

ANSWERS FOR SRMEEE-2009 –VERSION CODE- A

PART 1 – PHYSICS

1. Ans : Torque

Sol: $E = mc^2 = pc$

2. Ans : 8%

Sol: $\rho = \frac{F}{L^2} \Rightarrow \frac{\Delta P}{P} = \frac{\Delta F}{F} + \frac{2\Delta L}{L} = 4 + 4$
 $= 8\%$

3. Ans : 9 m

Sol: $v = kt$
 $\int dS = \int kt \cdot dt$
 $S = \frac{kt^2}{2} = \frac{2 \times 9}{2}$

4. Ans : 1 : 3 : 5

5. Ans : 45 m/s

Sol: $v = \int a \cdot dt = \frac{1}{2} \times 10 \times 9 = 45$

6. Ans : $-\frac{4u}{234}$

Sol: $4u = 234 v$
 $v = -\frac{4u}{234}$

7. Ans : $2\pi \times 10^{-2}$

Sol: $\frac{\omega}{t} = \alpha \Rightarrow \frac{20 \times 2\pi}{10} = 4\pi \text{ rad s}^{-2}$
 $\tau' = I\alpha = 5 \times 10^{-3} \times 4\pi = 20\pi \times 10^{-3}$
 $= 2\pi \times 10^{-2}$

8. Ans : 1 J

Sol: $K.E = \frac{1}{2}mv^2 = \frac{m^2v^2}{2m}$
 $= \frac{p^2}{2m} = \frac{4}{4} = 1$

9. Ans : Increases

10. Ans : Nearly 51 N

Sol: $F = Y.A. \frac{\Delta \ell}{\ell}$
 $= 0.9 \times 10^{11} \times \frac{\pi}{4} \times (0.6 \times 10^{-3})^2 \times 0.002$
 $= 51 \text{ N}$

11. Ans : 1 : 4

Sol: $\left(\frac{r_1}{r_2}\right)^2 = \frac{v_1}{v_2} = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$

12. Ans : $2\sqrt{2} \text{ cm}$

Sol: $\frac{KE}{PE} = 1 = \frac{A^2 - y^2}{y^2} \Rightarrow y^2$
 $= \frac{A^2}{2} \Rightarrow y = \frac{A}{\sqrt{2}}$
 $= \frac{4}{\sqrt{2}} = 2\sqrt{2} \text{ cm}$

13. Ans : $\frac{10}{9}$

Sol: $\frac{f_a}{f} = \frac{C}{C - 0.1C} = \frac{10}{9}$

14. Ans : $\frac{81}{1}$

Sol: $y_1 = 5 \sin 300\pi t = 4 \sin 300\pi t + 1 \sin 300\pi t$
 $y_1 + y_2 = 1 \sin 300\pi t + 4 \sin 300\pi t + 4 \sin 30\pi t$
 $= 1 \sin 300\pi t + 8 \sin 30\pi t \cos \pi t$
 The maximum amplitude = $(8 + 1) = 9$
 Minimum = 1
 [\therefore second term minimum = 0]
 $\therefore \frac{I_{\max}}{I_{\min}} = \frac{9^2}{1^2} = \frac{81}{1}$

15. Ans : 4.24

Sol: $\frac{4 + 9 + 16 + 25 + 36}{5}$
 $= \frac{90}{5} = 18$
 $rms = \sqrt{18} = 4.24$

16. Ans : Radiation

$$\frac{1}{\lambda_{\text{Lyman}}} = R \left[1 - \frac{1}{4} \right] = R \frac{3}{4} = \frac{1}{\lambda}$$

17. Ans : 0.68

$$\frac{5}{36} \times \frac{4}{3} = \frac{1}{6563} \times \lambda$$

Sol: $\lambda_1 T_1 = \lambda_2 T_2$

$$\frac{T_1}{T_2} = \frac{\lambda_2}{\lambda_1} = \frac{350}{510} = 0.68$$

$$\lambda = 6563 \times \frac{5}{27} = 1215.4 \text{ \AA}$$

18. Ans : 0.5 mA

26. Ans : (ii) and (iv)

Sol: $\alpha = \frac{\Delta I_C}{\Delta I_E} \rightarrow \Delta I_C = \alpha \Delta I_E$

$$\Delta I_E = \Delta I_C + \Delta I_B = \alpha \Delta I_E + \Delta I_B$$

$$\therefore \Delta I_E [1 - \alpha] = \Delta I_B$$

$$\Rightarrow 10[1 - 0.95] = 0.5 \text{ mA} = \Delta I_B$$

27. Ans : 180 - 2 A

Sol: $\mu = \cot\left(\frac{A}{2}\right) = \frac{\sin \frac{A+\delta}{2}}{\sin \frac{A}{2}}$

$$= \frac{\cos \frac{A}{2}}{\sin \frac{A}{2}}$$

$$\sin \frac{A+\delta}{2} = \sin\left(90 - \frac{A}{2}\right)$$

$$\frac{A}{2} + \frac{\delta}{2} = 90 - \frac{A}{2} \Rightarrow A = 90 - \frac{\delta}{2}$$

$$\frac{\delta}{2} = 90 - A \Rightarrow \delta = 180 - 2A$$

19. Ans : AND

Sol: $\overline{A+B} = A \cdot B$

Error in sketch

20. Ans : 18 and 8

Sol: $15 + 4 - 1 = 18$ mass number

$7 + 2 - 1 = 8$ - atomic number

28. Ans : 3

21. Ans : 5.47 A

Sol: $\frac{12.27}{\sqrt{V}} = 5.47 \text{ A}$

Sol: $d \sin \theta = n \lambda$

$$d = \frac{1}{5000 \times 100} = \frac{1}{5 \times 10^5} \text{ m}$$

$$\sin \theta = \sin 90^\circ = 1$$

$$\therefore n = \frac{d}{\lambda} = \frac{1}{5 \times 10^5 \times 6 \times 10^{-7}}$$

$$= \frac{100}{30} = 3.3 \Rightarrow n = 3$$

22. Ans : Short range and charge independent.

23. Ans : Potential difference between cathode and target.

24. Ans : -3.4 eV

Sol: $-\frac{13.6}{4} = -3.4 \text{ eV}$

29. Ans : Longitudinal waves in gas

30. Ans : -10 N

Sol: $K \frac{3 \times 8}{d^2} = 40 \Rightarrow \frac{K}{d^2} = \frac{40}{24}$

$$\frac{K(-2)(3)}{d^2} = -6 \cdot \frac{40}{24} = -10 \text{ N}$$

25. Ans : 1215.4

Sol: $\frac{1}{\lambda} = R \left[\frac{1}{n_f^2} - \frac{1}{n_i^2} \right]$

$$\frac{1}{\lambda_{\text{Balmer}}} = R \left[\frac{1}{4} - \frac{1}{9} \right] = R \frac{5}{36}$$

$$= \frac{1}{6563}$$

31. Ans : ϵ_0^{-1}

Sol: $\frac{q_0}{\epsilon_0} = \epsilon_0^{-1}$

32. Ans : 0.2 V

$$\text{Sol: } V = \frac{W}{q} = \frac{6}{30} = \frac{1}{5} = 0.2 \text{ V}$$

33. Ans : 9 μF

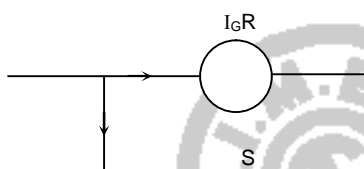
Sol: All in parallel = 9 μF

34. Ans : 0.10 Ω

$$\begin{aligned} \text{Sol: } P &= I^2 R \Rightarrow R = \frac{P}{I^2} = \frac{22.5}{(15)^2} \\ &= \frac{1}{10} = 0.1 \Omega \end{aligned}$$

35. Ans : 11.11 Ω

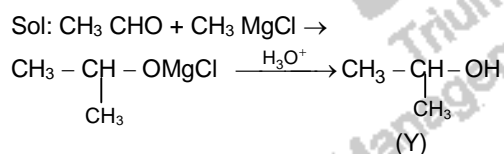
Sol:



$$\begin{aligned} S &= \frac{I_G R_G}{I - I_G} \\ &= \frac{10 \times 10^{-3} \times 100}{(100 - 10) \times 10^{-3}} = \frac{1000}{90} \\ &= 11.11 \Omega \end{aligned}$$

PART 2 – CHEMISTRY

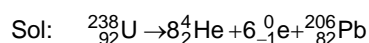
36. Ans : 2 – propanol



37. Ans : $[\text{Cr}(\text{NH}_3)_3 \text{Cl}_3]$

Sol: It is a non-ionic complex.

38. Ans : 82, 124



39. Ans : (i), (ii), (iii)

Sol: Fructose is a ketohexose.

40. Ans : Al^{3+} , Na

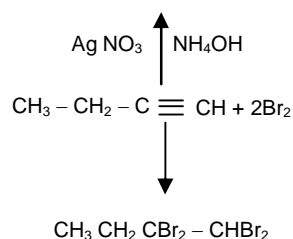
Sol: Along the group size decreases for isoelectronic species, size decreases with increase in charge.

41. Ans : P

Sol: P is oxidized to NaH_2PO_2 and reduced to PH_3 in alkaline medium.

42. Ans : 1 – Butyne

Sol: $\text{CH}_3\text{CH}_2 - \text{C} \equiv \text{CAg}$



43. Ans : Ruby copper and zincite

Sol: Ruby copper – Cu_2O
Zincite – ZnO

44. Ans : Buna – N - Rubber

Sol: Buna – N is a co-polymer of butadiene and acrylonitrile.

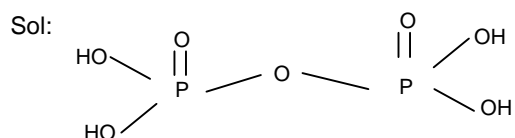
45. Ans : Antacid - Iodoform

Sol: Antiseptic – Iodoform

46. Ans : 123.1

$$\begin{aligned} \text{Sol: } M &= \frac{WRT}{PV} \\ &= \frac{0.5 \times 0.0821 \times 300}{0.1 \times 1} \\ &= 123.1 \end{aligned}$$

47. Ans : Pyrophosphoric acid



48. Ans : 3 – Ethyl – 2 - Hexene

49. Ans : sp^3 , sp, sp and sp^3

- 50. Ans :** Propene
Sol: Propene has only one Pi bond.
- 51. Ans :** -4, +6
Sol: NH₄ : N = -4
 NO₃ : N = + 6
- 52. Ans :** Both ΔH and $T\Delta S$ are +ve but $T\Delta S > \Delta H$.
Sol: $\Delta G = \Delta H - T\Delta S$
 = -ve when $T\Delta S > \Delta H$
- 53. Ans :** $\text{PCl}_5(\text{g}) \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$
Sol: Δn is +ve.
- 54. Ans :** $[\text{Co}(\text{NH}_3)_3\text{NO}_2]\text{Cl}_2$
Sol: One mole of the complex on ionization gives two moles of Cl⁻.
- 55. Ans :** It decreases the activation energy of a process.
Sol: Catalyst provides an alternative path with low activation energy.
- 56. Ans :** $\text{Ag}_2\text{O} + \text{H}_2\text{O}_2 \rightarrow 2\text{Ag} + \text{H}_2\text{O} + \text{O}_2$
Sol: Ag₂O is reduced to Ag.
- 57. Ans :** AgCl
Sol: AgCl is soluble in NH₄ OH due to complex formation.
- 58. Ans :** No answer.
 Mistake in question: Compounds (1) and (3) are same.
- 59. Ans :** 1.0 atm
Sol: $x_{\text{CO}_2} = \frac{0.5}{0.5+0.2+0.1} = \frac{0.5}{0.8}$
 $P_{\text{CO}_2} = \frac{0.5}{0.8} \times 1.6 = 1$
- 60. Ans :** A and R are true, but R is not the correct explanation
Sol: Fructose on complete reduction using HI and red P gives n – hexane. This shows the presence of six carbons in fructose in straight chain.
- 61. Ans :** CO₂, N₂O, C₃H₈
Sol: All these compounds have the same molar mass.
- 62. Ans :** Metal excess defect gives colour to the crystal.
Sol: Crystals with metal excess defect has F-centres.
- 63. Ans :** $\text{MnO}_4^- \rightarrow \text{Mn}^{2+}$
Sol: $\text{MnO}_4^- \rightarrow \text{Mn}^{2+}$
 +7 oxidation state +2 oxidation state
- 64. Ans :** Na₂O₂
Sol: Na₂O₂ is a true peroxide.
- 65. Ans :** NaOH
Sol: $\text{Na} + \text{H}_2\text{O} \rightarrow \text{NaOH} + \frac{1}{2}\text{H}_2$
 $2\text{NaOH} + \text{Zn} \rightarrow \text{Na}_2\text{ZnO}_2 + \text{H}_2$
- 66. Ans :** Sucrose
Sol: C₁₂ H₂₂ O₁₁ – Ratio in number of atoms cannot be reduced.
- 67. Ans :** 2, 3 - dichlorobutane
Sol: The isomer having plane of symmetry is the meso form.
- 68. Ans :** Short and strong
Sol: Resonance makes the bond shorter and stronger.
- 69. Ans :** Cu²⁺ and Al³⁺
Sol: Cu²⁺ is in gp. II and Al³⁺ in gp. III in qualitative analysis.
- 70. Ans :** Atomic chlorine
Sol: Atomic chlorine from CFC can decompose ozone.

PART 3 – MATHEMATICS

71. Ans: 4

Sol: $x < 0$
 $x^2 + 3x + 2 = 0 \Rightarrow x = -2, -1$
 $x > 0$
 $x^2 - 3x + 2 = 0 \Rightarrow x = 1, 2$
 No. of solutions = 4.

72. Ans: $(n - 1) 2^{n+1} + 2$

Sol: $u_n = n \times 2^n$
 $S = 1 \cdot 2 + 2 \cdot 2^2 + 3 \cdot 2^3 + \dots + n \cdot 2^n$
 $2S = 1 \cdot 2^2 + 2 \cdot 2^3 + \dots + (n - 1) \cdot 2^n + n \cdot 2^{n+1}$
 $-S = 2 + 2^2 + 2^3 + \dots + 2^n - n \cdot 2^{n+1}$
 $= 2(2^n - 1) - n \cdot 2^{n+1}$
 $\therefore S = 2^{n+1} \times n - 2^{n+1} + 2$
 $= (n - 1) 2^{n+1} + 2$

73. Ans: $\left(\frac{x - 7}{2}\right)^{1/3}$

Sol: $f(g(x)) = 2(x^3 + 5) - 3$
 $= 2x^3 + 10 - 3 = 2x^3 + 7$
 $y = 2x^3 + 7 \Rightarrow x^3 = \frac{1}{2}(y - 7)$
 $\therefore x = \left(\frac{y - 7}{2}\right)^{1/3}$
 $\Rightarrow [f(g)]^{-1}(x) = \left(\frac{x - 7}{2}\right)^{1/3}$

74. Ans: $x - 2$

Sol: Arranging in ascending order the middle most item is $x - 2$.

75. Ans: $\sqrt{e} - 1$

Sol: $u_n = \frac{1 \times 3 \times 5 \times \dots \times (2n - 1)}{(2n)!}$
 $= \frac{1 \times 2 \times 3 \times 4 \times \dots \times (2n)}{(2n)! (2 \times 4 \times 6 \times \dots \times (2n))}$
 $= \frac{1}{2^n n!}$
 $\therefore \sum u_n = \frac{1}{2 \times 1!} + \frac{1}{2^2 \times 2!} + \dots \infty$
 $= \sqrt{e} - 1$

76. Ans: 90°

Sol: Differentiating,

$$\text{slope of the first curve } m_1 = \frac{3(x^2 - y^2)}{6xy}$$

$$\text{Similarly } m_2 = \frac{-6xy}{3(x^2 - y^2)}$$

$$m_1 m_2 = -1$$

\Rightarrow angle between the curves is 90°

77. Ans: $xe^{\tan^{-1} x} + C$

$$\text{Sol: } \int \frac{1 + x + x^2}{1 + x^2} e^{\tan^{-1} x} dx$$

$$\text{Put } t = \tan^{-1} x \Rightarrow dt = \frac{1}{1 + x^2} dx$$

$$\text{Integral} = \int (\sec^2 t + \tan t) e^t dt$$

$$= e^t \times \tan t + C$$

$$= xe^{\tan^{-1} x} + C$$

78. Ans: $\frac{1}{10100}$

$$\text{Sol: } \int_0^1 x(1 - x)^{99} dx = \int_0^1 (1 - x)x^{99} dx$$

$$= \left(\frac{x^{100}}{100} - \frac{x^{101}}{101}\right)_0^1 = \frac{1}{100} - \frac{1}{101}$$

$$= \frac{1}{10100}$$

79. Ans: $x^2 - y^2 = x$

Sol: $(x^2 + y^2) dx = 2xy dy, y(1) = 0$

$$y = vx \Rightarrow \frac{dy}{dx} = v + x \frac{dv}{dx}$$

Substituting in the given equation,

$$2vx \frac{dv}{dx} = 1 - v^2$$

$$\Rightarrow \frac{2v dv}{(1 - v^2)} = \frac{dx}{x}$$

Integrating we get,

$$-\ln\left(1 - \frac{y^2}{x^2}\right) = \ln x + C$$

When $x = 1, y = 0 \Rightarrow C = 0$

$$\therefore \ln\left[x\left(\frac{x^2 - y^2}{x^2}\right)\right] = 0$$

\therefore Solution is $x^2 - y^2 = x$

80. Ans: $\frac{\pi}{3}$

Sol: $(\vec{a} + \vec{b})(\vec{a} + \vec{b}) = |c|^2$
 $9 + 25 + 30 \cos \theta = 49$
 $\Rightarrow \theta = \frac{\pi}{3}$

81. Ans: $(-1, -1, -1)$

Sol: $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} = r_1$
 $2r_1 + 1 = 5r_2 + 4$
 $3r_1 + 2 = 2r_2 + 1$
 $4r_1 + 3 = r_2$
 Solving, $r_1 = -1$; $r_2 = -1$.
 \therefore Point of intersection is $(-1, -1, -1)$

82. Ans: Transitive

Sol: As per definition.

83. Ans: $|z| = 1$

Sol: Putting $z = x + iy$ and equating the real part to zero, we get $x^2 + y^2 = 1$.

84. Ans: $-\frac{11}{97}$

Sol: Given determinant

$$= \begin{vmatrix} 4x & 6x+2 & 8x+1 \\ 2x+2 & 3x+1 & 4x-1 \\ 1 & -4 & 0 \end{vmatrix}$$
 $(R_2 \rightarrow R_2 - R_1 \text{ \& } R_3 \rightarrow R_3 - 2R_1)$
 Expanding we get,
 $-97x - 11 = 0 \Rightarrow x = -\frac{11}{97}$.

85. Ans: 0

Sol: $\cos 90^\circ = 0$. \therefore the expression vanishes.

86. Ans: $\frac{n}{3n+1}$

Sol: $t_n = \frac{1}{(3n-2)(3n+1)}$
 $= \frac{1}{3(3n-2)} - \frac{1}{3(3n+1)}$
 $\therefore S = \frac{1}{3} - \frac{1}{3(3n+1)} = \frac{n}{(3n+1)}$

87. Ans: 48

Sol: No. of arrangements = $4! \times 2! = 48$

88. Ans: 11

Sol: No. of diagonals of a polygon
 $= \frac{n(n-3)}{2} = 44$
 $\Rightarrow (n-11)(n+8) = 0$
 $\therefore n = 11$

89. Ans: 0

Sol: $C_1 \rightarrow C_1 + C_2$ and expanding the determinant, value of determinant is zero.

90. Ans: $x \cos \theta - y \sin \theta - a \cos 2\theta = 0$

Sol: Slope of the required line = $\frac{\cos \theta}{\sin \theta}$

\therefore Equation of the line passing through $(a \cos^3 \theta, a \sin^3 \theta)$ is

$$y - a \sin^3 \theta = \frac{\cos \theta}{\sin \theta} (x - a \cos^3 \theta)$$

$$x \cos \theta - y \sin \theta - a \cos 2\theta = 0$$

91. Ans: $y = 3\sqrt{\frac{2}{7}}x + \frac{15}{\sqrt{7}}$

Sol: Let $y = mx + c$ be a common tangent to the curves.

$$\therefore c^2 = 16m^2 - 9 \text{ and } c^2 = 9(1 + m^2)$$

Solving the two equations, $m^2 = \frac{18}{7}$

$$\therefore m = \pm 3\sqrt{\frac{2}{7}}$$

$$c = \pm \frac{15}{\sqrt{7}}$$

Appropriate answer among the choices

given is $y = 3\sqrt{\frac{2}{7}}x + \frac{15}{\sqrt{7}}$

92. Ans: $\frac{4}{5}$

Sol: The given equation can be written as

$$\frac{(x-3)^2}{9} + \frac{(y-5)^2}{25} = 1$$

$$e^2 = 1 - \frac{b^2}{a^2} = \frac{16}{25}$$

$$\therefore e = \frac{4}{5}$$

93. Ans: $\frac{\pi}{6}$

Sol: Given that the matrix is skew symmetric, the diagonal elements = 0.

$$\Rightarrow 2\sin\theta - 1 = 0 \text{ and } 2\cos\theta - \sqrt{3} = 0$$

$$\Rightarrow \sin\theta = \frac{1}{2} \text{ and } \cos\theta = \frac{\sqrt{3}}{2}$$

$$\Rightarrow \theta = \frac{\pi}{6}$$

94. Ans: $-\frac{1}{2}$

Sol: $\lim_{x \rightarrow 1} \frac{1 + \log x - x}{1 - 2x + x^2}$ $\left(\frac{0}{0}\right)$ form

$$= \lim_{x \rightarrow 1} \frac{\frac{1}{x} - 1}{x - 2 + 2x} \left(\frac{0}{0}\right) \text{ form}$$

$$= \lim_{x \rightarrow 1} \frac{-\frac{1}{x^2}}{2} = -\frac{1}{2}$$

95. Ans: $3a^2 = 4$

Sol: Let $P(x_1, y_1)$ be the point of intersection.

Slope of the first curve at P, $m_1 = \frac{-4x_1}{a^2 y_1}$

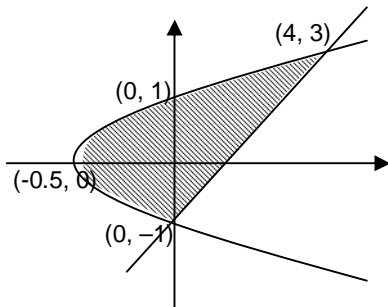
Slope of the second curve at P, $m_2 = \frac{16}{3y_1^2}$

Since $m_1 m_2 = -1$, $\frac{64x_1}{3a^2 y_1^3} = 1$.

Since P lies on the curve, we get $3a^2 = 4$.

96. Ans: $\frac{16}{3}$

Sol: Required area = $\int_{-1}^3 (x_2 - x_1) dy$

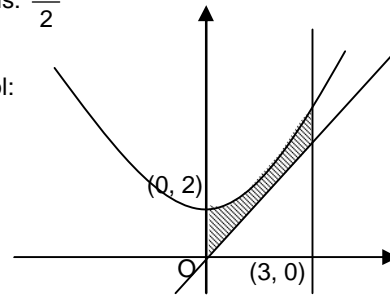


$$\frac{1}{2} \int_{-1}^3 (y^2 - 2y - 3) dy = \frac{16}{3}$$

97. Ans: $\frac{21}{2}$

Sol:

1



Required area = $\int_0^3 ((x^2 + 2) - x) dx = \frac{21}{2}$

98. Ans: $xe^{\tan^{-1}y} = \tan^{-1}y + C$

Sol: $(1 + y^2) \frac{dx}{dy} + x = e^{\tan^{-1}y}$

Putting $z = \tan^{-1}y$, $\therefore (1 + y^2) \frac{dx}{dy} = \frac{dx}{dz}$

$$\frac{dx}{dz} + x = e^{-z} \Rightarrow xe^z = z + C$$

$$xe^{\tan^{-1}y} = \tan^{-1}y + C$$

99. Ans: $\sqrt{34} : \sqrt{45} : 39$

Sol: $|\vec{a}| = \sqrt{3^2 + 5^2} = \sqrt{34}$

$$|\vec{b}| = \sqrt{6^2 + 3^2} = \sqrt{45}$$

$$\vec{c} = \vec{a} \times \vec{b} = 39\hat{k} \Rightarrow |\vec{c}| = 39$$

$$\therefore |\vec{a}| : |\vec{b}| : |\vec{c}| = \sqrt{34} : \sqrt{45} : 39$$

100. Ans: $k = 7$

Sol: $\frac{x-4}{1} = \frac{y-2}{1} = \frac{z-k}{2}$ passes through $(4, 2, k)$.

If this lies on the plane $2x - 4y + z - 7 = 0$, then $2 \times 4 - 4 \times 2 + k - 7 = 0 \Rightarrow k = 7$

101. Ans: $\frac{24}{25}$

Sol: Required Probability = $1 - 1 \times \frac{1}{25} = \frac{24}{25}$

102. Ans: $N - \{16\}$ No correct options

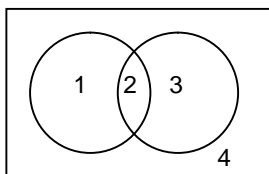
Sol: Refer Figure,

$$A \cup B = 1 + 2 + 3$$

$$B' = 1 + 4$$

$$(A \cup B) \cap B' = 1$$

$$\therefore A' \cup ((A \cup B) \cap B') = 3 + 4 + 1.$$

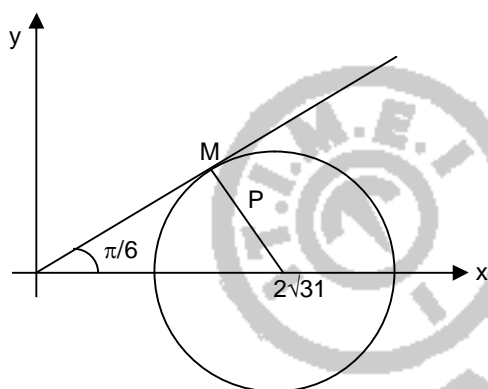


When $A \cap B = \phi$, then the answer is the Universal set.

Since in the given problem $A \cap B \neq \phi$ (in fact $A \cap B = \{16\}$), the answer is $N - \{16\}$

103. Ans: $\sqrt{31}$ No correct option

Sol: Refer figure



$$\frac{P}{2\sqrt{31}} = \sin \frac{\pi}{6} = \frac{1}{2}$$

$$P = \sqrt{31}.$$

\therefore Minimum value of $\sqrt{31}$

104. Ans: $7x^2 + 12xy - 2y^2 - 2x + 4y - 7 = 0$

$$\text{Sol: } SP^2 = e^2 PM^2$$

$$\Rightarrow (x-1)^2 + (y-1)^2 = 3 \frac{(2x+y-1)^2}{5}$$

$$\Rightarrow 7x^2 + 12xy - 2y^2 - 2x + 4y - 7 = 0$$

105. Ans: $5^{n+1} - 4^{n+1}$

$$\text{Sol: } (1 - 9x + 20x^2)^{-1}$$

$$= (1 - 4x)^{-1} (1 - 5x)^{-1}$$

$$= 5(1 - 5x)^{-1} - 4(1 - 4x)^{-1}$$

\therefore The coefficient of x^n

$$= 5 \cdot 5^n - 4 \cdot 4^n = 5^{n+1} - 4^{n+1}$$

PART 4 – BIOLOGY

71. Ans : Carolus Linnaeus

Sol: Carolus Linnaeus suggested binomial system.

72. Ans : 5% sodium hypochlorite and 20% alcohol.

Sol:

73. Ans : Apical meristem

Sol: Left behind part of apical meristem is the intercalary meristem.

74. Ans : H_2F

Sol: H_2A and H_2B are the part of octamer histone protein and H_1, H_3, H_4 also form the histone proteins.

75. No correct option. The option should be of $1 - c, 2 - d, 3 - b, 4 - a$

76. Ans : Fab region

Sol: Fab is the fragment of antigen binding site.

77. Ans : Two identical single strand RNA's

Sol: Retroviruses contain two helix RNA strands.

78. Ans : 2 and 3 only

Sol: Thymus develops at about sixth week of gestation and red blood production is known as haematopoiesis.

79. Ans : 3 ATP and 2 $NADPH_2$

Sol: 3 ATP and 2 $NADPH_2$ are required for the fixation of one molecule CO_2 in dark reaction.

80. Ans : CO15

Sol: CO15 is a variety of sugarcane.

- 81. Ans :**
 (a) In *Abelmoschus esculentus*, the fruit is schizocarp
 (d) ovary superior trilobular ovules on axile placentation in Musaceae
 Sol: Loculicidal capsule is seen in *Abelmoschus esculentus*. Ovary is inferior in Musaceae.
- 82. Ans :** 1 – b 2 – a 3 – d 4 - c
 Sol: All the pairing matches given in option a are correct.
- 83. Ans :** From going back to left auricle
 Sol: Mitral valve prevents back flow of blood to left auricle.
- 84. Ans :** 2, 3 and 4
 Sol: Diastolic pressure is monitored by sphygmomanometer.
- 85. Ans :** Sibling species
 Sol: Sibling species are closely related species of morphologically identical but are not involved in interbreeding.
- 86. Ans :** 5' TTAAGC 3'
 3'AATTGC5'
 Sol: DNA base sequences read as same in both directions in a double strand stretch of DNA.
- 87. Ans :** Carbon-di-oxide
 Sol: CO₂ accounts 60% in green house gas. The others are CH₄ ∴ 20% CFCs – 14% and N₂O – 6%.
- 88. Ans :** D loop, anticodon loop, Extra arm, Tyloop
 Sol: 1 – Dihydrouridine (d loop), 2 – Anticodon, 3 – Extra arm, 4 – Thymine pseudouridine cytosine arm.
- 89. Ans :** Calcitonin
 Sol: Calcitonin decreases HCl secretion.
- 90. Ans :** Copper and zinc
 Sol: Cu and Zn are required in trace quantity level for nutrition.
- 91. Ans :** CD4 plus T – helper cells
 Sol: HIV causes the depletion of WBC and results in the CD₄ plus T-helper cells.
- 92. Ans :** Plymouth rock
 Sol: Plymouth rack fowl is the oldest and most popular breed of America.
- 93. Ans :** *Schizanthus pinnatus*
 Sol: *Schizanthus pinnatus* plant shows 2 fertile stamens and 3 staminodes.
- 94. Ans :** Parenchyma
 Sol: Bundle sheath or border parenchyma present in the leaf vascular bundle.
- 95. Ans :** Fluorescence
 Sol: Fluorescence results immediate loss of light energy from the chlorophyll molecules.
- 96. Ans :** 2 and 3
 Sol: Photorespiration protects the plant when CO₂ supply is limited under high light. *Viscum* is a partial stem parasite.
- 97. Ans :** 1 – c 2 – a 3 – d 4 - b
 Sol: All the paired matchings given in option d are correct.
- 98. Ans :** Group C, B, D and G
 Sol: 23 pairs human chromosomes are grouped into seven categories as A, B, C, D, E, F and G.
- 99. Ans :** Nuclear radiation
 Sol: Nuclear radiation results Chernobyl disaster.

- 100.**Ans : Mycoprotein
Sol: Mycoprotein is used in SCP production.
- 101.**Ans : 2 only
Sol: Fertilization membrane prevents polyspermy.
- 102.**Ans : *Ravenala medagascariensis*
Sol: Traveller's palm is an ornamental plant in Musaceae.
- 103.**Ans : Variola virus – small pox
Sol: *Treponema palladium* causes syphilis, *salmonella typhi* causes typhoid and *yersinia pestis* causes plague diseases.
- 104.**Ans : 1 : 7 : 7 : 1
Sol: Repulsion shows the linkage genes and its inheritance results parental forms in higher frequency.
- 105.**Ans : Restriction enzyme
Sol: Restriction enzyme (REN) involved in specific nick of DNA sequence.
- 106.**Ans : Thymus
Sol: Thymus develops at about 6th week of gestation.
- 107.**Ans: Glyceric acid
Sol: Glyceric acid is directly formed from hydroxypyruvic acid.
- 108.**Ans : 1 – d 2 – a 3 – b 4 - c
Sol: All the matching pairs given in a are correct.
- 109.**Ans : Chlorofluorocarbon
Sol: CFCs are used in coolant refrigerator.
- 110.**Ans : 0.1%
Sol: 0.1% fungicides are used in mounted specimens.
- 111.**Ans : Glucoma – Decrease IOP
Sol: Glucoma increase IOP.
- 112.**Ans : 1 and 4
Sol: *Solanum nigrum* is black night shade plant and tungro is a viral disease seen in rice.
- 113.**Ans : RBC
Sol: Hayem's solution is used to count RBC.
- 114.**Ans : Recessive gene disease
Sol: r-globulin synthesis fails in Agammaglobulinemia.
- 115.**Ans: *Bos indicus*
Sol: Humped cattle is *Bos indicus*.
- 116.**Ans : Transversion
Sol: Transversion is a kind of mutation.
- 117.**Ans : $\frac{\text{Volume of CO}_2 \text{ evolved}}{\text{Volume of O}_2 \text{ evolved}}$
Sol: RQ is used for the detection of respiratory substrate.
- 118.**Ans : Copper sulphate – 9 kgs
Quick lime – 9 kgs
Water – 250 litres
Sol: Bordeaux mixture is a well known fungicide compound.
- 119.**Ans : 1, 4, 2, 3 and 5
Sol: Natural selection of Darwin accounts for species formation.
- 120.**Ans : 2, 3 and 4
Sol: Gobar gas plant is an anaerobic degradation of organic waste.