 14.75. (Not divisible)

=> Divisibility by 7: 5118 ÷ 7 ≈ 731.14. (Not divisible)

=> Divisibility by 6: 5118 ÷ 6 = 853. (Exactly divisible)

Therefore The correct answer is 6.

Additional Information

Divisibility by 3

A number is divisible by 3 if the sum of its digits is divisible by 3.

Divisibility by 4

A number is divisible by 4 if the last two digits are divisible by 4.

Divisibility by 9

A number is divisible by 9 if the sum of its digits is divisible by 9.

Divisibility by 11

A number is divisible by 11 if the difference between the sum of digits at odd places and even places is 0 or a multiple of 11.

Q53. Answer: (d) 71.5

Shortcut Trick

Average of first n multiples of k = k × (n + 1) / 2

Here, k = 11 and n = 12.

Average = 11 × (12 + 1) / 2 = 11 × 13 / 2

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Average = 143 / 2 = 71.5

Therefore The correct answer is 71.5.

Alternate Method

Given: First twelve multiples of 11 are 11, 22, 33, ..., 132.

Formula Used: Average of an Arithmetic Progression (AP) = (First term + Last term) / 2

=> First term (a) = 11 × 1 = 11

=> Last term (l) = 11 × 12 = 132

=> Total terms (n) = 12

=> Average = (11 + 132) ÷ 2

=> Average = 143 ÷ 2 = 71.5

Therefore The correct answer is 71.5.

Additional Information

Arithmetic Progression (AP)

A sequence of numbers where the difference between consecutive terms is constant. Multiples of any number always form an AP.

Sum of n terms in AP

The sum is calculated as $S_n = (n/2) \times (a + l)$, where a is the first term and l is the last term.

Average of Consecutive Numbers

For any set of consecutive numbers or terms in AP, the average is always the mean of the first and last terms.

Q54. Answer: (c) The kinetic energy of the particles will increase.

The correct answer is The kinetic energy of the particles will increase..

Key Points

• When the temperature of solids increases, the kinetic energy of the particles increases.

• This increased kinetic energy causes the particles to vibrate more vigorously.

• As the particles vibrate more, the overall energy within the solid structure rises.

• Despite the increase in kinetic energy, the shape of the solid typically remains the same unless the temperature reaches the melting point.

• Temperature has a direct impact on the motion and behavior of particles in all states of matter, including solids.

Additional Information

• Melting Point

• The temperature at which a solid turns into a liquid is known as the melting point.

• At the melting point, the kinetic energy of the particles becomes sufficient to overcome the forces holding them in the solid state.

• Thermal Expansion

• When solids are heated, they generally expand due to the increased vibration of particles.

• This phenomenon is known as thermal expansion.

• Heat Transfer in Solids

• In solids, heat is transferred mainly through conduction.

• During conduction, heat energy is transferred from high-temperature particles to low-temperature particles.

Q55. Answer: (b) depends on the shape of the conductor

The correct answer is depends on the shape of the conductor.

Key Points

• The pattern of the magnetic field lines around a current-carrying conductor is influenced by the shape of the conductor.

• A straight conductor generates concentric circles of magnetic field lines around it.

• A solenoid or a coil of wire produces a magnetic field similar to that of a bar magnet, with distinct north and south poles.

• The magnetic field strength and pattern can be altered by changing the shape of the conductor, such as bending it into loops or coils.

• The right-hand thumb rule helps in determining the direction of the magnetic field around straight conductors and coils.

Additional Information

• Magnetic Field of a Straight Conductor

• The magnetic field lines form concentric circles around the conductor.

• The direction of the magnetic field can be determined using the right-hand thumb rule.

• Magnetic Field of a Circular Loop

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• The magnetic field lines are concentric circles at every point of the loop.
• The magnetic field at the center of the loop is perpendicular to the plane of the loop.
• Electromagnets
• Electromagnets are formed when a current-carrying wire is wound into a coil around a magnetic core.
• They produce a strong magnetic field that can be controlled by adjusting the current through the coil.

Q56. Answer: (c) Gruner Renewable Energy

The correct answer is Gruner Renewable Energy

Key Points

• Gruner Renewable Energy has been honored as India's Fastest Growing Sustainable Brand for 2023-24.
• This prestigious recognition was awarded during a landmark event in Dubai at the JW Marriott Marquis Hotel, Business Bay, as part of the 24th Edition of the Asian Business and Social Forum
• The award was honoured by the renowned Indian politician Shri Anurag Thakur, Member of the Lok Sabha.
• The company has recently secured contracts for 11 compressed biogas plants, each valued at an average of Rs. 100 crores.
• With these plants, the company will produce an average of 88,000 tons of compressed biogas (CBG) annually.

Additional Information

Company	Primary Focus	Headquarters	Established	Key Achievements
Suzlon Energy	Wind Energy Solutions	Pune, India	1995	Extensive global presence, operations in multiple countries.
Adani Green Energy	Solar and Renewable Energy	Ahmedabad, India	2015	One of the largest renewable energy producers in India.
Tata Renewable Energy	Solar and Wind Energy	Mumbai, India	2009	Active in smart grids, energy storage solutions, and sustainability.

Q57. Answer: (a) 125%

Shortcut Trick

When a dimension changes by x%, the area (which depends on the square of the dimension) changes by the successive percentage formula: x + x + (x × x)/100.

Given radius increase = 50%.

Net percentage increase in Surface Area = 50 + 50 + (50 × 50)/100.

Net percentage increase = 100 + 25 = 125%.

Therefore The correct answer is 125%.

Alternate Method

Given:

Increase in radius of the sphere = 50%

Formula Used:

Surface area (A) of a sphere = $4\pi r^2$

Calculations:

=> Let the original radius be r.

=> Original Surface Area (A1) = $4\pi r^2$

=> New radius (R) = r + 50% of r = r + 0.5r = 1.5r

=> New Surface Area (A2) = $4\pi R^2 = 4\pi(1.5r)^2$

=> A2 = $4\pi \times 2.25r^2 = 2.25 \times (4\pi r^2) = 2.25A1$

=> Increase in area = A2 − A1 = 2.25A1 − A1 = 1.25A1

=> Percentage increase = (Increase / Original Area) × 100

=> Percentage increase = (1.25A1 / A1) × 100 = 125%

Therefore The correct answer is 125%.

Additional Information

Volume Change for Sphere

Since Volume V prop. to r^3, if the radius increases by 50% (factor of 1.5), the volume increases by $(1.5)^3 = 3.375$ times, which is a 237.5% increase.

General Area Scaling Rule

If all linear dimensions of any 3D shape change by a factor of k, then the surface area changes by a factor of k^2 and the volume changes by a factor of k^3.

Surface Area of Hemisphere

The curved surface area of a hemisphere is $2\pi r^2$ and the total surface area is $3\pi r^2$.

Q58. Answer: (d) Rs. 1,000

The correct answer is Rs. 1,000

Key Points

• The minimum annual contribution to the NPS Vatsalya scheme is Rs. 1,000, with no maximum limit.

• The NPS Vatsalya scheme is a financial investment that parents or guardians can make for their minor children.

• The scheme helps provide financial support for children until they are able to earn and invest on their own.

• The scheme offers flexibility for self-contributions.

• The scheme can be opened through various Points of Presence (PoPs) regulated by PFRDA.

• The scheme can be opened online through the eNPS platform of NPS Trust.

Additional Information

• Objectives of the Vatsalya Scheme

• Give top priority to children in all administrative activities under the Mission.

• Ensure the child's best interests when planning and delivering projects, focusing on their right to grow in a supportive family environment.

• Safeguard children's rights to survival, development, protection, and participation.

• Establish crucial services and enhance emergency support, both within families and communities, as well as institutional care, counseling, and support services at various levels.

• Promote inter-sectoral responses, coordination, and collaboration with allied systems to ensure seamless service delivery for children.

• Strengthen child protection at the family and community levels by empowering them to identify risks and take preventive measures.

• Encourage private sector partnerships within the legal framework for supporting children.

• Monitor progress using well-defined objectives and outcomes.

• Involve Panchayats and Municipal Local Bodies at the village and urban cluster levels to assess issues, implement appropriate interventions, and monitor progress in building a robust safety net for children.

Q59. Answer: (d) Air Force Station, Jodhpur

The correct answer is Air Force Station, Jodhpur

Key Points

• The Royal Australian Air Force (RAAF) debuted its combat aircraft in India at Air Force Station Jodhpur during Exercise Tarang Shakti 2024.

• The exercise took place from August 30 to September 13, 2024.

• The RAAF sent three EA-18G Growler aircraft and 120 personnel.

• The exercise was the first time the RAAF deployed combat aircraft to India.

• The exercise was part of a two-phase event, with the first phase taking place at Sulur Air Force Station in Tamil Nadu.

• The exercise was an opportunity for the RAAF to showcase its advanced capabilities and support regional allies.

Additional InformationSome Important Exercises

Exercise Name	Participant Nations
Sampriti	India & Bangladesh
Mitra Shakti	India & Sri Lanka
SLINEX	
Maitree Exercise	India & Thailand
Siam Bharat	

Vajra Prahar	India & US
Yudh Abhyas	
Cope India	
Nomadic Elephant	India & Mongolia
Garuda Shakti	India & Indonesia
IND-INDO CORPAT	
Samudra Shakti	

Q60. Answer: (d) In the cytoplasm

The correct answer is In the cytoplasm.

Key Points

• The breakdown of glucose into a three-carbon molecule, known as glycolysis, takes place in the cytoplasm.

• Glycolysis is the first step in cellular respiration and does not require oxygen (anaerobic process).

• During glycolysis, one molecule of glucose (a six-carbon molecule) is converted into two molecules of pyruvate (a three-carbon molecule).

• This process produces a small amount of ATP and NADH, which are used as energy carriers in the cell.

• The pyruvate produced in glycolysis can further enter the mitochondria for the citric acid cycle (Krebs cycle) if oxygen is available.

Additional Information

• Mitochondria

• Often referred to as the powerhouses of the cell, mitochondria are responsible for the production of ATP through oxidative phosphorylation.

• They have a double-membrane structure, with the inner membrane forming folds known as cristae to increase the surface area for ATP production.

• Mitochondria contain their own DNA and ribosomes, indicating their evolutionary origin from free-living prokaryotes.

• Golgi Apparatus

• The Golgi apparatus is involved in modifying, sorting, and packaging proteins and lipids for secretion or delivery to other organelles.

• It consists of a series of flattened membrane-bound sacs called cisternae.

• Nucleus

• The nucleus is the control center of the cell, housing the cell's genetic material (DNA).

• It is surrounded by a double membrane called the nuclear envelope, which contains nuclear pores for the exchange of materials between the nucleus and cytoplasm.

Q61. Answer: (d) X = 11, Y = 225

The logic followed here is:

Logic: (1st number - 3)^3 + 1st number. = 2nd number.

For, 9 : Y

=> (9 - 3)^3 + 9

=> (6)^3 + 9 = 216 + 9 = 225.

Here, Y = 225,

Now, combination of Y = 225, X = 11.

=> (11 - 3)3 + 11

=> (8)3 + 11 = 512 + 11 = 523.

Thus, X = 11, Y = 225.

Hence, the correct answer is "Option 4".

Q62. Answer: (a) Wife's mother's father's brother

Family Chart:

Decoding the Symbols:

Symbol	•	•	×	÷

Meaning	Mother	Brother	Wife	Father

Given: 'M − N ÷ P + S × T'

Means, M is brother of N, N is father of P,

P is mother of S and S is wife T

Thus, M is wife's mother's father's brother of T.

Hence, the correct answer is "Option 1".

Q63. Answer: (d) x2 + (a + b)x + ab

Shortcut Trick

Apply the Standard Algebraic Identity: $(x + a)(x + b) = x^2 + (a + b)x + ab$.

The first term is the product of variables ($x \times x = x^2$).

The middle term is the sum of constants multiplied by the variable ($(a + b) \times x$).

The last term is the product of constants ($a \times b = ab$).

Combining all components, we get the expanded polynomial form.

Therefore The correct answer is $x^2 + (a + b)x + ab$.

Alternate Method

Given: Expression = $(x + a)(x + b)$

Formula: Distributive Property of multiplication: $(m + n)(p + q) = m(p + q) + n(p + q)$

$\Rightarrow (x + a)(x + b) = x(x + b) + a(x + b)$

$\Rightarrow = (x \times x) + (x \times b) + (a \times x) + (a \times b)$

$\Rightarrow = x^2 + bx + ax + ab$

$\Rightarrow = x^2 + (b + a)x + ab$

$\Rightarrow = x^2 + (a + b)x + ab$

Therefore The correct answer is $x^2 + (a + b)x + ab$.

Additional Information

Square of a Binomial

When a = b, the identity becomes $(x + a)^2 = x^2 + 2ax + a^2$.

Negative Constants

If the constants are negative, the identity is $(x − a)(x − b) = x^2 − (a + b)x + ab$.

Difference of Squares

If one constant is positive and one is negative such that $a = −b$, then $(x + a)(x − a) = x^2 − a^2$.

General Quadratic Form

Any quadratic equation $x^2 + Sx + P$ can be factored into $(x + a)(x + b)$ where $S = a + b$ and $P = ab$.

Q64. Answer: (b) 39

The logic followed here is:

Logic: Addition of odd number in the series.

Thus, 39 is next number in this series.

Hence, the correct answer is "Option 2".

Q65. Answer: (b) 300m

Shortcut Trick

Convert Speed from km/h to m/s: $45 \times (5/18) = 12.5$ m/s.

Distance (Train Length) = Speed × Time

Length = 12.5 × 24 = 300 m.

Therefore The correct answer is 300 m.

Alternate Method

Given:

Speed of the train = 45 km/h

Time taken to cross the pole = 24 seconds

Formula Used:

Distance = Speed × Time

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

Calculations:

=> Speed in m/s = 45 × (5/18)

=> Speed = (5 × 5) / 2 = 12.5 m/s

=> Distance (L) = 12.5 m/s × 24 sec

=> L = 12.5 × 24

=> L = 300 m

The length of the train is 300 m, which corresponds to Option (2).

Therefore The correct answer is 300 m.

Additional Information

Unit Conversion

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

Crossing Stationary Objects

When a train crosses a pole or a stationary man, the distance covered is its own length. When it crosses a platform or bridge, the distance is (Length of train + Length of platform).

Relative Speed

For two bodies moving at speeds u and v: if moving in the same direction, relative speed = u − v; if moving in opposite directions, relative speed = u + v.

Q66. Answer: (b) X = 252, Y = 393

The logic followed here is:

Logic: (First number × 3) - 45 = Second number.

Given: X : 711 :: 146 : Y

Option 1) X = 218, Y = 456

Checking for X value

→ (218 × 3) - 45

→ 654 - 45

→ 609 (Not equal to 2^(nd)number 711)

Option 2) X = 252, Y = 393

Checking for X value

→ (252 × 3) - 45

→ 756 - 45

→ 711 (Equal to 2^(nd) number 711)

Now checking for Y value

→ (146 × 3) - 45

→ 438 - 45

→ 393 (Equal to 2nd number 393)

Option 3) X = 237, Y = 418

Checking for X value

→ (237 × 3) - 45

→ 711 - 45

→ 606 (Not equal to 2nd number 711)

Option 4) X = 269, Y = 379

Checking for X value

→ (269 × 3) - 45

→ 807 - 45

→ 762 (Not equal to 2nd number 711)

Hence, the correct answer is "Option 2".

Q67. Answer: (d) Bleaching powder

The correct answer is Bleaching powder.

Key Points

• Bleaching powder, also known as calcium hypochlorite, is commonly used to disinfect drinking water.

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• It is effective in killing bacteria, viruses, and other pathogens that can cause waterborne diseases.
• When added to water, bleaching powder releases chlorine, which is a powerful disinfectant.
• The use of bleaching powder helps in maintaining the safety and hygiene of drinking water.
• It is widely used in water treatment plants as well as in household water purification methods.

Additional Information

• Washing soda (Sodium carbonate)
• It is used in laundry detergents and cleaning products.
• It helps in softening water and removing stains from fabrics.
• Sodium hydroxide
• Also known as lye or caustic soda, it is used in the manufacture of soap and paper.
• It is a strong alkaline substance used in various industrial processes.
• Baking soda (Sodium bicarbonate)
• It is commonly used in baking as a leavening agent.
• It also has applications in cleaning and deodorizing.

Q68. Answer: (c) Nervous system

The correct answer is Nervous system.

Key Points

• The nervous system controls bladder pressure through a complex network of nerves that coordinate the activity of the bladder muscles.
• The autonomic nervous system, specifically the sympathetic and parasympathetic branches, plays a crucial role in bladder function.
• Parasympathetic nerves stimulate the bladder to contract and release urine, while sympathetic nerves help to store urine by relaxing the bladder muscle and contracting the urethral sphincter.
• Damage or dysfunction in the nerves controlling the bladder can lead to various bladder control issues, such as urinary incontinence or retention.
• Neurological conditions like spinal cord injury, multiple sclerosis, and Parkinson's disease can affect bladder control by disrupting the normal nerve signals.

Additional Information

• Kidneys
• The kidneys filter blood to produce urine, which is then transported to the bladder.
• They play a crucial role in maintaining fluid and electrolyte balance, but do not directly control bladder pressure.
• Heart
• The heart pumps blood throughout the body, including to the kidneys, but it is not involved in controlling bladder pressure.
• Heart health can indirectly affect kidney function and overall fluid balance in the body.
• Blood Pressure
• Blood pressure refers to the force of blood against the walls of the arteries.
• While blood pressure can affect kidney function, it does not directly control bladder pressure.

Q69. Answer: (a) One

Given terms: (Left) 7 8 & $ 2 @ % 4 6 3 Ω £ 5 1 9 # * (Right)

Here,

We need to find the numbers in the series that are immediately preceded by a symbol and also immediately followed by a symbol.

Required pattern: Symbol - Numbers - Symbol

Let's analyze the series step-by-step:

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

So, there is only one such number in the series.

Hence, the correct answer is "Option 1".

Q70. Answer: (d) 33.33%

Shortcut Trick

Ratio of Income to Expenditure = 13,500 : 9,000 = 3 : 2

Savings = Income − Expenditure = 3 − 2 = 1 unit

Savings % = (Savings ÷ Income) × 100 = (1 ÷ 3) × 100

Therefore The correct answer is 33.33%.

Alternate Method

Given:

Monthly Income = Rs. 13,500

Monthly Expenditure = Rs. 9,000

Formula Used:

Savings = Income − Expenditure

Savings % = (Savings ÷ Income) × 100

Calculations:

=> Savings = 13,500 − 9,000 = 4,500

=> Savings % = (4,500 ÷ 13,500) × 100

=> Savings % = (45 ÷ 135) × 100

=> Savings % = (1 ÷ 3) × 100

=> Savings % = 33.333...

Therefore The correct answer is 33.33%.

Additional Information

Income, Expenditure, and Savings Relationship

The fundamental equation for individual finance is Income = Expenditure + Savings. Any change in one variable affects the others.

Percentage Conversion

Common fraction to percentage conversions: 1/2 = 50%, 1/3 = 33.33%, 1/4 = 25%, 1/5 = 20%, and 1/6 = 16.67%.

Percentage of Base

Always identify the base for percentage calculation. In this question, the base is Monthly Income. If asked for savings as a percentage of expenditure, the base would change to 9,000.

Q71. Answer: (a) 30

Given:

Exports in 2016 = Rs. 20 crore

Exports in 2018 = Rs. 40 crore

Formula used:

Average = (Sum of exports)/(Number of years)

Calculation:

Average = (20+40)/2

=> 60/2

=> 30 crore

Therefore The average export (in crore) for the years 2016 and 2018 is Rs. 30 crore.

Q72. Answer: (c) New hair-growth patterns

The correct answer is New hair-growth patterns.

Key Points

• One of the significant changes that signify sexual maturation during puberty is the development of new hair-growth patterns.

• These new hair-growth patterns typically include the appearance of pubic hair and underarm hair.

• In males, facial hair and chest hair may also begin to develop as a sign of sexual maturation.

• These changes are driven by the increase in sex hormones, such as testosterone in boys and estrogen in girls.

• Other signs of puberty include changes in voice, development of secondary sexual characteristics, and changes in body composition.

Additional Information

• Mood Swings

• Mood swings are common during puberty due to hormonal changes, but they are not a direct indicator of sexual maturation.

• Increase in Height

• An increase in height is a general growth change during puberty and is not specifically indicative of sexual maturation.

• Changes in Behavior

• Behavioral changes are influenced by both biological and psychological factors during puberty, but they do not specifically signify sexual maturation.

Q73. Answer: (c) 39 years

Shortcut Trick

Assume the Son's age is 1 unit.

Then Mother = 3 units and Daughter = 1 unit + 5 years.

Total = (3 + 1 + 1) units + 5 years = 70 years.

5 units = 65 years => 1 unit = 13 years.

Mother (3 units) = 3 × 13 = 39 years.

Therefore The correct answer is 39 years.

Alternate Method

Given:

Total sum of ages = 70 years

Mother's age = 3 × Son's age

Daughter's age = Son's age + 5 years

Let the age of the Son be x years.

=> Mother's age = 3x

=> Daughter's age = x + 5

According to the problem:

=> 3x + x + (x + 5) = 70

=> 5x + 5 = 70

=> 5x = 65

=> x = 13

=> Mother's age = 3 × 13 = 39 years.

Therefore The correct answer is 39 years.

Additional Information

Ratio of Ages

If the age of A and B are in the ratio a:b, then their ages can be taken as ax and bx respectively.

Sum of Ages After n Years

If the current sum of ages of k people is S, then after n years, the new sum will be S + (k × n).

Constant Age Difference

The numerical difference between the ages of two individuals always remains constant, regardless of how many years pass.

Q74. Answer: (a) mgh

The correct answer is mgh.

Key Points

• The gravitational potential energy (GPE) of a body is the energy possessed by the body due to its position in a gravitational field.

• The formula to calculate gravitational potential energy is given by U = mgh, where 'm' is the mass of the body, 'g' is the acceleration due to gravity, and 'h' is the height above the ground.

• GPE increases with an increase in height 'h' and mass 'm' of the body.

• Gravitational potential energy is a form of mechanical energy, which can be converted into kinetic energy as the body falls.

• This concept is crucial in understanding the conservation of energy in mechanical systems.

Additional Information

• Work-Energy Theorem

• The work done by the force of gravity on a body is equal to the change in its gravitational potential energy.

• This theorem helps in solving problems related to the motion of bodies under the influence of gravity.

• Kinetic Energy

• It is the energy possessed by a body due to its motion, given by the formula KE = 1/2 mv^2.

• Kinetic energy and gravitational potential energy are interconvertible in the absence of non-conservative forces.

• Conservation of Mechanical Energy

• The total mechanical energy (sum of kinetic and potential energy) of an isolated system remains constant if only conservative forces are acting.

• This principle is widely used in physics to solve various problems involving energy transformation.

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Q75. Answer: (c) 19

Given Equation: 10 B 27 D 9 A 4 C 3 = ?

BODMAS Rule:

Decoding the given information:

Alphabet	A	B	C	D
Meaning	•	−	×	÷

Now replacing the signs from left to right using BODMAS Rule, we get:

=> 10 − 27 ÷ 9 + 4 × 3

=> 10 − 3 + 4 × 3

=> 10 − 3 + 12

=> 7 + 12

=> 19

Hence, the correct option is "Option 3".

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