TARGET IIT-JEE

HINT & SOLUTIONS

ANSWER KEY WITH SOLUTION

CLASS XI (DATE 11-10-09)

MATHEMATICS

1.	C	2.	B	3.	B	4.	A	5.	C	6.	B	7.	D
8.	B	9.	A	10.	B	11.	A	12.	C	13.	B	14.	B
15.	D	16.	A	17.	D	18.	C	19.	A	20.	C	21.	D
22.	A	23.	D	24.	D	25.	B						

PHYSICS

1.	B	2.	B	3.	B	4.	D	5.	A	6.	D	7.	A
8.	A	9.	A	10.	B	11.	D	12.	A	13.	C	14.	B
15.	A	16.	A	17.	C	18.	A	19.	A	20.	A	21.	A
22.	B	23.	C	24.	B	25.	A						

CHEMISTRY

1.	B	2.	C	3.	D	4.	C	5.	A	6.	C	7.	A
8.	D	9.	B	10.	A	11.	A	12.	B	13.	C	14.	A
15.	B	16.	B	17.	B	18.	A	19.	C	20.	A	21.	A
22.	B	23.	C	24.	B	25.	A						

SOLUTIONS

MATHEMATICS

1. **C**

a, ar, ar^2, ar^3 , ... with a = 2

$\frac{1}{T_3}+\frac{1}{T_4}=2+T_2$; $\frac{1}{ar^2}+\frac{1}{ar^3}$ = 2 + ar ; $\frac{1}{r^2}+\frac{1}{r^3}$ = 4 + 4r

$\frac{r+1}{r^3}=4(r+1) \Rightarrow r=-1$ or $r=\frac{1}{(4)^{1/3}}$

$T_7 = ar^6 = 2(-1)^6 = 2$ ....(1)

or $2\left(\frac{1}{2^{2/3}}\right)^6 = 2 \times \frac{1}{16}=\frac{1}{8}$ ....(2)

hence sum = $\frac{17}{8}$ Ans.

2. **B**

Let a = x ; b = x + d_1 ; c = x + $2d_1$

and d = x + $3d_1$ (as a, b, c,d are in A.P.)

hence a, b, d are in G.P.

$\therefore (x + d_1)^2 = x(x + 3d_1)$

$2xd_1 + d_1^2 = 3xd_1$

$d_1^2 = xd_1 \Rightarrow x = d_1$(as $d_1 \neq 0$)

hence a = d_1 ; b = $2d_1$; c = $3d_1$, d = $4d_1$

$\therefore \quad \frac{ad}{bc}=\frac{d_1.4d_1}{2d_1.3d_1}=\frac{4}{6}=\frac{2}{3}$ Ans.

3. **B**

Let $ax^2 + (a + 3)x + a - 3 = 0$ $\langle^{\alpha}_{\beta}$

$\alpha+\beta=-\frac{(a+3)}{a}=-1-\frac{3}{a}$; $\alpha\beta=\frac{a-3}{a}=1-\frac{3}{a}$

$\alpha + \beta - \alpha\beta = -2 \Rightarrow \alpha + \beta - \alpha\beta - 1 = -3$

$\Rightarrow \alpha\beta + 1 - \alpha - \beta = 3$

$\Rightarrow \alpha(\beta - 1) - (\beta - 1) = 3 \Rightarrow (\alpha - 1)(\beta - 1) = 3$

hence $\alpha - 1 = 3$ and $\beta - 1 = 1$

$\alpha = 4$ and $\beta = 2 \Rightarrow$ product = 8 Ans.

4. **A**

taking A.M. and G.M. of 7 numbers

$\frac{a}{2}, \frac{a}{2}, \frac{b}{3}, \frac{b}{3}, \frac{b}{3}, \frac{c}{2}, \frac{c}{2}$, we get

$$=\frac{2.\frac{a}{2}+3.\frac{b}{3}+2.\frac{c}{2}}{7} \geq \left\{\left(\frac{a}{2}\right)^2\left(\frac{b}{3}\right)^3\left(\frac{c}{2}\right)^2\right\}^{1/7}$$

$$\Rightarrow \frac{3}{7} \geq \left(\frac{a^2b^3c^2}{2^2 3^3 2^2}\right)^{1/7} \quad \Rightarrow \frac{3^7}{7^7} \geq \frac{a^2b^3c^2}{2^2.3^3.2^2}$$

$$\Rightarrow a^2b^3c^2 \leq \frac{3^{10}.2^4}{7^7}$$

$\therefore$ greatest value of $a^2b^3c^2 = \frac{3^{10}.2^4}{7^7}$

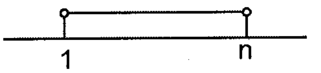
5. **C**

Simplifies to tan 15°

6. **B**

$(1 - x)(x - n) > 0$

or $(x - 1)(x - n) < 0$



[From 2 to (n – 1)]

hence number of integers = (n – 2)

$\therefore$ n – 2 = 2n – 11

$\therefore$ n = 9 Ans.

7. **D**

If α, β, γ are the roots then $\alpha + \beta + \gamma = 2$; also $\alpha + \beta = 0$ (where α, β are additive inverse)

$\therefore \gamma = 2$ which must satisfy the given equation

$\therefore$ a = – 5 $\Rightarrow$ [D]

8. **B**

$S_1=\frac{n}{2}[16+(n-1)4]$; $S_2=\frac{n}{2}[34+(n-1)2]$

hence 16 + (n – 1) 4 = 34 + (n – 1) 2

16 + 4n – 4 = 34 + 2n – 2

2n = 20 $\Rightarrow$ n = 10 Ans.

9. **A**

$4y^2 - 4xy + (x + 6) = 0$

$$y=\frac{4x \pm \sqrt{16x^2-16(x+6)}}{8}=\frac{x \pm \sqrt{x^2-x-6}}{2}$$

$\therefore$ $y \in R$ hence the expression inside the radical sign ≥ 0

$x^2 - x - 6 \geq 0$

$(x - 3)(x + 2) \geq 0 \Rightarrow$ [A]

10. **B**

$$\log_2 2 + \log_2\left(2x^2 + 2x + \frac{7}{2}\right) > \log[(x^2 + 1)c]$$

$\log(4x^2 + 4x + 7) > \log[c(x^2 + 1)]$

$4x^2 + 4x + 7 > cx^2 + c \quad (c > 0)$

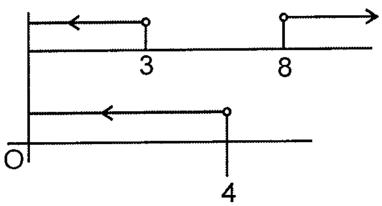
$(4 - c)x^2 + 4x + (7 - c) > 0$

hence $4 > c$ and $16 - 4(4 - c)(7 - c) < 0$

$0 < c < 4$ and $4c(28 - 11c + c^2)$

$c^2 - 11c + 24 > 0$

$(c - 8)(c - 3) > 0$



$\Rightarrow$ common solution $c \in (0, 3)$

$\therefore$ no. of integral values of c = 2

11. **A**

$$\frac{2\sin(\theta - 30^\circ)}{2\sin(\theta + 120^\circ)} \cdot \frac{\cos(\theta + 120^\circ)}{\cos(\theta - 30^\circ)} = \frac{1}{3}$$

$$\frac{\sin(2\theta + 90^\circ) - \sin 150^\circ}{\sin(2\theta + 90^\circ) + \sin 150^\circ} = \frac{1}{3} \text{ or } \frac{\cos 2\theta - \frac{1}{2}}{\cos 2\theta + \frac{1}{2}} = \frac{1}{3}$$

$$\Rightarrow 3\cos 2\theta - \frac{3}{2} = \cos 2\theta + \frac{1}{2}$$

$2\cos 2\theta = 2 \Rightarrow \cos 2\theta = 1$ Ans.

12. **C**

Let the roots are x_1, x_2, x_3, x_4

$\Rightarrow x_1 + x_2 + x_3 + x_4 = 12$ and $x_1 x_2 x_3 x_4 = 81$

$\Rightarrow \frac{x_1 + x_2 + x_3 + x_4}{4} = 3$ and $(x_1 x_2 x_3 x_4)^{1/4} = 3$

since A.M. = G.M. $\Rightarrow x_1 = x_2 = x_3 = x_4 = 3$

$\Rightarrow x^4 - 12x^3 + bx^2 + cx + 81 = (x - 3)^4$

$\Rightarrow b = 54, \; c = -108$

13. **B**

(i) $b^2 = ac$

(ii) $2b = 3c$

from (i) and (ii)

$$\Rightarrow b = \frac{3c}{2} \;\&\; a = \frac{9c}{4}$$

14. **B**

$$E = \frac{a}{2} + \frac{2}{a} + \frac{2a}{3} - a^2 + 2$$

$$E = \frac{7a}{6} + \frac{2}{a} - a^2 + 2 = \frac{-6a^3 + 7a^2 + 12a + 12}{6a} \quad \text{...(1)}$$

$$\text{given } E = \frac{pa^3 + qa^2 + ra + s}{ta} \quad \text{...(2)}$$

comparing (1) and (2)

we have p = – 6 ; q = 7; r = 12; s = 12; t = 6

$\therefore$ p + q + r + s + t = – 6 + 7 + 12 + 12 + 6 = 31

15. **D**

L = –2/5 ; M = 1/5; N = – 2; r + s = – 2/5; rs = 1/5

$$C = (r + s)^2 - 2rs = \frac{4}{25} - \frac{10}{25} = -\frac{6}{25};$$

$$\frac{L + M + N}{C} = \frac{55}{6}$$

16. **A**

$$\text{LHS} = \operatorname{cosec}\frac{2 \times 180^\circ}{7} + \operatorname{cosec}\frac{3 \times 180^\circ}{7}$$

$$\text{suppose } \alpha = \frac{180^\circ}{7}$$

$$\operatorname{cosec}2\alpha + \operatorname{cosec}3\alpha = \frac{\sin 3\alpha + \sin 2\alpha}{\sin 3\alpha \sin 2\alpha}$$

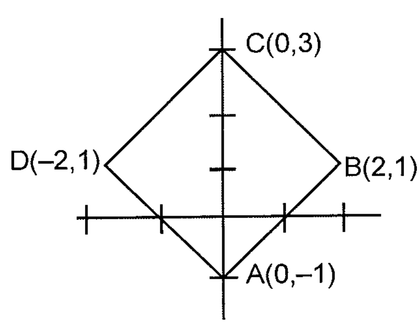
$$= \frac{\sin 4\alpha + \sin 2\alpha}{\sin 3\alpha \sin 2\alpha} = \frac{2\sin 3\alpha + \cos 2\alpha}{\sin 3\alpha . 2\sin\alpha . \cos\alpha}$$

$$= \operatorname{cosec}\alpha = \operatorname{cosec}\left(\frac{180^\circ}{7}\right)$$

$$\therefore \theta = \frac{180^\circ}{7} \Rightarrow x = 180 \;\&\; y = 7$$

17. **D**

Diagonal are equal and bisects at right angles $\Rightarrow$ a square



18. **C**

$$f(x) = \frac{(\operatorname{cosec}^2 x - 1)^2}{(\operatorname{cosec}^2 x - 1) + 1 - \cot x + \cot x}$$

$$f(x) = \frac{(\cot x)^4}{1 + \cot^2 x} = 0$$

$f(x) = 0 \Rightarrow \cot x = 0 \quad \Rightarrow x = (2n-1)\frac{\pi}{2}$

$\therefore \quad x = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2} \ldots\ldots\ldots, \frac{199\pi}{2}$

sum $= \frac{\pi}{2}[1 + 3 + 5 + \ldots\ldots + 199]$ (100 solutions)

$= \frac{\pi}{2}.\frac{100}{2}.200 = 5000\pi$

19. **A**

$\sin 3x + 3\cos x = 2\sin 2x \sin x + 2 \sin 2x \cos x$

$\sin 3x + 3\cos x = \cos x - \cos 3x + \sin 3x + \sin x$

$\cos 3x + 2\cos x = \sin x$

$4\cos^3 x - 3 \cos x + 2 \cos x = \sin x$

$4\cos^3 x - \cos x = \sin x$

$4\cos^2 x - 1 = \tan x$ (dividing by cosx)

$2(1 + \cos 2x) - 1 = \tan x$

$2\cos 2x + 1 = \tan x$

$\frac{2(1-t^2)+1+t^2}{1+t^2} = t$ ($t = \tan x$)

$3 - t^2 = t(1 + t^2)$

$3 - t^2 = t + t^3$

$t^3 + t^2 + t - 3 = 0$

$(t-1)(t^2 + 2t + 3) = 0 \Rightarrow \tan x = 1$

$x = n\pi + \frac{\pi}{4}, \; n \in I$

20. **C**

$\cos\alpha \,.\cos\beta \,.\, \cos(\alpha+\beta) = -\frac{1}{8}$

$8 \cos\alpha \,.\cos\beta \,.\, \cos(\alpha+\beta) = -1$

$4 \{\cos(\alpha+\beta) + \cos(\alpha-\beta)\} \cos(\alpha+\beta) + 1 = 0$

$4 \cos^2(\alpha+\beta) + 4\cos(\alpha-\beta) \cos(\alpha+\beta) + 1 = 0$

$$\cos(\alpha+\beta) = \frac{-4\cos(\alpha-\beta) \pm \sqrt{16\cos^2(\alpha-\beta) - 16}}{8} \quad \ldots(1)$$

$\Rightarrow \cos^2(\alpha-\beta) - 1 \geq 0 \quad \Rightarrow \quad \cos(\alpha-\beta) = 1$

$\Rightarrow \alpha = \beta$

putting in (1) '

$\cos(\alpha+\alpha) = -\frac{4}{8} \Rightarrow \cos(2\alpha) = -\frac{1}{2}$

$\Rightarrow \alpha = \beta = \frac{\pi}{3}$

21. **D**

From the right triangles ADE, BDE, and CDE, respectively, we get $\tan\alpha = \frac{1}{3}$ and $\tan\beta = \frac{1}{2}$. The addition formula for tangent is

$$\tan(\alpha+\beta) = \frac{\tan\alpha + \tan\beta}{1 - \tan\alpha\tan\beta} = \frac{(1/3)+(1/2)}{1-(1/6)} = \frac{(5/6)}{(5/6)} = 1$$

Since the angle $\alpha + \beta$ is in the first quadrant, it has to be $\pi/4$ $(=\gamma)$

22. **A**

N^r of LHS $= \frac{1}{1-\sin x}$; D^r of LHS $= \frac{1}{1+\sin x}$

hence $\frac{1+\sin x}{1-\sin x} = \frac{4}{\sec^2 x} = 4\cos^2 x = 4(1-\sin x)(1+\sin x)$

hence $4(1-\sin x)^2 = 1$

$(1-\sin x)^2 = \frac{1}{4} \Rightarrow (1-\sin x) = \frac{1}{2}$ or $-\frac{1}{2}$

$\therefore \sin x = \frac{1}{2}$ or $\sin x = \frac{3}{2}$ (rejected)

$\therefore \sin x = \sin\frac{\pi}{6} \Rightarrow \quad x = n\pi + (-1)^n\frac{\pi}{6}, \; n \in I$

23. **D**

LHS : $S = \sin 5 + \sin 10 + \sin 15 + \ldots\ldots + \sin 170 + \sin 175$

$$S\left(2\sin\frac{5}{2}\right) = 2\sin\frac{5}{2}[\sin 5 + \sin 10 + \ldots\ldots + \sin 175]$$

$T_1 = \cos\frac{5}{2} - \cos\frac{15}{2}$

$T_2 = \cos\frac{5}{2} - \cos\frac{25}{2}$

similarly

$T_{35} = \cos\frac{345}{2} - \cos\frac{355}{2}$

$$\left(2\sin\frac{5}{2}\right).S = \cos\frac{5}{2} - \cos\frac{355}{2} = 2\sin\frac{180}{2}.\sin\frac{175}{2} = 2\sin\frac{175}{2}$$

$$S = \frac{\sin\frac{175}{2}}{\sin\frac{5}{2}} = \frac{\sin\frac{175}{2}}{\cos\left(90 - \frac{5}{2}\right)} = \frac{\sin\frac{175}{2}}{\cos\frac{175}{2}} = \tan\left(\frac{175}{2}\right) = \tan\left(\frac{m}{n}\right)$$

$\therefore$ m = 175 and n = 2 $\Rightarrow$ m + n = 177 Ans.

24. **D**

$f'(x) = 4x^3 - 36x^2 \le 0$

$4x^2(x-9) \le 0$

$x^2(x-9) \le 0$

$x \in (-\infty, 9]$

$f''(x) = 12x^2 - 72x < 0$

$12x(x-6) < 0$

$x \in (0, 6)$

Integral value of x in $(-\infty, 9] \cap (0, 6)$

$= \{1, 2, 3, 4, 5\}$

$\Rightarrow$ 5 values

25. **B**

$x^2 + px + qr = 0$ ...(i)

$x^2 + qx + rp = 0$ ...(ii)

$x^2 + rx + pq = 0$ ...(iii)

Every pair has a common root.

Let the roots are α, β for (i) ; β, γ for (ii) ; γ, α for (iii)

$\alpha + \beta = -p$ ...(iv)

$\alpha\beta = qr$ ...(v)

$\beta + \gamma = -q$ ...(vi)

$\beta\gamma = rp$ ...(vii)

Common roots are α, β, γ. By (i) and (ii),

$\beta^2 + p\beta + qr = 0$, $\beta^2 + p\beta + rp = 0$

Subtracting, $(p-q)\beta + r(q-p) = 0$ or, $\beta = r$

Put this in (vii), $r\gamma = rp$ or, $\gamma = p$. Put $\beta = r$ in (v), $\alpha = q$.

$\therefore$ $\alpha + \beta + \gamma = q + r + p$. ...(A)

But $\alpha + \beta = -p$; $\beta + \gamma = -q$; $\gamma + \alpha = -r$

$\Rightarrow \alpha + \beta + \gamma = -\frac{1}{2}(p+q+r)$ ...(B)

By (A) and (B) $\Rightarrow p + q + r = 0 \Rightarrow \alpha + \beta + \gamma = 0$

PHYSICS

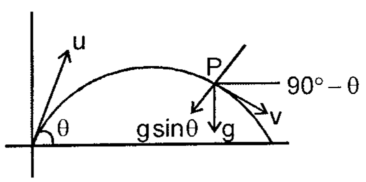
1. **B**

2. **B**

$v \cos(90° - \theta) = u \cos\theta$

$v \sin\theta = u \cos\theta$

$v = u \cot\theta$



at P $\frac{V_T^2}{R} = a_c$

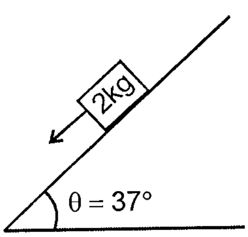
$\frac{u^2 \cot^2\theta}{g\sin\theta} = R$

3. **B**

4. **D**

5. **A** $F = -\frac{dU}{dx}$

6. **D**



$\int_0^t (g\sin\theta - \mu g\cos\theta)dt = d\theta$

$\Rightarrow \sin\theta gt - \frac{t^2}{2\times4} g\cos\theta = 0$

$\frac{3}{5}t - \frac{t^2}{8}.\frac{4}{5} \Rightarrow 3t = \frac{t^2}{2} \Rightarrow t = 6$ sec

7. **A**

$10 - T - 2\mu g = 0$ (For zero acceleration Tension in heavy string)

$T - f = 0$

If $T \to 0$

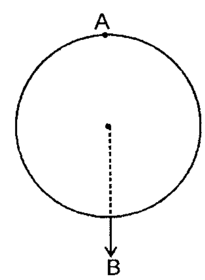
$\mu = 0.5$

If $f = 4\mu g$ = maximum frictional force

$\mu = \frac{1}{6} = 0.166$

8. **A**

Top view of the problem



$T = ma + \frac{mv^2}{R}$

compare it with vertical circle by replacing mg by ma.

9. **A**

Velocity of vertical rod with respect to horizontal rod is

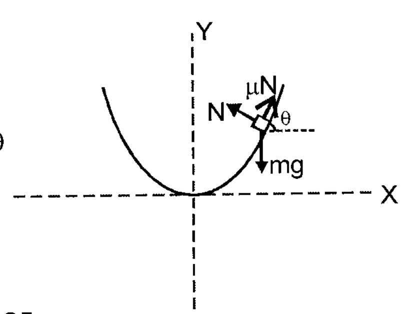
$\vec{v}_{rel} = v\hat{i} - (-2v\hat{j})$

$\therefore$ $\hat{v}_{rel} = \frac{v\hat{i} + 2v\hat{j}}{\sqrt{v^2 + (2v)^2}} = \frac{\hat{i} + 2\hat{j}}{\sqrt{5}}$

$\therefore$ unit vector along friction force $= -\hat{v}_{rel}$

10. **B**

$\frac{dy}{dx} = \frac{x}{10} = \tan\theta$



$\mu N\cos\theta = N\sin\theta$

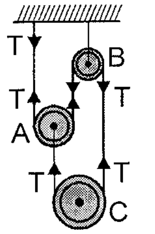
$\tan\theta = \mu = \frac{1}{2}$

$\Rightarrow x = 5m$

$\Rightarrow y = \frac{25}{20} = 1.25m$

11. **D**

Let the acceleration of pulleys A, B and C be denoted by a, b and c respectively all in downward directions



$a + 2c = 0$ ...(i)

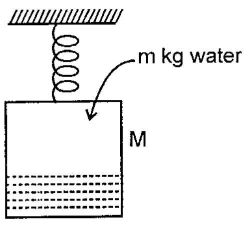
And from F.B.D. of A

$2T - T = 0.a \Rightarrow T = 0$

Then C must be falling freely and the acceleration of 'A' will be 2g upwards.

12. **A**

for m kg of water rise in water level w.r.t cylinder



$h = \frac{V}{A} = \frac{m}{\rho A}$

∴ So cylinder must move downwards.

by $h = \frac{m}{\rho A}$ = extra. extension in the spring

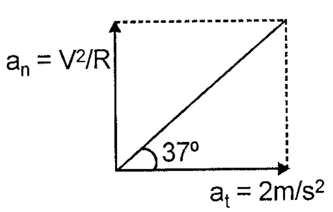
∴ $\frac{m}{\rho A} = \frac{mg}{K} \Rightarrow K = \rho A g$

13. **C**

From the constraint relation, as the string length should not change, B will be at rest w.r.t. A.

So its velocity 2 m/s $[V_A = V_B]$

14. **B**



ϕ = arc/radius = S/R = 3/8

$\tan 37° = \frac{V^2/R}{2} \Rightarrow R\ V^2/2\ \{V^2 - 0^2 = 2aS \Rightarrow V^2/4 = S\}$

15. **A**

$l_1 + l_2 = L$

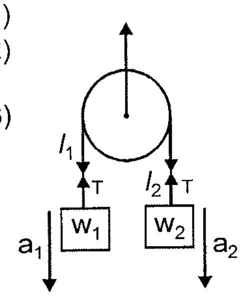
$\frac{d^2 l_1}{dt^2} + \frac{d^2 l_2}{dt^2} = 0$

$(g + a_1) + (g + a_2) = 0$

$a_1 + a_2 = -2g$ ...(1)

$w_1 - T = \omega_1 a_1 \backslash g$ ...(2)

$w_2 - T = \omega_2 a_2 \backslash g$ ...(3)



On solving (1), (2) and (3)

$T = \frac{4 w_1 w_2}{w_1 + w_2}$

16. **A**

Kinetic energy is (+ve) and total ME is 2 Joule. So, PE cannot be 6J.

17. **C**

(A) sum of angle is 90 not difference.

(B) Max. height $\propto \sin^2\theta$

(C) $H_1 = \frac{u^2 \sin^2\theta}{2g}$, $H_2 = \frac{u^2 \sin^2\left(\frac{\pi}{2} - \theta\right)}{2g} = \frac{u^2 \cos^2\theta}{2g}$

$\Rightarrow H_1 + H_2 = \frac{u^2}{2g}$

(D) see (B)

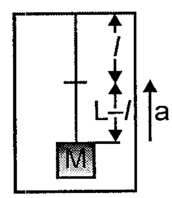
18. **A**

Because tension at both side of the spring balance will be same in case (a) $T_a = 20g$ and in case (b) $T_b = 20g$.

19. **A**

Let a be the acceleration of the lift.

Mass of lower portion of string



$= \frac{m}{L}(L - l)$

$\therefore T - Mg - \frac{mg}{L}(L - l) = \left(M + \frac{m}{L}(L - l)\right)a$

$\therefore a = \frac{T}{M + m - \frac{ml}{L}} - g$

20. **A**

21. **A**

$\frac{2s}{v} = T_0$

$T_w = \frac{s}{v - v_w} + \frac{s}{v + v_w} = S\left[\frac{2v}{v^2 - v_w^2}\right] = \frac{2s}{v}\left[\frac{v^2}{v^2 - v_w^2}\right]$

$T_w = T_0\left[\frac{1}{1 - (v_w/v)^2}\right]$

22. **B**

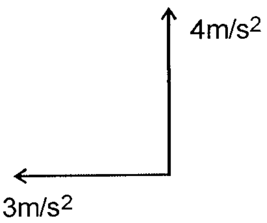
$N - mg = ma$

$N = mg + ma$

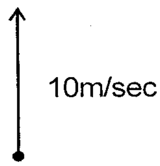
∴ $N > mg$

23. **C**

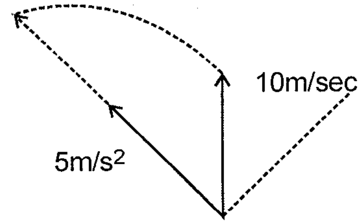
Acceleration of A with respect to B.



velocity of A with respect to B



then now



24. **B**

$v = 0 - 9 + t^2$

$a = 0 - 0 + 2t$

25. **A**

CHEMISTRY

1. **B**

More stable the structure, less will be internal energy

2. **C**

3. **D**

4. **C**

$MCl_x + AgNO_3$

$Cl^- + Ag^+ \longrightarrow AgCl$

$0.1\,x \qquad 0.3$

for complete reaction

moles of Cl^- = moles of Ag^+

$0.1\,x = 0.3$

$x = 3$

$\therefore$ valency of metal = 3

$\Rightarrow$ formula of the metal phosphate = MPO_4

5. **A**

Let the wt of Na_2CO_3 be x

$\Rightarrow \quad \frac{x}{106} = \frac{2-x}{84}$

$\Rightarrow \quad x = 1.12$

For complete neutralisation

moles of HCl = moles of $NaHCO_3$ + moles of Na_2CO_3

$0.1 \times V = \frac{2x}{106} + \frac{2-x}{84}$

putting the value of x and solving

V = 315.76 ml

6. **C**

$A_2O_3 + 3H_2 \longrightarrow 2A + 3H_2O$

moles of metal oxide = $\frac{0.1596}{2x+48}$

where x is atomic weight of metal

3 mole H_2 = 1 mol A_2O_3

$\Rightarrow \quad \frac{6\times10^{-3}}{2}$ mol $H_2 \equiv \frac{1}{3}\times3\times10^{-3} = 10^{-3}$

$\Rightarrow \quad \frac{0.1596}{2x+48} = 10^{-3} \Rightarrow x = 55.8$

7. **A**

For complete reaction

moles of HCl = moles of KOH

$$\frac{w\times\frac{60}{100}}{36.5} = 0.1\times10$$

$\Rightarrow \quad w = 60.8$ gm

8. **D**

$Mg + 2In + 4S \longrightarrow MgIn_2S_4$

	Mg	2In	4S
	1 g	1 g	1 g
mole	1/24	1/114.8	1/32

$\therefore$ In will be limiting reagent

$\Rightarrow$ moles of $MgIn_2S_4$ formed = $\frac{1}{2}\times\frac{1}{114.8} = 4.35\times10^{-3}$

9. **B**

$C_xH_y + (x + y/4)\,O_2 \longrightarrow x\,CO_2 + y/2\,H_2O$

20 $\qquad$ 100 $\qquad$ 60

volume of CO_2 = 60

contraction = volume of reactant – volume of prduct

60 = volume of O_2 + volume of Hydrocarbon – volume of unreacted O_2 – Volume of CO_2

60 = volume of reacted O_2 + 20 – 60

$\Rightarrow$ volume of reacted O_2 = 100 ml

volume CO_2 = 60 = 20x

$\Rightarrow x = 3$

$20(x + y/4) = 100 \Rightarrow y = 8$

$\therefore$ formula of hydrocarbon = C_3H_8

10.	A	**11.**	A	**12.**	B
13.	C	**14.**	A	**15.**	B
16.	B	**17.**	B	**18.**	A
19.	C	**20.**	A		

21. A

22. B

Let A – B be 100 % ionic

If dipole moment is ed, then compound is 100% ionic

If dipole moment is μ_0, then compound is — $\frac{100}{ed}\mu_0$% ionic

$\therefore$ % covalent character = p = $100 - \frac{100\mu_0}{ed}$

$$100 - p = \frac{100\mu_0}{ed}$$

$$d = \frac{100\mu_0}{e(100-p)} = \frac{\mu_0}{e - ep\times 10^{-2}}$$

23. C

24. B

Let V mL of each are mixed

For I solution H_2SO_4 is 30% by weight

$\therefore$ Wt. of H_2SO_4 = 30 g

and Wt. of solution = 100g

$\therefore$ Volume of solution = $\frac{100}{1.218}$mL

i.e., $\frac{100}{1.218}$mL contains 30 g H_2SO_4

For II solution. H_2SO_4 is 70% by weight

$\therefore$ Wt. of H_2SO_4 = 70 g

Wt. of solution = 100 g

$\therefore$ Volume of solution = $\frac{100}{1.610}$mL

i.e., $\frac{100}{1.610}$mL contains 70 g H_2SO_4

$\Rightarrow$ Vml contain $\frac{30\times V\times 1.218}{100}$g H_2SO_4

$\therefore$ V mL contains $\frac{70\times V\times 1.610}{100}$ g H_2SO_4

On mixing these two, total weight of H_2SO_4

$$= \left[\frac{30\times 1.218}{100} + \frac{70\times 1.610}{100}\right]Vg$$

= 1.4924 V g

Total volume of solution = 2V mL

$\therefore$ Molarity of solution = $\frac{1.4924\,V}{98\times\frac{2V}{1000}} = 7.61$

Now Wt. of total solution = 2V × 1.425 g = 2.85 V gm

$\therefore$ Wt. of water = (2.85 V – 1.4924 V) g

= 1.3576 V g

$\therefore$ Molality of solution = $\frac{1.4924\,V}{98\times\frac{1.3576\,V}{1000}} = 11.22$

25. A

mol. wt. of air = $\frac{20\times 32 + 80\times 28}{100}$ = 30.8

$N_2 + 3H_2 \longrightarrow 2NH_3$

1	3	0
1 – x	3 – 3x	2x

where x = 1/2

mol. wt. of the mixture

$$= \frac{28\times(1-x) + (3-3x)\times 2 + 2x + \times 17}{1 - x + 3 - 3x + 2x} = 11.33$$

density of the mixture relative to air

$$= \frac{\text{mol. wt. of the mixture}}{\text{mol. wt. of the air}} = \frac{11.33}{30.8} = 0.37$$