Physics

1. **(a)** $\gamma = 1 + \frac{2}{f}$

$f =$ number of degrees of freedom

$f = 5$ for O_2

2. **(b)** $V = \omega\sqrt{A^2 - y^2}$

$a = -\omega^2 y$

3. **(a)** $\Delta f = f\left(\frac{V_s}{V - V_s}\right)(V_0 = V_s)$

$$\Delta f = 325\left(\frac{5}{330 - 5}\right) = 5$$

4. **(c)** $Q = ne$

$$n = \frac{Q}{e} = \frac{3.2 \times 10^{-6}}{1.6 \times 10^{-19}}$$

$n = 2 \times 10^{13}$

5. **(b)** Force on 1^{st} charge due to 2^{nd} charge is equal to force on 2^{nd} charge due to first charge.

$\vec{F}_1 = -\vec{F}_2$

6. **(b)** $\phi = E.A = 3 \times 10^5 \times 300 \times 10^{-4}$

$= 9 \times 10^3\ V - m$

7. **(a)** As net charge is zero.

8. **(c)** The excess charge resides on the surface of the conductor.

9. **(b)** $X_e = \frac{P}{E} \times n$

$$X_e = \frac{0.2 \times 10^{-6}}{(10^{-2})^3 \times 4} \times 100 = 5C^2\ N^{-1}\ m^{-2}$$

10. **(a)** $u = \frac{1}{2}CV^2$

$$\frac{du}{dt} = \frac{1}{2}C2\ V\frac{dV}{dt} = CV\frac{dV}{dt}$$
$$\frac{du}{dt} = 5 \times 10^{-6} \times 4 \times 0.6 = 12 \times 10^{-6}$$

11. **(c)** Ohms law $V = iR$

$$V = i\frac{\rho\ell}{A}$$
$$\frac{V}{\ell} = \frac{i}{A}\rho$$
$$\vec{E} = \rho\vec{j}$$

12. (d) $i = \frac{V_0}{R_{eff}}$

$R_{eff} = R + 2R = 3R$

13. (a) $Q = ne =$ area under $I - t$ graph

$$n = \frac{5000 \times 10^{-3}}{1.6 \times 10^{-19}} = 3.125 \times 10^{19}$$

14. (a) $R_1 = \frac{1}{\tan 45^\circ} = 1$

$$R_2 = \frac{1}{\tan 30^\circ} = \sqrt{3}$$

$$\alpha = \frac{R_2 - R_1}{R_1 t_2 - R_2 t_1} = 3.22 \times 10^{-3} / {}^\circ C$$

15. (c) $P = \frac{V^2}{R} \Rightarrow R = \frac{120 \times 120}{60} = 240\Omega$

$$I = \frac{P}{V} = \frac{60}{120} = \frac{1}{2}\ A$$

$$R = \frac{V}{I} = \frac{220}{1/2} = 440\Omega$$

$R_s = 200\Omega$

16. (c) $R = \frac{Sl}{100 - l}$

$R_1 = 4\Omega$

$R_2 = 6\Omega$

$$\alpha = \frac{R_2 - R_1}{R_1 t_2 - R_2 t_1} = \frac{6 - 4}{4 \times 100 - 0} = \frac{2}{400}$$

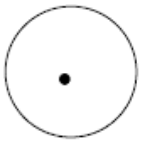
$\alpha = 0.005^0 C^{-1}$

17. (b) Moving electron produce both electric and magnetic field.

18. (a)

No.of turns $= N_1 = 9$

$$B_1 = \frac{\mu_0 N_1 i}{2R} = \frac{9\mu_0 i}{2R}$$



$$B_2 = \frac{\mu_0 N_2 i}{2r} = \frac{\mu_0 i}{2R}$$

$$\frac{B_1}{B_2} = \frac{\frac{9\mu_0 i}{2R}}{\frac{\mu_0 i}{2R}} = 9 \Rightarrow B_1 = 9\, B_2$$

$$\therefore B_2 = \frac{B_1}{9}$$

19. (d) Time period $T = \frac{2\pi m}{qB} = \frac{2\pi}{m \times 2} = 15$

Particle will be at point P after time $t = \frac{1}{12}\ s = \frac{1}{12} = \frac{T}{12}$

It is deviated by angle $\theta = \frac{2\pi}{12} = 30°$

$\therefore$ Velocity of particle at point P

$\vec{v} = 10\cos 30\hat{i} + 10\sin 30\hat{j}$

$= 10\left(\frac{\sqrt{3}}{2}\hat{i} + \frac{1}{2}\hat{j}\right)$

$\vec{v} = 5(\sqrt{3}\hat{i} + \hat{j})$

20. (d) $B_{centre} = 64\, B_{axis}$

$$B_C = \frac{\mu E}{2R} = 64\frac{\mu_0 I R^2}{2(R^2 + x^2)^{3/2}}$$

$$(R^2 + x^2)^{3/2} = 64R^3 = (4R)^3$$

$$(R^2 + x^2) = 16R$$

$$15R^2 = x^2$$

$$x = \sqrt{15}R$$

21. (c)

22. (c) $\chi \propto \frac{1}{T}$

$$\frac{\chi_1}{\chi_2} = \frac{T_2}{T_1} \Rightarrow \chi_2 = \chi_1 \cdot \frac{T_1}{T_2}$$

$$= 1.2 \times 10^{-5} \times \frac{300}{200}$$

$$= 1.8 \times 10^{-5}$$

23. (a) Flux entering = Flux leaving Flux entering

$\phi = B.A$

$= 2 \times 10^{-3} \times \pi \times \frac{10^2}{\pi} \times 10^{-4}$

$= -20\mu wb$

Flux leaving

$\phi = 20\mu wb$

24. (c)

25. (b) $e = \frac{d\phi}{dt}$

$iR = \frac{d\phi}{dt}$

$2 \times 10 = \frac{d\phi}{1 \times 10^{-3}}$

$\phi = 2 \times 10^{-3}$

$= 2 \times 10^{-2} wb$

26. (c) $\frac{M=\mu_0 N_1 N_2 i\pi r_2^2}{l}$

"M" independent of " t "

27. (d) For good communication Q factor should be high

$Q = \frac{1}{R}\sqrt{\frac{L}{C}}$

$\frac{1}{5}\sqrt{\frac{3.5}{30}}$

$= 0.022$

28. (c)

$f_0 = \frac{1}{2\pi}\sqrt{\frac{L}{C}}$

29. (c)

30. (a) $F = \frac{2IA}{C}$

31. (d)

32. (c) $\mu = \frac{\sin\left(\frac{A+d_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$

$A = d_m = 60°$

$\mu = \frac{\sin 60°}{\sin 30°} = \sqrt{3}$

$\frac{C}{C_m} = \mu = \sqrt{3}$

$C_m = \frac{C}{\sqrt{3}}$

$= \sqrt{3} \times 10^8$ m/sec

33. (a) $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$

$\frac{3/2}{v} - \frac{4}{3(-2R)} = \frac{3/2 - 4/3}{R}$

$V = -3R = -30$ cm

34. (d) Effective focal length

$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} = \frac{(\mu_1 - 1)}{R} + \frac{(\mu_2 - 1)}{R}$

$\Rightarrow f = 20$ cm

$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{20} = \frac{1}{v} - \left(\frac{1}{-40}\right) \Rightarrow v = 40$ cm

35. (a) $\frac{\Delta\lambda}{\lambda} = \frac{v}{c}$

$\Rightarrow \frac{1}{600} = \frac{v}{3 \times 10^8}$

$V = \frac{3 \times 10^8}{600} = 500$ km/s

36. (b) $I_{res} = \frac{I_0}{2}\cos^2\theta\sin^2\theta$

$= \frac{I_0}{2}\cos^2 30°\sin^2 30°$

$= \frac{3I_0}{32}$

37. (d) $\beta = \frac{\lambda D}{d} \Rightarrow \beta \propto \lambda$

$\lambda = \frac{h}{p} = \frac{h}{mv} \Rightarrow \lambda \propto \frac{1}{m}$

$\Rightarrow m_e < m_p$

$\Rightarrow \lambda_e > \lambda_p \ \therefore \beta_1 > \beta_2$

38. (c) $KE_{max} = E - w_0$

$= E - \frac{E}{3} = \frac{2E}{3}$

KE lies from 0 to $\frac{2E}{3}$

39. (c) $w_0 = 2.4ev$

$$\lambda_0 = \frac{12400}{w_0} = \frac{12400}{2.4}$$

$$\lambda_0 = 5166\ A^0$$

$$= 516.6\ nm = \text{maximum}$$

$\therefore$ For $\lambda = 700$ nm photo electric effect does not take place.

40. (d) $V^2 \propto \frac{1}{d}$

$$\frac{d_2}{d_1} = \left(\frac{V_1}{V_2}\right)^2 = \left(\frac{V}{2V}\right)^2$$

$$d_2 = \frac{d}{4}$$

41. (d) Area $\alpha r^2 \alpha n^4$

$$\frac{A_1}{A_2} = \left(\frac{n_1}{n_2}\right)^4 = \left(\frac{2}{1}\right)$$

$$= \frac{16}{1}$$

42. (d) $\frac{V}{\text{Area}} = \frac{\frac{4}{3}\pi R^3}{4\pi R^2} = \frac{1}{3}R$

$$= \frac{1}{3} \times R_0 A^{1/3}$$

$$= \frac{1}{3} \times 1.2 \times 10^{-15} \times (27)^{1/3}$$

$$= 1.2 \times 10^{-15}\ m$$

43. (d) $K.E_n = \frac{\text{B.E of products} - \text{B.E of reactants}}{3}$

$$= \frac{1980 - 1800}{3} = 60MeV$$

44. (c) $\log_e R_0 = 2$

$$R_0 = e^2 = 7.5$$

$$R_0 = \lambda No$$

$$\lambda = \text{slope} = \frac{1}{10 \times 10^3} = \frac{1}{10^4} = 10^{-4}/sec$$

$$No = \frac{R_0}{\lambda} = \frac{7.5}{10^{-4}} = 75{,}000$$

45. (b) As recombination of holes and electrons takes place, it is free from charge carriers.

46. (b) Copper is a conductor, In conductors, V.B and C-B are overlapped

47. (d) $I = I_z + I_L \Rightarrow I_z = I - I_L = \left(\frac{V_0 - V_Z}{R_S}\right) - I_L$

$I = I_z + I_L \Rightarrow I_z = I - I_L$

48. (b) $i = \frac{V - V_B}{R_S} = \frac{5.7 - 0.7}{5 \times 10^3} = \frac{5}{5} \times 10^{-3} = 1\ mA$

49. (a) Distance $= \frac{3\pi r}{2} = 60\pi$

Displacement $= \sqrt{2}R = 40\sqrt{2}$

50. (d) Resultant of two vectors is always lies between maximum $(P + Q)$ and minimum $(P \sim Q)$ resultant

51. (b) $f_s = \mu_s mg\cos\theta$

$= 0.6 \times mg \times \cos 30$

$= 0.3\sqrt{3}mg$

$mg\sin\theta = mg\sin 30 = \frac{mg}{2}$

As $f_s > mg\sin\theta$ the block will be at rest.

52. (c) $w = \Delta kE =$ Area under the graph

$$25 = \frac{P^2}{2\,m}$$

$$25 = \frac{P^2}{2 \times 500 \times 10^{-3}}$$

$P = 5\ kg\ m/s$

53. (c) D.F for activity is $\frac{1}{T} = M^0\ L^0\ T^{-1}$

54. (d) Direction of angular velocity is along -ve z axis.

55. (b) $m_1 gh = \frac{1}{2}\ m_1\ V^2 + \frac{1}{2} I\omega^2$

$$I = \frac{m_2 R^2}{2} \times \frac{V^2}{R^2} = \frac{M_2}{2} V^2$$

$$m_1 gh = \frac{1}{2}\ m_1\ V^2 + \frac{1}{2}\frac{m_2}{2}\ V^2$$

$$1 \times 10 \times 1.6 = \left(\frac{1}{2} \times 1 + \frac{1}{2} \times 1\right) V^2$$

$V = 4\ ms^{-1}$

56. (a) $g_h = \frac{gR^2}{(R+h)^2} = \frac{4\,g}{9} = \frac{4}{9} \times 9.8 = 4.4\ m/s^2$

57. (b) Increase in weight due to its own weight $= \frac{mgl}{2Ay} = \frac{L^2 \rho g}{2y}$

58. (c) $Q = AV$

$0.314 = \pi r^2 . V$
$0.314 = 3.14 \times 10^{-2} \times V$
$V = 10\ ms^{-1}$

59. (c) Heat energy supplied

$Q = ms_1(\theta_1 - \theta_0) + mL_f + mS_2(\theta_2 - \theta_1) + mL_V$

60. (d) Work done $W = \frac{1}{2} \times$ Base $\times$ height

$= \frac{1}{2}(3\ V_0 - V_0)(3P_0 - P_0)$

$= \frac{1}{2}(2\ V_0)(2P_0)$

$W = 2P_0\ V_0$

Chemistry

61. (d) Calcination of calcium carbonate is endothermic
62. (c)
63. (d) Ozone absorbs infrared radiation
64. (a) Gold solution is not a macromolecular colloid. i.e the particle size in gold solution is not large.
65. (d)
66. (b)
67. (a)
68. (a)
69. (b)
70. (c)
71. (b)
72. (b)
73. (d) $\alpha - D - (+)$-glucose and $\beta - D - (+)$-glucose are those diastereomers that differ in configuration at $C - 1$ atom. Such isomers are referred as anomers. In this case, $C - 1$ carbon atom is the anomeric carbon atom.
74. (c)
75. (c)
76. (d)
77. (a)
78. (c)
79. (b)
80. (d)
81. (d)
82. (c)
83. (d)
84. (b)
85. (a)
86. (a)
87. (c)
88. (a)
89. (a)
90. (d)
91. (d)

92. **(a)**
93. **(c)**
94. **(d)**
95. **(d)**
96. **(b)**
97. **(b)**
98. **(d)**
99. **(b)**
100. **(c)**
101. **(b)**
102. **(b)**
103. **(d)**
104. **(c)**
105. **(a)**
106. **(b)**
107. **(d)**
108. **(d)**
109. **(d)**
110. **(d)**
111. **(b)**
112. **(b)**
113. **(c)**
114. **(a, c)**
115. **(c)**
116. **(b)**
117. **(b)**
118. **(d)**
119. **(c)**
120. **(c)**

Mathematics

121. **(b)** $f(2) = 2,\ f(0) = 0$

$$f'(c) = \frac{2-0}{2-0} = 1$$

$$f'(c) = 2c(c-1) + (c-1)^2$$

option verification

122. **(d)** $x = 2\cos\theta$

$$\frac{2+x}{2-x} = \frac{2(1+\cos\theta)}{2(1-\cos\theta)} = \cot^2\frac{\theta}{2}$$

$$\therefore \frac{d}{dx}\frac{1}{2}(1+\cos\theta) = \frac{1}{2}\frac{d}{dx}\left(1+\frac{x}{2}\right)$$

$$= \frac{1}{4}$$

123. **(b)** $f'(x) = 3x^2 - 12x + 12$

$f''(x) = 6x - 12$

$f''(2) = 0$

$f'''(2) \neq 0$

124. **(b)**

125. **(b)** $\log y = \log(2.x^{3x})$

$= \log 2 + 3x\log x$

$\frac{1}{y}\frac{dy}{dx} = 3\left[x \cdot \frac{1}{x} + \log x\right]$

$\frac{dy}{dx} = 2 \cdot x^{3x} \cdot 3(1 + \log x)$

$\left(\frac{dy}{dx}\right)_{x=1} = 6$

126. **(a)** $f(x) = k^x$

$f(5) = 3$

$k^5 = 3$

$\therefore f(x) = 3^{x/5}$

$f'(x) = 3^{x/5}\log_e 3 \cdot \frac{1}{5}$

$f'(0) = 2$

$\frac{\log_e 3}{5} = 2$

$\log_e 3 = 10$

$f'(x) = 2(3)^{x/5}$

$f'(5) = 2 \times 3 = 6$

127. **(b)** Put $\log x = t \Rightarrow \frac{1}{x}dx = dt$

$I = \int \frac{1}{(3t+2)(2t+1)}dt$

$\frac{1}{(3t+2)(2t+1)} = \frac{A}{3t+2} + \frac{B}{2t+1}$

After solving $A = -3, B = 2$

$\therefore I = \int \frac{-3}{3t+2}dt + \int \frac{2}{2t+1}dt$

$= -\log|3t+2| + \log|2t+1| + C$

128. **(c)** $\int \frac{2\sin\left(\frac{5x}{2}\right)\cos\frac{x}{2}}{2\sin\frac{x}{2}\cos\frac{x}{2}}dx$

$= \int \frac{\sin 3x + \sin 2x}{\sin x}dx$

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

$= \int 1 + 2\cos 2x + 2\cos x dx$

$= x + \sin 2x + 2\sin x + C$

129. **(a)** $\int_1^5 (|x-3| + |x+1|)dx$

$= \int_1^3 2dx + \int_3^5 2x - 4dx$

$= 2(2) + (x^2 - 4x)_3^5$

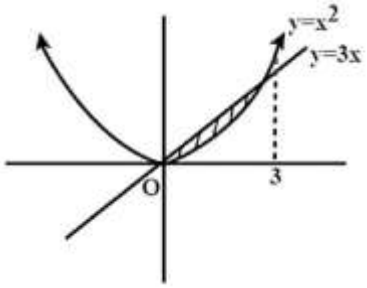
$= 4 + [(25-20) - (9-12)] = 4 + 8 = 12$

130. **(c)** $\lim_{n\to\infty}\sum_{r=1}^{2n}\left(\frac{n}{n^2+r^2}\right)$

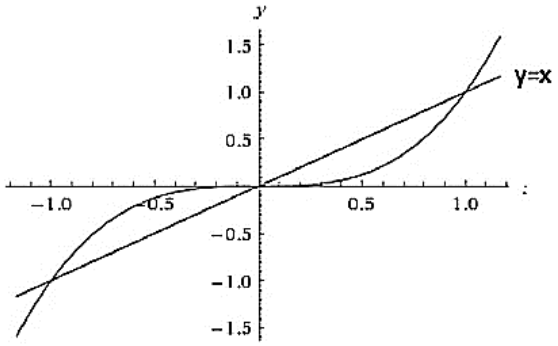
$= \lim_{n\to\infty}\sum_{r=1}^{2n}\frac{n}{n^2\left(1+\left(\frac{r}{n}\right)^2\right)}$

$= \int_0^2 \frac{1}{1+x^2}dx = \tan^{-1}2$

131. **(b)** $A = \int_0^3 (3x - x^2)dx = 3\left(\frac{x^2}{2}\right) - \frac{x^3}{3}\Big]_0^3 = \frac{9}{2}$



132. **(d)** $A = 2\int_0^1 (x - x^3)dx = 2\left[\frac{x^2}{2} - \frac{x^4}{4}\right]_0^1 = 0.5$ sq. units



$y=x^3$

133. **(d)** Since $\vec{a}\cdot(\vec{b}\times\vec{c})=[\vec{a}\vec{b}\vec{c}]$,

$(\vec{a}+\vec{b})\cdot\vec{p}+(\vec{b}+\vec{c})\cdot\vec{q}+(\vec{c}+\vec{a})\cdot\vec{r}=1+1+1=3$

134. **(a)** $(-3)(3k)+(2k)(1)+2(-5)=0$

135. **(c)** $d=\frac{|6-4|}{\sqrt{4+9+16}}=\frac{2}{\sqrt{29}}$

136. **(a)** $\sin\theta=\frac{3(2)+4(-2)+5(1)}{\sqrt{9+16+25}\sqrt{4+4+1}}$

137. **(b)**

138. **(a)** $\vec{n}=\begin{vmatrix} i & j & k \\ 0 & 4 & 4 \\ 1 & 5 & 4 \end{vmatrix}$

$=\hat{i}(16-20)-\hat{j}(0-4)+\hat{k}(0-4)$

$=-4\hat{i}+4\hat{j}-4\hat{k}$

∴ Eq. of plane is

$-4(x-3)+4(y-2)-4(z-0)=0$

$\Rightarrow -4x+12+4y-8-4z=0$

$\Rightarrow x-y+z=1$

139. **(d)**

140. **(c)** $n=10, p=\frac{1}{2}; q=\frac{1}{2}$

$P(x\geq 1)=1-P(x=0)$

$=1-{}^{10}C_0\left(\frac{1}{2}\right)^0\left(\frac{1}{2}\right)^{10}$

141. **(b)** $\sum p_i x_i=\frac{1}{3}\Rightarrow 0+k+\frac{2}{36}=\frac{1}{3}\Rightarrow K=\frac{1}{3}-\frac{1}{18}=\frac{5}{18}\ \sigma^2+\mu^2=\frac{\sum p_i x_i^2}{\sum p_i}=\frac{0+6+\frac{4}{36}}{1}=\frac{14}{36}$

$\Rightarrow \sigma^2=\frac{14}{36}-\mu^2=\frac{14}{36}-\frac{1}{9}=\frac{5}{18}$

142. **(b)** Given $n=5, P(X=2)=9P(X=3)$

$\Rightarrow {}^n c_2\cdot q^{n-2}\cdot p^2=9.\ {}^n c_3\cdot q^{n-3}\cdot p^3$

$\Rightarrow q = 3(n-2) \cdot p$

$\Rightarrow 1 - p = 3(3) \cdot p$

$\Rightarrow p = \frac{1}{10}$

143. **(c)** $2^m = 56 + 2^n$ then verification $m = 6, n = 3$

144. **(b)** $([x]-2)([x]-3) = 0$

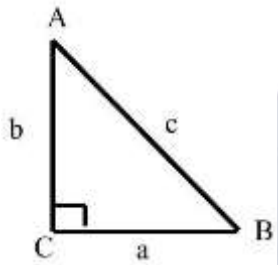
$\Rightarrow [x] = 2$ or $[x] = 3$

$\Rightarrow x \in [2,4)$

145. **(b)** $l_1 = l_2, \theta_1 = 30°, \theta_2 = 78°$

Then $\frac{l_1}{l_2} = \frac{r_1\theta_1}{r_2\theta_2} \Rightarrow \frac{r_1}{r_2} = \frac{\theta_2}{\theta_1} = \frac{78^0}{30°} = \frac{13}{5}$

146. **(c)**



Since C is a right angle then

$\text{Tan A} + \text{Tan B} = \frac{a}{b} + \frac{b}{a} = \frac{a^2+b^2}{ab} = \frac{c^2}{ab}$

147. **(c)** $z = \frac{1-i\sin\alpha}{1+2i\sin\alpha}$, after simplify

$z = \frac{(1-2\sin^2\alpha)+i(-3\sin\alpha)}{1+4\sin^2\alpha}$ and z is purely real

then $\text{Im}(z) = 0$

$\Rightarrow \sin\alpha = 0$

$\Rightarrow \alpha = n\pi, n \in N$

148. **(b)** Given $l = 5b, P \geq 180$

$\Rightarrow 2(l+b) \geq 180$

$\Rightarrow b \geq 15$

149. **(a)** Since $n_{c_r} + n_{c_{r-1}} = (n+1)_{c_r}$,

$^{49}C_3 + {}^{48}C_3 + {}^{47}C_3 + {}^{46}C_3 + ({}^{45}C_3 + {}^{45}C_4)$

$= {}^{49}C_3 + {}^{48}C_3 + {}^{47}C_3 + {}^{46}C_3 + {}^{46}C_4 \ldots\ldots$

$= {}^{50}C_4$

150. **(a)** $\frac{C_1}{C_0} + 2\frac{C_2}{C_1} + 3\frac{C_3}{C_2} + \cdots .. + n\frac{C_n}{C_{n-1}}$

$= n + (n-1) + (n-2) + \cdots \ldots . + 1 = \frac{n \cdot (n+1)}{2}$

151. **(b)**

$\frac{S_n}{S_{2n}} = \frac{\frac{a \cdot (r^n - 1)}{r-1}}{\frac{a \cdot (r^{2n} - 1)}{r-1}} = \frac{r^n - 1}{(r^n - 1)(r^n + 1)} = \frac{1}{(r^n + 1)}$

152. **(d)** Given A.M $= \frac{\alpha+\beta}{2} = 5 \Rightarrow \alpha + \beta = 10$,

G.M $= \sqrt{\alpha \cdot \beta} = 4 \Rightarrow \alpha\beta = 16$

$\therefore$ The quadratic equation is

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

153. **(c)** Slope of $x + y = 3$ is $m_1 = -1$ and

Slope of line joining the points $(1,1), (-3,4)$ is $m_2 = -\frac{3}{4}$

and $\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1\, m_2}\right| \Rightarrow \theta = \tan^{-1}\frac{1}{7}$

154. **(a)** Focus $==$ F $= (a, 0) = (6,0)$

Equation of directrix is $x = -6$ then equation of parabola is of the form $y^2 = 4ax, a = 6$

155. **(c)** By L.H. Rule

$\text{Lt}_{x \to \frac{\pi}{4}} \frac{-\sqrt{2} \times \sin x - 0}{-\text{cosec}^2 x} = \frac{\sqrt{2} \times \frac{1}{\sqrt{2}}}{(\sqrt{2})^2} = \frac{1}{2}$

156. **(c)**

157. **(d)** adding constant each observation of S.D does not effect.

158. **(b)** $\tan x = 1 \Rightarrow x = n\pi + \frac{\pi}{4}$

159. **(c)** $f(x) = x^2 + 1 = 17 \Rightarrow x = \pm 4$ $x^2 + 1 = -3$ is not possible.

No preimage of -3

160. **(c)** $g(f(x)) = g(\sin^2 x) = \sqrt{\sin^2 x} = \sin x$

$fog(x) = f[\sqrt{x}] = (\sin\sqrt{x})^2$

161. **(c)** 6 Pairs

$\{(3,2), (6,4), (9,6), (12,8), (18,12), (15,10)\}$

162. **(c)** $x = y = z = -1$

$\Rightarrow x(y+z) + y(z+x) + z(x+y) = 6$

163. **(b)** $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$

$\cos^{-1} x = \frac{\pi - 4}{5}$

$\sin^{-1} x = \frac{3\pi + 8}{10}$

164. **(c)** $(I + A)^3 = I + 3A + 3A + A = 7A + I$

165. **(b)** $A^2 = 2^1 A,\ A^4 = A^3 A - A^{10} = 2^9 A$

166. **(d)**

167. **(b)** $f(x) = -x^2 \cos x + x \sin x$

$\therefore \lim_{x \to 0} \frac{f(x)}{x^2} = 0$

168. **(c)** $\log 1 = 0$

169. **(c)**

$|P| = |A - A| = |A|^2 = 16 \Rightarrow 2\alpha - 6 = 16 \Rightarrow \alpha = 11$

170. **(a)** $A = x^2 - 1, \frac{dB}{dx} = 3(x^2 - 1) = 3A$

171. **(d)** $f^1(x) = e^{x - x^2}(x - 2x^2)$

$\Rightarrow$ f is increasing in $\left[-\frac{1}{2}, 1\right]$

172. **(a)** Put

$\cos x = t \Rightarrow \int \frac{-dt}{3 + (2t)^2} = -\frac{1}{\sqrt{3}} \times \frac{1}{2} \times \tan^{-1}\left(\frac{2t}{\sqrt{3}}\right)$

173. **(d)** $f(x)$ is Odd function, then $I = 0$

174. **(c)** $f^1(x) = x^x(1 + \log x) \Rightarrow f^1(x) > 0 \Rightarrow x > \frac{1}{e}$

175. **(a)** $V = \frac{1}{3}\pi r^2 h,$

$l^2 = r^2 + h^2,$

$r^2 = 36 - h^2,$

$\Rightarrow x > 16\sqrt{3}\pi$

$V_{max} = 16\sqrt{3}\pi$

176. **(c)** $\frac{1}{2}|\overline{AB} + \overline{AC}| = \frac{1}{2}|8\hat{i} - 2\hat{j} + 8\hat{k}| - |4\hat{i} - \hat{j} + 4\hat{k}| = \sqrt{33}$

177. **(b)**

$[\hat{j} + \hat{k}\,\hat{i} + \hat{k}\hat{i} + \hat{j}] = \begin{vmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{vmatrix} = 2$ cub units

178. **(c)** $|\bar{a}+\bar{b}|^2 = 1 \Rightarrow 1+1+2|\bar{a}||\bar{b}|\cos\theta = 1$

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

179. **(d)**

$\frac{dy}{dx} = \log(x+1) \Rightarrow \int dy = \int \log(x+1)dx$

And $y(0) = 3$ then

$\Rightarrow y + x - 3 = (x+1)\log(x+1)$

180. **(c)** $\frac{x}{2x_1} + \frac{y}{2y_1} = 1 \Rightarrow xy = c$

Biology

181. **(c)**
182. **(a)**
183. **(b)**
184. **(d)**
185. **(b)**
186. **(b)**
187. **(c)**
188. **(d)**
189. **(b)**
190. **(c)**
191. **(b)**
192. **(b)**
193. **(a)**
194. **(c)**
195. **(c)**
196. **(a)**
197. **(d)**
198. **(d)**
199. **(c)**
200. **(d)**
201. **(b)**
202. **(d)**
203. **(a)**
204. **(c)**
205. **(b)**
206. **(a)**
207. **(d)**
208. **(a)**
209. **(c)**
210. **(a)**
211. **(d)**
212. **(c)**
213. **(b)**

214. (c)
215. (d)
216. (a)
217. (d)
218. (b)
219. (b)
220. (c)
221. (b)
222. (a)
223. (b)
224. (c)
225. (b)
226. (d)
227. (a)
228. (a)
229. (c)
230. (c)
231. (c)
232. (c)
233. (b)
234. (d)
235. (d)
236. (b)
237. (a)
238. (d)
239. (c)
240. (a)