Answer Key

Other (130 Questions)

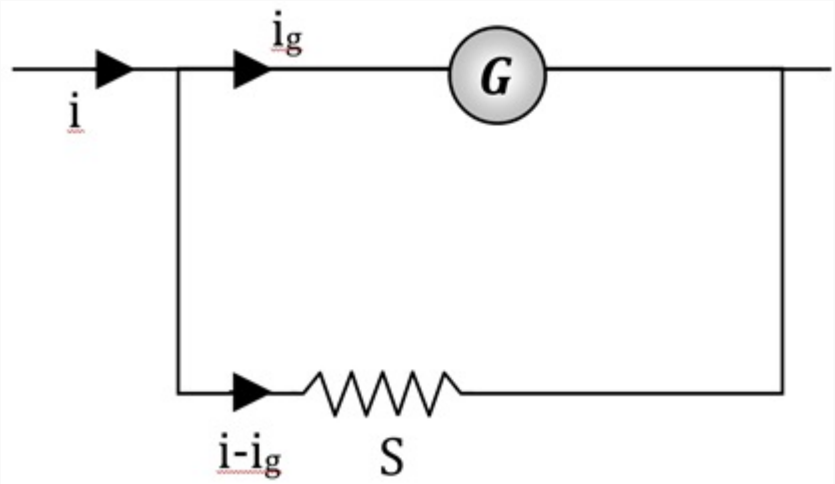
Q1. (B)	Q2. (B)	Q3. (A)	Q4. (A)	Q5. (B)
Q6. (D)	Q7. (C)	Q8. (D)	Q9. (B)	Q10. (D)
Q11. (C)	Q12. (A)	Q13. (A)	Q14. (B)	Q15. (B)
Q16. (D)	Q17. (C)	Q18. (A)	Q19. (C)	Q20. (C)
Q21. (D)	Q22. (C)	Q23. (C)	Q24. (A)	Q25. (B)
Q26. (C)	Q27. (C)	Q28. (B)	Q29. (C)	Q30. (C)
Q31. (B)	Q32. (C)	Q33. (D)	Q34. (D)	Q35. (B)
Q36. (D)	Q37. (A)	Q38. (C)	Q39. (A)	Q40. (A)
Q41. (B)	Q42. (C)	Q43. (B)	Q44. (B)	Q45. (D)
Q46. (C)	Q47. (B)	Q48. (A)	Q49. (A)	Q50. (B)
Q51. (C)	Q52. (B)	Q53. (D)	Q54. (C)	Q55. (A)
Q56. (B)	Q57. (C)	Q58. (D)	Q59. (B)	Q60. (C)
Q61. (A)	Q62. (C)	Q63. (A)	Q64. (D)	Q65. (A)
Q66. (A)	Q67. (D)	Q68. (B)	Q69. (D)	Q70. (B)
Q71. (D)	Q72. (A)	Q73. (C)	Q74. (D)	Q75. (A)
Q76. (A)	Q77. (C)	Q78. (D)	Q79. (D)	Q80. (C)
Q81. (C)	Q82. (B)	Q83. (C)	Q84. (C)	Q85. (A)
Q86. (B)	Q87. (B)	Q88. (A)	Q89. (C)	Q90. (B)
Q91. (C)	Q92. (B)	Q93. (A)	Q94. (B)	Q95. (B)
Q96. (D)	Q97. (B)	Q98. (D)	Q99. (B)	Q100.(D)
Q101.(C)	Q102.(B)	Q103.(D)	Q104.(C)	Q105.(C)

Q106.(B)	**Q107.(B)**	**Q108.(C)**	**Q109.(A)**	**Q110.(B)**
Q111.(A)	**Q112.(B)**	**Q113.(C)**	**Q114.(A)**	**Q115.(D)**
Q116.(A)	**Q117.(B)**	**Q118.(D)**	**Q119.(D)**	**Q120.(D)**
Q121.(D)	**Q122.(A)**	**Q123.(B)**	**Q124.(A)**	**Q125.(D)**
Q126.(A)	**Q127.(B)**	**Q128.(B)**	**Q129.(A)**	**Q130.(A)**

Solutions

Q1. Solution

Correct Answer: (B)



$$\begin{aligned} i_g \times G &= (i - i_g) \times S \\ S &= \frac{0.1}{0.9} \times G \quad \{i_g = 0.1i\} \\ S &= \frac{1}{9} \times 9 = 1\Omega \end{aligned}$$

Q2. Solution

Correct Answer: (B)

The speed of satellite is called orbital speed

$$v_0 = \sqrt{\frac{GM_e}{R_e}} \Rightarrow v \propto \frac{1}{\sqrt{R}} \Rightarrow \frac{v_B}{v_A} = \sqrt{\frac{R_A}{R_B}}$$

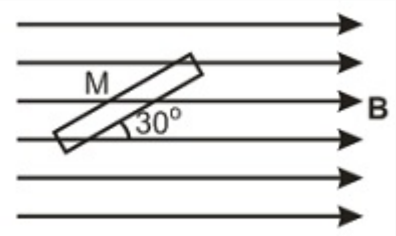
$$\frac{v_B}{3v} = \sqrt{\frac{4R}{R}} \Rightarrow v_B = 6v$$

Q3. Solution

Correct Answer: (A)

Given, uniform magnetic field

B = 0.25 T



The magnitude of torque $\tau = 4.5 \times 10^{-2}\mathrm{J}$

Angle between magnetic moment and magnetic field $\theta = 30^{\circ}$

Torque experienced on a magnet placed in external magnetic field

$\tau = \mathrm{M} \times \mathrm{B}$

$\tau = \mathrm{MB}\sin\theta \ \left(\because\ \mathrm{A} \times \mathrm{B} = \mathrm{AB}\sin\theta\right)$

$4.5 \text{ x } 10^{-2} = \mathrm{M} \text{ x } 0.25 \text{ x } \sin 30^{\circ}$

$\mathrm{M} = \frac{4.5\times10^{-2}}{0.25\times\sin 30^{\circ}}$

$= \frac{4.5\times10^{-2}\times2}{0.25\times1} \ \left(\because\ \sin 30^{\circ} = \frac{1}{2}\right)$

= 0.36 J/T.

Q4. Solution

Correct Answer: (A)

From kinetic theory of gases

$\mathrm{P} = \frac{1}{3}\frac{\mathrm{M}}{\mathrm{V}} \times \mathrm{V}_{\mathrm{rms}}^{2}$

Since, P and V are constant (same)

$\therefore\ \mathrm{M}_1\mathrm{V}_{\mathrm{rms}\,1}^{2} = \mathrm{M}_2\mathrm{V}_{\mathrm{rms}\,2}^{2}$

$\Rightarrow \frac{\mathrm{V}_{\mathrm{rms}\,1}^{2}}{\mathrm{V}_{\mathrm{rms}\,2}^{2}} = \frac{\mathrm{M}_2}{\mathrm{M}_1}$

$\Rightarrow \frac{\mathrm{V}_{\mathrm{rms}\,1}}{\mathrm{V}_{\mathrm{rms}\,2}} = \sqrt{\frac{\mathrm{M}_2}{\mathrm{M}_1}} = \sqrt{4/1} = 2 \quad \left[\text{given, } \frac{\mathrm{M}_1}{\mathrm{M}_2} = \frac{1}{4}\right]$

Q5. Solution

Correct Answer: (B)

Since, the table is frictionless, i.e., it is smooth, therefore, force on the block is given by

$F = (m_1 + m_2 + m_3)a$

$\Rightarrow \quad a = \frac{F}{m_1+m_2+m_3}$

$\Rightarrow \quad a = \frac{40}{10+6+4} = \frac{40}{20} = 2\ \mathrm{m\ s}^{-2}$

Now, the tension between 10 kg and 6 kg masses is given by

$T_2 = (m_2 + m_3)a$

$= (4 + 6)2 = 10 \times 2$

$T_2 = 20\ \mathrm{N}$

Q6. Solution

Correct Answer: (D)

In the presence of thin glass plate, the fringe width pattern shifts, but no change in fringe width. It is because of the uniform path difference that gets introduced by adding a glass plate.

Q7. Solution

Correct Answer: (C)

The surface area of the liquid drop is $A = 4\pi R^2$

Its surface energy is E

When the drop splits in 512 droplets, the surface area of each droplet is $4\pi r^2$

$\therefore$ Total surface area $A_2 = 512 \times 4\pi r^2$

The volume of the bigger drop is $\frac{4}{3}\pi R^3$ and the volume of small droplets is $512 \times \frac{4}{3}\pi r^3$

$\therefore \quad \frac{4}{3}\pi R^3 = 512 \times \frac{4}{3}\pi r^3 \Rightarrow r = \frac{R}{8}$

$\therefore \quad A_2 = 512 \times 4\pi r^2 = 512 \times 4\pi\left(\frac{R}{8}\right)^2 = 8A_1$

Surface energy $E = A.T$ (T is surface tension and A is area)

$\therefore \quad \frac{E_n}{E_0} = \frac{A_2 \cdot T}{A_1 \cdot T} = \frac{8 \cdot A_1}{A_1} = 8$

$\therefore \quad E_n = 8E$

Q8. Solution

Correct Answer: (D)

As we known that, the velocity of a body is given by the slope of displacement - time graph. So initially slope of the graph is positive and after sometimes, it becomes zero and then will be negative.

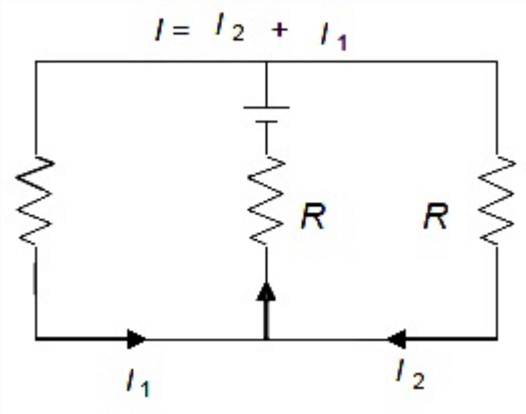
Q9. Solution

Correct Answer: (B)

A moving conductor is equivalent to battery of emf

$= vBl$ (motion emf)

Equivalent circuit



$I = I_2 + I_2$

Applying Kirchhoff's law

$I_1 R + IR - vBl = 0 \qquad \ldots$(i)

$I_2 R + IR - vBl = 0$ ...(ii)

Adding Eqs. (i) and (ii), we get

$2IR + IR = 2vBl$

$I = \frac{2vBl}{3R}$

$I_1 = I_2 = \frac{vBl}{3R}$ ~

Q10. Solution

Correct Answer: (D)

$.\mathrm{V}_{\mathrm{R}}^2 + \left(\mathrm{V}_{\mathrm{L}} - \mathrm{V}_{\mathrm{C}}\right)^2 = \mathrm{E}_{\mathrm{rms}}^2$

$(\mathrm{V}_{\mathrm{L}} - \mathrm{V}_{\mathrm{C}})^2 = (500)^2 - (400)^2$

$\mathrm{V}_{\mathrm{L}} - \mathrm{V}_{\mathrm{C}} = \sqrt{(500)^2 - (400)^2} = 300$

$\mathrm{V}_{\mathrm{C}} = \mathrm{V}_{\mathrm{L}} - 300 = 700 - 300 = 400$

$\therefore \quad \mathrm{V}_{\mathrm{C}}(\mathrm{peak}) = \sqrt{2}\mathrm{V}_{\mathrm{c}} = \sqrt{2} \times 400$ volts ,

Q11. Solution

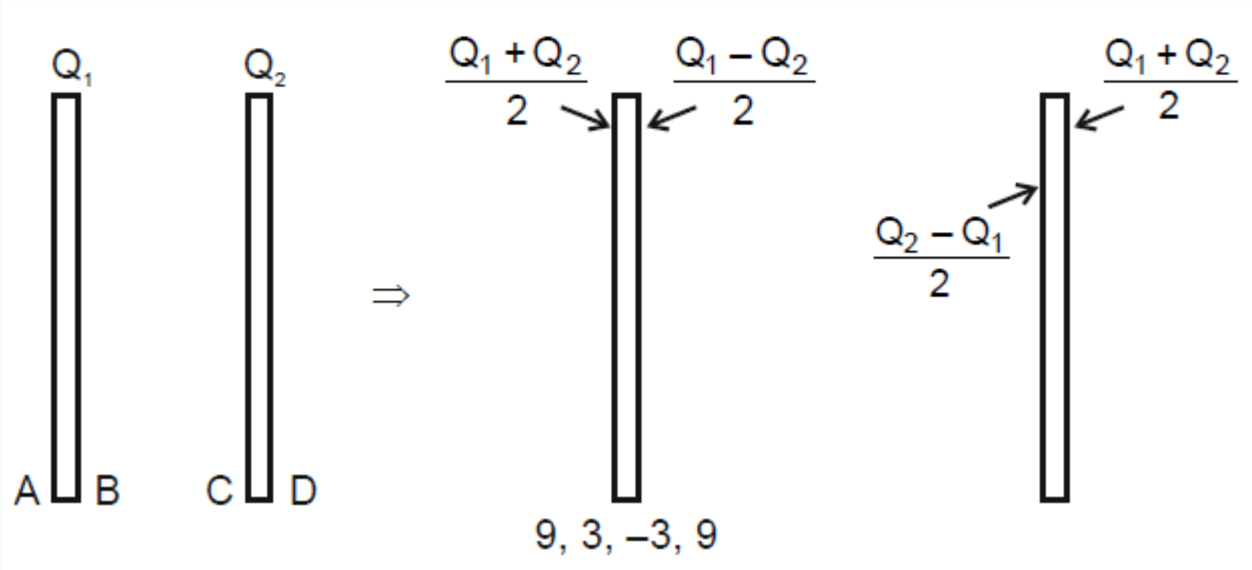
Correct Answer: (C)

Efficiency, $\eta = 1 - \frac{T_2}{T_1} = 1 - \frac{500}{800}$

$= \frac{3}{8} = 0.375$

Q12. Solution

Correct Answer: (A)

Hint : 

Q13. Solution

Correct Answer: (A)

Current in toroidal solenoid increases uniformly from 0 to 6.0 A in 3.0 μs.

Magnitude of self-induced emf is given by

$|\varepsilon| = L\left|\frac{di}{dt}\right|$ [Symbols have usual meanings]

$= \left(40 \times 10^{-6}\right)\left(\frac{6-0}{3.0\times10^{-6}}\right) = 80$ V ,

Q14. Solution

Correct Answer: (B)

According to Einstein photelectric equation

$K.E = \frac{hc}{\lambda} - \phi$

$\frac{hc}{\lambda_1} = KE_1 + \phi$ .... (i) (for λ_1)

$\frac{hc}{\lambda_2} = KE_2 + \phi$ .... (ii) (for λ_2)

Let $\lambda_1 = \lambda$ and $\lambda_2 = \frac{\lambda_1}{2} = \frac{\lambda}{2}$

From Eqs. (i) and (ii),

$\frac{KE_2}{KE_1} = \frac{\frac{hc}{\lambda_2}-\phi}{\frac{hc}{\lambda_1}-\phi} = \frac{\frac{hc}{\frac{\lambda}{2}}-\phi}{\frac{hc}{\lambda}-\phi} = \frac{\frac{2hc}{\lambda}-\phi}{\frac{hc}{\lambda}-\phi}$

$= \frac{\frac{hc}{\lambda}-\phi}{\frac{hc}{\lambda}-\phi} + \frac{\frac{hc}{\lambda}}{\frac{hc}{\lambda}-\phi}$

$\because \frac{\frac{hc}{\lambda}}{\frac{hc}{\lambda}-\phi} > 1$

$\therefore \frac{KE_2}{KE_1} = 1 + (>1) > 2$

Thus, $KE_1 < \frac{KE_2}{2}$ ~

Q15. Solution

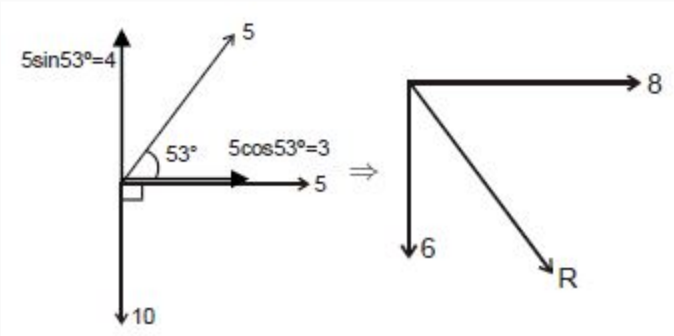
Correct Answer: (B)

$x_1 = 5\sin\ \omega t$

$x_2 = 5\sin(\omega t + 53^\circ)$

$x_3 = -10\cos\omega t$

we can write $x_3 = 10\sin(\omega t - 90^\circ)$ Finding the resultant amplitude by vector notation.



Resultant Amplitude $\left|R\right| = \sqrt{8^2 + 6^2} = 10.$

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Q16. Solution

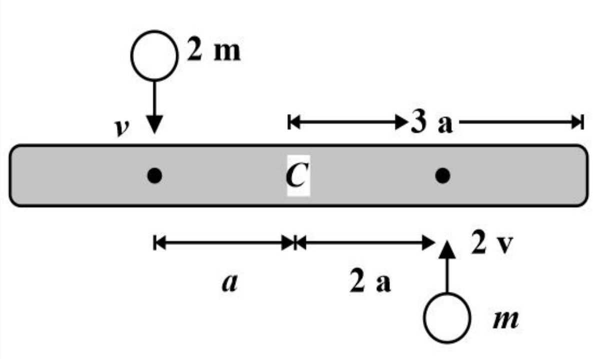
Correct Answer: (D)

$A(q_1) \rightarrow (2,-1,3)$
$B(q_2) \rightarrow (0,0,0)$
$\overrightarrow{F}_{BA} = \frac{kq_Aq_B}{\overrightarrow{r_B}-\overrightarrow{r_A}\ ^3}\left(\overrightarrow{r_B}-\overrightarrow{r_A}\right)$

$\overrightarrow{r_A} = 2\hat{i}-\hat{j} + 3\widehat{k};\ \overrightarrow{r_B} = 0$
Putting all the values in the formula,
We get $\overrightarrow{F}_{BA} = \frac{q_1q_2}{56\sqrt{14}\ \pi\varepsilon_0}\left(-2\hat{i} + \hat{j}-3\widehat{k}\right)$.

Q17. Solution

Correct Answer: (C)



From conservation of angular momentum about point C

$L_{\text{initial}(2m)} + L_{\text{initial}(m)} = L_{\text{final(system)}}$

$m(2v)\ (2a) + 2m(v)(a) = \left[\frac{1}{12}(8m)(6a)^2 + m(2a)^2 + 2m(a)^2\right]\omega$

$6\ mva = 30\ ma^2\omega$

$\omega = \frac{v}{5a}$ ^

Q18. Solution

Correct Answer: (A)

For deviation without dispersion

$(\mu_{V_1} - \mu_{r_1})\alpha_1 = (\mu_{V_2} - \mu_{r_{12}})\alpha_2$

or $\alpha_2 = \frac{(1.523-1.513)}{(1.665-1.645)} 6^\circ$

$\alpha = 3^\circ$ ^

Q19. Solution

Correct Answer: (C)

$E = 3 \times 10^4 NC^{-1}$

Here $p = 6 \times 10^{-30} Cm$ We have, torque acting on a dipole $\Gamma = pE\sin\theta$ The maximum value of Γ, i.e.

$\Gamma_{max} = ?$

$\Gamma_{max} = pE$ $\therefore \Gamma_{max} = \left(3 \times 10^4 \times 6 \times 10^{-30}\right) Nm$!

$= 18 \times 10^{-26} Nm$

Q20. Solution
Correct Answer: (C)

In Zener diode,
$\Rightarrow \frac{V_{max}-V_Z}{R_1} \geq I_{knee} + I_R$

R_1 is the series resistance of $50\ \Omega$ and I_R is the current through the resistance R
$\Rightarrow \frac{10-6}{50} \geq 5m + I_R$
$\Rightarrow I_R \leq 80\ mA - 5\ mA$
$\because (I_R)_{max} = 75\ mA$ (the maximum current through R)

So the minimum value of the resistance R is
$R_{min} = \frac{V}{(I_R)_{max}} = \frac{6\ V}{75\ mA} = \frac{6000}{75} = 80\ \Omega$

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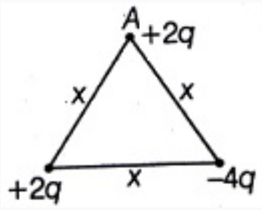
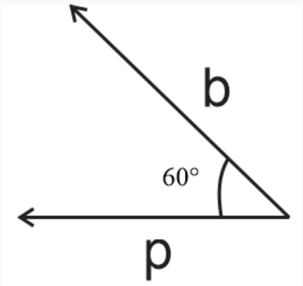
Q21. Solution
Correct Answer: (D)

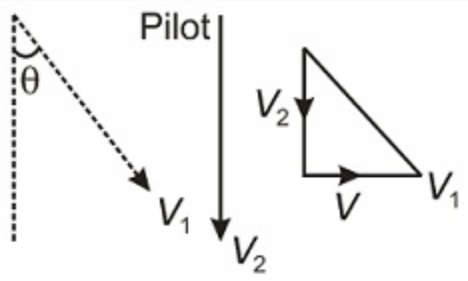
According to the equation of magnitude of the electric dipole moment





$P_{net} = \sqrt{p^2 + p^2 + 2p\,p\cos 60^o}$
$= \sqrt{2p^2 + 2p^2 \times \frac{1}{2}}$
$= \sqrt{3} \cdot p$
We know that, $p = 2\,q \cdot x\ [\because p = q \cdot]$
$= \sqrt{3} \cdot 2\,qx = 2\sqrt{3}\,qx$

Q22. Solution
Correct Answer: (C)



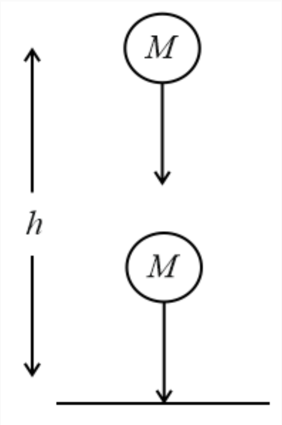
we can see from the diagram, vector v_1 is resultant of two vectors v and v_2

Hence $v^2 + v_2^2 = v_1^2$
$\Rightarrow v = \sqrt{v_1^2 - v_2^2}$

Q23. Solution
Correct Answer: (C)

$E_n = -13.6\,\frac{z^2}{n^2}$
$\Delta E = E_4 - E_2$
$=$ - 13.6 $z^2\left[\frac{1}{16} - \frac{1}{4}\right]$
$= -13.6 \times \frac{1-4}{16} \quad = \frac{13.6\times3}{16}$
$= 2.55\,\mathrm{eV}$

Q24. Solution
Correct Answer: (A)



kinetic energy of the ball on reaching ground
$KE_1 = mgh + \frac{1}{2}mv_0^2$
after collision $\frac{KE_1}{2} = mgh$
$\frac{mgh+\frac{1}{2}mv_0^2}{2} = mgh$
$v_0 = \sqrt{2gh} = 20\,\mathrm{m\ s}^{-1}$

Q25. Solution

Correct Answer: (B)

Given $E = 3\ \text{eV} = 3 \times 1.6 \times 10^{-19}\ \text{J}$

We know that $\lambda = \frac{h}{\sqrt{2mE}}$

$= \frac{6.6 \times 10^{-34}}{\sqrt{2 \times 1.7 \times 10^{-27} \times 3 \times 1.6 \times 10^{-19}}} = 1.65 \times 10^{-11}\ \text{m}$

Q26. Solution

Correct Answer: (C)

According to the law of conservation of energy,

The kinetic energy of $\alpha-$ particle = Potential energy of alpha $\alpha-$particle at a distance of closest approach.

$\Rightarrow \quad \frac{1}{2} m v^2 = \frac{1}{4\pi\varepsilon_0} \frac{q_1 q_2}{r}$

$\Rightarrow \quad 5\ \text{MeV} = \frac{9 \times 10^9 (2e)(92e)}{r}$

$r = 5.3 \times 10^{-14}\ \text{m}$

Q27. Solution

Correct Answer: (C)

At P there are two fields

(1) Due to $\mathrm{A} = \mathrm{E_A} = \frac{\mathrm{kq}}{\mathrm{r}^2}$

(2) Due to $\mathrm{B} = \mathrm{E_B} = \frac{\mathrm{kq}}{\mathrm{r}^2}$

$\mathrm{r} = (\mathrm{a}^2 + \mathrm{d}^2)^{1/2}$ at angle $180 - 2\theta$

$\mathrm{E_{net}} = 2\mathrm{E_A} \cos \frac{1}{2} (180 - 2\theta) = 2\mathrm{E_A} \cos(90 - \theta)$

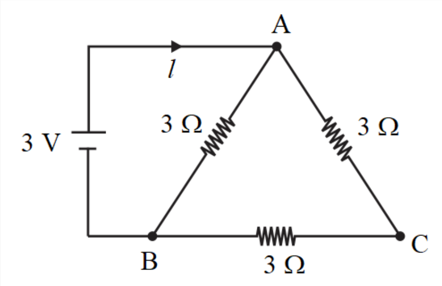
$= 2\mathrm{E_A} \sin\theta = \frac{2\mathrm{kq}}{\mathrm{r}^2} \frac{\mathrm{d}}{(\mathrm{r})}$

$= \frac{2\mathrm{kqd}}{(\mathrm{a}^2 + \mathrm{d}^2)^{3/2}}$ in $-\mathrm{z}$ direction.

Q28. Solution

Correct Answer: (B)

Resistance in the arms AC and BC are in series,



$\therefore \quad R' = 3 + 3 = 6\ \Omega$

Now, R' and $3\ \Omega$ are in parallel,

$\therefore \quad R_{eq} = \frac{6\times3}{6+3} = 2\ \Omega$

Now, V=IR

$\implies \quad I = \frac{3}{2} = 1.5\ A$

Q29. Solution

Correct Answer: (C)

At x distance from end

$\text{Velocity in string} = \sqrt{\frac{\text{Tension}}{\text{Mass per unit length}}}$

$v = \sqrt{\frac{T}{\mu}}$

$v = \sqrt{\frac{\mu x g}{\mu}}$

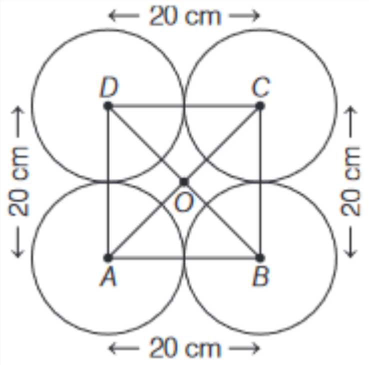
$v = \sqrt{xg}$

$v \propto \sqrt{x}$

Q30. Solution

Correct Answer: (C)

The given situation is shown in the figure,



$AB = BC = CD = DA = 20$ cm Since, all spheres are identical with mass 1 kg and radius 10 cm each, hence according to figure, it is clear that all spheres are symmetrically arranged, hence centre of mass will be at intersection point of diagonals of square $ABCD$.

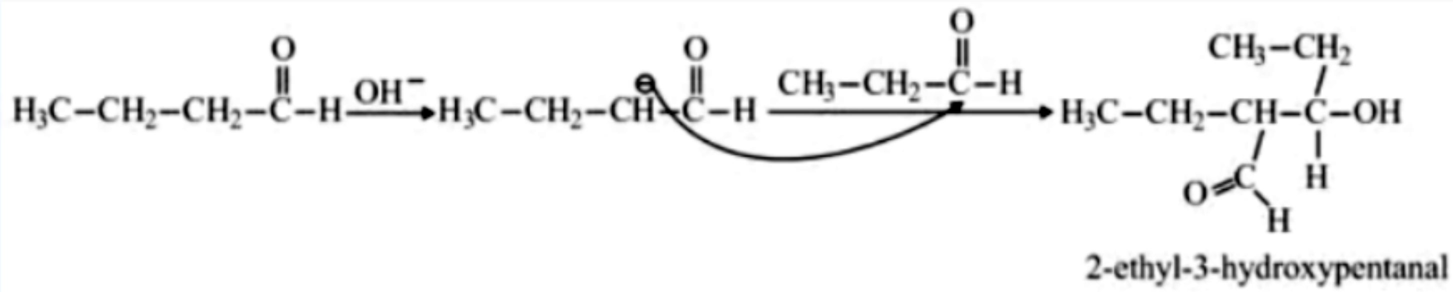
$$\therefore \quad AC = \sqrt{20^2 + 20^2} = 20\sqrt{2} \text{ cm}$$

$$\therefore \quad AO = BO = CO = DO = \frac{20\sqrt{2}}{2} = 10\sqrt{2} \text{ cm}$$

Q31. Solution

Correct Answer: (B)

Both the carbonyl compounds are aldehyde group have an equal chance to lose $\alpha - \mathrm{H}$ and forms carbanion. When Butanal acts as carbanion (nucleophile) and propanal acts as carbanion acceptor (electrophile).



Q32. Solution

Correct Answer: (C)

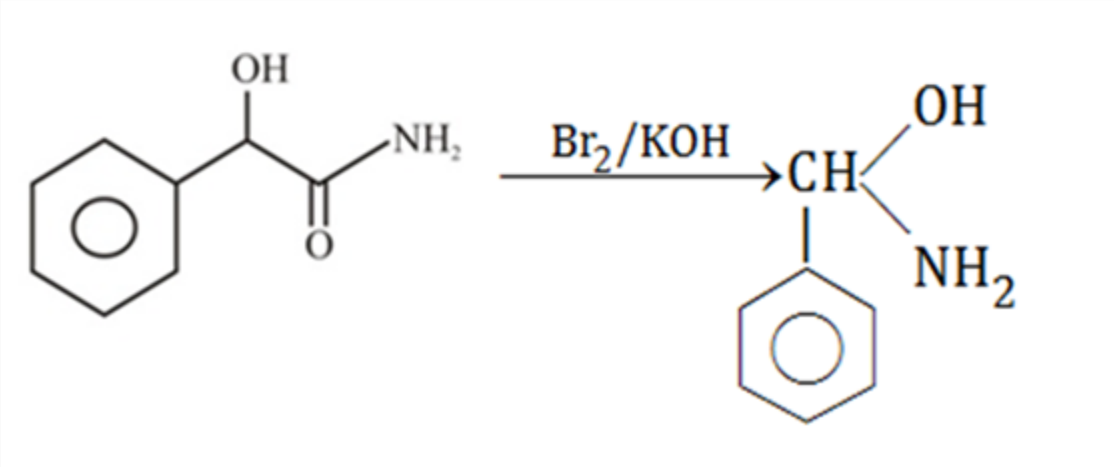
$\mathrm{C_2H_5ONa + IC_2H_5 \rightarrow C_2H_5OC_2H_5 + NaI}$.

This reaction is known as Williamson's synthesis.

Q33. Solution

Correct Answer: (D)

Here the product is formed as follows

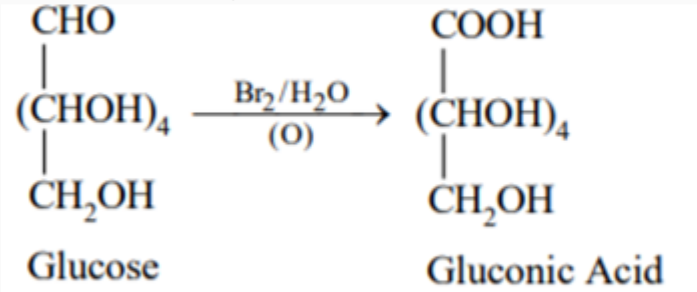


Q34. Solution

Correct Answer: (D)

D-Glucose and D-Fructose can be differentiated by Br_2/H_2O .

D-Glucose $\xrightarrow{Br_2}$ D-gluconic acid.



Q35. Solution

Correct Answer: (B)

Acidity order $\alpha-$ I effect. $-$I power deceases with distance.

Q36. Solution

Correct Answer: (D)

$N_2 + 3H_2 \rightleftharpoons 2NH_3$

$K_1 = \frac{[NH_3]^2}{[N_2][H_2]^3} \ldots (i)$

$N_2{+}O_2 \rightleftharpoons 2NO; K_2 = \frac{[NO]^2}{[N_2][O_2]} \ldots (ii)$

$H_2 + 1/2O_2 \rightleftharpoons H_2O; K_3 = \frac{[H_2O]}{[H_2][O_2]^{1/2}} \ldots (iii)$

For the reaction, $2NH_3 + \frac{5}{2}O_2 \rightleftharpoons 2NO + 3H_2O$

$K = \frac{[NO]^2[H_2O]^3}{[NH_3]^2\ [O_2]^{5/2}}$

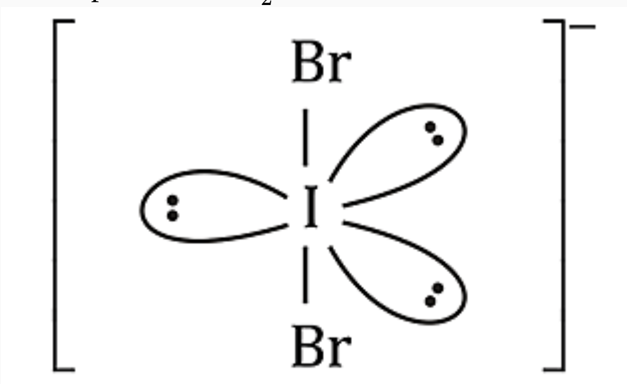
$= \frac{[NO]^2}{[N_2]\ [O_2]} \times \frac{[H_2O]^3}{[H_2]^3[O_2]^{3/2}} \times \frac{[N_2]\ [H_2]^3}{[NH_3]^2}$

$= \frac{K_2 \times K_3^3}{K_1}$

Q37. Solution

Correct Answer: (A)

the shape of the IBr_2^- ion is Linaer



IBr : $X = 2 + \frac{1}{2}[7{-}2{+}1]$=(2σ bonds + 3 lone pairs) sp^3d -hybridisation shape → Linear.

Q38. Solution

Correct Answer: (C)

$\ln\left(\frac{k_2}{k_1}\right) = \frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

$\ln(4) = \frac{E_a}{R}\left(\frac{1}{300} - \frac{1}{310}\right)$

$2 \times 0.693 = \frac{E_a}{R}\left(\frac{10}{300 \times 310}\right)$

$E_a = \frac{2 \times 0.693 \times 300 \times 310 \times 8.314}{10} = 107.2\ kJ/mol$

Q39. Solution

Correct Answer: (A)

Noradrenaline is a neurotransmitter and it belongs to catecholamine family that functions in brain and body as a hormone and neurotransmitter.

Q40. Solution
Correct Answer: (A)

As size $\propto \frac{\mathrm{e}}{\mathrm{p}}$ ratio for ions.
Size of anion > size of atom > size of cation
$\mathrm{H}^{-} > \mathrm{H} > \mathrm{H}^{+}$
In case of $\mathrm{F}^{-}, \mathrm{O}^{-2}, \mathrm{Na}^{+}$
radii order is $\mathrm{O}^{-2} > \mathrm{F}^{-} > \mathrm{Na}^{+}$
correct order for $\mathrm{Al}^{+3}, \mathrm{Mg}^{+2}, \mathrm{N}^{-3}$ *is* $\mathrm{N}^{-3} > \mathrm{Mg}^{+} > \mathrm{Al}^{+3}$

Q41. Solution
Correct Answer: (B)

- Magnetic moment: $\begin{array}{ll} \mu_{[\mathrm{Fe(H_2O)_6}]^{2+}} = 4.9\mathrm{BM} & (\text{High spin, 4 unpaired electrons}) \\ \mu_{[\mathrm{Fe(CN)_6}]^{4-}} = 0BM & (\text{Low spin, 0 unpaired electrons}) \end{array}$ - Colour difference: - Due to different d-d transitions caused by the ligand field strength.

Q42. Solution
Correct Answer: (C)

In general, the ligands can be arranged in a series in the order of increasing field strength as
$\mathrm{I}^{-} < \mathrm{Br}^{-} < \mathrm{SCN}^{-} < \mathrm{Cl}^{-} < \mathrm{S}^{2-} < \mathrm{F}^{-} < \mathrm{OH}^{-} < \mathrm{C_2O_4^{2-}} < \mathrm{H_2O} < \mathrm{NCS}^{-} < \mathrm{EDTA}^{4-} < \mathrm{NH_3} < \mathrm{en} < \mathrm{NO_2^{-}}$

Q43. Solution
Correct Answer: (B)

Given,
$\mathrm{Zn}^{2+} + 2\mathrm{e}^{-} \rightarrow \mathrm{Zn}, \quad \mathrm{E}^{\circ} = -0.76\ \mathrm{V}$
$\mathrm{Cu}^{2+} + 2\mathrm{e}^{-} \rightarrow \mathrm{Cu}, \quad \mathrm{E}^{\circ} = 0.34\ \mathrm{V}$
$\mathrm{Ag}^{+} + \mathrm{e}^{-} \rightarrow \mathrm{Ag}, \quad \mathrm{E}^{\circ} = 0.8\ \mathrm{V}$
Cell reaction of (I) is
$\mathrm{Zn} + \mathrm{Cu}^{2+} \rightarrow \mathrm{Zn}^{2+} + \mathrm{Cu}$
$\mathrm{E}^{\mathrm{o}}_{\mathrm{cell}} = \mathrm{E}^{\mathrm{o}}_{\mathrm{red}}(\text{cathode}) - \mathrm{E}^{\mathrm{o}}_{\mathrm{red}}(\text{anode})$
$= 0.34 - (-0.76)$
$= 1.10\ \mathrm{V}$
Cell reaction of (II) is
$\mathrm{Zn} + 2\mathrm{Ag}^{+} \rightarrow \mathrm{Zn}^{2+} + 2\mathrm{Ag}$
$\mathrm{E}^{o}_{\mathrm{Cell}} = +0.80 - (-0.76) = +1.56\ \mathrm{V}$
Cell reaction of (III) is
$\mathrm{Cu} + 2\mathrm{Ag}^{+} \rightarrow \mathrm{Cu}^{2+} + 2\mathrm{Ag}$
$\mathrm{E}^{o}_{\mathrm{Cell}} = +0.80 - (0.34) = +0.46\ \mathrm{V}$
So, the correct order of $\mathrm{E}_{\mathrm{cell}}$ of these cell is
II > I > III.

Q44. Solution
Correct Answer: (B)

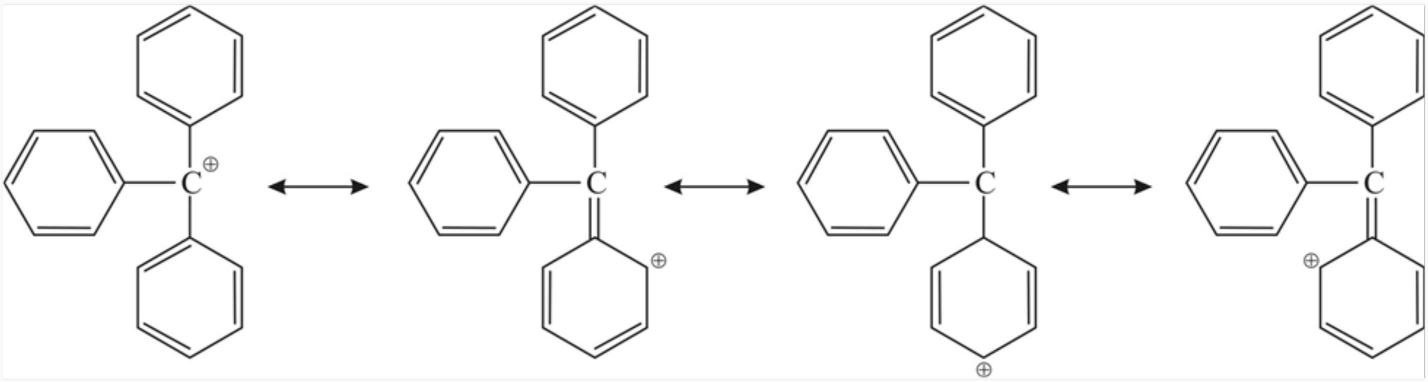
$CuSO_4 + Fe \rightarrow Cu + FeSO_4$
Oxidation potential of Fe is greater than Cu .

Q45. Solution
Correct Answer: (D)

- Reaction: $CH_4 + 4O_3 \rightarrow CO_2 + 2H_2O + 4O_2$ - Correct Products: CO_2 and H_2O

Q46. Solution
Correct Answer: (C)

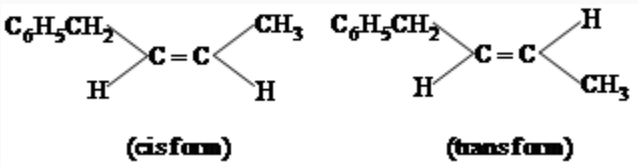
Resonance effect (+ M effect) are always more stabilizing than the inductive effects (+I effect), because +M groups neutralize the +ve charge on the carbon atom more effectively than the +I groups.
Triphenyl carbocation in the most stable in this series, because its +ve charge is dispersed by resonance (+M effect of $-C_6H_5$ group).



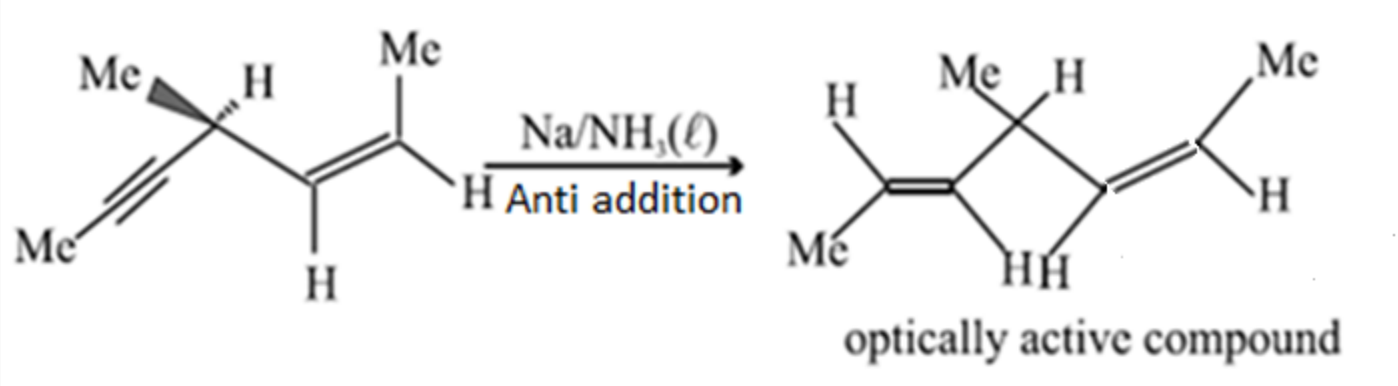
The correct order of stability is
1 < 2 < 3 < 4

Q47. Solution
Correct Answer: (B)

$C_6H_5CH_2 - CH = CH - CH_3$ (1-phenyl-2-butene) Exhibits the phenomenon of geometrical isomerism due to $C_{ab} = C_{ad}$ structure, so its two isomers are possible which are given as follow.



Q48. Solution
Correct Answer: (A)



Q49. Solution
Correct Answer: (A)

$Ag_2CrO_4 \rightleftharpoons 2Ag^+ + CrO_4^{2-}$; $K_{sp} = 1.1 \times 10^{-12}$
S 2S S

$K_{sp} = [Ag^+]^2 \cdot [CrO_4^{2-}]$

$K_{sp} = [2S]^2 \cdot [S] = 4S^3$

$S^3 = \frac{K_{sp}}{4} = \frac{1.1 \times 10^{-12}}{4}$

$\Longrightarrow S = 6.53 \times 10^{-5}$

Q50. Solution
Correct Answer: (B)

The dissociation of dihydrogen into its atoms is only ~0.081% around 2000 K.

Q51. Solution
Correct Answer: (C)

In the hydrides of group 15 and group 16 (except NH_3 and H_2O) the energy difference between 3s and 3p orbital's is quite high. Hybridization increases the energy of 3s orbital so much that lone pair rather prefers to occupy unhybridized s orbital. For example, in PH_3 , $600 kJmol^{-1}$ of energy is required to hybridize the central atom. So, to avoid such energy demanding hybridization P forms bonds with unhybridized p orbitals leaving the lone pair in the spherical s orbital which leads to a bond angle close to 90° .

Q52. Solution
Correct Answer: (B)

The polymer formed by the condensation polymerisation is known as condensation polymer. Decron (Terylene) is a condensation polymer. It is formed by the condensation polymerisation of terephthalic acid and ethylene glycol.

Q53. Solution
Correct Answer: (D)

In Frenkel defect, smaller ion displaces from its actual lattice site into the interstitial sites.

Q54. Solution
Correct Answer: (C)

Metal carbides on reaction with $\mathrm{H_2O}$ form $\mathrm{CH_4}$

$\mathrm{Be_2C + H_2O \longrightarrow Be(OH)_2 + CH_4}$

Q55. Solution
Correct Answer: (A)

$\mathrm{i\ for\ KCl = 2,\ i\ for\ for\ CaCl_2 = 3}$
$\Delta \mathrm{T_f} \propto \mathrm{i}$
$\frac{\Delta \mathrm{T_f(KCl)}}{\Delta \mathrm{T_f(CaCl_2)}} = \frac{2}{3}$
$\Delta \mathrm{T_f(CaCl_2)} = \frac{3}{2} \times 2 = 3^\circ\mathrm{C}$
Freezing point of $\mathrm{CaCl_2} = -3^\circ\mathrm{C}$

Q56. Solution
Correct Answer: (B)

$\mathrm{M\ eq.\ of\ conc.\ solution} = 1600 \times 0.2050 = 328$
Let the volume of the solution after dilution V mL
$\mathrm{M\ eq.\ of\ dil.\ solution} = 0.20 \times \mathrm{V}$
$\therefore \quad 328 = 0.20 \times \mathrm{V}$
($\because$ M eq. does not change on dilution)
$\mathrm{V} = 1640\ \mathrm{mL}$
Thus, volume of water used to prepare 1640 mL of 0.20 N solution
$= 1640 - 1600 = 40\ \mathrm{mL}$

Q57. Solution
Correct Answer: (C)

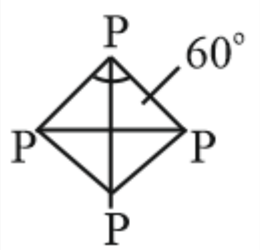
Tyndall effect is not observed in sugar solution because it is a true homogeneous solution. Colloidal solutions show Tyndall effect.

Q58. Solution
Correct Answer: (D)

$$P_1 = \frac{nRT}{V_1} = \frac{2 \times 0.0821 \times 243.6}{20} = 2 \text{ atm}$$
$$\Delta S = nR\ell n\left(\frac{P_1}{P_2}\right)$$
$$= 2 \times 2\ell n\ 2$$
$$= 2 \times 2 \times 0.693$$
$$[\because \ell n\ 2 \text{ or } \log_e 2 = 0.693]$$
$$= 2.77 \text{ cal/K}$$

Q59. Solution
Correct Answer: (B)

White phosphorus is highly reactive, due to angle strain bursting into flames when exposed to air, and is thus stored under water.



Q60. Solution
Correct Answer: (C)

'Neither' is used for two things. For more than two things, 'none' is used.

Q61. Solution
Correct Answer: (A)

Intensive properties are those that depend upon the nature of the substance.
The ratio of two extensive properties is an intensive property.

Q62. Solution
Correct Answer: (C)

The word "abstruse" means difficult to understand; obscure. "Esoteric" means intended for or likely to be understood by only a small number of people with specialized knowledge or interest. Both terms refer to something that is not easily comprehensible to the general population, making "esoteric" the correct synonym.

Q63. Solution

Correct Answer: (A)

"Whether" is correct because the question concerns a choice not a condition. With the expression "the number of' a singular verb is needed and hence "was" is correct. "Liable" is used in expressions such as "liable to prosecution" and not for expressions of possibility.

Q64. Solution

Correct Answer: (D)

The word "perfunctory" means (of an action or gesture) carried out with a minimum of effort or reflection. "Superficial" means existing or occurring at or on the surface; lacking in depth or thoroughness. Both words imply a lack of depth or thoroughness, making "superficial" the correct synonym.

Q65. Solution

Correct Answer: (A)

(1) is the right answer. The last line of the passage explains that this is a true statement. But it cannot be inferred from the passage that either of (2), (3) or (4) is true. Though the passage mentions that women buy smaller cars but it does not necessarily mean that sale of small cars is rising.

Q66. Solution

Correct Answer: (A)

Here is a concise reasoning for why (A) "sedate, reliable, less macho" is the best answer: 1. Reliability matters most. The passage explicitly states that women "put more store on reliability than men," and attributes the rise of Japanese imports partly to their reputation for reliability. 2. Sedate styling is favored. The contrast between the Thunderbird ("high performance," "styled to look aggressive") and its toned-down sibling the Cougar ("the same car with a more sedate body") shows that the "more sedate" version appeals more to women (and thus, overall, sells better). 3. 'Less macho' design is in. The passage repeatedly points out that "automacho is going out of style" and that designs appealing to women are "less aggressive" (i.e., less macho). While "cheaper" also gets mentioned in the text (women often buy less expensive models because of lower average incomes), the author's main emphasis for what sells-especially when carmakers tweak a model to be more woman-friendly-is on reliability and a toned-down (sedate, less macho) style. Hence option (A) aligns perfectly with these focal points from the passage.

Q67. Solution

Correct Answer: (D)

The appropriate word to be used in the blank is 'assured.' The term 'assured' is used to give positive expectation or guarantee. Here, the assurance of getting passed is inferred in the given sentence.

'Insured' means to be covered by insurance.
'Ensured' is used to make certain of providing or obtaining something.
'Assumed' means to accept something to be true without question or proof.

Q68. Solution
Correct Answer: (B)

'Spell' is a noun that refers to a continuous period of time. Example: A spell of intense mining took place in KGF. Here, the word 'spell' perfectly fits the blank.

Hence, the correct sentence is 'A spell of chilly cold weather is expected in the next few months'.

Q69. Solution
Correct Answer: (D)

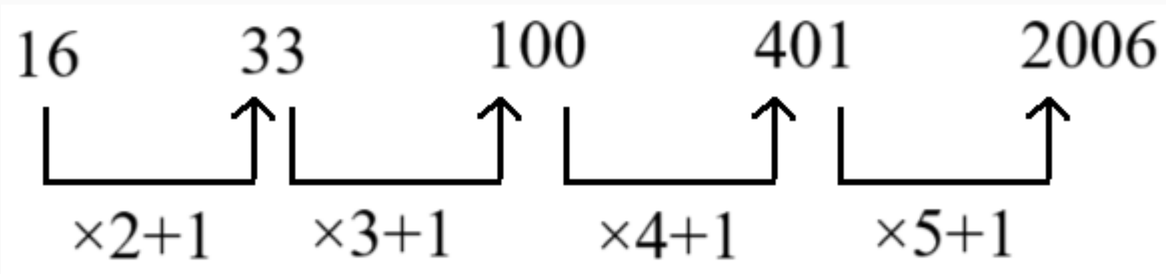
According to the given condition, we can rearrange the letters of the word 'TACLRAENOCIE' to form the word 'ACCELERATION' that means the rate of change of velocity or speed per unit of time.
This term is used in physics and the first letter of 'ACCELERATION' is 'A'.
Hence, 'A' is the correct answer.

Q70. Solution
Correct Answer: (B)

The correct sentence will be "not only that girl but also her friends come on every Sunday".
When the subjects are joined by 'either-or', 'neither-nor', 'not only-but also', etc, they are considered as different persons and the verb agrees with the nearer subject. This is known as the proximity rule. Here, 'her friends' is the nearer plural subject. So, the verb must agree with the person and number of the subject. So, it will be the plural verb, 'come'.

Q71. Solution
Correct Answer: (D)

The pattern followed here is:



Hence, '2006' is the correct answer.

Q72. Solution
Correct Answer: (A)

If you observe the pattern, then you can see $\begin{matrix} 2 \times 2.5 = 5 \\ 5 \times 2.5 = 12.5 \end{matrix}$ $12.5 \times 2.5 = 31.25$ $\begin{matrix} 31.25 \times 2.5 = 78.125 \\ 78.125 \times 2.5 = 195.3125 \end{matrix}$

Hence, the correct answer is 31.25

Q73. Solution

Correct Answer: (C)

Clearly, the answer is (3). In all other pairs, second is the working place of the first.

Q74. Solution

Correct Answer: (D)

In all the given letter groups except (D), we move one place in the forward direction to get the next letter, i.e. the letters in a group are related in the following manner -

$\mathrm{Z} + 1 = \mathrm{A}$ and $\mathrm{A} + 1 = \mathrm{B}$

Similarly,

$\mathrm{Y} + 1 = \mathrm{Z}$ and $\mathrm{Z} + 1 = \mathrm{A}$

$\mathrm{P} + 1 = \mathrm{Q}$ and $\mathrm{Q} + 1 = \mathrm{R}$

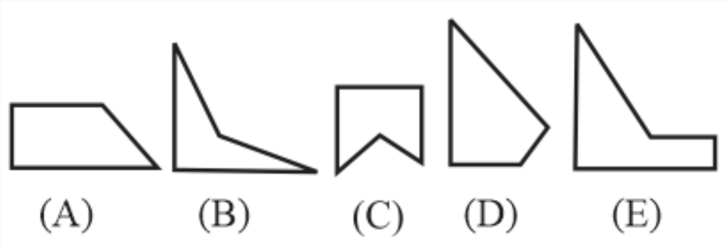
But, in the fourth option,

$\mathrm{Y} + 1 = \mathrm{Z}$ and $\mathrm{Z} + 2 = \mathrm{B}$

Option D is not following the same pattern and therefore, it is the odd one out.

Q75. Solution
Correct Answer: (A)

Given figures:

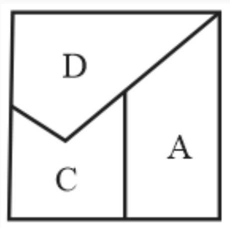


We observe from the above figure that if we rotate (A) to the left side, and put it in the frame at the right corner of the bottom of the frame.

Then, take (C) and rotate it 360°, and put it left side of (A).

Now take (D) and rotate it according to the shape which is left after the (A), (C).

So, the final result and square created by (A, C, D) is as follows,



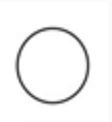
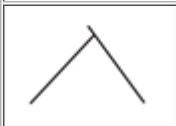
.
Hence, the correct answer is ACD.

Q76. Solution
Correct Answer: (A)

The upper element is converted to an element similar to the lower elements and each one of the lower elements is converted to an element similar to the upper element.

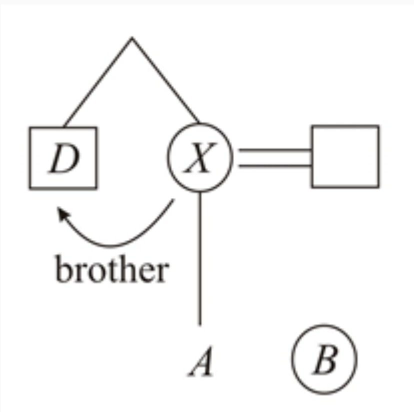
Q77. Solution
Correct Answer: (C)

Draw the family tree:

Symbol in diagram	Meaning
	Female
	Male
	Married couple
	siblings
	Difference of a generation

Let us take the information one by one accordingly:-

We can draw the family tree like:



As, D is the brother-in-law of B's father, D is the brother of B's mother. As, B is the sister of A and A is the child of X.

So, X is the mother of A. Thus D is the brother of X.

Hence, the correct answer will be option (C): Brother.

Q78. Solution
Correct Answer: (D)

D is father of A and grandfather of F. So, A is father of F. Thus. D and A are the two fathers. C is the sister of F So. C is the daughter of A. Since there is only one mother, it is evident that E is the wife of A and hence the mother of C and F. So, B is brother of A There are three brothers. So. F is the brother of C. Clearly, A is E's Husband.

Q79. Solution
Correct Answer: (D)

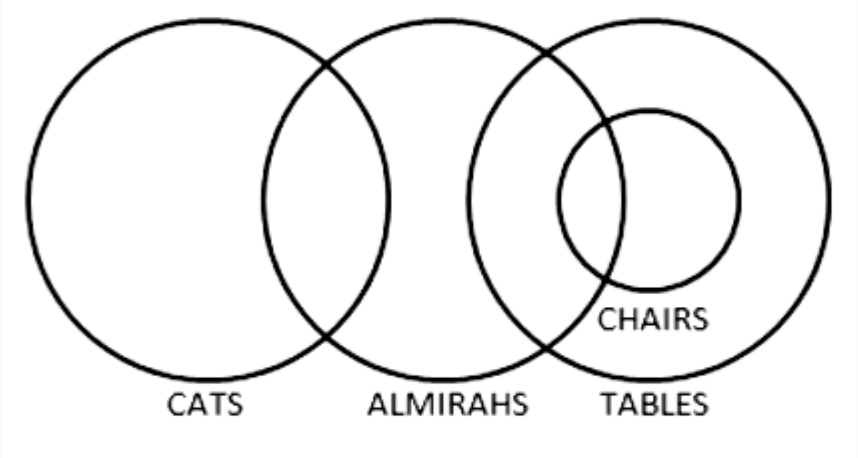
Required percentage $= \left[\frac{(840+1050+920+980+1020)}{(7500+9200+8450+9200+8800)} \times 100\right] = \left[\frac{4810}{43150} \times 100\right]\%$
$= 11.15\%$

Q80. Solution
Correct Answer: (C)

$$\left[\frac{(1020+1240)}{(8800+9500)} \times 100\right]6$$
Required percentage $\left[\frac{2260}{18300} \times 100\right]\%$
$= 12.35\%$

Q81. Solution
Correct Answer: (C)

The least possible logical Venn diagram according to given statements is,



Conclusion I: Certainly some almirahs are tables - True(as some almirahs are chairs and all chairs are tables).
Conclusion II: Some cats may not be chairs - True(It can be possible as shown above, but not a definite). Hence, Both Conclusion-I and Conclusion-II Follow.

Q82. Solution
Correct Answer: (B)

The logically consistent pairs for the statement, 'Drinking milk is sufficient for building strong bones' is 'If you drink milk, then you have strong bones'.

So, CB is a valid pair.

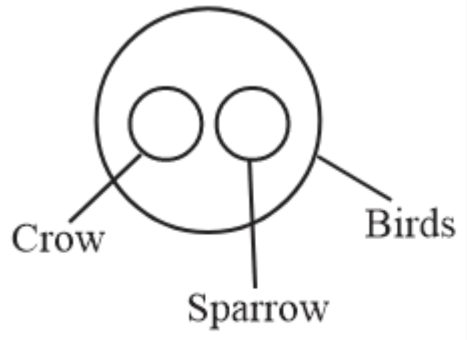
Q83. Solution
Correct Answer: (C)

All the given pieces are cut out from figure (C). The first piece will be fixed in the left upper corner of figure (C). The second piece will be fixed in the right upper corner of figure (C). The third piece will be fixed in the right bottom corner of figure (C). The fourth piece will be fixed in the left bottom corner of figure (C).

Thus, option (C) is correct.

Q84. Solution
Correct Answer: (C)

We know that the crow and sparrow are birds. So, they come inside the birds circle. Crow is not a sparrow. So they are drawn separately. Therefore, the required Venn diagram is:



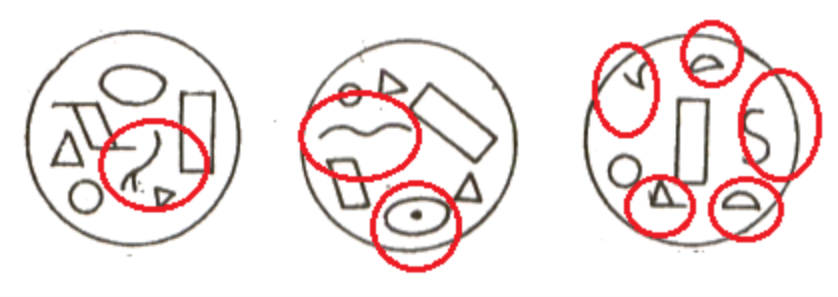
Hence, option C is the correct answer.

Q85. Solution

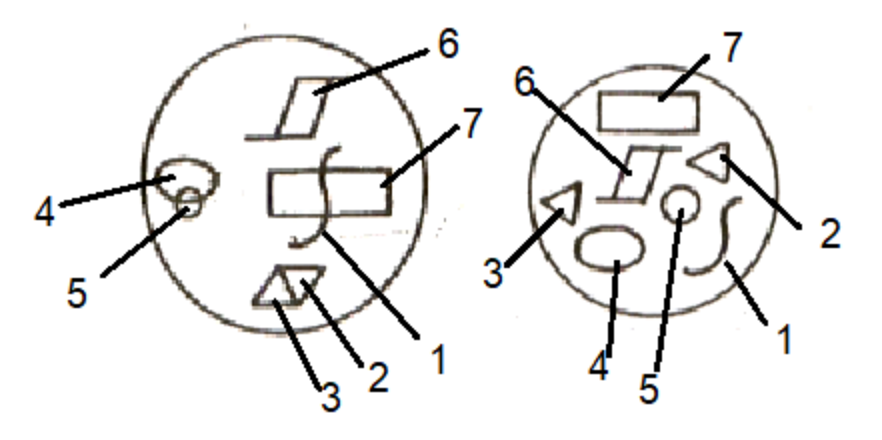
Correct Answer: (A)

In question figure, there are 7 elements of different shapes inside the given circle. To identify the correct option, the number of elements and shape should be same.

In options b , c and d, the elements and inside the given circle do not match the question figure.(as shown below)



In option a, the number of elements and shape are same as question figure. (As shown below)



Hence, the option 'a' is correct answer.

Q86. Solution
Correct Answer: (B)

Given that,

Year starts and ends with monday. Therefore, the next year starts with tuesday. Hence, the given year is a non leap year, because only in leap years the starting and ending days of the year are different.

A non leap year has usually 365 days. That is 52 weeks and 1 odd day.

$365 = 52 \times 7 + 1$

That one odd day will be a Monday, since the year has the starting and ending day as Monday. So, there will be 53 mondays in a year.

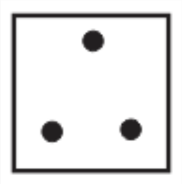
$\therefore$ The required answer is 53.

Q87. Solution
Correct Answer: (B)

We can see in the given matrix that each row or column of a matrix contains three different symbols in different boxes respectively. We can also see that each box contain similar symbols.

Now in option A and D, we can see that two different symbols are present in each box. Whereas option B and C contain similar symbols respectively. Now in the third row or column the second box contains triangles thus we can conclude that the third box will contain dots.

Hence, the figure which will fit in the blank space is,



Q88. Solution

Correct Answer: (A)

The points earned by Hyundai on the basis of comfort

$$= \frac{(650 \times 14)}{100}$$

$$= \frac{9100}{100}$$

$$= 91$$

The points earned by Siena on the basis of ride/handle

$$= \frac{(600 \times 18)}{100}$$

$$= \frac{10800}{100}$$

$$= 108$$

Now, the required percentage is

$$= \frac{(108-91)}{108} \times 100$$

$$= \left(\frac{17}{108}\right) \times 100$$

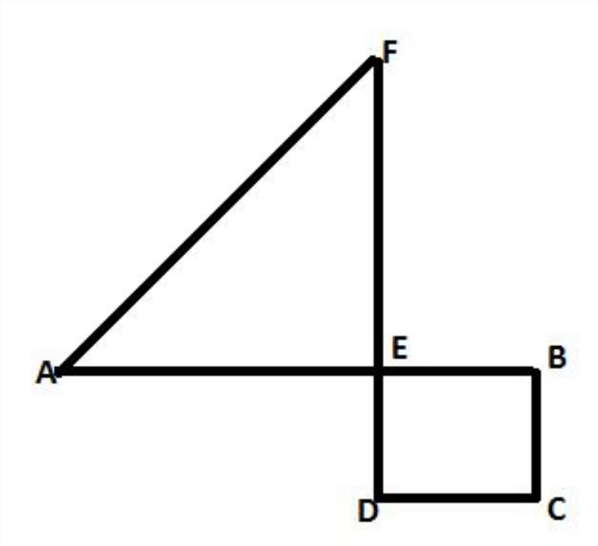
$$= 15.74\%$$

Q89. Solution

Correct Answer: (C)

According to the given condition,

The direction chart is given below:



$\mathrm{AB} = 90\ \mathrm{m} \mathrm{BC} = 20\ \mathrm{m} = \mathrm{DE}\, \mathrm{CD} = 30\ \mathrm{m} = \mathrm{BE}$

$\mathrm{AE} = \mathrm{AB} - \mathrm{BE}\, \mathrm{AE} = 90\ \mathrm{m} - 30\ \mathrm{m} \mathrm{AE} = 60\ \mathrm{m}$

$\mathrm{EF} = \mathrm{DF} - \mathrm{DE}\, \mathrm{EF} = 100\ \mathrm{m} - 20 \mathrm{EF} = 80\ \mathrm{m}$

We have to find the value of AF.

Using Pythagoras Theorem,

$(\mathrm{H})^2 = (\mathrm{P})^2 + (\mathrm{B})^2 (\mathrm{AF})^2 = (\mathrm{EF})^2 + (\mathrm{AE})^2 (\mathrm{AF})^2 = (80)^2 + (60)^2 (\mathrm{AF})^2 = 10000 \mathrm{AF} = 100\ \mathrm{m}$

Hence, the required answer is $100\ $ metres.

Q90. Solution

Correct Answer: (B)

Let a_n be the general term of a GP whose first term is a and common ratio is r. Now according to the question,

$$\begin{aligned} a_n &= a_{n+1} + a_{n+2} \\ ar^{n-1} &= ar^n + ar^{n+1} \end{aligned} \Rightarrow \quad r^{n-1} = r^n + r^{n+1} \Rightarrow \quad 1 = \tfrac{r^n}{r^{n-1}} + \tfrac{r^{n+1}}{r^{n-1}} \Rightarrow \quad 1 = r + r^2 \Rightarrow r^2 + r - 1 = 0$$

$$\Rightarrow \begin{aligned} r &= \frac{-1 \pm \sqrt{(1)^2 - 4(1)(-1)}}{2(1)} \\ &= \frac{-1 \pm \sqrt{1+4}}{2} = \frac{-1 \pm \sqrt{5}}{2} \end{aligned}$$ since, GP consists only positive terms $\therefore r = \frac{\sqrt{5}-1}{2}$

Q91. Solution

Correct Answer: (C)

$\left(1+\cos\frac{\pi}{8}\right)\left(1+\cos\frac{3\pi}{8}\right)\left(1+\cos\frac{5\pi}{8}\right)\left(1+\cos\frac{7\pi}{8}\right)$

$\therefore A+B=\pi,\ A=\pi-B$

$=\left(1+\cos\frac{\pi}{8}\right)\left(1+\cos\frac{3\pi}{8}\right)\left(1+\cos\left(\pi-\frac{3\pi}{8}\right)\right)\times\left(1+\cos\left(\pi-\frac{\pi}{8}\right)\right)=\left(1+\cos\frac{\pi}{8}\right)\left(1+\cos\frac{3\pi}{8}\right)\left(1-\cos\frac{3\pi}{8}\right)\times$

$=\left(1-\cos^2\frac{\pi}{8}\right)\left(1-\cos^2\frac{3\pi}{8}\right)$

$=\sin^2\frac{\pi}{8}.\sin^2\frac{3\pi}{8}=\frac{1}{4}\left[2\sin\frac{\pi}{8}\sin\frac{3\pi}{8}\right]^2$

$\therefore 2sinAsinB=cos(A-B)-cos(A+B)$

$=\frac{1}{4}\left[\cos\frac{\pi}{4}-\cos\frac{\pi}{2}\right]^2=\frac{1}{4}\left[\frac{1}{\sqrt{2}}-0\right]^2=\frac{1}{8}$

Q92. Solution

Correct Answer: (B)

$\frac{dy}{dx}=-3x^2+6x-4=Z(\text{let})$

For maximum value of Z,

$\frac{dZ}{dx}=0$

$-6x+6=0$

$x=1$

$\left(\frac{d^2Z}{dx^2}\right)=-6<0$ so, maxima occurs at $x=1$

$Z_{\max}=-3+6-4=-1$

Q93. Solution

Correct Answer: (A)

We may rewrite all the statements using the meaning of the symbols used. We therefore have (1) $3+2-4>6\div 3-2$ (True) We may check the other statements also to make sure that our answer is correct (2) $3\div 2-4>6\times 3+2$ (False) (3) $3\times 2-4=6+3+2$ (False) (4) $3+2+4<6\div 3-2$ (False)

Q94. Solution

Correct Answer: (B)

The circle is $x^2+y^2-4x-8y-5=0$

$\Rightarrow (x-2)^2+(y-4)^2=5^2$

Length of the perpendicular from centre $(2,4)$ on the line $3x-4y-m=0$ should be less than radius.

$\Rightarrow \frac{|6-16-m|}{5}<5$

$\Rightarrow |10+m|<25$

$\Rightarrow -35<\mathrm{m}<15.$

Q95. Solution

Correct Answer: (B)

Let, $2x+y=t \Rightarrow \frac{dy}{dx}+2=\frac{dt}{dx}$

$\frac{dt}{dx}+xt=x^3t^3 \Rightarrow \frac{1}{t^3}\frac{dt}{dx}+\frac{1}{t^2}x=x^3$

Let, $\frac{1}{t^2}=u \Rightarrow \frac{-2}{t^3}\frac{dt}{dx}=\frac{du}{dx}$

$\frac{du}{dx}+(-2x)u=-2x^3$

$\mathrm{I.F.}=e^{-\int 2xdx}=e^{-x^2} \Rightarrow u.e^{-x^2}=\int e^{-x^2}\left(-2x^3\right)dx$

$\frac{e^{-x^2}}{(2x+y)^2}=-2\int e^{-x^2}.x^3dx$

$\frac{e^{-x^2}}{(2x+y)^2}=\int e^{-x^2}.x^2(-2x)dx$

Let, $-x^2=v$

$-2xdx=dv \Rightarrow \frac{e^{-x^2}}{(2x+y)^2}=-\int e^v vdv$

$\Rightarrow \frac{e^{-x^2}}{(2x+y)^2}+v\cdot e^v-e^v=C$

$\Rightarrow \frac{e^{-x^2}}{(2x+y)^2}-x^2e^{-x^2}-e^{-x^2}=C$

$\Rightarrow \frac{1}{(2x+y)^2}=\left(x^2+1\right)+C\mathrm{e}^{x^2}$

Q96. Solution

Correct Answer: (D)

$(\sin \mathrm{A}-\sin \mathrm{B})^2+(\cos \mathrm{A}-\cos \mathrm{B})^2=\frac{1}{2}+\frac{3}{2}=2$

$\Rightarrow 2-2(\sin \mathrm{A}\sin \mathrm{B}+\cos \mathrm{A}\cos \mathrm{B})=2$

$\Rightarrow \cos(\mathrm{B}-\mathrm{A})=0 \Rightarrow \mathrm{B}-\mathrm{A}=\frac{\pi}{2} \Rightarrow \mathrm{B}=\mathrm{A}+\frac{\pi}{2}$

$\sin \mathrm{A}-\sin \mathrm{B}=\frac{1}{\sqrt{2}} \Rightarrow \sin \mathrm{A}-\cos \mathrm{A}=\frac{1}{\sqrt{2}}$

$\Rightarrow \sin \mathrm{A}.\frac{1}{\sqrt{2}}-\cos \mathrm{A}.\frac{1}{\sqrt{2}}=\frac{1}{2}$

$\Rightarrow \sin\left(\mathrm{A}-\frac{\pi}{4}\right)=\sin\frac{\pi}{6}$

$\Rightarrow \mathrm{A}=\frac{\pi}{6}+\frac{\pi}{4}=\frac{5\pi}{12}$

$\mathrm{A}+\mathrm{B}=\mathrm{A}+\mathrm{A}+\frac{\pi}{2}=\frac{5\pi}{6}+\frac{\pi}{2}=\frac{4\pi}{3}$

Q97. Solution

Correct Answer: (B)

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

Substituting $\sin x+\cos x=t$, the expression becomes

$g(t)=\frac{t^2-1}{t}=t-\frac{1}{t}$

Now, $t=\sin x+\cos x,\ \forall x\in\left(0,\frac{\pi}{2}\right)$

$t\in\left(1,\sqrt{2}\right]$

$g'(t)=1+\frac{1}{t^2}>0$

Therefore, $g(t)$ is an increasing function.

Maximum value $=g\left(\sqrt{2}\right)=\frac{2-1}{\sqrt{2}}=\frac{1}{\sqrt{2}}$

Q98. Solution

Correct Answer: (D)

volume of parallelopiped is given scalar triple product or determinant of given vectors ; $\vec{a}$, $\vec{b}$, & $\vec{c}$

$\text{V}=\begin{vmatrix}1&-1&1\\2&-4&5\\3&-5&2\end{vmatrix}=|1(-8+25)-(-1)(4-15)+1(-10-(-12))|$

$=|+17-11+2|=8$ cubic unit

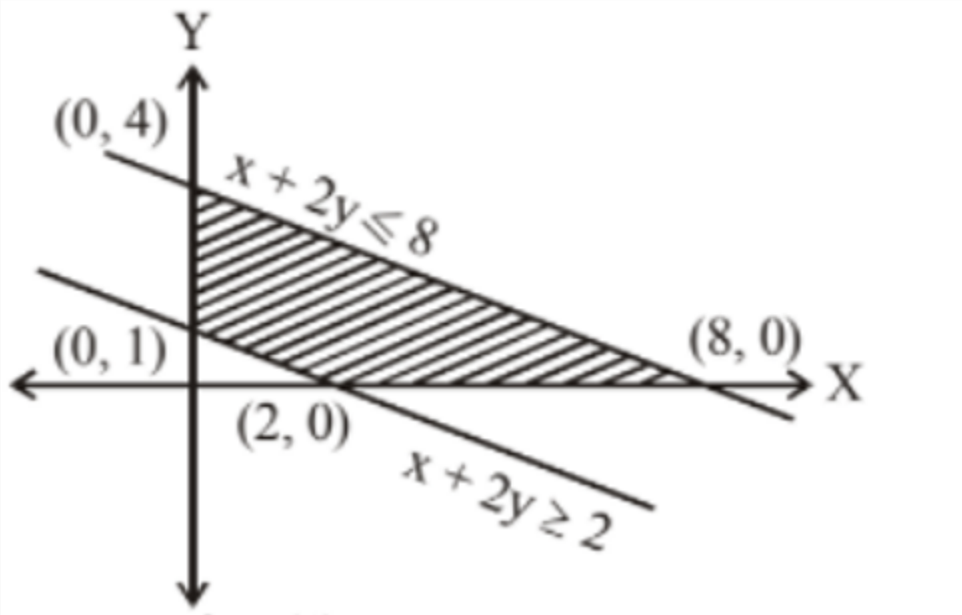
Q99. Solution

Correct Answer: (B)

Given : $x+2y \geq 2 \ldots(i)$

$x+2y \leq 8 \ldots(ii)$

and $\quad x, y \geq 0$



For equation (1)

$\frac{x}{2}+\frac{y}{1}=1$

and for equation (2)

$\frac{x}{8}+\frac{y}{4}=1$

Given : $z=3x+2y$

At point $(2,0) ; z=3 \times 2+0=6$

At point $(0,1) ; z=3 \times 0+2 \times 1=2$

At point $(8,0) ; z=3 \times 8+2 \times 0=24$

At point $(0,4) ; z=3 \times 0+2 \times 4=8$

$\therefore$ maximum value of z is 24 at point $(8,0)$.

Q100. Solution
Correct Answer: (D)

Let, $I = \int \frac{x^2-1}{(x^4+3x^2+1)\tan^{-1}\left(x+\frac{1}{x}\right)} dx$
On dividing numerator and denominator by x^2,
$I = \int \frac{1-\frac{1}{x^2}}{\left(x^2+\frac{1}{x^2}+3\right)\tan^{-1}\left(x+\frac{1}{x}\right)} dx$
Put $x + \frac{1}{x} = t$
$\Rightarrow \left(1 - \frac{1}{x^2}\right)dx = dt$ and
$x^2 + \frac{1}{x^2} = t^2 - 2$
$\therefore I = \int \frac{dt}{(t^2-2+3)\tan^{-1} t}$
$= \int \frac{dt}{(1+t^2)\tan^{-1} t}$
$= \log\left(\tan^{-1} t\right) + C$
$= \log\left[\tan^{-1}\left(x + \frac{1}{x}\right)\right] + C$

Q101. Solution
Correct Answer: (C)

Given,

$x = \log\left(1 + t^2\right)$ and $y = t - \tan^{-1} t$

On differentiating,

$\frac{dx}{dt} = \frac{1}{1+t^2} \cdot 2t$
and $\frac{dy}{dt} = 1 - \frac{1}{1+t^2}$

$= \frac{t^2}{1+t^2} \ldots\ldots$(i)
Also, $x = \log\left(1 + t^2\right) \Rightarrow t^2 = e^x - 1 \ldots\ldots(ii)$

From Equations (i) and (ii), we get
$\frac{dy}{dx} = \frac{\sqrt{e^x-1}}{2}$.

Q102. Solution
Correct Answer: (B)

In any triangle, centroid divides the line joining orthocentre and circumcentre internally in the ratio $2 : 1$
$\left(\frac{6+0}{3}, \frac{12+0}{3}\right)$
So, centroid is $(2, 4)$ [using section formula]

Q103. Solution

Correct Answer: (D)

$\because \quad \text{AM} \geq \text{GM}$

$\Rightarrow \quad \frac{a+b+c}{3} \geq (abc)^{1/3}$

or $\quad a+b+c \geq 3(abc)^{1/3}$ ......(I)

But given

ab^2c^3 , $a^2b^3c^4$, $a^3b^4c^5$ are in AP (Divide the sequence by ab^2c^3)

$\Rightarrow$ 1,abc, $a^2b^2c^2$ are also in AP($\because abc \neq 0$)

$\Rightarrow$ 2abc = 1 + $a^2b^2c^2$

$\Rightarrow$ $(abc - 1)^2 = 0$

$\therefore$ abc = 1

Now from Eq. (i),

$a+b+c \geq 3(1)^{1/3}$

or $\quad (a+b+c) \geq 3$

Hence, minimum value of a + b + c is 3.

Q104. Solution

Correct Answer: (C)

Given,

$$\int_{-1}^{1} \frac{\sqrt{1+x+x^2}-\sqrt{1-x+x^2}}{\sqrt{1+x+x^2}+\sqrt{1-x+x^2}} dx$$

Let $f(x) = \frac{\sqrt{1+x+x^2}-\sqrt{1-x+x^2}}{\sqrt{1+x+x^2}+\sqrt{1-x+x^2}}$

$$f(-x) = -\left(\frac{\sqrt{1+x+x^2}-\sqrt{1-x+x^2}}{\sqrt{1+x+x^2}+\sqrt{1-x+x^2}}\right) = -f(x)$$

$\Rightarrow f(x)$ is an odd function.

$$\Rightarrow \int_{-1}^{1} \frac{\sqrt{1+x+x^2}-\sqrt{1-x+x^2}}{\sqrt{1+x+x^2}+\sqrt{1-x+x^2}} dx = 0$$

Q105. Solution

Correct Answer: (C)

The middle term in the expansion $\left(\frac{x^3}{3}+\frac{3}{x}\right)^8$

$=T_{\frac{8}{2}+1}=T_5={}^8C_4\left(\frac{x^3}{3}\right)^4\cdot\left(\frac{3}{x}\right)^4$

$={}^8C_4\cdot x^8$

$\Rightarrow 70x^8=5670$

$\Rightarrow x^8=\frac{5670}{70}=81$

$\Rightarrow x^8=\left(\sqrt{3}\right)^8\Rightarrow x=\ \pm\sqrt{3}$

$\Rightarrow \text{Sum}=\sqrt{3}-\sqrt{3}$

$=0.$

Q106. Solution

Correct Answer: (B)

On rearranging the given equation, we reduce the equation in the form.

$\frac{x^2dx}{1+x^3}=\frac{y^2dy}{1+y^3}$

Integrating both side, using method of substitution

let $\left(1+x^3\right)=t$, on differentiating both sides we get $3x^2=\frac{dt}{dx}\Rightarrow x^2dx=\frac{dt}{3}$

Now, $\int\frac{x^2dx}{1+x^3}=\frac{1}{3}\int\frac{dt}{t}=\frac{1}{3}\ln t$

Doing similarly for right-hand side we obtain, $\frac{1}{3}\ln\left(1+x^3\right)=\frac{1}{3}\ln\left(1+y^3\right)+\frac{\ln C}{3}$

$\ln\left(1+x^3\right)=\ln\left(c\left(1+y^3\right)\right)$

$\left(1+x^3\right)=\left(c\left(1+y^3\right)\right)$

Q107. Solution
Correct Answer: (B)

We have, $f(x)=x^2, g(x)=\log_{\mathrm{e}} x$
$(fog)(x)=f(g(x))=f(\log_{\mathrm{e}} x)=(\log_{\mathrm{e}} x)^2$
And $(gof)x=g(f(x))=g(x^2)=\log_{\mathrm{e}} x^2$
Now, $(fog)(x)=(gof)(x) \Rightarrow (\log_{\mathrm{e}} x)^2=\log_{\mathrm{e}} x^2$

$\Rightarrow (\log_e x)^2=2\log_e x$

$\Rightarrow (\log_e x)^2-2\log_e x=0$

$\Rightarrow \log_e x(\log_e x-2)=0$

$\Rightarrow \log_e x=0$ or $\log_e x=2$

$\Rightarrow \quad x=e^2$ or 1
So, there exists only two values of x .

Q108. Solution
Correct Answer: (C)

Let the roots be $\frac{a}{r^2},\ \frac{a}{r},\ a,\ ar,\ ar^2$

$\Rightarrow a\left(\frac{1}{r^2}+\frac{1}{r}+1+r+r^2\right)=40$

Also, $\frac{1}{a}\left(\frac{1}{r^2}+\frac{1}{r}+1+r+r^2\right)=10$

Now product of roots $=-s$

$a^5=-s \Rightarrow |s|=|a|^5=32$

Q109. Solution
Correct Answer: (A)

$\cos 52^\circ+\cos 68^\circ+\cos 172^\circ \quad =2\cos 60^\circ \cos 8^\circ+\cos(180^\circ-8^\circ)=0$

Q110. Solution

Correct Answer: (B)

We know that, $|z_1+z_2|^2 = |z_1|^2 + |z_2|^2 + 2\operatorname{Re}(z_1\bar{z}_2)\ldots$ (i) Given, $|z_1+z_2|^2 = |z_1|^2 + |z_2|^2 \ldots$ (ii)

From equation (i) and (ii), we get

$$
\begin{aligned}
&2\operatorname{Re}(z_1\overline{z_2}) = 0 \\
&\Rightarrow z_1\overline{z_2} + \overline{z_1 z_2} = 0\ (\because 2\operatorname{Re}(z) = z + \bar{z}, \bar{\bar{z}} = z) \\
&\Rightarrow z_1\overline{z_2} + \overline{z_1} z_2 = 0 \\
&\Rightarrow z_1\overline{z_2} = -\overline{z_1} z_2 \\
&\Rightarrow \frac{z_1}{z_2} = -\overline{\overline{z_1 z_2}} \\
&\Rightarrow \frac{z_1}{z_2} + \left(\frac{z_1}{z_2}\right) = 0 \left(\because \left(\overline{\frac{z_1}{z_2}}\right) = \overline{\overline{z_1}}\right) \\
&\Rightarrow 2\operatorname{Re}\left(\frac{z_1}{z_2}\right) = 0 \\
&\Rightarrow \operatorname{Re}\left(\frac{z_1}{z_2}\right) = 0
\end{aligned}
$$

Alternate Solution We know that, $|z_1+z_2|^2 = |z_1|^2 + |z_2|^2 + 2\operatorname{Re}(z_1\bar{z}_2)\ldots$ Given, $|z_1+z_2|^2 = |z_1|^2 + |z_2|^2 \ldots$ (ii) From equation (i) and (ii), we get

$$
\begin{aligned}
&2\operatorname{Re}(z_1\overline{z_2}) = 0 \\
&\Rightarrow \operatorname{Re}\left(\frac{z_1 z_2 \overline{z_3}}{z_2} = 0\right) \\
&[\because z\bar{z} = |z|^2] \\
&\Rightarrow \operatorname{Re}\left(\frac{z_1}{z_2}|z_2|^2\right) = 0 \\
&\Rightarrow \frac{z_1}{z_2}|z_2|^2 \text{ is purely imaginary}
\end{aligned}
$$

So, $\frac{z_1}{z_2}$ will also be purely imaginary $\therefore \operatorname{Re}\left(\frac{z_1}{z_2}\right) = 0$

Q111. Solution

Correct Answer: (A)

Given that

$$
\begin{aligned}
&\mathbf{A} = \hat{\mathbf{i}} + x\hat{\mathbf{j}} + 3\hat{\mathbf{k}}, \mathbf{B} = 3\hat{\mathbf{i}} + 4\hat{\mathbf{j}} + 7\hat{\mathbf{k}}, \\
&\mathbf{C} = y\hat{\mathbf{i}} - 2\hat{\mathbf{j}} - 5\hat{\mathbf{k}}
\end{aligned}
$$

and $\mathbf{BC} = (y-3)\hat{\mathbf{i}} - 6\hat{\mathbf{j}} - 12\hat{\mathbf{k}} \Rightarrow$ Since, A, B, C are collinear, then

$$
\begin{aligned}
\mathbf{AB} &= 2\hat{\mathbf{i}} + (4-x)\hat{\mathbf{j}} + 4\hat{\mathbf{k}}, \\
\mathbf{AB} &= t\mathrm{BC}
\end{aligned}
$$

$2\hat{\mathbf{i}} + (4-x)\hat{\mathbf{j}} + 4\hat{\mathbf{k}} = t\{(y-3)\hat{\mathbf{i}} - 6\hat{\mathbf{j}} - 12\hat{\mathbf{k}}\}$ Equating the coefficient, of $\hat{\mathbf{i}}, \hat{\mathbf{j}}, \hat{\mathbf{k}}$

$$
\Rightarrow 2\hat{\mathbf{i}} + (4-x)\hat{\mathbf{j}} + 4\hat{\mathbf{k}} = t(y-3)\hat{\mathbf{i}} - 6t\hat{\mathbf{j}} - 12t\hat{\mathbf{k}}
$$

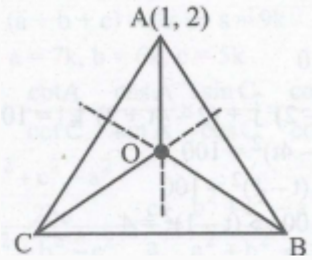
$$
\begin{aligned}
&t(y-3) = 2, \\
&\quad 4 - x = -6t,\ \text{and } 4 = -12t \\
&\qquad t = -\frac{1}{3}
\end{aligned}
$$

and

$$
\begin{aligned}
\therefore 4 - x &= -6\left(-\frac{1}{3}\right) = 2 \Rightarrow x = 2 \\
-\frac{1}{3}(y-3) &= 2 \\
y - 3 &= -6 \Rightarrow y = -3 \\
\text{Then } (x, y) &= (2, -3)
\end{aligned}
$$

Q112. Solution

Correct Answer: (B)



OC&OB the equations of medians respectively and point O is the centroid. $\because$ Intersection OC \& OB is centroid. Solving $x+y=5 \& x=4$, we get the centroid as $(4,1)$. Let the coordinate of point $C=(4, a)$ and coordinate of point $B=(b, 5-b)$ So, $\frac{1+4+b}{3}=4 \Rightarrow b=7$ $\frac{2+a+5-b}{3}=1 \Rightarrow a=3$

$\therefore A=(1,2); B=(7,-2); C=(4,3)$ $\Delta=\frac{1}{2}\left|\begin{array}{ccc}1 & 1 & 2 \\ 1 & 7 & -2 \\ 1 & 4 & 3\end{array}\right|$ $\Delta=\frac{1}{2} \times 18=9$

Q113. Solution

Correct Answer: (C)

From mean value theorem $f^{\prime}(c)=\frac{f(b)-f(a)}{b-a}$

Given, $a=0 \quad \Rightarrow \quad f(a)=0$

and $b=\frac{1}{2} \quad \Rightarrow \quad f(b)=\frac{3}{8}$

Now, $f^{\prime}(x)=(x-1)(x-2)+x(x-2)+x(x-1)$

$\therefore \quad f^{\prime}(c)=(c-1)(c-2)+c(c-2)+c(c-1)$

$=c^2-3c+2+c^2-2c+c^2-c$

$\Rightarrow \quad f^{\prime}(c)=3c^2-6c+2$

By definition of mean value theorem

$f^{\prime}(c)=\frac{f(b)-f(a)}{b-a}$

$\Rightarrow \quad 3c^2-6c+2=\frac{\left(\frac{3}{8}\right)-0}{\left(\frac{1}{2}\right)-0}=\frac{3}{4}$

$\Rightarrow \quad 3c^2-6c+\frac{5}{4}=0$

This is a quadratic equation in c

$\therefore \quad c=\frac{6 \pm \sqrt{36-15}}{2 \times 3}=\frac{6 \pm \sqrt{21}}{6}=1 \pm \frac{\sqrt{21}}{6}$

Since, 'c' lies between $\left[0, \frac{1}{2}\right]$

$\therefore \quad c=1-\frac{\sqrt{21}}{6}$ neglecting $\left(c=1+\frac{\sqrt{21}}{6}\right)$.

Q114. Solution
Correct Answer: (A)

Let A be a symmetric matrix, then A' = A
Now consider $X = B\prime AB$

$$X = B\prime\ AB \Rightarrow X\prime = \ (B\prime\ A\ B)\prime\ \Rightarrow X\prime = \ B\prime\ A\prime\ (B\prime)\prime\ \Rightarrow X\prime = \ B\prime\ AB = X$$

Hence it is symmetric.

Q115. Solution
Correct Answer: (D)

$\sin^4\theta - 2\sin^2\theta - 1 = 0 \Rightarrow \quad \sin^2\theta = \frac{2\pm\sqrt{4+4}}{2} \Rightarrow \quad \sin^2\theta = 1 \pm \sqrt{2}$ which is not possible as $1+\sqrt{2} > 1$ and $1-\sqrt{2} < 0$. So, no value of θ can satisfy the given equation.

Q116. Solution
Correct Answer: (A)

$$\text{Now, } \mathrm{P}^{\mathrm{T}}\mathrm{P} = \begin{bmatrix} \sqrt{3}/2 & -1/2 \\ 1/2 & \sqrt{3}/2 \end{bmatrix} \begin{bmatrix} \sqrt{3}/2 & 1/2 \\ -1/2 & \sqrt{3}/2 \end{bmatrix}$$

$$\Rightarrow \quad \mathrm{P}^{\mathrm{T}}\mathrm{P} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \Rightarrow \mathrm{P}^{\mathrm{T}}\mathrm{P} = \mathrm{I} \Rightarrow \mathrm{P}^{-1} = \mathrm{P}^{\mathrm{T}}$$

Since, $\mathrm{Q} = \mathrm{PAP}^{\mathrm{T}}$

$\mathrm{P}^{\mathrm{T}}\mathrm{Q}^{2005}\mathrm{P}$ .... (i)

$$= \mathrm{P}^{\mathrm{T}}\left[\left(\mathrm{PAP}^{\mathrm{T}}\right)\left(\mathrm{PAP}^{\mathrm{T}}\right)\text{.......... 2005 times}\right]\mathrm{P}$$

$$\underbrace{(\mathrm{P}^{\mathrm{T}}\mathrm{P})\mathrm{A}(\mathrm{P}^{\mathrm{T}}\mathrm{P})\mathrm{A}(\mathrm{P}^{\mathrm{T}}\mathrm{P})\text{......}(\mathrm{P}^{\mathrm{T}}\mathrm{P})\mathrm{A}(\mathrm{P}^{\mathrm{T}}\mathrm{P})}_{\text{2005 Times}}$$

= $1\mathrm{A}^{2005}$ = A^{2005} [from Eq. (i)]

$$\mathrm{A}\begin{bmatrix} 0 & 1 \\ 0 & 1 \end{bmatrix}$$

$$\mathrm{A}^{\mathrm{Z}} = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$$

$$\mathrm{A}^{3} = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$$

$$\mathrm{A}^{2005} = \begin{vmatrix} 1 & 2005 \\ 0 & 1 \end{vmatrix}$$

$$\mathrm{P}^{\mathrm{T}}\mathrm{Q}^{2005}\mathrm{P} = \begin{vmatrix} 1 & 2005 \\ 0 & 1 \end{vmatrix}$$

Q117. Solution
Correct Answer: (B)

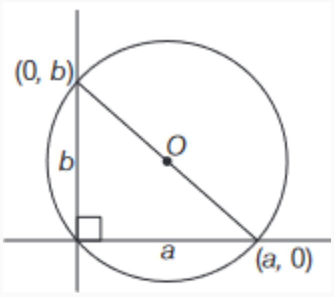
Given $\frac{dV}{dt} = 2\pi \mathrm{cm}^3/\mathrm{s} \because$ Volume of sphere, $V = \frac{4}{3}\pi r^3$ On differentiating w.r.t. t, we get

$$\begin{aligned} \frac{dV}{dt} &= \frac{4}{3}\pi \times 3r^2 \frac{dr}{dt} \\ \Rightarrow \quad 2\pi &= 4\pi r^2 \frac{dr}{dt} \qquad \left[\because V = 288\pi = \tfrac{4}{3}\pi r^3 \Rightarrow 216 = r^3 \Rightarrow r = 6\right] \\ \Rightarrow \quad \frac{dr}{dt} &= \frac{1}{2r^2} = \frac{1}{2 \times 6^2} = \frac{1}{72} \ \mathrm{cm/s} \end{aligned}$$

Q118. Solution
Correct Answer: (D)

We have, $f(x) = \sqrt{\log_{0.5} x!}$ So, $f(x)$ will be defined when, $\begin{aligned} &\log_{0.5} x! \geq 0 \\ &x! \leq (0.5)^0 \\ &x! \leq 1 \quad \therefore x \in \{0, 1\} \end{aligned}$ Hence, the domain of the function is $\{0, 1\}$.

Q119. Solution
Correct Answer: (D)



$$\text{Centre} = \left(\frac{a}{2}, \frac{b}{2}\right)$$

$$\text{Radius} = \frac{\sqrt{a^2 + b^2}}{2}$$

Equation of circle
$$\begin{aligned} &\Rightarrow \left(x - \frac{a}{2}\right)^2 + \left(y - \frac{b}{2}\right)^2 = \frac{a^2 + b^2}{4} \\ &\Rightarrow x^2 + a^2 - ax + y^2 + b^2 - bx = a^2 + b^2 \\ &\Rightarrow x^2 + y^2 - ax - bx = 0 \end{aligned}$$

Q120. Solution
Correct Answer: (D)

The number of three digit numbers in which 9 appears at hun dred place only is = 1 × 9 × 9 = 81 Similarly, the number of three digit numbers in which 9 appears at ten or unit place only is = (8 × 1 × 9) × 2 = 144

Q121. Solution
Correct Answer: (D)

A line L passes through the points $(1,1)$ and $(2,0)$ then its equation will be $(y-1)=\frac{-1}{1}(x-1)$

$y-1=-x+1$

$y+x=2$

And another line L' passes through $\left(\frac{1}{2},0\right)$ and perpendicular to L. So, its equation will be $(y-0)=1\left(x-\frac{1}{2}\right)$

$y-x+\frac{1}{2}=0\Rightarrow 2y-2x+1=0$

And equation of $y-$axis is $x=0$

So, coordinate of vertices will be $(0,2),\ \left(0,-\frac{1}{2}\right),\ \left(\frac{5}{4},\frac{3}{4}\right)$

Then the area of the triangle formed by the lines L,L' and $Y-$axis is

$$=\frac{1}{2}\begin{vmatrix}0 & 2 & 1\\ 0 & \frac{-1}{2} & 1\\ \frac{5}{4} & \frac{3}{4} & 1\end{vmatrix}=\frac{25}{16}$$

Q122. Solution
Correct Answer: (A)

Given that three six faced dice thrown togrther then

$\Rightarrow$The total number of cases a $==6\times6\times6=216$
$\Rightarrow$The number of favourable ways = Coefficient of x^k in $\left(x+x^2+\ldots+x^6\right)^3$
= Coefficient of x^{k-3} in $(1-x)^{-3}$, $(0\le k-3\le 5)$
= Coefficient of x^{k-3} in $\left(1+\ {}^3C_1\text{x}+\ {}^4C_2x^2+\ {}^5C_3x^3+\ldots\right)$
$=\ {}^{(k-3)+3-1}C_{3-1}$ [$\because$ coefficient of x^n in $(1-x)^{-r}=\ {}^{n+r-1}C_{r-1}$

$=\ {}^{k-1}C_2=\frac{(k-1)(k-2)}{2}$
Thus the probability of the required event is

P(E)=$\frac{\text{favourable events}}{\text{total number of cases}}$

$=\frac{(k-1)(k-2)}{2\times6^3}=\frac{(k-1)(k-2)}{432}$.

Q123. Solution
Correct Answer: (B)

We know, $25^{15} = (26-1)^{15}$

$= {}^{15}C_0 26^{15} - {}^{15}C_1 26^{14} + \ldots\ldots - {}^{15}C_{15}$

$= 26I - 1 = 26I - 13 + 12 = 13I + 12$

Q124. Solution
Correct Answer: (A)

Given, $\left[\sqrt{\frac{x}{3}} + \frac{\sqrt{3}}{x^2}\right]^{10}$
General term, $T_{r+1} = {}^{10}C_r \left(\frac{x}{3}\right)^{\frac{1}{2}(10-r)} \left(\frac{\sqrt{3}}{x^2}\right)^r$
$\Rightarrow\ T_{r+1} = {}^{10}C_r \left(\frac{1}{3}\right)^{\frac{10-r}{2}} \left(\sqrt{3}\right)^r x^{\frac{1}{2}(10-r)-2r}$
For the term independent of x, put
$\frac{1}{2}(10-r) - 2r = 0$
$\Rightarrow\quad r = 2$
$\therefore\ T_{2+1} = T_3 = {}^{10}C_2 \left(\frac{1}{3}\right)^{\frac{8}{2}} \left(\sqrt{3}\right)^2$
$= 45 \times \frac{1\times 3}{81} = \frac{5}{3}$

Q125. Solution
Correct Answer: (D)

Let

$I = \lim_{n\to\infty} \frac{1}{n}\left[f(0) + f\left(\frac{5}{n}\right) + f\left(\frac{10}{n}\right) + \ldots\ldots + f\left(\frac{5(n-1)}{n}\right)\right]$

$\Rightarrow I = \sum_{r=0}^{n-1} f\left(\frac{5r}{n}\right)\frac{1}{n}$

$\Rightarrow I = \int_0^1 f\left(5x\right)dx$

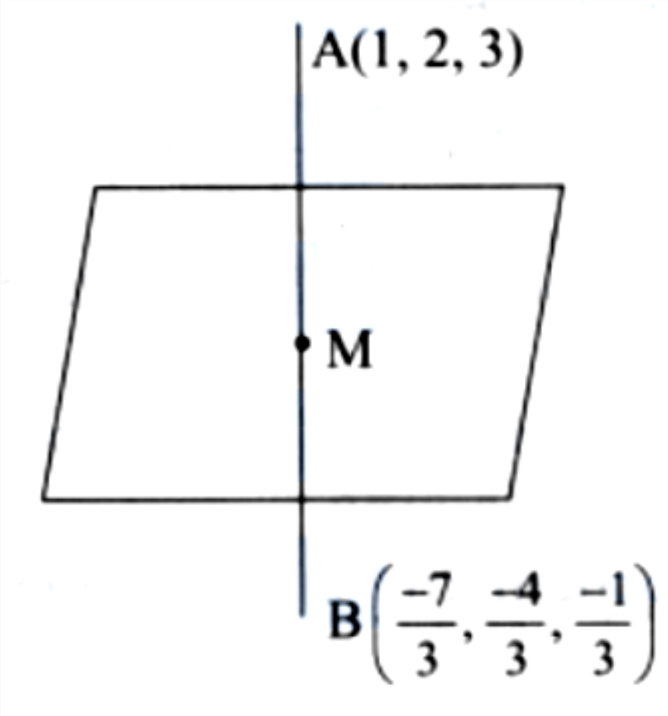
$\Rightarrow I = \int_0^1 (5x+1)dx$

$\Rightarrow I = \left[\frac{5x^2}{2} + x\right]_0^1$

$\Rightarrow I = \frac{5}{2} + 1 = \frac{7}{2}$

Q126. Solution

Correct Answer: (A)



M is the midpoint. $\therefore$ M $\equiv \left(-\frac{2}{3}, \frac{1}{3}, \frac{4}{3}\right)$ D.r.s of AB are $\frac{-10}{3}, \frac{-10}{3}, \frac{-10}{3}$ i.e., $1, 1, 1$ Equation of plane is $1\left(x+\frac{2}{3}\right)+1\left(y-\frac{1}{3}\right)+1\left(z-\frac{4}{3}\right)=0$ Option (A) satisfies this equation of the plane.

$\Rightarrow x+y+z=1$

Q127. Solution

Correct Answer: (B)

$\alpha^2+\beta^2+\gamma^2=2\alpha+2\beta+2\gamma-3$

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

$\alpha=\beta=\gamma=1$

Q128. Solution
Correct Answer: (B)

$x-2y+z=-4\ldots(1)$

$2x-y+2z=2\ldots(2)$

$x+y+\lambda z=4\ldots(3)$

$(1)\times(2)-(2)\Rightarrow -\mathrm{y}=-10$

$\therefore\ \lambda=16-z$

$\therefore$ put in equation (3)

$16-z+10+\lambda z=4$

$22=z(1-\lambda)$

$\therefore$ for no solution, $\lambda=1$.

Q129. Solution
Correct Answer: (A)

$$\sum_{k=1}^{5}\frac{1^3+2^3+\ldots+k^3}{1+3+5+\ldots.+(2k-1)}$$
$$=\sum_{k=1}^{5}\frac{\left(\frac{k(k+1)}{2}\right)^2}{k^2}$$
$$\left[\begin{array}{l}\because n^3=\left(\frac{n(n+1)}{2}\right)^2\\ \text{and } 1+3+5\ldots+(2K-1)=K^2\end{array}\right]$$
$$=\sum_{k=1}^{5}\frac{(k+1)^2}{4}=\frac{2^2+3^2+4^2+5^2+6^2}{4}$$
$$=\frac{4+9+16+25+36}{4}=\frac{90}{4}=22.5$$

Q130. Solution
Correct Answer: (A)

Given $=\frac{\sum x_i}{n}=\overline{x}$
Now let new observation y_i
$y_i=\frac{x_i}{b}+12$
New mean$=\frac{\sum y_i}{n}=\frac{\sum\left(\frac{x_i}{b}+12\right)}{n}$
$=\frac{\sum x_i}{bn}+12$
$=\frac{\overline{x}}{b}+12$