



SCIENCE APTITUDE TEST CLASS - 10 SOLUTIONS

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PART - I : MENTAL ABILITY

1.

Sol. (d) Australia: Pound

- India uses Rupee, America uses Dollar, and Kuwait uses Dinar.
- Australia's official currency is the Australian Dollar (AUD), not Pound.

2.

Sol. (b) North-west

- At 10:30, the minute hand points directly at 6 (South).
- The hour hand lies halfway between 10 and 11, which falls in the top-left quadrant.
- Therefore, the hour hand points towards North-West.

3.

Sol. (c) AAEGMNR

- The letters of 'PLAYER' are rearranged in alphabetical order: A, E, L, P, R, Y.
- Applying alphabetical sorting to 'MANAGER': A, A, E, G, M, N, R.

4.

Sol. (b) V

- Alphabet positions: B(2), D(4), G(7), K(11), P(16).
- Differences between consecutive terms: +2, +3, +4, +5.
- Next increment is +6: $16 + 6 = 22$, which corresponds to V.

5.

Sol. (c) 123

- Observe pattern: $5^2 + 2 = 27$, $7^2 + 2 = 51$, $9^2 + 2 = 83$.
- Following sequence of odd numbers (5, 7, 9, 11): $11^2 + 2 = 121 + 2 = 123$.

6.

Sol. (b) 22

- In 12 hours, the hour and minute hands coincide 11 times.
- In a full 24-hour day, they coincide $11 \times 2 = 22$ times.

7.

Sol. (a) Monday

- 14th April 1992 to 14th April 1993 covers 365 days (February 1993 has 28 days).
- $365 \bmod 7 = 1$ odd day.
- Sunday + 1 day = Monday.

8.

Sol. (b) 552

- Substitute $a = 3$ and $b = 8$:
- $3 \$ 8 = (3^2 \times 8^2) - (3 \times 8) = (9 \times 64) - 24 = 576 - 24 = 552$.

9.

Sol. (b) Payal

- Clockwise arrangement around table: Payal $\rightarrow$ Tanuj $\rightarrow$ Akhil $\rightarrow$ Sahil $\rightarrow$ Rahul.
- Between Rahul and Tanuj lies Payal.

10.

Sol. (a) 4

Dice Face Identification

To find the number opposite to 3, identify all faces that are adjacent (neighboring) to 3 from the four positions:

- From position (i) [6, 3, 1]: 3 is adjacent to 6 and 1.
- From position (iii) [3, 5, 1]: 3 is adjacent to 5 and 1.
- From position (iv) [2, 3, 6]: 3 is adjacent to 2 and 6.

Conclusion: Combining these positions, the four numbers adjacent to 3 are 1, 2, 5, and 6.

Since a standard six-sided die contains numbers 1 through 6, the only remaining number that is not adjacent to 3 is 4.

Therefore, 4 is the number opposite to 3.

11.

Sol. (d) 4:21 $\frac{9}{11}$

- Formula: Minute = $\frac{5H \times 12}{11}$, where $H = 4$.
- $M = \frac{20 \times 12}{11} = \frac{240}{11} = 21 \frac{9}{11}$ minutes.
- Time = 4:21 $\frac{9}{11}$

12.

Sol. (c) 50

- $n(H \cup E) = n(H) + n(E) - n(H \cap E)$
- $400 = 250 + 200 - n(H \cap E) \Rightarrow n(H \cap E) = 450 - 400 = 50$.

13.

Sol. (d) 200

- Only Hindi = $n(H) - n(H \cap E) = 250 - 50 = 200$.

14.

Sol. (b) 350

- Only Hindi = 200, Only English = $200 - 50 = 150$.
- Total speaking exactly one language = $200 + 150 = 350$.

15.

Sol. (a) 6°

- Speed of hour hand = $360^\circ / 720 \text{ minutes} = 0.5^\circ/\text{minute}$.
- Angle in 12 minutes = $12 \times 0.5^\circ = 6^\circ$.

Correct Option: (a) 6°

PART - II : MATHEMATICS

1.

Sol. (b) $x^2 + 7x + 12 = 0$

- Student A's x-coefficient is correct: sum of roots $= -(-5 + -2) = 7 \Rightarrow b = 7$.
- Student B's constant term is correct: product of roots $= (-6)(-2) = 12 \Rightarrow c = 12$.
- Correct equation: $x^2 + 7x + 12 = 0$.

2.

Sol. (d) 21 m

- Base distance 1: $x_1 = \sqrt{(15^2 - 9^2)} = \sqrt{(225 - 81)} = \sqrt{144} = 12$ m.
- Base distance 2: $x_2 = \sqrt{(15^2 - 12^2)} = \sqrt{(225 - 144)} = \sqrt{81} = 9$ m.
- Total street width $= x_1 + x_2 = 12 + 9 = 21$ m.

3.

Sol. (d) 2 and 7

- Solve $P(x) = 0 \Rightarrow x^2 + x - 6 = (x + 3)(x - 2) = 0 \Rightarrow x = -3$ or $x = 2$.
- Set $t - 5 = -3 \Rightarrow t = 2$,
- $t - 5 = 2 \Rightarrow t = 7$.

4.

Sol. (a) $2x^2 - 10x - 28$

- Family of polynomials: $k(x^2 - (\text{sum of zeros})x + \text{product of zeros}) = k(x^2 - 5x - 14)$.
- For $k = 2$: $2(x^2 - 5x - 14) = 2x^2 - 10x - 28$.

5.

Sol. (a) $\frac{1}{101}$

- Total possible integral marks from 0 to 100 = 101 outcomes.
- Getting exactly 75 marks = 1 favorable outcome.
- Probability $= \frac{1}{101}$.

6.

Sol. (b) $\frac{3}{5}$

- Evaluate x^2 for each element: $(-2)^2=4$, $(-1)^2=1$, $0^2=0$, $1^2=1$, $2^2=4$.
- Favorable outcomes where $x^2 < 2$ are $\{-1, 0, 1\}$ (3 outcomes out of 5).
- Probability $= \frac{3}{5}$.

7.

Sol. (b) 60°

- $\tan 45^\circ = 1$. So $\sin^2\left(\frac{x}{2}\right) + \cos^2\left(\frac{(x+30^\circ)}{3}\right) = 1$.
- By identity $\sin^2\theta + \cos^2\theta = 1$, we equate arguments: $\frac{x}{2} = \frac{x+30^\circ}{3}$
- $3x = 2x + 60^\circ \Rightarrow x = 60^\circ$

8.

Sol. (d) 6

- $\left(\frac{9}{7}\right)^3 = \left(\frac{7}{9}\right)^{-3}$, and $\left(\frac{49}{81}\right)^{(2x-6)} = \left(\frac{7}{9}\right)^{(4x-12)}$.
- $\text{LHS} = \left(\frac{7}{9}\right)^{(-3+4x-12)} = \left(\frac{7}{9}\right)^9 \Rightarrow \left(\frac{7}{9}\right)^{(4x-15)} = \left(\frac{7}{9}\right)^9$
- Equate exponents: $4x - 15 = 9 \Rightarrow 4x = 24 \Rightarrow x = 6$.

9.

Sol. (a) $\frac{26}{45}$

- Let $x = 0.5777\ldots$ (i)
 - $10x = 5.777\ldots$ (ii)
 - $100x = 57.777\ldots$ (iii)
- Subtract equation (ii) from (iii)

$$100x - 10x = 52 \Rightarrow 90x = 52 \Rightarrow x = \frac{52}{90} = \frac{26}{45}$$

10.

Sol. (b) 207

- $\text{HCF} \times \text{LCM} = \text{Num}_1 \times \text{Num}_2$
- $23 \times 1449 = 161 \times \text{Num}_2$
- $\text{Num}_2 = \frac{23 \times 1449}{161} = \frac{1449}{7} = 207$

11.

Sol. (a) 2

- Product of roots $\alpha\beta = \frac{c}{a}$
- $\alpha \times \left(\frac{1}{\alpha}\right) = 1$.
- $\frac{c}{a} = \frac{4k}{k^2 + 4} = 1$
- $k^2 - 4k + 4 = 0 \Rightarrow (k - 2)^2 = 0 \Rightarrow k = 2$.

12.

Sol. (b) 1-c

- Expand $f(x) = x^2 - px - (p+c)$. So $\alpha + \beta = p$ and $\alpha\beta = -(p+c)$.
- $(\alpha+1)(\beta+1) = \alpha\beta + \alpha + \beta + 1 = -(p+c) + p + 1 = 1 - c$.

13.

Sol. (a) parallel

- An inconsistent system has no solutions, representing parallel lines.

14.

Sol. (b) 3

- $y = \sqrt{(6+y)} \Rightarrow y^2 - y - 6 = 0 \Rightarrow (y-3)(y+2) = 0.$
- $y = 3, -2$
- Since principal square root is non-negative, $y = 3.$

15.

Sol. (b) 312

- 12-hour cycle strikes = $1 + 2 + \dots + 12 = \frac{12 \times 13}{2} = 78.$
- 2 days = 48 hours = 4 cycles of 12 hours.
- Total strikes = $78 \times 4 = 312.$

16.

Sol. (a) 15 units

- $\triangle OAQ \sim \triangle OBP$ (AA similarity).
- $\frac{AQ}{PB} = \frac{AO}{OB} \Rightarrow \frac{AQ}{9} = \frac{10}{6} \Rightarrow AQ = 9 \times \left(\frac{5}{3}\right) = 15$ units.

17.

Sol. (b) 6

- $\text{Slope}(AB) = \text{Slope}(BC) \Rightarrow \frac{(k-3)}{(5-2)} = \frac{(7-k)}{(6-5)}.$
- $\frac{(k-3)}{3} = 7-k \Rightarrow k-3 = 21-3k \Rightarrow 4k = 24 \Rightarrow k = 6.$

18.

Sol. (d) 6

- Interior points satisfy $x > 0, y > 0, x + y < 5.$
- For $x=1$: $y \in \{1, 2, 3\}$ (3 points); $x=2$: $y \in \{1, 2\}$ (2 points); $x=3$: $y \in \{1\}$ (1 point).
- Total = $3 + 2 + 1 = 6.$

19.

Sol. (a) $L = 21P$

- $P = 2^3 \times 3 \times 5 = 120$
- $Q = 3^2 \times 5 \times 7 = 315$
- $L = \text{LCM}(120, 315) = 2^3 \times 3^2 \times 5 \times 7 = 2520.$
- Check $\frac{L}{P} = \frac{2520}{120} = 21 \Rightarrow L = 21P.$

20.

Sol. (c) 45

- When $a = d$
- $T_3 = a + 2d = d + 2d = 3d = 9 \Rightarrow d = 3, a = 3.$
- $T_{15} = a + 14d = 3 + 14(3) = 45.$

21.

Sol. (b) 21 cm

- $PR = PQ + QR = 4 + 14 = 18$ cm.
- By Secant Theorem: $PQ \times PR = PS \times PT \Rightarrow 4 \times 18 = 3 \times PT \Rightarrow PT = 24$ cm.
- $ST = PT - PS = 24 - 3 = 21$ cm.

22.

Sol. (d) Any value except 3 and -6

- Condition for unique solution: $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$
- $\frac{3}{k} \neq \frac{k+3}{6} \Rightarrow k(k+3) \neq 18 \Rightarrow k^2 + 3k - 18 \neq 0 \Rightarrow (k+6)(k-3) \neq 0$.
- Thus $k \neq 3$ and $k \neq -6$.

23.

Sol. (b) 1452

- $p = 2^3 \times 3^2 \times 7^2 \times 11^6$ and $q = 2^2 \times 3^1 \times 5^4 \times 11^2 \times 13^2$.
- $\text{GCD}(p, q) = 2^2 \times 3^1 \times 11^2$.
- $\text{GCD}(p, q) = 4 \times 3 \times 121 = 1452$.

24.

Sol. (b) 80°

- Formula: $\angle BOC = 90^\circ + \frac{\angle A}{2}$. (by interior angle bisector of any two angles of a triangle)
- $130^\circ = 90^\circ + \frac{\angle A}{2} \Rightarrow \frac{\angle A}{2} = 40^\circ \Rightarrow \angle A = 80^\circ$.

25.

Sol. (d) Centroid

- The intersection point of three medians is defined as the Centroid.

26.

Sol. (c) 54

- $M + W = 99$ and $M - W = 9$.
- Adding equations: $2M = 108 \Rightarrow M = 54$ (Wife's age = 45).

27.

Sol. (a) 45° and 15°

- $\sin(A - B) = \frac{1}{2} \Rightarrow \sin(A - B) = \sin 30^\circ$
- $A - B = 30^\circ$ (i)
- $\cos(A + B) = \frac{1}{2} \Rightarrow \cos(A + B) = \cos 60^\circ$
- $A + B = 60^\circ$ (ii)
- On Solving gives $A = 45^\circ$ and $B = 15^\circ$.

28.

Sol. (d) 27

- $2^x = 2^{(3y+3)}$
- On comparing exponents $\Rightarrow x - 3y = 3....$ (i)
- $3^{(2y)} = 3^{(x-9)}$
- On comparing exponents $\Rightarrow 2y = x - 9 \Rightarrow x - 2y = 9....$ (ii)
- Subtracting (i) from (ii) gives $y = 6 \Rightarrow x = 21$.
- $x + y = 21 + 6 = 27$.

29.

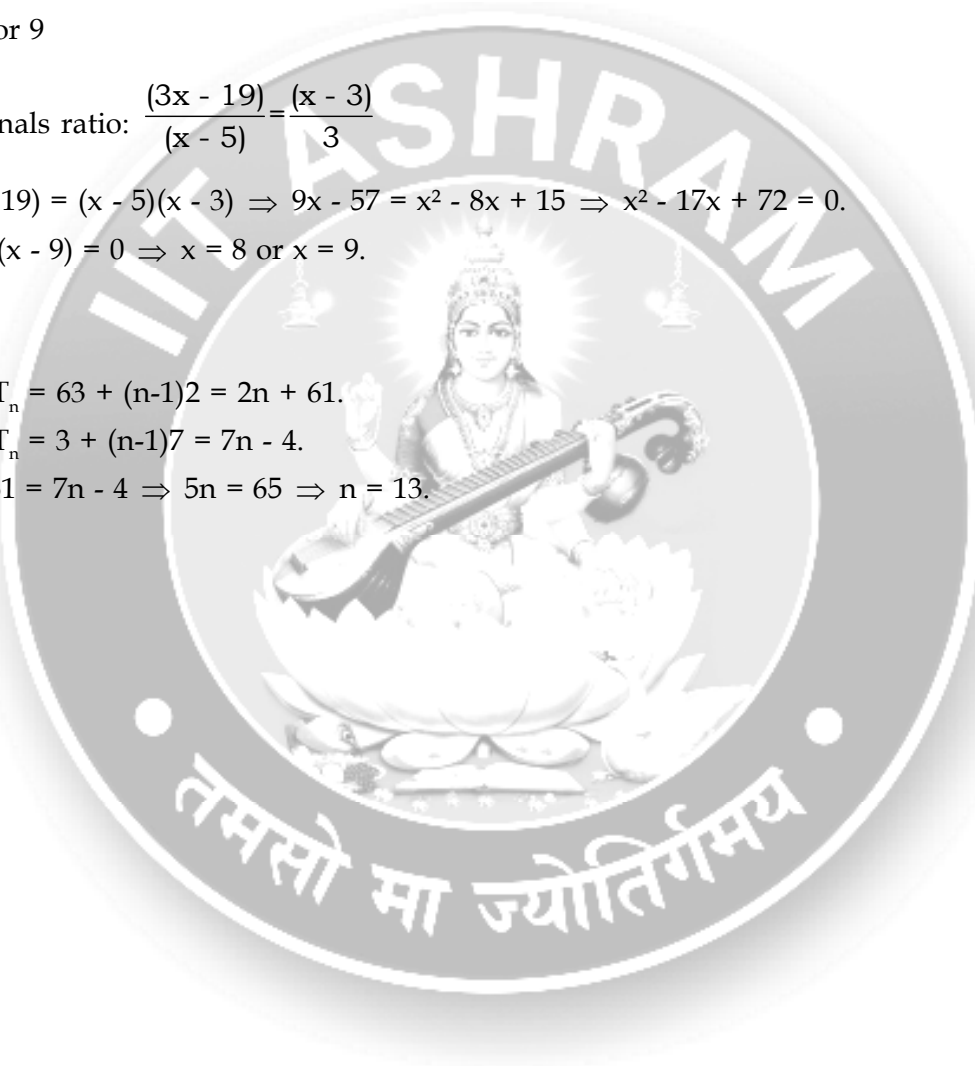
Sol. (c) $x = 8$ or 9

- Diagonals ratio: $\frac{(3x - 19)}{(x - 5)} = \frac{(x - 3)}{3}$
- $3(3x - 19) = (x - 5)(x - 3) \Rightarrow 9x - 57 = x^2 - 8x + 15 \Rightarrow x^2 - 17x + 72 = 0$.
- $(x - 8)(x - 9) = 0 \Rightarrow x = 8$ or $x = 9$.

30.

Sol. (c) 13

- AP1: $T_n = 63 + (n-1)2 = 2n + 61$.
- AP2: $T_n = 3 + (n-1)7 = 7n - 4$.
- $2n + 61 = 7n - 4 \Rightarrow 5n = 65 \Rightarrow n = 13$.



PART - III : PHYSICS & CHEMISTRY

1.

Sol. (b) a net external force

The linear momentum 'p' is given as $p = mv$. From Newton's second law, $dp/dt = F_{\text{net}}$.
Therefore, momentum changes only when a net external force acts on the body.

2.

Sol. (d) $1/3 F$ Total mass = $1 + 2 = 3 \text{ kg}$.

Since the system is frictionless, acceleration $a = \frac{F}{(m_1 + m_2)} = \frac{F}{3}$

The tension accelerating the 1 kg block is $T = m_1 \times a = 1 \times a = F/3$ unit

3.

Sol. (d) Yes, an example would be a falling object in the presence of air resistance

Yes. Velocity increases whenever acceleration is in the direction of velocity. The magnitude of acceleration can decrease while remaining positive. For example, a falling body with air resistance can continue speeding up while its acceleration decreases toward zero.

4.

Sol. (a) Focal length of a plane mirror is zero

A plane mirror has radius of curvature $R = \infty$, so its focal length $f = \frac{R}{2} = \infty$, (non zero).

Its power $\left(P = \frac{1}{f}\right)$ is zero, magnification is +1, and the angle of deviation for one reflection is given as $\delta = 180^\circ - 2i$.

5.

Sol. (d) -5, 15, -7.5, 3Given: object distance $u = -5 \text{ cm}$ and radius $R = -15 \text{ cm}$. Hence $f = R/2 = -7.5 \text{ cm}$.Using the mirror formula $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

$$\therefore \frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{-1}{7.5} + \frac{1}{-5} = \frac{1}{15}, \quad \text{so } v = +15 \text{ cm}.$$

Magnification $m = -v/u = -15/(-5) = +3$.

6.

Sol. (c) $2f$

For the stated two-part cutting arrangement, the effective power of each part becomes half of the original lens power. Since $P = 1/f$, halving power doubles the focal length.

$$\therefore f' = 2f.$$

7.

Sol. (a) 1.7 A

According to Kirchhoff's current law at any junction or node the total current flowing in should be equal to the total current flowing out.

At the first junction, $2\text{ A} + 2\text{ A} = 4\text{ A}$ flows toward the right. At the second junction, 1 A leaves upward, so $4 - 1 = 3\text{ A}$ reaches the third junction. At the third junction, 1.3 A leaves along the upper-right branch. By Kirchhoff's current law, current in lower right branch, $i = 3 - 1.3 = 1.7\text{ A}$.

8.

Sol. (b) 2V

The upper branch has resistance $1 + 3 = 4\Omega$ and the lower branch has $3 + 1 = 4\Omega$.

Their parallel equivalent is 2Ω . With the 3Ω resistor in series, total resistance = 5Ω .

So battery current $I = \frac{V}{R} = \frac{10}{5} = 2\text{ A}$.

Parallel branches have equal resistances so current is divided equally between them.

$\therefore$ Parallel branches carry 1 A each. Relative to the left junction, A is 1 V lower while B is 3 V lower. Hence potential difference between A and B, $V_A - V_B = (-1) - (-3) = 2\text{ V}$.

9.

Sol. (d) 1:4

Let each wire have resistance R . For two equal wires in series, $R_s = 2R$; for equivalent parallel resistance, $R_p = R/2$. For the same voltage and time, heat produced is given by $H = V^2t/R$.

Therefore $H_{\text{series}} : H_{\text{parallel}} = 1/(2R) : 1/(R/2) = 1:4$.

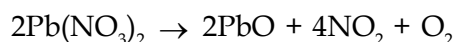
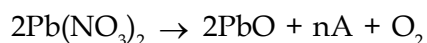
10.

Sol. (b) $4r/3$

The centre node is connected to the circular conducting wire through three resistors r : left, top and bottom. All these resistors are connected to the outer conducting circle on which point 'b' is marked and they are connected by an ideal wire, so they are equipotential. Thus the three resistors are in parallel: $1/R_{\text{eq}} = 1/r + 1/r + 1/r = 3/r$. Therefore $R_{\text{eq}} = r/3$ for the centre-to-circle network. The branch from the centre to 'a' contains another r , which is in series to the resistances connected in parallel so between 'a' and 'b' the effective network resistance is

$R_{\text{eq}} = r + (r/3) = 4r/3$.

11.

Sol. (a) 4NO_2 

12.

Sol. (a) 22 g

In CO_2 , carbon and oxygen are always in the ratio 3:8 (by mass), because:

Mass of C in $\text{CO}_2 = 12$

Mass of O in $\text{CO}_2 = 32$

Ratio C : O = 12 : 32 = 3 : 8

Given carbon = 6 g

So, oxygen = $6 \times (8/3) = 16$ g

Total mass of CO_2 sample = carbon + oxygen = 6 + 16 = 22 g

13.

Sol. (d) lime

CaO in lime does not give CO_2 , when react with acid

14.

Sol. (b) co-ordinate covalent

$\text{H} + \text{H}_3\text{O}^+$, co-ordinate covalent bond

15.

Sol. (b) 1.806×10^{24}

Step 1: Find moles of glucose

Molar mass of glucose = $6(12) + 12(1) + 6(16) = 72 + 12 + 96 = 180$ g/mol

Moles of glucose = $90/180 = 0.5$ mol

Step 2: Find moles of oxygen atoms

Each glucose molecule has 6 oxygen atoms.

So, moles of O atoms = $0.5 \times 6 = 3$ mol

Step 3: Convert to number of atoms

Number of O atoms = $3 \times 6.022 \times 10^{23} = 1.806 \times 10^{24}$

16.

Sol. (c) Basic

$\text{PH} + \text{POH} = 14$ ($\text{POH} = 4$), $\text{pH} = 14 - 4 = 10$, (Basic)

17.

Sol. (b) Conc. H_2SO_4 , HCl

Conc. H_2SO_4 , HCl , concentrated H_2SO_4 react with NaCl it produces HCl gas. It changes the colour of blue litmus paper to Red.

18.

Sol: (d) $\text{NaOH} < \text{NH}_4\text{OH} < \text{HCl} < \text{H}_2\text{SO}_4$

Order of acidic strength $\text{NaOH} < \text{NH}_4\text{OH} < \text{HCl} < \text{H}_2\text{SO}_4$

19.

Sol: (b) 250 u

Add up the atomic masses of everything present:

$\text{Cu} = 64$, $\text{S} = 32$, $\text{O}_4 = 4 \times 16 = 64$, $5\text{H}_2\text{O} = 5 \times 18 = 90$

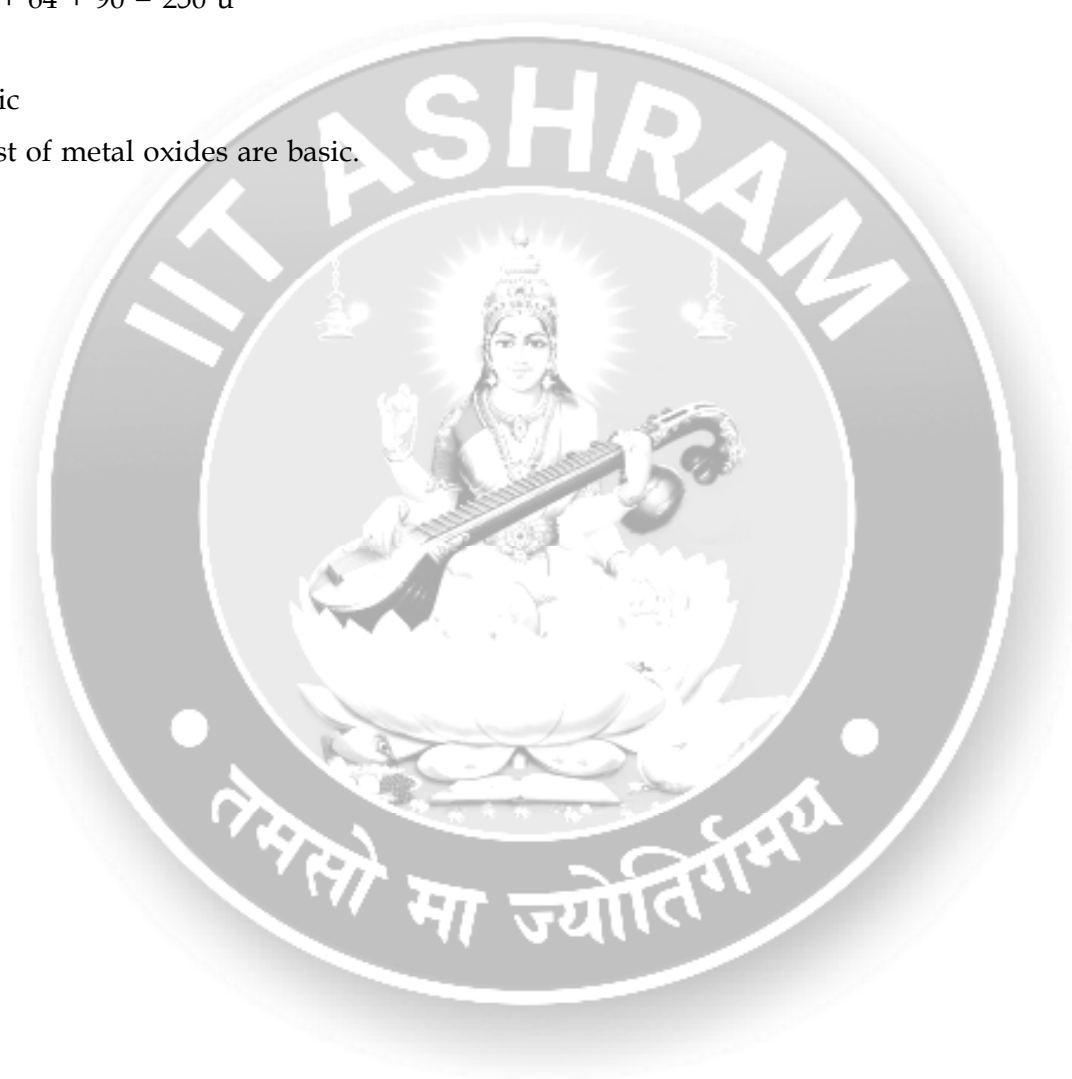
Now add all:

$64 + 32 + 64 + 90 = 250 \text{ u}$

20.

Sol: (a) basic

The most of metal oxides are basic.



PART - IV : BIOLOGY

1.

Sol. (b) Smooth muscles are also known as fusiform muscles because of their tapered ended shape

2.

Sol. (d) Cell wall performs many functions for a plant cell such as protection from mechanical damage and infections, it provides a shape to the cells.

3.

Sol. (c) There are many cell organelles are single membrane bound such as endoplasmic reticulum, vacuoles, Golgi's apparatus and lysosomes. Many are double membrane bound such as mitochondrion, plastids and nucleus

4.

Sol. (b) Bile juice is produced and secreted by liver and carried by hepatic duct to the Duodenal part of small intestine

5.

Sol. (b) Oxygenated blood from lungs to the heart is carried by pulmonary veins

6.

Sol. (b) Walls of Alveolar sacs are made up of simple squamous epithelial tissue which form a diffusion layer or the exchange of gases

7.

Sol. (c) Lenticels are the tiny pores found in the bark of woody stem of trees and roots for gaseous exchange

8.

Sol. (a) Sympathetic nervous system is activated and releases epinephrine and nor-epinephrine from adrenal gland.

When a person suddenly sees a snake, the body triggers the fight-or-flight response. This is controlled by the sympathetic nervous system, which stimulates the adrenal gland to release epinephrine (adrenaline) and nor-epinephrine (noradrenaline).

9.

Sol. (b) Ovary is the part of female reproductive system and secrete some hormones such as progesterone and oestrogen etc.

Assertion (A): True — Haemodialysis removes nitrogenous wastes from the blood.

Reason (R): True — Hemodialysis consist of a set of tubes made up of cellophane

10.

Sol. (c) A-Euglena, B-Amoeba, C-Plasmodium

A → Longitudinal fission → occurs in Euglena

B → Transverse fission → occurs in Amoeba

C → Multiple fission → occurs in Plasmodium

So, A-Euglena, B-Amoeba, C-Plasmodium