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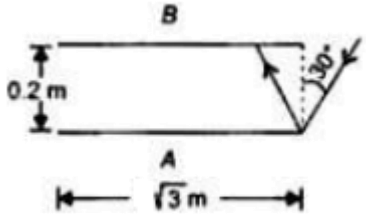
Subjective — Boards

Section – A
Science

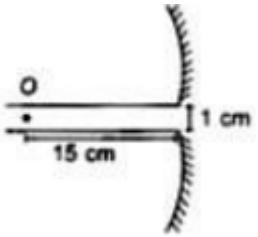
This section contains **30 Multiple Choice Questions**. Each question has four options out of which **ONLY ONE** is correct.

1. Two plane mirrors A and B are aligned parallel to each other as shown in the figure. A light ray is incident at an angle 30^o at a point just inside one end of A. The plane of incidence coincides with the plane of the figure. The maximum number of times the ray undergoes reflections (including the first one), before it emerges out, is:



(a) 17
(b) 15
(c) 13
(d) 10

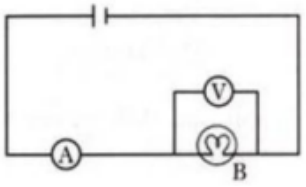
2. A mirror is broken into two parts and these parts are separated by a distance of 1 cm as shown in figure. The focal length of the mirror is 10 cm. The distance between the images (in cm), formed by the two parts of mirror when the object is midway between the two principal axes are



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

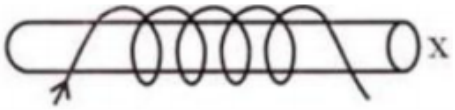
3. A heater coil is cut into two equal parts and now connected in parallel and used in the heater the heat generated now will be:
(a) Doubled
(b) Four times
(c) One fourth
(d) Halved

4. The diagram given below shows a circuit containing a bulb B, a ideal voltmeter V and a ideal ammeter. The voltmeter reading is 5.6 volt and the ammeter reading is 7 ampere. Which of the following options is incorrect for the given circuit diagram?



(a) The resistance of the bulb is 0.6 ohm
(b) The power of the bulb is 39.2 watt
(c) The resistance of the circuit is 0.8 ohm
(d) Potential difference across battery is 5.6V

5. In the given figure a solenoid wound on a core of soft iron. Polarity of end x when the current flows in the direction opposite to that as shown?



(a) North
(b) South
(c) South-north
(d) North-south

6. A body falls freely from a tower and travels a distance of 55 m in its last second. The height of the tower is:
(a) 154 m
(b) 145 m
(c) 180 m
(d) 165 m

7. The radius of the path of a charged particle in a uniform magnetic field is directly proportional to:
(a) Charge of the particle
(b) Momentum of the particle
(c) Energy of the particle
(d) Intensity of field

8. A lens behaves as a converging lens in air and a diverging lens in water. The refractive index of lens must not be
(a) 1.2
(b) 1.3
(c) 1.1
(d) 1.4

9. In a neon gas discharge tube Ne^+ ions moving through a cross-section of the tube each second to the right is 2.9×10^{18} while 1.2×10^{18} electrons move towards left in the same time; the electronic

charge being 1.6 $\times 10^{-19}$ C the net electric current is:

(a) 0.27 A to the right
(b) 0.66 A to the right
(c) 0.66 A to the left
(d) Zero

10. A short sighted person uses a spectacle of power -0.4 D to see very distant objects. How far can he see without using spectacle?
(a) 40 m
(b) 100 m
(c) 2.5 m
(d) 10 m

11. For the given reaction, match column I with column and mark the correct option from the codes given below

$Fe_2O_3 + xCO \rightarrow yFe + xCO_2$

Column I	Column II
(1) Oxidizing agent	(i) 2
(2) Reducing agent	(ii) 3
(3) x	(iii) Fe_2O_3
(4) y	(iv) CO

(a) 1 – (iv); 2 – (iii); 3 – (ii); 4 – (i)
(b) 1 – (iv); 2 – (iii); 3 – (i); 4 – (ii)
(c) 1 – (iii); 2 – (iv); 3 – (ii); 4 – (i)
(d) 1 – (iii); 2 – (iv); 3 – (i); 4 – (ii)

12. Match column I with Column II and mark the correct option from the given codes.

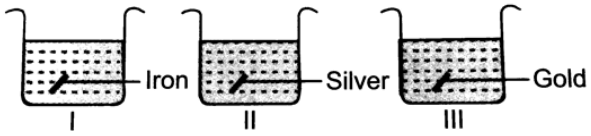
Column I	Column II
(1) $NaHCO_3$	(i) used for disinfecting water
(2) Na_2CO_3	(ii) used in soda –acid fire extinguishers
(3) $CaOCl_2$	(iii) used for removing permanent hardness of water
(4) $CaSO_4.\frac{1}{2}H_2O$	(iv) Used for making toys, materials for decoration

(a) 1 – (iii); 2 – (i), 3 – (iv); 4 – (ii)
(b) 1 – (ii); 2 – (iii), 3 – (i); 4 – (iv)
(c) 1 – (iii); 2 – (ii), 3 – (i); 4 – (iv)
(d) 1 – (i); 2 – (ii), 3 – (iv); 4 – (iii)

13. A water insoluble substance 'X' on reacting with dilute H_2SO_4 released a colorless and odorless gas 'Y'. When this gas was passed through lime water, it initially became milky due to the formation of 'Z' and the milkness disappeared when the gas pass in excess & form 'R'. X, Y, Z & R are respectively
(a) Limestone, Carbonic acid, Carbon dioxide, Calcium bicarbonate
(b) Quick lime, Limestone, Carbon dioxide, Calcium bicarbonate
(c) Limestone, Carbon dioxide, Calcium bicarbonate, Calcium hydroxide
(d) Limestone, Carbon dioxide, Limestone, Calcium bicarbonate

14. In the reaction, $CO_3^{2-} + H_2O \rightarrow HCO_3^- + OH^-$,water is a
(a) Bronsted acid
(b) Bronsted base
(c) Conjugate acid
(d) Conjugate base

15. Vishakha took few wire pieces made up of different metals and placed them in blue solution of copper sulphate. What will be the colour of the solutions present in beakers I, II and III after half an hour?



(a) (i) → Green; (II) → Blue; (III) → Green
(b) (i) → Blue; (II) → Green; (III) → Green
(c) (i) → Green; (II) → Blue; (III) → Blue
(d) (i) → Blue; (II) → Blue; (III) → Blue

16. A person adds 1.71 gram of sugar ($C_{12}H_{22}O_{11}$) in order to sweeten his tea. The number of carbon atoms added are
(mol. mass of sugar = 342)
(a) 3.6×10^{22}
(b) 7.2×10^{22}
(c) 0.05
(d) 6.6×10^{22}

17. Oxidation is process which involves:
(a) Addition of oxygen
(b) Removal of hydrogen
(c) Loss of electrons
(d) All are correct

18. For the following reaction

$2Pb(NO_3)_{\underline{P}} \xrightarrow{\Delta} 2PbO_{\underline{Q}} + \underline{R}NO_2 + \underline{Z}O_2$

$\frac{P\times R}{Q+Z}$ *is*

(a) 3
(b) 4
(c) 1
(d) 5

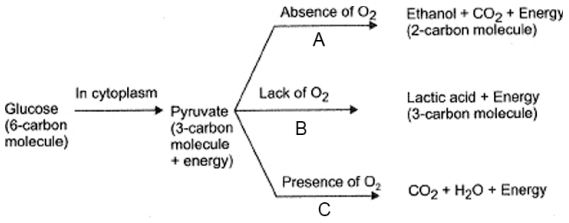
19. The pH number of liquid tells its level of acidity or alkalinity. Some chemicals have different Colours when put into liquids with different levels of acidity. These chemicals are called indicators. The following table shows the colour changes that occur with four different acid-base indicators.

Indicator	Colour of Indicator
	Acidic pH Basic 1 2 3 4 5 6 7 8 9 10 11 12 13 14
A	red | blue
B	clear | pink
C	red | orange
D	yellow | purple

Four liquids a, b, c and d were tested with indicators A, B, C and D. The results are recorded Below. Which liquid has the highest pH?

	Colour of indicator			
Liquid	**Indicator A**	**Indicator B**	**Indicator C**	**Indicator D**
(a)	Blue	clear	orange	purple
(b)	Blue	pink	orange	purple
(c)	Red	clear	red	yellow
(d)	Red	clear	orange	yellow

20. If H^+ ion concentration of a solution is increased 10 times its pH will
    (a) Increases by 1
    (b) Remains unchanged
    (c) Decreases by 1
    (d) Increases by 10
21. Which one of the following statements is correct?
    Statement 1: In aerobic respiration, 38 molecules of ATP are produced by complete oxidation of one gram – mole of glucose.
    Statement 2: In anaerobic respiration only 2 molecules of ATP are formed.
    (a) Statement 1
    (b) Statement 2
    (c) Both the statement are correct
    (d) Both statements are in correct
22. What is the function of blood?
    (a) Transportation of respiratory gases
    (b) Regulation of body temperature.
    (c) Transportation of waste products.
    (d) All the above
23. Which of the following is the correct sequence of the processes taking place in nutrition in animals?
    (a) Ingestion, Assimilation, Digestion, Absorption, Egestion
    (b) Assimilation, Absorption, Ingestion, Digestion, Egestion
    (c) Ingestion, Digestion, Absorption, Assimilation, Egestion
    (d) Ingestion, Digestion, Assimilation, Absorption, Egestion
24. The nephrons and alveoli are common in their
    (a) Structural anatomy
    (b) Functional similarity in elimination of nitrogenous waste
    (c) Functional similarity in elimination of metabolic waste
    (d) Surface area for exchange of material
25. Which metal is associated with haemoglobin?
    (a) Copper
    (b) Iron
    (c) Aluminium
    (d) Potassium
26. The xylem in plants are responsible for
    (a) Transport of food
    (b) Transport of water only
    (c) Transport of water and dissolved minerals in solution form
    (d) Transport of food in glucose form
27. In a monohybrid cross between two heterozygous individuals, percentage of pure homozygous individuals obtained in F1 generation is
    (a) 25%
    (b) 50%
    (c) 75%
    (d) 100%
28. In the below reaction indicates the product of glucose breakdown under different conditions. Identify for the A, B, C respectively where these reactions are taking place



    (a) Mitochondria, Yeast, Muscles cells
    (b) Yeast, Mitochondria, Muscles cells
    (c) Mitochondria, Muscles cells, Yeast
    (d) Muscles cells, Yeast, Mitochondria
29. The genotype for the height of an organism is Tt. What conclusion may be drawn from this?
    (a) The allele for height has at least two different genes
    (b) There are at least two different alleles for the gene for height
    (c) There are two different genes for height, each having a single allele
    (d) There is one allele for height with two different forms.
30. Pure breeding pea plants with green pods are crossed with pure breeding pea plants with yellow pods. All the F1 generation plants have green pods. Plants from the F1 generation are allowed to be interbred. What colour of pods will be observed in F2 generation plants?
    (a) All green

(b) All yellow
(c) 1 green : 1 yellow
(d) 3 green : 1 yellow

Section – B
Mathematics

This section contains **20 Multiple Choice Questions**. Each question has four options out of which **ONLY ONE** is correct.

31. The length, breadth and height of a room are 8 m 25 cm, 6 m 75 cm and 4 m 50 cm respectively, then the longest rod which can measure the three dimensions of the room exactly:
(a) 65 cm
(b) 70 cm
(c) 75 cm
(d) 80 cm

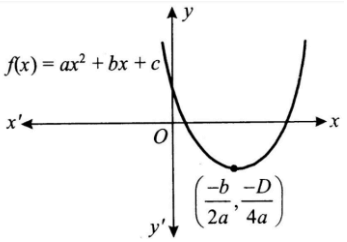
32. The rationalizing factor of $\sqrt[5]{a^2b^3c^4}$ is_____
(a) $\sqrt[5]{a^3b^2c}$
(b) $\sqrt[4]{a^3b^2c}$
(c) $\sqrt[3]{a^3b^2c}$
(a) $\sqrt{a^3b^2c}$

33. If x and y are any positive integers, then $(x^2 - x) + (y^2 - y)$ is always:
(a) Even number
(b) Odd number
(c) Can't say
(d) Both even and odd are possible

34. Find the sum of
$$\frac{1}{3\times7}+\frac{1}{7\times11}+\frac{1}{11\times15}+....+\frac{1}{99\times103}$$
(a) $\frac{100}{309}$
(b) $\frac{101}{309}$
(c) $\frac{25}{309}$
(d) $\frac{105}{309}$

35. Find the greatest number that will divide 46, 91 and 181 so as to leave the same remainder in each case:
(a) 4
(b) 7
(c) 9
(d) 45

36. In figure shows the graph of the polynomial $f(x) = ax^2 + bx + c$. Then:



(a) a > 0, b > 0 and c > 0
(b) a > 0, b < 0 and c > 0
(c) a > 0, b < 0 and c < 0
(d) a > 0, b > 0 and c < 0

37. If $p(x) = x^3 + bx^2 + cx + 5$ has one zero $\sqrt{5}+2$ and b and c are rational numbers then find sum of other two zeros.
(a) $\sqrt{5}+7$
(b) $\sqrt{5}-7$
(c) $7+\sqrt{5}$
(d) $7-\sqrt{5}$

38. If α *and* β are the zeros of $p(x) = 3x^2 - 5x + b$ then find the polynomial whose zeros are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$:
(a) $k[bx^2 + 5x + 3]$
(b) $k[bx^2 - 5x + 3]$
(c) $k[x^2 - 5x + 9]$
(d) $k[x^2 - x + 1]$

39. If $11^7 + 4^7$ is divided by 15 then the remainder is:
(a) 0
(b) 1
(c) 2
(d) – 2

40. If $\sin\theta - \cos\theta = \sqrt{2}\sin(90° - \theta)$, then $\tan\theta$ =

(a) $\sqrt{2} - 1$

(b) $\sqrt{2}$

(c) $1 - \sqrt{2}$

(d) $\sqrt{2} + 1$

Section – C
Mental Aptitude

This section contains **10 Multiple Choice Questions**. Each question has four options out of which **ONLY ONE** is correct.

Logical Puzzle

Directions **(Q.No. 41 to 45):** Study the following information carefully and answer the questions given below:

J, K, L, M, N, P, Q and R are eight members of a group in a company. Four of them are engineers and rests are managers. All of them have a different car, *viz.* Indica, Innova, Alto, Safari, i20, Santro, Audi and Nano but not necessarily in the same order. There are three female members in the group.

P is an engineer and he comes in Innova. Q comes in Alto. The one who has i20 is not an engineer. No female has either Santro or Safari. The one who has Safari is not an engineer. N and J do not own either Santro or Audi. J is a female and both L and J are not managers. R is a manager and she has an Audi. K is not a manager and he comes in a Nano. M is a female.

41. Which of the following is a group of females?
(a) J, N, L (b) M, R, K (c) J, M, R (d) M, N, J

42. N has which of the following cars?
(a) i20 (b) Safari (c) Indica (d) Santro

43. Who among the following has Indica?
(a) The one who is a female manager
(b) The one who is a male engineer
(c) The one who is a female engineer
(d) Can't be determined

44. Who among the following is not a male?
(a) M (b) L (c) K (d) N

45. Which of the following statements is true?
(a) K is a manager and he has Nano
(b) N is a female and she is a manager
(c) J is an engineer and she has Safari
(d) None of these

Directions (Q.No. 46 to 50): Study the following information carefully and answer the questions given below:
L, M, N, O, P, Q, R and S are sitting around a circular table. Two of them are not facing the center but sit opposite each other.
R is second to the right of L and third to the right of N. M is second to the left of N and fourth to the right of O. P. is second to the right of S and is facing the center. The person facing outward is an immediate neighbor of R and L, O sits second to the right of N and is not a neighbor of L.

46. Who among the following is an immediate neighbor of P?
(a) M, S (b) L, Q (c) N, M (d) Can't be determined

47. Who among the following is second to the left of Q?
(a) O (b) M (c) R (d) P

48. Who among the following is third to the left of M?
(a) N (b) S (c) R (d) Can't be determined

49. Who among the following are not facing the center?
(a) PM (b) NL (c) RQ (d) NQ

50. Who among the following sits second to the right of N?
(a) L (b) O (c) S (d) Q

Mathematical Puzzles

51. You have a 4 litre jug and a 9 litre jug and you have got a pool with water. What is the minimum number of steps you have to take to come up with exactly 6 litres of water? Well, you cannot pour some water into the 9 litre jug and then guess whether there is 6 litres or not. And you cannot fill just half of any jar with water. One step means- one movement- putting water into one or another jug. Emptying the jug is not a step. For instance, filling the 4 litre jug and then pouring it into the 9 litre jug are 2 steps.

52. I went on a holiday to a hill station. It snowed for 15 days. But when it snowed in the morning the afternoon was lovely. And when it snowed in the afternoon the day was preceded by a clear morning. Altogether there were 14 very nice mornings and 17 very nice afternoons. How many days did my holiday last?

53. 100 people standing in a circle in an order 1 to 100. No. 1 has a sword. He kills the next person (i.e. No. 2) and gives the sword to the next (i.e. No. 3). All people do the same until only one survives. Which number survives at the last?

54. A thief wants to open a lock with 5 digits as the key to open it. He knows that the 3rd digit is three less than 2nd digit, while 2nd digit is five smaller than 4th digit. The first digit is three times the fifth digit. None of its digit is zero, also third and fifth digits are equal. Find the sum of digits of the 5-digit number to be used as a key to open a lock.

55. Consider a number 268, where last digit is the sum of first two digits i.e. 2 + 6 = 8. How many such 3-digit numbers are there?

56. You have 12 similar looking coins. 11 of them weigh the same. One of them is heavier than the others. You also have a scale. You can put coins on both sides of the scale and it'll tell you which side is heavier or will stay in the middle if both sides weight the same. What is the minimum number of weighing required to find out the odd coin.

57. In a building there are 888 doors and 888 residents. Each door is assigned a number from 1 to 888. Initially all doors are open. On day 1, resident no. 1 reverses the positions of all the doors. On day 2 resident no. 2 reverses the positions of door numbers 2, 4, 6….. On day 3 resident no. 3 reverses the positions of door numbers 3, 6, 9…. And so on. This happens till day no. 888. How many doors are closed at the end of day 888?

58. Four persons (A, B, C, D) have to get across a bridge. However, it is dark and they need a flashlight, but the problem is that they have only one flashlight with them. Moreover, the bridge is not in a good condition and can take the weight of only two persons at a time. Each of them walks at a different speed: person A takes only 1 minute to cross the bridge, Person B take 2 minutes, C takes 5 minutes and D takes 10 minutes to cross the bridge. When two people cross the bridge together (sharing the flashlight), they both walk at the slower person's pace. Think about that how they would minimize the time to get across without violating the stated conditions. What is the minimum time needed?

59. There are 3 persons- A, B and C. On some day, A lent tractors to B and C as many as they had. After a month B gave as many tractors to A and C as many as they have. After a month C did the same thing. At the end of this transaction each one of them had 16. Find the no of tractors A originally had?

60. Sahil would like to take a new apartment on rent. The owner asks him: "Please tell me how many children you have." Sahil answers: "I have three of them." The owner: "What are the ages of your children?". He answers: "The product of the ages is equal to 12." The owner replies: "This is not enough information dear!". "Sorry that I was a little bit unclear, but the sum of the ages is equal to prime number," says Sahil. The owner: "Thanks for your cooperation, I now know the ages." Are you as smart as the owner? Then find the age of elder son.

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

Answer Key

1	b	21	c	41	c
2	b	22	d	42	b
2	b	23	c	43	c
4	a	24	c	44	a
5	a	25	b	45	d
6	c	26	c	46	c
7	b	27	a	47	a
8	d	28	b	48	b
9	b	29	b	49	d
10	c	30	d	50	b
11	c	31	c	51	6
12	b	32	a	52	23
13	d	33	a	53	73
14	a	34	c	54	18
15	c	35	d	55	45
16	a	36	b	56	3
17	d	37	d	57	29
18	b	38	b	58	17
19	b	39	a	59	26
20	c	40	d	60	3