19/10/2025

Code-A

Corporate Office : AESL, 3rd Floor, Incuspaze Campus-2, Plot No. 13, Sector-18,
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MM : 300 | AIATS For One Year JEE(Main)-2026 (XII Passed)_Test-01 | **Time : 180 Min.**

PHYSICS

Section-I

1. (4)
2. (1)
3. (2)
4. (3)
5. (2)
6. (2)
7. (3)
8. (3)
9. (4)
10. (3)
11. (3)
12. (2)
13. (4)
14. (2)
15. (2)
16. (3)
17. (3)
18. (1)
19. (3)
20. (4)

Section-II

21. (2)
22. (4)
23. (7)
24. (3)
25. (5)

CHEMISTRY

Section-I

26. (1)
27. (1)
28. (2)
29. (1)
30. (2)
31. (3)
32. (1)
33. (2)
34. (4)
35. (1)
36. (3)
37. (4)
38. (2)
39. (3)
40. (1)
41. (1)
42. (1)
43. (1)
44. (1)
45. (3)

Section-II

46. (30)

47. (3)

48. (67)

49. (6)

50. (18)

MATHEMATICS

Section-I

51. (4)

52. (4)

53. (3)

54. (4)

55. (3)

56. (2)

57. (1)

58. (3)

59. (1)

60. (3)

61. (3)

62. (2)

63. (1)

64. (2)

65. (3)

66. (3)

67. (4)

68. (4)

69. (4)

70. (1)

Section-II

71. (2)

72. (2)

73. (1)

74. (114)

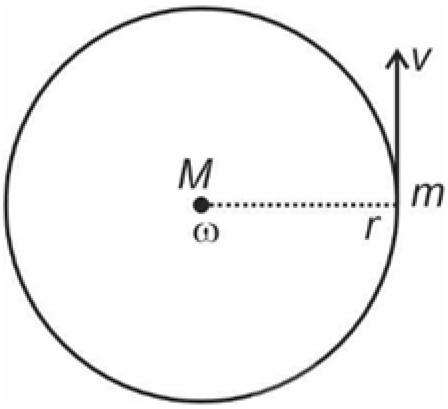
75. (10)

Hints and Solutions

PHYSICS

Section-I

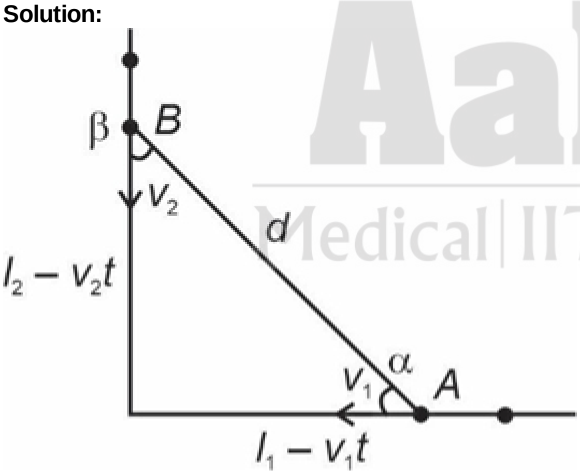
(1) **Answer :** (4)
Hint:
Conserve angular momentum
Solution:



$2MR^2\omega = MR^2\omega^1$

$(\omega' + \omega)\ R = v$

(2) **Answer :** (1)
Hint:
$\omega = \frac{v}{R}$
Solution:



In reference of *B*

$\omega = \frac{v_2 \sin\beta - v_1 \sin\alpha}{d^2}$

$= \frac{v_2 l_1 - v_1 l_2}{(l_2 - v_2 t)^2 + (l_1 - v_1 t)^2}$

$\frac{d\omega}{dt} = 0$

$t = \frac{l_1 v_1 + l_2 v_2}{v_1^2 + v_2^2}$

$(\omega)_{\max} = \frac{v_1^2 + v_2^2}{l_1 v_2 - l_2 v_1} = \frac{5v_0}{a}$

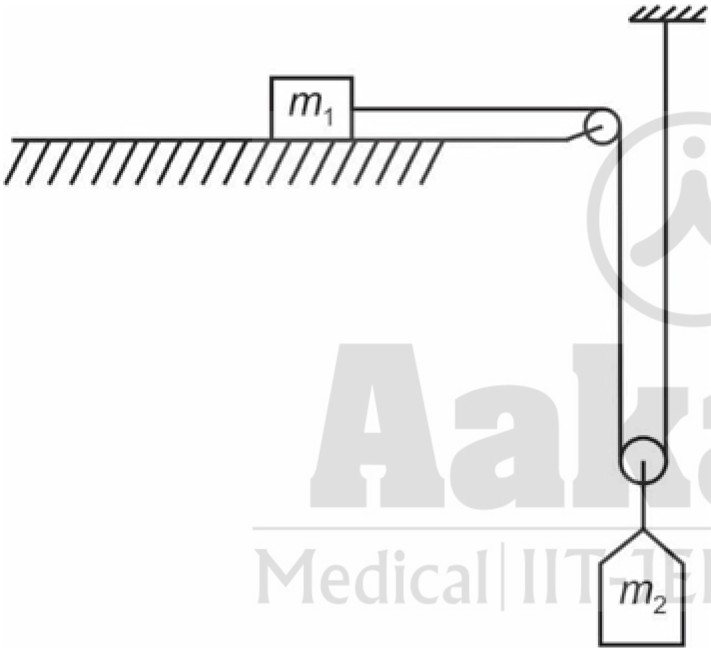
(3) **Answer :** (2)
Hint:
T = Time from beginning to impact with wall + time from wall.
Solution:

t_1 = 10 s t_2 = $\frac{10}{3}$ s

$-\frac{g\sqrt{3}u^2}{2g}$

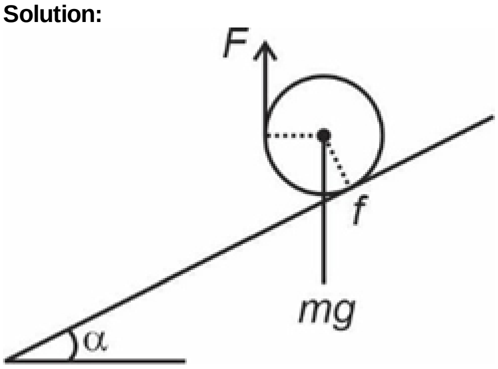
(4) **Answer :** (3)
Hint:
F = *ma*
Solution:
$x^2 = at^2 + 2bt + c$
$t = \frac{-b+\sqrt{b^2-a(c-x^2)}}{a}$
$x \cdot \frac{dx}{dt} = at + b$
$\frac{dv}{dt} = \frac{a-v^2}{x} = \frac{1}{x}\left[a - \left(\frac{at+b}{x}\right)^2\right]$
Here $(b+at) = \sqrt{b^2 - a(c-x^2)}$
So, $\frac{dv}{dt} = \frac{ac-b^2}{x^3}$
$F = m\left(\frac{ac-b^2}{x^3}\right)$
$F.x^3$ = constant

(5) **Answer :** (2)
Hint:
W = *mg* – *ma*
Solution:



$\frac{m_2 g}{2} = \mu m_1 g$
⇒ m_2 = 50 kg

(6) **Answer :** (2)
Hint:
At equilibrium, Net torque is zero.
Solution:

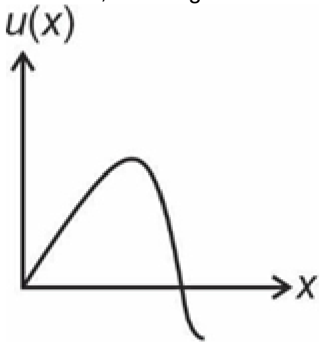


F = *f*
$F = f = \frac{mg\sin\alpha}{1+\sin\alpha}$
F cos α + *N* – *mg* sinα = 0
$N = \frac{mg\cos\alpha}{1+\sin\alpha}$, $f_{max} = \mu N$

tan α = μ

(7) **Answer :** (3)
Hint:
dU = – *F*.*dx*
Solution:
$F=\frac{-dU}{dx},\ U=-\int F\cdot dx$

$U=\frac{x^2}{2}-\frac{x^4}{2}=\frac{1}{2}(x^2-x^4)=0,\ x\ =\ \pm 1$
For $x \geq 0$, U is zero at $x = 1$,
also at $x = 0$, $U = 0$
For $x < 1$, U is positive
For $x > 1$, U is negative



(8) **Answer :** (3)
Hint:
Velocity can be zero even if acceleration is constant.
Solution:
Velocity can be zero even if acceleration is constant.

(9) **Answer :** (4)
Hint:
$I = mk^2$
Solution:
(A) $I=I_{cm}+mr^2,\ r=\frac{2R}{\pi}$
(B) $I=\frac{mR^2}{3}\sin^2\theta$
(C) $I=\frac{mR^2}{3}\sin^2\theta$
(D) $I=\frac{MR^2}{2}-\frac{mr^2}{2}$

(10) **Answer :** (3)
Hint:
Use concept of error analysis.
Solution:
$y=20e^{\frac{x}{100}},\ \frac{dy}{dx}=\frac{e^{\frac{x}{100}}}{20}$
$dy=\frac{1}{5}\,e^{\frac{x}{100}}\cdot dx$
Dividing both side by y
$\frac{dy}{y}=\frac{1}{5}\,e^{\frac{x}{100}}\cdot\frac{dx}{y}$
$\frac{dy}{y}\times 100\%=\left(\frac{1}{5}\,e^{\frac{x}{100}}\right)\ \left(\frac{dx}{20e^{\frac{x}{100}}}\right)\times 100\%$
$=\frac{dx}{100}\times 100\%$
$=\frac{1}{100}\left(\frac{dx}{x}\right)\cdot x\times 100\%$
$=\frac{1}{100}(1\%)\times 300=3\%$

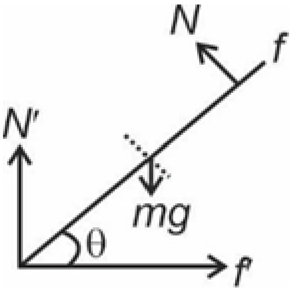
(11) **Answer :** (3)
Hint:
$B=\frac{-\Delta P}{\left(\frac{\Delta V}{V}\right)}$
Solution:
$\Delta P = (n - 1)P_0$
From $M = \rho V$, the decrease in volume due to increase in pressure ΔP is

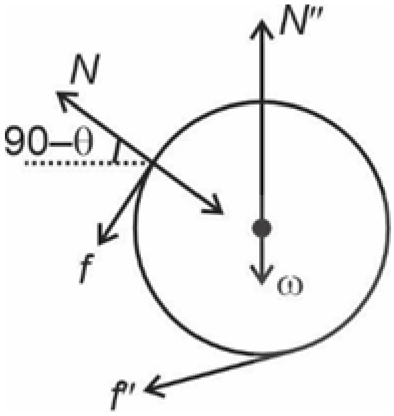
$\beta = \frac{\rho \cdot \Delta P}{\Delta P}$

$= \frac{\rho_0 (n-1) P_0}{\rho_0}$

$\beta = (n-1) P_0$

(12) **Answer :** (2)
Hint:
$\tau_{net} = 0$
Solution:





Here $f = f'$

$N = \frac{mg}{2} \cos\theta$

For disc, $N \sin\theta = f + f \cos\theta$

$f = \frac{mg \sin 2\theta}{4(1+\cos\theta)}$

(13) **Answer :** (4)
Hint:

$T = \frac{2\pi(3R)}{\sqrt{\frac{GM}{3R}}}$

Solution:

$\frac{GM}{(3R)^3} = \frac{4\pi^2}{T^2}$

$g_0 = \frac{GM}{R^2} = \frac{4\pi^2}{T^2} \frac{(3R)^3}{(R)^2}$

$g_0 = \frac{108\pi^2 R}{T^2}$

$g_h = \frac{GM}{4R^2} = \frac{27\pi^2 R}{T^2}$

(14) **Answer :** (2)
Hint:
$v^2 = 2as$
Solution:
After collision
$v_1 = 0$ and $v_2 = 3$ m/s
So $v_2^2 = 2\mu g s$

⇒ $9 = \frac{2\times 2}{10} \times 10\, s$

⇒ $s = \frac{9}{4} m$

(15) **Answer :** (2)
Hint:
For accelerating water, surface became inclined.

Solution:
For accelerating water, surface became inclined.

(16) **Answer :** (3)
Hint:
$P = \vec{F} \cdot \vec{V}$
Solution:
$n = t^3, v \propto t, a \propto t \Rightarrow p = Fv \propto t^3$

(17) **Answer :** (3)
Hint:
Uniform acceleration
Solution:
Conceptual

(18) **Answer :** (1)
Hint:
Bernoulli's theorem
Solution:
$\rho + \rho g h + \frac{1}{2}\rho v^2$ = constant

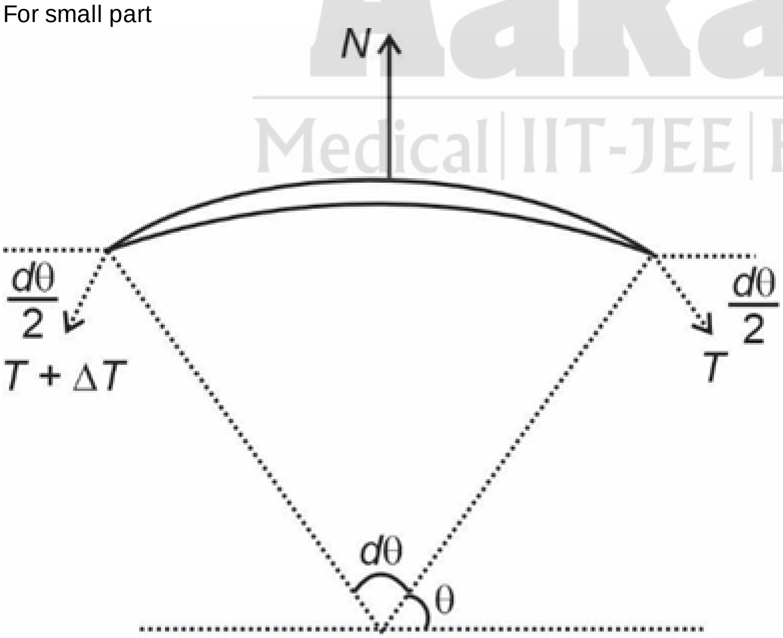
(19) **Answer :** (3)
Hint:
Use conservation of energy.
Solution:
$v_3 = \sqrt{\frac{9gR}{32}} = \sqrt{\frac{R^2 g}{R+h}}$

$h = \frac{23}{9}R$

$0 - \frac{GMm}{R} = \frac{1}{2}mv^2 - \frac{GMm}{R}$

$v = \frac{\sqrt{23gR}}{4}$

(20) **Answer :** (4)
Hint:
Apply Newton 2nd law on small element.
Solution:
For small part



Along horizontal:

$T\cos\left(\frac{\Delta\theta}{2}\right) - f - (T + \Delta T)\cos\left(\frac{\Delta\theta}{2}\right) = F_x$

For small angel, $\cos\left(\frac{\Delta\theta}{2}\right) \approx 1$, $\sin\left(\frac{\Delta\theta}{2}\right) \approx \frac{\Delta\theta}{2}$

$F_X = -f - \Delta T = 0$ …(i)

Along vertical:

$F_y = -T\sin\left(\frac{\Delta\theta}{2}\right) + N - (T + \Delta T)\sin\left(\frac{\Delta\theta}{2}\right)$

$= -T\Delta\theta + N - \Delta T\frac{\Delta\theta}{2}$
Here $\Delta T \cdot \Delta\theta \approx 0$
$F_y = -T\Delta\theta + N = 0$
$N = T.\Delta\theta$
$f = \mu(N)$ …(ii)
So from equation (i)
$\mu T.\Delta\theta = \Delta T$
$\frac{\Delta T}{\Delta\theta} = -\mu T$
The derivative of tension w.r.t. angle θ
$\frac{dT}{d\theta} = -\mu T$
$\frac{dT}{T} = -\mu\theta$
$T_B = T_0 e^{\mu\theta}$

Section-II

(21) **Answer :** 2
Hint:
$\Delta P = \frac{2s}{r}$
Solution:
$\frac{\frac{2s}{2r} + \frac{2s}{r} - \frac{2s}{2r}}{\frac{2s}{2r}} = 2$

(22) **Answer :** 4
Hint:
$F \geq$ (Shear stress) × (Area)
Solution:
$F \geq$ (Shear stress) × (Area)
$F_{\min} = (\sigma)\ (2\pi r)t$
$= 4\pi \times 10^4$
= 40 π kN

(23) **Answer :** 7
Hint:
Dimensional analysis
Solution:
$\frac{x^2}{akT} = M^0L^0T^0$
$[a] = [M^{-1}\ T^2]$
$[a]\ [b] = [F]$
$[b] = [M^2\ LT^{-4}]$

(24) **Answer :** 3
Hint:
$F.dt = \Delta P$
Solution:
$mv_0 = (2m + m)v$

(25) **Answer :** 5
Hint:
Use concept of conservation of angular momentum and energy.
Solution:
$2A = r_{max} + r_{min}$
⇒ $E = \frac{-GMm}{2A}$
⇒ $E = \frac{-GMm}{5a}$

CHEMISTRY

Section-I

(26) **Answer :** (1)
Hint:

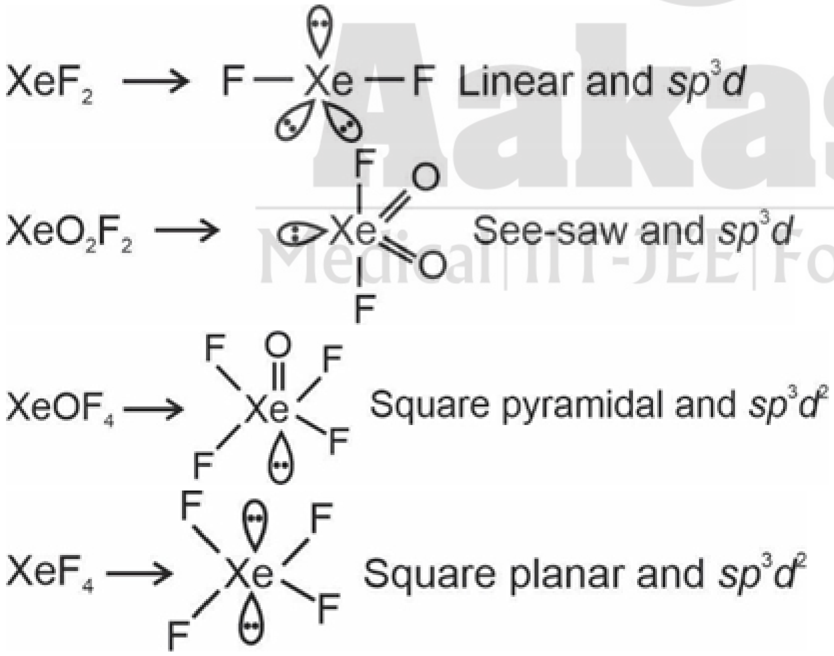
The equilibrium can be shifted in the opposite direction by adding reagents that removes Fe^{3+} or SCN^{-} ions.
Solution:
Addition of oxalic acid which react with Fe^{3+} to form stable complex $[Fe(C_2O_4)_3]^{3-}$, decreases conc. of free Fe^{3+}.
Addition of $HgCl_2$, also decreases conc. of SCN^{-} as it forms stable complex $[Hg(SCN)_4]^{2-}$. Hence, (A) and (C) are correct statement. Addition of KSCN, increases SCN^{-} ions, hence, equilibrium shifts towards right side, ∴ colour intensity of yellow colour decreases and red colour increases.

(27) **Answer :** (1)
Hint:
Due to H-Bond molecules bind with each other.
Solution:
The decrease in escaping tendency of molecules for each component and consequently the vapour pressure decreases resulting in negative deviation from Raoult's law.

(28) **Answer :** (2)
Hint:
Rate of first order reaction, increases linearly with concentration.
Solution:
A and C ⇒ zero order reaction.
B ⇒ second order reaction.
E and D ⇒ first order reaction.

(29) **Answer :** (1)
Hint:
Permanganate in basic medium turn to MnO_2.
The balanced chemical equation is
$6I^{-} + 2\ MnO_4^{-} + 4\,H_2O \rightarrow 3I_2 + 2\ MnO_2 +\ 8\ OH^{-}$
∴ Ans. 6, 2 and 8 respectively.

(30) **Answer :** (2)
Hint:
XeF_2 is Linear and have 3 lone pairs and 2 bond pairs.
Solution:



(31) **Answer :** (3)
Hint:
Anode Reaction:
$Pb(s)\ +\ SO_4^{2-}(aq.)\ \rightarrow\ PbSO_4(s)\ +\ 2e^{-}$
Solution:
Pb (0) changes to Pb^{2+}.

(32) **Answer :** (1)
Hint:
Molality = $\frac{\text{moles of solute}}{\text{mass of solvent (kg)}}$

Solution:

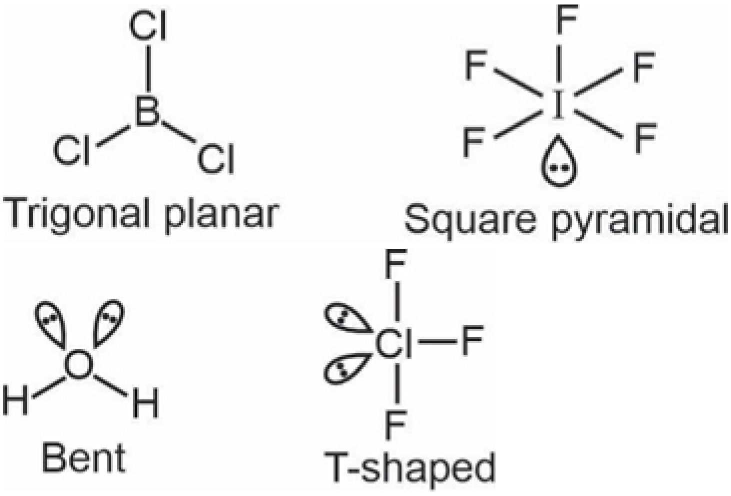
Molality = $\frac{5\times1000}{18\times5} = 55.55\ m$

(33) **Answer :** (2)

Hint:

BCl_3 planar → Trigonal planar, no lone pair.

Solution:



(34) **Answer :** (4)

Hint:

% by mass of

$\text{O} = \frac{\text{mass of O in compound}}{\text{molar mass of the compound}} \times 100$

Solution:

% by mass of O in $Na_2S_2O_3$ = 30%

% by mass of O in $KMnO_4$ = 40.5%

% by mass of O in Na_3PO_4 = 39%

% by mass of O in $MgCO_3$ = 57%

(35) **Answer :** (1)

Hint:

Removal of e^- from positively charged ion, requires more energy.

Solution:

Assertion is correct, as

$I.E_3 > I.E_2 > I.E_1$ for any atom and reason given is also correct.

(36) **Answer :** (3)

Hint:

Shortest wavelength → Maximum energy.

Solution:

Shortest wavelength of Lyman ⇒ ∞ → 1

Shortest wavelength of Paschen ⇒ ∞ → 3

Difference = 9

(37) **Answer :** (4)

Hint:

More the dilution less is the conductivity, but more is the molar conductivity.

Solution:

Conductivity always decrease with decrease in concentration both, for weak and strong electrolytes.

(38) **Answer :** (2)

Hint:

$\Delta T_f = K_f\, m$.

and molality = $\frac{\text{moles of ethylene glycol}}{\text{mass of water (in kg)}}$

Solution:

$\text{n} = \frac{37.2\text{ g}}{60\text{ g}} = 0.6$ moles of ethylene glycol.

Mass of water = 300 g = 0.3 kg

$\text{m} = \frac{0.6}{0.3} = 2 \text{ mole kg}^{-1}$

$\Delta T_f = K_f . m = 1.86 \times 2 = 3.72$ K

$\Delta T_f = T_f^0 - T_f$

$T_f = T_f^0 - \Delta T_f = 273.15 - 3.72$ K

= 269.43 K

(39) **Answer :** (3)
Hint:
In disproportionation reaction, compounds with intermediate O.S. converts to two compounds, one of higher and one of lower O.S.
Solution:

$\overset{0}{Pb} + \overset{+4}{Pb}O_2 + O_4 \rightarrow \overset{+2}{Pb}SO_4 + H_2O$

This is an example of comproportionation reaction.

(40) **Answer :** (1)
Hint:
This is law of Multiple proportion.
Solution:

$\underset{2\,g}{\text{Hydrogen}} + \underset{16\,g}{\text{Oxygen}} \rightarrow \underset{18\,g}{\text{Water}}$

$\underset{2\,g}{\text{Hydrogen}} + \underset{32\,g}{\text{Oxygen}} \rightarrow \underset{34\,g}{\text{Hydrogen peroxide}}$

∴ 16 : 32 = 1 : 2 ⇒ simple whole number ratio.

(41) **Answer :** (1)
Hint:
Ionic product > solubility product, excess of ions will precipitate.
Solution:
When ionic product < solubility product, the solution is unsaturated
When ionic product = solubility product, solution is saturated.

(42) **Answer :** (1)
Hint:
109 atomic number = [Rn] $5f^{14}\ 6d^7\ 7s^2$
Solution:
IUPAC Name of 109 = Unnilennium.

(43) **Answer :** (1)
Hint:
An ideal body, which emits and absorbs radiations of all frequencies uniformly, is called black body.

(44) **Answer :** (1)
Hint:
Br_2 exist as liquid.
Solution:
Standard molar enthalpy of formation of
$Cl_2(g) \Rightarrow 0$
$Br_2(l) \Rightarrow 0$
$I_2(s) \Rightarrow 0$
C(graphite, s) ⇒ 0
$H_2(g) \Rightarrow 0$

(45) **Answer :** (3)
Hint:
Isotopes → same atomic number but different mass number
Solution:
Isobars → Same mass number but different atomic number
Isotones → Same number of neutrons.
Isodiaphers → same difference of Neutrons – Protons.

Section-II

(46) **Answer :** 30
Hint:

$Na + H_2O \rightarrow NaOH + \frac{1}{2} H_2$

$NaOH + HCl \rightarrow NaCl + H_2O$

Solution:
meq. of Na ≡ meq. of NaOH formed ≡ meq. of HCl used

$\frac{0.69}{23} \times 1000 = \frac{36.5}{36.5}$ × V ml

(meq. of HCL ≡ N × V)

$\boxed{\mathrm{V = 30\ ml}}$

(47) **Answer :** 3

Hint:

Overall order is determined by slowest step of the reaction.

Solution:

Rate of slowest step:

Rate = k^2 [$NOBr_2$] [NO]

⇒ [$NOBr_2$] = k′[NO] [Br_2]

Rate = k′[NO] [Br_2] × k^2[NO]

Rate = k′ k^2 $[NO]^2$ [Br_2]

∴ Overall Rate = k$[NO]^2$ [Br_2]

Hence overall order = 2 + 1 = 3.

(48) **Answer :** 67

Hint:

Q = it

Solution:

Moles of $\mathrm{Cl_2} = \frac{0.710\times1000}{71} = 10\ \mathrm{mol}$

Q = 2 × moles of Cl_2 × F = 2 × 10 F

Q = 2 × 10 × 96500 C

$\mathrm{i} = 25 \times \frac{0.64}{100} = 16\ \mathrm{A}$

Q = it

$\mathrm{t} = \frac{\mathrm{Q}}{\mathrm{i}} = \frac{2\times10\times96500}{16\times3600}\ \mathrm{hours}$

t = 33.506 ≈ 33.5

x = 33.5 hours

$\boxed{\mathrm{2x = 67}}$

(49) **Answer :** 6

Hint:

Odd no. of e^- ⇒ Always paramagnetic

Solution:

N_2, F_2, Li_2, CN^-, $\mathrm{O_2^{2-}}$, $\mathrm{NO^+}$ are diamagnetic species.

(50) **Answer :** 18

Hint:

Noble gas have highest I.E. in any group.

Solution:

Noble gas have group 18.

MATHEMATICS

Section-I

(51) **Answer :** (4)

Hint:

Substitute $\frac{\tan 2x}{\tan x} = t$

Solution:

Substituting $\frac{\tan 2x}{\tan x} = t$

$t + \frac{1}{t} + 2 = 0 \quad \Rightarrow \quad t^2 + 2t + 1 = 0$

$\Rightarrow \quad t = -1 \quad \Rightarrow \quad \frac{\tan 2x}{\tan x} = -1$

$\Rightarrow \quad \frac{2}{1-\tan^2 x} = -1$

⇒ –2 = 1 – $\tan^2 x$

$\tan^2 x$ = 3

$\tan^2 x = \tan^2 \frac{\pi}{3}$

$\Rightarrow \quad x = n\pi \pm \frac{\pi}{3}$

(52) Answer : (4)
Hint:
Let $z = x + iy$
Solution:
Let $z = x + iy$
Then $|z - 3 - 4i|^2 + |z + 2 - 7i|^2 + |z - 5 + 2i|^2$
$= 3\{(x - 2)^2 + (y - 3)^2\} + 68$
The least value occurs when $x = 2$ and $y = 3$
$z = 2 + 3i$

(53) Answer : (3)
Hint:
$|KA| = K^m |A|$
25A−1=4AT
⇒25A−1=4AT
Solution:
$\Rightarrow \frac{25^4}{|A|} = 4^4 |A^T|$
$\Rightarrow |A| = \pm\left(\frac{5}{2}\right)^4$
det(adj(adj(adj(adj(A)))))
$= |A|^{3^4} = \left(\pm\left(\frac{5}{2}\right)^4\right)^{81} = \pm\left(\frac{5}{2}\right)^{324}$

(54) Answer : (4)
Hint:
$\left({}^6C_4 + \frac{6!}{3!2!} + \frac{6!}{(2!)^3 3!}\right)3!$
Solution:
Placing 6 different colour balls into 3 different size boxes is as the number of onto function form 6 elements set to 3 element sets.
∴ Total number of ways $3^6 - 3.2^6 + 3.1^6$
(By inclusion – Exclusion principle)
or $\left({}^6C_4 + \frac{6!}{3!2!} + \frac{6!}{(2!)^3 3!}\right)3!$

(55) Answer : (3)
Hint:
$n(a + n - 1) = 270 = 2 \times 3^3 \times 5$
Solution:
$n(a + n - 1) = 270 = 2 \times 3^3 \times 5$
Hence, n take 15 values

(56) Answer : (2)
Hint:
Take conjugate on both sides
$(\bar{a} + c)\overline{\omega}_1^2 + (\bar{b} + b)\overline{\omega}_1 + (a + \bar{c}) = 0$
Solution:
Now divide the whole equation by $\overline{\omega}_1^2$

(57) Answer : (1)
Hint:
$f(x) = 25\sin^2 x - 60\sin x + 84$
Solution:
$f(x) = (3\sin x - 4\cos x - 10)(3\sin x + 4\cos - 10)$
$f(x) = 25\sin^2 x - 60\sin x + 84$
$x = \frac{\pi}{2} \quad \Rightarrow \quad \sin x = 1$
when $f\left(\frac{\pi}{2}\right) = 25 - 60 + 84$
$f\left(\frac{\pi}{2}\right) = 49$

(58) Answer : (3)
Hint:
$x = \frac{-1}{2}, 1$
Solution:

$x = \frac{-1}{2}, 1$

$D > 0 \& f\left(\frac{-1}{2}\right) < 0 \& f(1) < 0$

$f\left(\frac{-1}{2}\right) < 0 \Rightarrow m > \frac{1}{12}$

$f(1) < 0 \Rightarrow 1 < 0$ (This inequality never satisfy.

$\therefore m$ is φ

(59) Answer : (1)

Hint:

Simplify

Solution:

2cos10° + sin100° + sin1000° + sin10000*

= 2cos10° + sin(90° + 10°) + sin(3 × 360° – 80°) + sin(27 × 360° + 280°)

= cos10°

(60) Answer : (3)

Hint:

Six matrix is possible

Solution:

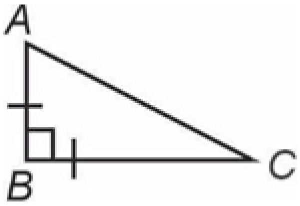
$\begin{bmatrix} -1 & 1 & 1 \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{bmatrix}$, number of matrices

= 3!

= 6

(61) Answer : (3)

Hint:



Solution:

$\frac{z_3 - z_2}{|z_3 - z_2|} = \frac{(z_1 - z_2)}{|z_1 - z_2|} e^{i\pi/2}$

$\therefore$ *ABC* is a right angled triangle

(62) Answer : (2)

Hint:

$4x^2 - 4x + 2 = \sin^2 y$

Solution:

$4x^2 - 4x + 2 = \sin^2 y$

since $0 \le \sin^2 y \le 1$

$\Rightarrow 0 < 4x^2 - 4x + 2 \le 1$ ($\because 4x^2 - 4x + 2 > 0$)

$\Rightarrow (2x - 1)^2 \le 0$

$\Rightarrow x = \frac{1}{2}$

$\therefore \sin^2 y = 1$

$y = \pm\frac{\pi}{2}$

(63) Answer : (1)

Hint:

Let *A* & *B* get *a* & *b* votes.

Solution:

Let *A* & *B* get *a* & *b* votes. Ordered pair of (*a*, *b*) = (0, 20), (1, 19), (2, 18) …. (20, 0)

Total ways = 21

(64) Answer : (2)

Hint:

$n = 5$

Solution:

Sum of coefficients in $(1 - 3x + 10x^2)^n$ is 8^n

$= 8^5$

$= 2^{15}$

(65) **Answer :** (3)
Hint:
Area of triangle loving vertices as $(x_1, y_1)(x_1, y_1)$
Solution:
The given triangle is right angled triangle having side length as 3, 4, 5.
$\therefore\ D = \frac{1}{2} \times 3 \times 4 = 6$
$\therefore\ 2D = 12$

(66) **Answer :** (3)
Hint:

$$\lim_{n\to\infty} \sum_{r=1}^{n} A_r = \left(\alpha + \alpha^2 + \alpha^3 + ...\right) + \left(\beta + \beta^2 + \beta^3 + ...\right)$$
$$= \frac{\alpha}{1-\alpha} + \frac{\beta}{1-\beta} = \frac{1}{2}$$

Solution:

$$\lim_{n\to\infty} \sum_{r=1}^{n} A_r = \left(\alpha + \alpha^2 + \alpha^3 + ...\right) + \left(\beta + \beta^2 + \beta^3 + ...\right)$$
$$= \frac{\alpha}{1-\alpha} + \frac{\beta}{1-\beta} = \frac{1}{2}$$

(67) **Answer :** (4)
Hint:
$x_1 + x_2 + x_3$ £ 10
Solution:
$x_1 + x_2 + x_3$ £ 10
Number of positive integral solution of $x_1 + x_2 + x_3$ £ 10 will be equal to no. of non-negative solution of equation
$y_1 + y_2 + y_3 + y_4 = 7$ i.e. ${}^{10}C_3$

(68) **Answer :** (4)
Hint:
A positive integer having more than 10 digits cannot have all distinct digits.
⇒ The number of such numbers is finite.
Solution:
A positive integer having more than 10 digits cannot have all distinct digits.
⇒ The number of such numbers is finite.
Number of numbers having distinct digits.
⇒ 9 + 9 × 9 + 9 × 9 × 8 + … + 9 × 9 × 8!

(69) **Answer :** (4)
Hint:

$$\sum_{K=1}^{\infty} \frac{1}{(2K-1)^2} = \frac{3}{4}\left(\frac{\pi^2}{60}\right)$$

Solution:

$$\sum_{K=1}^{\infty} \frac{1}{(2K-1)^2} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} - \frac{1}{2^2}$$
$$\left(\frac{1}{1^2} + \frac{1}{2^2} + ...\right)$$
$$= \frac{\pi^2}{6} \times \frac{3}{4} = \frac{\pi^2}{8}$$

(70) **Answer :** (1)
Hint:
Applying $R_3 \to R_3 + xR_1 + yR_2$, we get
Solution:
Applying $R_3 \to R_3 + xR_1 + yR_2$, we get

$$\Delta = \begin{vmatrix} x & ay & a \\ y & -ax-c & b \\ x^2+y^2+1 & 0 & 0 \end{vmatrix} = 0$$

⇒ $(x^2 + y^2 + 1)(aby + a^2x + ac) = 0$
⇒ $ax + by + c = 0$
as $(x^2 + y^2 + 1) \neq 0$ being sum of three positive numbers.

Section-II

(71) **Answer :** 2
Hint:

This represents the intersection of a circle and positive x-axis.
Solution:
This represents the intersection of a circle and positive x-axis.
Circle: Center at (5, 2), radius 3
⇒ There are 2 intersection points.

(72) **Answer :** 2
Hint:
Use identity: $\Sigma r^2 = (\Sigma r)^2 - 2(\Sigma rr)$
Solution:
Use identity: $\Sigma r^2 = (\Sigma r)^2 - 2(\Sigma rr')$
$(2)^2 - 2(1) = 2$

(73) **Answer :** 1
Hint:
Use identity:
$\sum_{K=1}^{n}$ use summation formulae
Solution:
$$\frac{\cos\left(\frac{6\pi}{11}\right)\cdot\sin\left(\frac{5\pi}{11}\right)}{\sin\left(\pi/11\right)}$$
$$= -\frac{1}{2}$$

(74) **Answer :** 114
Hint:
General term: $T_{r+1} = {}^9C_r \times ((3x^2)/2)^{(9-r)} \times (1/(4x))^r$
Solution:
Power of $x = 2(9 - r) - r = 18 - 3r = 0$
$\Rightarrow r = 6$

(75) **Answer :** 10
Hint:
Break the sum: $S = \Sigma[n^2 + 2n]/n! = \Sigma\, n^2/n! + 2\Sigma n/n!$
Solution:
Break the sum: $S = \Sigma[n^2 + 2n]/n! = \Sigma\, n^2/n! + 2\Sigma n/n!$
Use known identities:
$\Sigma n/n! = e$, $\Sigma n^2/n! = (x^2 + x)e$ at $x = 1 = 2e$
$\Rightarrow S = 2e + 2e = 4e \approx 10.873$