HINTS & SOLUTIONS (PRACTICE PAPER-1)

ANSWER KEY

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	A	B	D	A	C	C	C	A	C	D	D	D	A	A	B
Ques.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	C	A	D	A	B	B	A	A	C	D	A	C	A	D	C
Ques.	31	32	33	34	35	36	37	38	39	40					
Ans.	B	B	B	B	A	C	C	C	A	D					

PART - A (1 Mark)

MATHEMATICS

1. Obvious (A) is greatest

2. $S = \frac{1}{10} + \frac{2}{10^2} + \frac{3}{10^3} + ... + \frac{n}{10^n} + ... \infty$

$\frac{S}{10} = \frac{1}{10^2} + \frac{2}{10^3} + ... \infty$

Subtracting,

$\frac{9S}{10} = \frac{1}{10} + \frac{1}{10^2} + \frac{1}{10^3} + ... \infty$

$\frac{9S}{10} = \frac{\frac{1}{10}}{1-\frac{1}{10}}$

$\frac{9S}{10} = \frac{1}{9}$

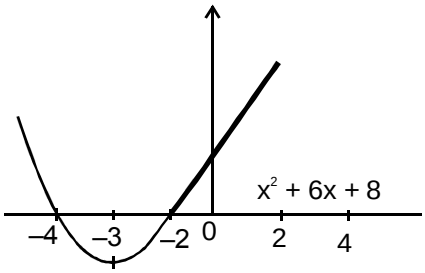
$S = \frac{10}{81}$

3. $(1024)^{1024} = (16)^{16n}$
$(2^{10})^{1024} = (2^4)^{16n}$
$10 \times 1024 = 4 \times 16n$

$n = \frac{10 \times 1024}{4 \times 16}$

$n = 160$

4. $x^2 + 6x + 8$
$x \in R$
$x^2 - 2x - 8 \leq 0$
$x^2 - 2x - 8 =$ $x^2 + 2x - 4x - 8$
$x(x + 2) - 4(x + 2) \leq 0$



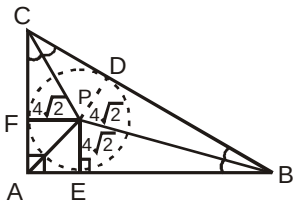
$x \in [-2, 4]$
clearly min value of expression is 0
at $x = -2$

5. Check by option
$P_{12} = \{24, 36, 60, 84, ...\}$
$P_{20} = \{40, 60, 100, ...\}$
$P_{12} \cap P_{20}$ has common element

6. All even values of a i.e. 50 and 1, 9, 25, 49, 81, total 55

7. If any statement is true then remaining 2 are false.

8.



Angle bisector $\therefore$ Incircle is formed whose radius = $4\sqrt{2}$

PE = r = $4\sqrt{2}$

PF = r = $4\sqrt{2}$ also PF = AE

$\therefore$ ΔAPE, $(AP)^2 = (AE)^2 + (PE)^2$

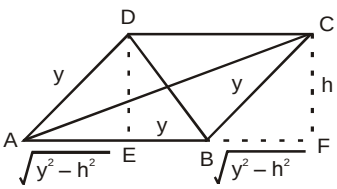
$= (4\sqrt{2})^2 + (4\sqrt{2})^2 = 64$

$\therefore$ AP = 8

9. Area of rhombus = $\frac{1}{2} d_1 d_2$

Let one diagonal = x

$= \frac{1}{2} \times (x)(2x) = x^2$



$A = x^2$

Let side of rhombus = y & height = h

ΔBFC side BF = $\sqrt{y^2 - h^2}$

In ΔAFC, $(y + \sqrt{y^2 - h^2})^2 + h^2 = (AC)^2 = 4x^2$

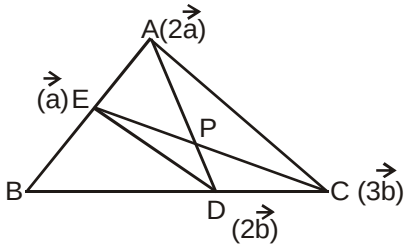
ΔDEB $(y - \sqrt{y^2 - h^2})^2 + h^2 = (BD)^2 = x^2$

Adding

$4y^2 = 5x^2$

$y = \sqrt{\frac{5x^2}{4}} = \frac{\sqrt{5A}}{2}$

10.



Let B is origin and the position vector of A and C are $2\vec{a}$ and $3\vec{b}$

Then P.V. of E = $\vec{a}$ and P.V. of D = $2\vec{b}$
Now, let P divides AD in $\lambda : 1$ ratio
and P divides EC in $\mu : 1$

$$\therefore \quad \frac{2\vec{b}\lambda + 2\vec{a}}{\lambda + 1} = \frac{3\vec{b}\mu + \vec{a}}{\mu + 1}$$

$$2\vec{b}\,\lambda\mu + 2\vec{b}\,\lambda + 2\vec{a}\,\mu + 2\vec{a} = 3\vec{b}\,\lambda\mu + \vec{a}\,\lambda + 3\vec{b}\,\mu + \vec{a}$$

$$\vec{a}\,(2\mu + 2 - \lambda - 1) = \vec{b}\,(3\lambda\mu + 3\mu - 2\lambda\mu - 2\lambda)$$

But $\vec{a}$ and $\vec{b}$ are not collinear.
$2\mu - \lambda + 1 = 0$ and $\lambda\mu + 3\mu - 2\lambda = 0$
We get $\mu = 1$

Now, P.V. of P is = $\frac{\vec{a} + 3\vec{b}}{2}$

Now, $$\frac{\text{ar}\,\Delta PED}{\text{ar}\,\Delta ABC} = \frac{\frac{1}{2}\left|\left(\vec{a} - \frac{\vec{a} + 3\vec{b}}{2}\right) \times \left(2\vec{b} - \frac{\vec{a} + 3\vec{b}}{2}\right)\right|}{\frac{1}{2}\left|2\vec{a} \times 3\vec{b}\right|}$$

$$= \frac{\frac{1}{4}\left|\left(\vec{a} - 3\vec{b}\right) \times \left(\vec{b} - \vec{a}\right)\right|}{6\left|\vec{a} \times \vec{b}\right|} = \frac{1}{12}$$

PHYSICS

11. speed will not decrease, so answer is (D)

12. For electron, $t_1 = \sqrt{\frac{2s}{a_e}}$

For protion, $t_2 = \sqrt{\frac{2s}{a_p}}$

or $\frac{t_2}{t_1} = \sqrt{\frac{a_e}{a_p}} = \sqrt{\frac{eE}{m_e} \times \frac{m_p}{eE}}$

$= \sqrt{\frac{m_p}{m_e}}$

13. Focal length, f = 6 cm
u = 1.5m = 150 cm
v = ?

$$\frac{1}{f}=\frac{1}{v}-\frac{1}{u}$$

$$\frac{1}{6}=\frac{1}{v}+\frac{1}{150}$$

$$\frac{1}{v}=\frac{1}{6}-\frac{1}{150}=\frac{25-1}{150}$$

$$v=\frac{150}{24}=\frac{75}{12}=\frac{25}{4}=6.25$$

change in distance = 6.25 – 6 = 0.25 cm
= 0.25cm = 2.5 mm decreased

14. Initial momentum, P_1 = mvcos30
and final momentum, P_2 = mvcos30
change in momentum
ΔP = – 2mv cos30

$\Delta P = -\sqrt{3}$ mv

Force on wall-1

$$F_1=\frac{2mv}{\Delta t}$$

Force on wall-2

$F_2=\frac{\sqrt{3}mv}{\Delta t}$, so $F_1 > F_2$

17. $A_1u_1 = A_2u_2$

$$\frac{u_1}{u_2}=\frac{A_2}{A_1}=\frac{1}{16}$$

18. resultant force at centre is zero. On removing the charge from the position 6, the resultant force at centre will be $\frac{kq}{r^2}$ downward.

20. $$\frac{v}{V}=\frac{d_w}{d_L}$$

$$\frac{1}{2}=\frac{d_w}{840} \qquad \Rightarrow d_w = 420 \text{ kg/m}^3$$

$$\text{R.D.} = \frac{420}{10^3}=0.42$$

CHEMISTRY

21. NaOH HCl
$N_1V_1 = N_2V_2$
$0.5 \times V = 2 \times 10$
$V = 40$ mL

25. Ethanol (C_2H_5OH) and dimethyl ether ($CH_3 – O – CH_3$) have same molecular formula but different functional groups, so they are isomers.

26. For the elements belonging to one period, increase in atomic number results in decrease in atomic radius. So Li has the largest atomic radius.

27. $2H_2O_2 \longrightarrow 2H_2O + O_2$

29.

S	+	O_2	$\longrightarrow$	SO_2
1 mole		1 mole		1 mole
$\frac{1}{2}$ mole		$\frac{1}{2}$ mole		$\frac{1}{2}$ mole
3.01×10^{23}		0.5 mole		?

$\therefore$ 3.01×10^{23} molecules of SO_2 will be formed.

30. Zn and Pb are placed above hydrogen in the metal activity series, so they will produce hydrogen gas with dilute acids.

DESCRIPTIVE TYPE ANSWER

PART - B (5 Mark)

MATHEMATICS

1. $ab \times cd = (10a + b)(10c + d)$

$= [40b + 10a - 39b][51d - (50d - 10c)]$

$= [10(4b + a) - 39b][51d - 10(5d - c)]$

$= [10 \times 13k_1 - 39b][51d - 10 \times 17k_2]$

$= 13 \times 17(10k_1 - 3b)(3d - 10k_2)$

$= 221(10k_1 - 3b)(3d - 10k_2)$

Hence, the largest number that will divide the product ab and cd is 221.

2. Sum of numbers when tens digit is 1.

$S_1 = 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 = 45$

Sum of number when ten's digit is 2

$S_2 = 2 + 4 + 6 + ...+ 18$

$= 2(1 + 2 + 3 + ...+ 9) = 2 \times 45$

Similarly

$S_3 = 3 + 6 + 9 + ...+ 27$

$= 3(1 + 2 + 3 + ...+ 9)$

$= 3 \times 45$

$S_4 = 4 \times 45$

-

-

$S_9 = 9 \times 45$

$\therefore$ Total sum $= S_1 + S_2 + S_3 + ... + S_9$

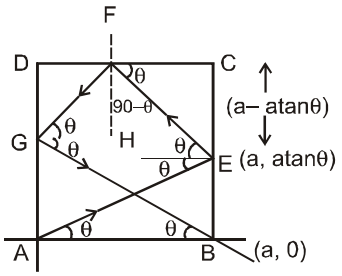
$= 45 + 2 \times 45 + ...+ 9 \times 45$

$= 45(1 + 2 + 3 + ...+ 9)$

$= 45 \times 45$

$= 2025.$

3. Let AB = a then BE = a $\tan\theta$



$\frac{CE}{CF} = \tan\theta$

$CF = a\cot\theta - a$

Now, In ΔGHF

$\tan\theta = \frac{HF}{GH} = \frac{1 - \tan\theta}{2 - \cot\theta}$

Solving we get

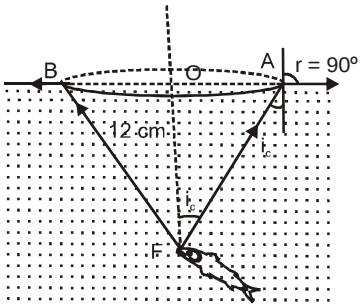
$\tan\theta = \frac{2}{3}$

$\therefore \quad \sin\theta = \frac{2}{\sqrt{13}}$

PHYSICS

4. Real depth of fish, FO = 12 cm

from figure $\angle$ FO A = i_c



$\tan i_c = \frac{OA}{12}$ .....(i)

$\because \sin i_c = \frac{1}{\mu} = \frac{3}{4}$

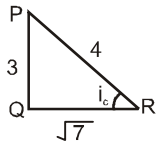
QR = $\sqrt{4^2 - 3^2} = \sqrt{7}$

from equation (i)

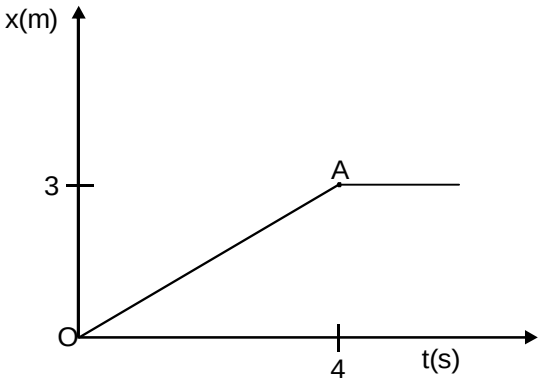
$OA = 12 \tan i_c = 12 \times \frac{3}{\sqrt{7}}$

from Δ PQR

Hence $\tan i_c = 3/\sqrt{7}$



5. (a) For t < 0 and t > 4 s, the particle is at rest as the position does not change with respect to time Evidently no force acts on the particle during these intervals.



Further, for 0 < t < 4 s, the position of the particle continuously changes with respect to time. As the position-time graph is a straight line, it represents uniform motion and there is no acceleration. Hence, it is also clear that no force acts on the paticle during this interval.

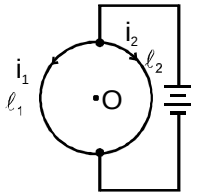
(b) Becuase the velocity is uniform O to A hence velocity at O

= velocity at A = Slope of the graph OA = (3/4) m/s

Impulse (at t = 4s) = change in momentum = final momentum – initial momentum

= 0 – mv = – 4 × (3/4) = – 3 kg m/s

6.



Let the length ℓ_1 and ℓ_2

Then the resistance will be in the ratio of the ℓ_1 and ℓ_2

$\frac{R_1}{R_2} = \frac{\ell_1}{\ell_2}$ but $I \propto \frac{1}{R}$ so $\frac{I_1}{I_2} = \frac{\ell_2}{\ell_1}$

$\Rightarrow I_1\ell_1 = I_2\ell_2$ ...(i)

Magnetic field at centre due to current I_1

$B_2 = \frac{\mu_0 I_1}{2r} \times \frac{\ell_1}{2\pi r}$ ⊙ (here $N = \frac{\ell_1}{2\pi r}$)

Magnetic field due to current I_2

$B_2 = \frac{\mu_0 I_2}{2r} \times \frac{\ell_2}{2\pi r}$ ⊗

Net magnetic field at centre

$B = B_1 - B_2 = \frac{\mu_0 I_1 \ell_1}{2r \times 2\pi r} - \frac{\mu_0 I_2}{2r} \times \frac{\ell_2}{2\pi r}$

$B = \frac{\mu_0}{4\pi r^2} (I_1\ell_1 - I_2\ell_2) = 0$

CHEMISTRY

7. (a) (iv) is alkaline earth metal as it contains two electrons in the outermost s-orbital
(b) : (vi) has the lowest chemical reactivity as it is a noble gas element.
(c) (vii) contains three electrons in the p-subshell and group number for p-subshell is 15 (10 + no. of valence electrons).
(d) (ii) is a transition element as the last electron enters into d-subshell.
(f) (iii) belongs to second period as the maximum principal quantum number (n) is 2.
(g) (i) contains only one electron in the outermost s-orbital so it forms unipositive ions in its compound.

8. Bond order is defined as half of the difference between the number of electrons present in bonding (N_b) and anti bonding (N_a) orbitals.

Bond order = $\frac{N_b - N_a}{2}$

Bond orders of (i) nitrogen (N_2) molecule
The electronic configuration of N_2 is
$[KK\ \sigma(2s)^2\ \sigma^*(2s)^2\ \pi(2p_x)^2 = \pi(2p_y)^2\ \sigma(2p_z)^2]$
As $N_b = 8$, $N_a = 2$, therefore.
bond order = 1/2 $(N_b - N_a)$ = 1/2 (8 – 2) = 3

(ii) Oxygen (O_2) molecule. The electronic configuration of O_2 molecule is
$KK\sigma(2s)^2\ \sigma^*(2s)^2\ \sigma(2p_z)^2\pi(2p_x)^2 = \pi(2p_y)^2\pi^*(2p_y)^1 = \pi^*(2p_x)^1$
As $N_b = 8$ and $N_a = 4$, therefore
bond order 1/2 $(N_b - N_a)$ = 1/2 (8 – 4) = 2

(iii) Oxygen molecular positive ion (O_2^+). The electronic configuration of O_2^+ is
$KK\sigma(2s)^2\ \sigma^*(2s)^2\ \sigma(2p_z)^2\pi(2p_x)^2 = \pi(2p_y)^2\pi^*(2p_y)^1 = \pi^*(2p_x)$
As $N_b = 8$ and $N_a = 3$, therefore

bond order = $\frac{1}{2}(N_b - N_a) = \frac{1}{2}$ (8 – 3) = 2.5

(iv) oxygen molecular negative ion (O_2^-). The electronic configuration of O_2^- is
$KK\sigma(2s)^2\ \sigma^*(2s)^2\ \sigma(2p_z)^2\pi(2p_x)^2 = \pi(2p_y)^2\pi^*(2p_y)^2 = \pi^*(2p_x)^1$
As $N_b = 8$, and $N_a = 5$, therefore
Bond order = $1/2\ (N_b - N_a) = 1/2\ (8 - 5) = 1.5$

9. We are given
(i) $C\ (graphite) + O_2(g) \longrightarrow CO_2(g)\ ;\ \Delta H = -393.4\ kJ$
(a) From the above equation, we known that
393.4 kJ of heat is produced by 12 g of graphite.
$\therefore$ 196.7 kJ of heat is produced by

$$\frac{12}{393.4} \times 196.7 = 6 \text{ grams of graphite.}$$

(b) From equation (i), we can say that
production of 393.4 kJ of heat is accompanied by the formation of 1 mole of CO_2.
$\therefore$ Production of 196.7 kJ of heat will be accompanied by the formation of 0.5 mole of CO_2.
(c) volume of oxygen required at S.T.P. to burn 12 g of graphite = 22.4 litres.
$\therefore$ Volume of oxygen required at S.T.P. to burn 24g of graphite = $22.4 \times 2 = 44.8$ litres.

BIOLOGY

10. **(A) (i)** Cartilagenous rings prevent it from collapse when air pressure is low in respiratory tract.

(ii) Alveoli sac are covered with blood capillaries for the exchange of gases.

(iii) To prevent entry of food into trachea.

(B) (i) Prokaryotic **(ii)** Metabolism

11. (i) Ethylene hormone

(ii) Ammonia and uric acid respectively

(iii) Prokaryotic

(iv) DNA

(v) Alchohol with boiling water is used to remove chlorophyll from a green leaf during photosynthesis experiments.

12. **(i)** Auxins **(ii)** Cytokinins **(iii)** Abscisic acid **(iv)** Thymosin **(v)** Anti diuretic hormone