

## ClampHook CBT Mock Test, 24th June, Shift 2

Tribhuvan University

2080

Full Marks: 140

Time: 2 hours

Pass Marks: 56

1. Least count of a stopwatch is 0.2 sec. The time of 20 oscillations of a pendulum is measured to be 25 sec. The maximum % error in measurement is:

- a. 16%                      b. 0.8%  
c. 1%                        d. 8%

2. Which of the following results in acceleration? [IOE 2078]

- a. Angular momentum      b. Linear momentum  
c. Torque                      d. Force

3. The value of  $g$  will increase 1% of its value at the surface of earth at a height ( $R_c = 6400 \text{ km}$ )

- a. 6400 km                    b. 2560 km  
c. 64000 km                d. 57600 km

4. The maximum acceleration of a body executing SHM is  $a_0$  and maximum velocity is  $v_0$ . The amplitude is given by

- a.  $v_0^2$                         b.  $v_0 a_0$   
c.  $\frac{1}{a_0 v_0}$                     d.  $\frac{v_0^2}{a_0}$

5. A balloon filled with helium is left in air: It will [IOE 2077]

- a. rise in air indefinitely      b. fall in air indefinitely  
c. rise and halt after certain height      d. fall and halt after certain height

6. 10gm of water is given a heat 420J. Find the raise in temperature

- a.  $1^\circ C$                         b. 1K  
c.  $10^\circ F$                       d. 10K

7. If the height of Kulekhani hydro – power dam is 50 m. What will be difference in temperature of water at the top and bottom of the dam ?

- a.  $0.50^\circ C$                     b.  $0.42^\circ C$   
c.  $0.30^\circ C$                     d.  $0.12^\circ C$

8. Image from a convex lens is formed beyond 1.5F. The object should be placed at

- a. between F and 3F              b. at F  
c. Beyond 2F                        d. Infinity

9. Chromatic aberration is due to

- a. Deviation                        b. Dispersion

c. Interference

d. Diffraction

**10. 8 small drop of capacitance and radius V combines to form a big drop of radius R then the capacitance of big drop will be**

a. 2 C

b. 4 C

c. 8 C

d. 16 C

**11. the neutral temperature of a thermo couple is  $300^{\circ}\text{C}$ . what is the inversion temperature if the temperature of cold junction is  $10^{\circ}\text{C}$ ?**

a.  $590^{\circ}\text{C}$ b.  $610^{\circ}\text{C}$ c.  $310^{\circ}\text{C}$ d.  $290^{\circ}\text{C}$ 

**12. When a charged particle enters in strong magnetic field, its kinetic energy**

a. Increases

b. Decreases

c. Remain constant

d. First increases and becomes constant

**13. Magnetic flux  $\phi$  in Weber in a closed circuit of resistance  $10\ \Omega$  varies with time t (sec) as  $\phi = 6t^2 - 5t + 1$ . The magnitude of induced current at  $t = 0.25\text{ s}$  is**

a. 0.8 A

b. 0.6 A

c. 0.4 A

d. 0.2 A

**14. Red light of  $6500\text{ \AA}$  from distant falls on a slit of 0.5 mm wide. The distance between two dark band on each side of central bright band of diffraction pattern on screen placed at 1.8 m from slit will be:**

a.  $2.34\text{ mm}$ b.  $1.67\text{ mm}$ c.  $4.68\text{ mm}$ d.  $9.34\text{ mm}$ 

**15. Phase difference between two waves  $y_1 = a \sin \omega t$  and  $y_2 = a \cos \omega t$**

a.  $0^{\circ}$ b.  $\pi$ c.  $\frac{\pi}{2}$ d.  $\frac{3\pi}{4}$ 

**16. If electron, proton, neutron &  $\alpha$  – particle are deflected in the same electric field with same velocity what will be the deflection in them?**

a. Proton less than electron

b. Proton more than electron

c. Electron more than  $\alpha$  – particled. Proton more than  $\alpha$  – particle

**17. Forbidden energy gap in a conductor is:**

a. 6 eV

b. 0 eV

c. 1.1 eV

d. 0.7 eV

**18. The domain of function  $\log_e(a^2 - x^2)$  is [IOE 2076]**

a.  $(-\infty, \infty)$ b.  $[-a, a]$ c.  $[0, \infty)$ d.  $(-a, a)$ 

**19. The element in the first row and third column of the**

**inverse of the matrix  $\begin{bmatrix} 1 & 2 & -3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$  is**

a. 1

b. 7

c. -2

d. 0

**20. The values of z for which  $|z + i| = |z - i|$  are**

a. Any purely real number

b. Any complex number

c. Any natural number

d. Any purely imaginary number

21. In how many ways can be 4 boys and 3 girls be arranged in a row so that a boy and a girl are alternate?

- a.  $7!$                                       b.  $4! \times 3!$   
c.  $P(4, 3) \times 3!$                               d.  $4 \times 3$

22. If  $\cos \left[ x \cos^{-1} \left( -\frac{1}{2} \right) \right] = -\frac{1}{\sqrt{2}}$ , then x is equal to:

- a.  $\frac{1}{8}$     b.  $\frac{5}{8}$   
c.  $\frac{3}{8}$     d.  $\frac{9}{8}$

23. The general solution of the equation

$$\frac{\tan 3x - \tan 2x}{1 + \tan 3x \tan 2x} = 1 \text{ is}$$

- a.  $n\pi + \frac{\pi}{4}$                                       b.  $n\pi \pm \frac{\pi}{4}$   
c.  $n\pi - \frac{\pi}{4}$                                       d. The solution does not exist

24. The expression

$$\frac{(a+b+c)(c+a-b)(a+b-c)(b+c-a)}{4b^2c^2} \text{ is :}$$

- a.  $\cos 2A$                                       b.  $1 - \cos A$   
c.  $\sin^2 A$                                       d.  $1 + \cos A$

25. If  $\vec{a} \cdot \vec{b} = \vec{b} \cdot \vec{c} = \vec{c} \cdot \vec{a} = 0$  then  $\vec{a} \cdot (\vec{b} \times \vec{c})$  is equal to

- a.  $a$     b.  $\pm abc$   
c.  $0$     d. None

26. If the sum of the slopes of the lines represented by  $4x^2 + 2hxy - 7y^2 = 0$  is equal to the product of slopes then the value of h is :

- a. 4    b. -4  
c. -6    d. -2

27. The equation of the circle center at  $(3, -4)$  and touching x - axis is :

- a.  $(x-3)^2 + (y-4)^2 = 4^2$     b.  $(x-3)^2 + (y+4)^2 = 4^2$   
c.  $(x-3)^2 + (y-4)^2 = 3^2$     d.  $(x-3)^2 + (y+4)^2 = 3^2$

28. The eccentricity of the ellipse  $4x^2 + 9y^2 = 36$  is :

- a.  $\frac{1}{2}$     b.  $\frac{1}{3}$   
c.  $\frac{\sqrt{5}}{3}$     d.  $\frac{3}{\sqrt{5}}$

29. The eccentricity of the hyperbola  $16x^2 - 9y^2 = -144$  is

- a.  $\frac{5}{3}$     b.  $\frac{5}{4}$   
c.  $\frac{3}{5}$     d.  $\frac{4}{5}$

30. Let  $L_1$  be the line of intersection of the planes  $3x + 2y + z = 5$  and  $x + y - 2z = 3$  and  $L_2$  be the line of intersection of the planes  $2x - y - z = 0$  and  $7x + 10y - 8z = 0$

Then the angle between  $L_1$  and  $L_2$  is

- a.  $90^\circ$     b.  $\cos^{-1} \left( \frac{1}{\sqrt{3}} \right)$   
c.  $\cos^{-1} \left( \frac{2}{3} \right)$                                       d.  $\cos^{-1} \left( \frac{1}{3} \right)$

31.  $\lim_{x \rightarrow \pi/2} \frac{\sec 3x}{\sec x} = [\text{IOE 2074}]$

- a.  $-1/3$     b.  $1/3$

c. 0

d. 1

32.  $x^3 \sin(y) + \cos(x)y^3 = 0$ , then  $\frac{dy}{dx} =$

a.  $-\frac{[x^3 \sin(y) - 3y^2 \sin(x)]}{[x^2 \cos(y) + y^3 \cos(x)]}$  b.  $-\frac{[3x^2 \sin(y) - y^3 \sin(x)]}{[x^3 \cos(y) + 3y^2 \cos(x)]}$

c. 0

d.  $-\frac{[3x^3 \sin(y) - y^3 \sin(x)]}{[x^3 \cos(y) + 3y^3 \cos(x)]}$

33. The differential coefficient of  $\tan^{-1} \left( \frac{\sqrt{1+x^2}-1}{x} \right)$  with respect to  $\tan^{-1} x$  is

a.  $\frac{1}{1+x^2}$

b.  $\frac{1}{\sqrt{1-x^2}}$

c.  $\frac{2}{1+x^2}$

d.  $\frac{1}{2}$

34. The equation of the tangent to the curve is  $y = 2x^2 - 3x - 1$  at the point  $(1, -2)$  is

a.  $x - y + 3 = 0$

b.  $x - y - 3 = 0$

c.  $x + y + 3 = 0$

d.  $x + y - 3 = 0$

35. What is the maximum value of  $\left(\frac{1}{x}\right)^x$ ?

a.  $e^{1/e}$

b.  $\left(\frac{1}{e}\right)^e$

c.  $e^{-e}$

d. None

36.  $\int_0^{\pi/4} \frac{\tan^2 \theta}{\sin^2 \theta} d\theta$  [IOE 2076]

a.  $\sqrt{3}$

b.  $1/\sqrt{3}$

c.  $1/2$

d. 1

37. The area bounded by the lines  $x = 0, x = 2$  and curves  $y = 2^x, y = 2x - x^2$  is:

a.  $\frac{4}{\log_e 2} - \frac{4}{3}$

b.  $\frac{3}{\log_e 2} - \frac{3}{4}$

c.  $\frac{3}{\log_e 2} - \frac{4}{3}$

d.  $\frac{3}{\log_e 2}$

38. Which of the following is used as anti knocking material?

a. T.E.L

b.  $C_2H_5OH$

c. glyoxal

d. Freon

39. Gobar gas mainly contains

a. methane

b. butane

c. ethane

d. propane

40. Which of following allotrope of sulphur is most stable

a. Rhombic sulphur

b. Monoclinic sulphur

c. Milk sulphur

d. Plastic sulphur

41. When red phosphorus is heated with nitric acid, \_\_\_\_\_ is formed.



42. When NaCl is dissolved in water,  $Na^+$  ion is [IOE 2075]

a. Hydrolysed

b. Oxidised

c. Reduced

d. Hydrated

43. Copper matte is [IOE 2074]

- a. copper sulphate and iron sulphate      b. copper sulphide and iron sulphide  
c. copper oxide and iron oxide      d. copper chloride and iron chloride

**44. Iron is heated to red hot and cooled slowly in a heating process . This process is called [IOE 2076]**

- a. annealing      b. quenching  
c. tempering      d. none

**45. In which of the following is the oxidation number of carbon zero**

- a.  $C_6H_{12}O_6$       b.  $C_{11}H_{22}O_{11}$   
c.  $CH_2F_2$       d. all of these

**46. O.N. of cobalt in  $[Co(CO)_4]$  is**

- a. +3      b. 0  
c. +5      d. -1

**47. Ionic bond is highly favoured between**

- a. Large cation & small anion      b. Large cation & large anion  
c. Small cation & small anion      d. Small cation & large anion

**48. Which of the following is correct ? [IOE 2074]**

- a.  $Cu = [Ar] 4s^2 3d^{10}$       b.  $Cr = [Ar] 4s^2 3d^4$   
c.  $Cr = [Ar] 4s^2 3d^5$       d.  $Mn = [Ar] 4s^2 3d^5$

**49. He is as old as .....**

- a. me      b. I  
c. her      d. him

**50. Several theories on the topic ..... discussed.**

- a. was      b. is

- c. has been      d. were

**51. I am surprised \_\_\_\_ the results. [IOE 2077]**

- a. by      b. with  
c. at      d. of

**52. Gopal killed Ram . Its pattern is [IOE 2075]**

- a. S + V + O      b. S + V + SC  
c. S + V + OC      d. S + V + Adverbial

**53. Before he shifted to Pokhara, he \_\_\_\_\_ in Kathmandu.**

- a. lived      b. was living  
c. had lived      d. had been living

**54. They publish the newspaper daily. Its passive voice is**

- a. The newspaper are published daily.      b. The newspaper is published daily.  
c. The newspaper was published daily..      d. None.

**55. Which of the following vowels is there in the word 'tongue'?**

- a. /a/      b. /ɑ:/  
c. /ɔ:/      d. /a:/

**56. After I got home from school, I walked the dog, put away laundry, and finished my homework. It is a \_\_\_\_\_.**

- a. Simple Sentence      b. Compound Sentence  
c. Complex Sentence      d. Compound-Complex Sentence

**57. These days I am in hot water. It means**

- a. I am in love                      b. I am in Pond  
c. I am in a big trouble              d. I am still swimming.

**58. The antonym of the word 'novice' is [IOE 2074]**

- a. recruit                              b. apprentice  
c. veteran                              d. amateur

**59. I wish I ..... a bird.**

- a. am                                      b. was  
c. were                                      d. Where

**60. Public speaking \_\_\_\_\_ a skill.**

- a. are                                      b. have  
c. has                                      d. is

**61. Two bullets are fired horizontally with velocity  $u_1$  and  $u_2$  in opposite direction from top tower. The time after which their velocity become perpendicular to each other is**

- a.  $\frac{2u_1u_2}{(u_1 + u_2)g}$                       b.  $\frac{\sqrt{u_1u_2}}{g}$   
c.  $\frac{u_1 + u_2}{g}$                               d.  $\frac{\sqrt{u_1^2 + u_2^2}}{g}$

**62. The apparent change in weight of a mass in bringing from pole of earth to equator is 0.4 N. The apparent change in weight of mass is taken from pole to a place of latitude of  $45^\circ$  is:**

- a. 0.3 N                                      b. 0.2 N  
c. 0.1 N                                      d. 0

**63. The total energy of particle executing SHM is E. The KE of particle at half of amplitude is:**

- a.  $E/2$                                       b.  $E/\sqrt{2}$

- c.  $E/4$                                       d.  $3E/4$

**64. An object weighs 30 g in air and 25 g when totally immersed in water density of object is:**

- a. 4 g/ cc                                      b. 5 g/ cc  
c. 6 g/ cc                                      d. 8 g/ cc

**65. Kinetic energy of 1gm  $N_2$  at  $127^\circ C$  is [IOE 2077]**

- a. 4.99KJ                                      b. 0.178 KJ  
c. 8.31KJ                                      d. 5.68KJ

**66. A diver in water at a depth 1 m sees the whole outside world in a horizontal circle of radius \_\_\_\_\_. when the refractive index is  $\mu$ .**

- a.  $\frac{1}{\mu - 1}$                                       b.  $\frac{1}{\sqrt{\mu^2 - 1}}$   
c.  $\frac{\mu}{\sqrt{\mu^2 - 1}}$                               d.  $\frac{1}{\mu}$

**67. Two capacitors of  $6\mu F$  at 500 V and  $2\mu F$  at 220 V are joined in parallel with their unlike plates together . The common potential difference is [IOE 2074]**

- a. 125 V                                      b. 225 V  
c. 325 V                                      d. 425 V

**68. An ammeter of  $10 \Omega$  resistance has a scale of 100 divisions and indicates  $1 \mu A$  per division. It is covered into voltmeter reading 10 v at maximum deflection what is the resistance used in series:**

- a. 1 k $\Omega$                                       b. 0.1 k  $\Omega$   
c. 99990  $\Omega$                                       d. 9990  $\Omega$

**69. If proton and  $\alpha$  – particle moving with same energy normally in a uniform magnetic field then the ratio of their radii and time period will be**

- a. 1 : 1 and 1 : 2                      b. 1 : 2 and 1 : 1  
c. 1 : 2 and 2 : 1                      d. 2 : 1 and 2 : 1

**70. Mutual inductance of two coils is 5 mH. The current changes from 3A to 2A in 0.01 sec, then the emf produced is:**

- a. 0.5 V                                      b. 1 V  
c. 2 V                                        d. 5 V

**71. The speed of sound in air is 320 m/s. A closed organ pipe of length 1 m can resonate with a frequency of**

- a. 80 Hz                                      b. 240 Hz  
c. 400 Hz                                    d. All

**72. A train 'A' is travelling at a speed of 108 km/hr. The train approaching another train 'B' standing on the platform. The engine of the train 'B' blows its horn. The frequency of horn as observed by driver in train A is 504 Hz. The frequency of train 'B' (speed of sound = 220 m/sec)**

- a. 504 Hz                                      b. 458 Hz  
c. 550 Hz                                    d. 407 Hz

**73. How many fast moving electrons strike on target per second to get total anode current 0.02 Å?**

- a.  $1.25 \times 10^{17}$                               b.  $1.25 \times 10^{18}$   
c.  $1.25 \times 10^{19}$                               d.  $1.25 \times 10^{20}$

**74. Two radioactive materials a and b have decay constant  $5\lambda$  and  $2\lambda$  respectively. Initially both materials have same numbers of nuclei, then the ratio will be  $\frac{1}{e^3}$  after time [IOE 2075]**

- a.  $\lambda$  sec                                      b.  $\frac{1}{\lambda}$  sec

c.  $9\lambda$  sec

d.  $\frac{1}{9\lambda}$  sec

**75. The domain and range of the function  $y = \frac{1}{x}$  are**

- a.  $(-\infty, \infty)$  and  $(0, \infty)$                       b.  $R - \{0\}$  and  $R - \{0\}$   
c.  $(-\infty, 0)$  and  $[0, \infty)$                       d.  $(0, \infty)$  and  $(-\infty, \infty)$

**76. If  $A = \begin{bmatrix} 0 & 2 & 0 \\ 0 & 0 & 3 \\ -2 & 2 & 0 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 4 & 5 \\ 5 & -4 & 0 \end{bmatrix}$ , then the element of 3rd row and third column in AB will be**

- a. -18    b. 4  
c. -12    d. None of these

**77.  $\left( \frac{\cos \theta + i \sin \theta}{\sin \theta + i \cos \theta} \right)^4$**

- a.  $\sin 8\theta + i \cos 8\theta$                       b.  $\sin 8\theta - i \cos 8\theta$   
c.  $\cos 8\theta - i \sin 8\theta$                       d.  $\cos 8\theta + i \sin 8\theta$

**78. If  $b^2, a^2, c^2$  are in A.P., then  $a + b, b + c, c + a$  will be in**

- a. GP    b. HP  
c. AP    d. None

**79.  $\frac{(x-y)}{x} + \frac{(x-y)^2}{2x^2} + \frac{(x-y)^3}{3x^3} + \dots =$  [IOE 2074]**

- a.  $\log \frac{x+y}{y}$     b.  $\log \frac{x}{x+y}$   
c.  $\log \frac{x}{y}$     d.  $\log \frac{y}{x}$

**80.  $\sin^{-1}\left(\frac{1}{\sqrt{5}}\right) + \cot^{-1}(3)$  is [IOE 2078]**

- a.  $\frac{\pi}{2}$                       b.  $\frac{\pi}{3}$   
c.  $\frac{\pi}{4}$                       d.  $\pi$

**81. In  $\triangle ABC$ ,  $C = 45^\circ$  then,  $\tan A + \tan B - \tan A \tan B = ?$  [IOE 2078]**

- a.  $\tan C$                       b. 0  
c. 1                      d. -1

**82. The vector  $14\vec{i} - 34\vec{j} + 12\vec{k}$  [IOE 2078]**

- a. is perpendicular to  $4\vec{i} - 12\vec{j} + 8\vec{k}$                       b. is parallel to  $4\vec{i} - 12\vec{j} + 8\vec{k}$   
c. Makes  $\frac{\pi}{3}$  with  $4\vec{i} - 12\vec{j} + 8\vec{k}$                       d. None

**83. If the lines represented by  $ax^2 + 2hxy + by^2 = 0$  are equally inclined to the lines given by  $ax^2 + 2hxy + by^2 + \lambda(x^2 + y^2) = 0$ , then  $\lambda$  has [IOE 2078]**

- a. One values                      b. Two values  
c. Infinite values                      d. No value

**84. If  $lx + my = 1$  tangent to  $x^2 + y^2 = a^2$ , the point  $(l, m)$  lies on circle [IOE 2074]**

- a.  $x^2 + y^2 = a^2$                       b.  $x^2 + y^2 = \frac{1}{a^2}$   
c.  $x^2 + y^2 = 2a^2$                       d.  $x^2 + y^2 = \frac{1}{2a^2}$

**85. If  $x + y = k$  is normal to  $y^2 = 12x$ , then find the value of k? [IOE 2078]**

- a. 3                      b. 6  
c. 9                      d. 12

**86. The d.c's of line passing through  $(1, 0, 0)$ ,  $(0, 1, 0)$  and making an angle  $\frac{\pi}{4}$  with plane  $x + y = 3$  is [IOE 2078]**

- a.  $\langle 1, 1, \sqrt{2} \rangle$                       b.  $\langle 1, \sqrt{2}, 1 \rangle$   
c.  $\langle \sqrt{2}, 1, 1 \rangle$                       d.  $\langle 1, 1, 2 \rangle$

**87.  $\lim_{x \rightarrow 0} \frac{x \sin x - \log(1 + x^2)}{x^2} =$  [IOE 2075]**

- a. 0                      b. 1  
c.  $\frac{1}{2}$                       d. 2

**88. If  $y = \cosh t$ ,  $x = \sinh t$**

**$\frac{dy}{dx} =$  [IOE 2078]**

- a.  $\tanh t$                       b.  $-\tanh t$   
c.  $\coth t$                       d.  $-\coth t$

**89.  $\int \frac{1}{\cos x \sqrt{\cos 2x}} dx =$  [IOE 2075]**

- a.  $\sin^{-1}(\tan x) + c$                       b.  $\sin^{-1}(\cot x) + c$   
c.  $\cos^{-1}(\tan x) + c$                       d.  $\cos^{-1}(\cot x) + c$

**90. The reaction**

**$\text{CH}_3\text{Br} + \text{C}_6\text{H}_5\text{Br} + \text{Na} \longrightarrow \text{CH}_3 - \text{C}_6\text{H}_5 + 2\text{NaBr}$  is called,**

- a. Wurtz reaction                      b. Wurtz- fittig reaction  
c. Sand Mayer's reaction                      d. Friedel craft's reaction

**91. Ammonia reacts with Nessler's reagent in presence of 'X' to give brown ppt. compound 'X' is [IOE 2077]**



- a. KCl                                      b. HCl  
c. KClO<sub>4</sub>                                      d. NaOH

**92. German silver is an alloy of**

- a. Copper, zinc and nickel              b. Copper and silver  
c. Copper, zinc and tin                  d. Copper, zinc and silver

**93. Which one of the following pairs of compounds illustrate the law of multiple proportions?**

- a. H<sub>2</sub>S and SO<sub>2</sub>                              b. NH<sub>3</sub> and NCl<sub>3</sub>  
c. FeCl<sub>2</sub> and FeCl<sub>3</sub>                              d. CuO and Cu<sub>2</sub>O

**94. 100ml of a dibasic acid solution contains 3.15gm of the acid 10ml of this solution neutralizes 10ml of 0.5N NaOH solution. The mol. Wt of acid is**

- a. 63    b. 126  
c. 31.5    d. 30

**95. The precipitation of CaF<sub>2</sub> ( $K_{sp} = 1.7 \times 10^{-10}$ ) is obtained when equal volume of the following are mixed**

- a.  $10^{-4} \text{ M Ca}^{++} + 10^{-4} \text{ M F}^{-}$       b.  $10^{-2} \text{ M Ca}^{++} + 10^{-3} \text{ M F}^{-}$   
c.  $10^{-5} \text{ M Ca}^{++} + 10^{-3} \text{ M F}^{-}$       d.  $10^{-3} \text{ M Ca}^{++} + 10^{-5} \text{ M F}^{-}$

**96. Aluminium oxide may be electrolyzed at 1000° C to furnish aluminium metal (at mass =27, 1 faradays =96500 coulomb). The cathode reaction is**



**To prepare 5.12 kg of aluminium metal by this method, we require**

- a.  $5.49 \times 10^4 \text{ C of electricity}$       b.  $5.49 \times 10^1 \text{ C of electricity}$   
c.  $5.49 \times 10^7 \text{ C of electricity}$       d.  $1.83 \times 10^7 \text{ C of electricity}$

**Read the following passage carefully, and find out the correct answers for the questions given below:  
(Questions from 97 to 100)**

At one time in the history of India, most women knew very well how to bring up their infants and they lived a perfectly healthy life, free from diseases. The overall standard of women and children in the country was much better than that of other civilizations of that period. But ever since India was exposed to frequent foreign invasions from foreign nations, the life was unsafe and property unprotected, the people were forced to congregate in towns in such a compact way that it led to awful insanitation and diseases. The traditional knowledge of domestic and personal health and hygiene was ignored. Women were confined indoors for fear of insults and a train of social and unhealthy dangers followed all round. It is a problem how now we can restore the original conditions of healthy and happy life in India. This is a socio-economic problem which needs to be given priority to bring back the original culture and restore welfare of women and children in India.

**97. What was the main cause of poor health conditions of women in India?**

- a. Women were confined indoors.                              b. Illiteracy among women.  
c. Frequent foreign invasions.                              d. Awful sanitation.

**98. What question has the writer posed before the readers?**

- |   |   |
|---|---|
| a. How to check foreign invasion?             | b. Why has the traditional knowledge been ignored?                            |
| c. What should be done for infants and women? | d. How to restore the original conditions of healthy and happy life in India? |

**99. What does the word 'congregate' mean in the passage?**

- |           |             |
|-----------|-------------|
| a. forced | b. assemble |
| c. live   | d. settle   |

**100. Select from the answer choices the word which is as nearly opposite in meaning to 'confine' used in the passage?**

- |                |             |
|----------------|-------------|
| a. forced      | b. directed |
| c. to keep out | d. reject   |

### Answer Key

1.b	2.d	3.d	4.d	5.c	6.d	7.d	8.c
9.b	10.a	11.a	12.c	13.d	14.c	15.c	16.a
17.b	18.d	19.b	20.a	21.b	22.d	23.d	24.c
25.b	26.d	27.b	28.c	29.b	30.a	31.a	32.b
33.d	34.b	35.a	36.d	37.c	38.a	39.a	40.a
41.d	42.d	43.b	44.a	45.d	46.b	47.a	48.d
49.b	50.d	51.c	52.a	53.d	54.b	55.b	56.c
57.c	58.c	59.c	60.d	61.b	62.b	63.d	64.c

65.b	66.b	67.c	68.c	69.a	70.a	71.d	72.b
73.a	74.b	75.b	76.b	77.d	78.b	79.c	80.c
81.d	82.d	83.c	84.b	85.c	86.a	87.a	88.a
89.a	90.b	91.d	92.a	93.d	94.b	95.b	96.c
97.c	98.d	99.b	100.c				

## Solutions

1. b

$$\frac{\Delta t}{t} \times 100\% = \frac{0.2}{25} \times 100\% = 0.8\%$$

2. d

$$F = ma$$

3. d

$$g = 1$$

$$\therefore n = 100$$

$$h = (\sqrt{n} - 1)R = (\sqrt{100} - 1)R = 9R = 9 \times 6400 = 57600km$$

4. d

$$a_0 = \omega^2 a$$

$$v_0 = \omega a$$

$$v_0^2 = \omega^2 a^2 = a \times a_0$$

$$a = \frac{v_0^2}{a_0}$$

5. c

$$\rho_{He} \ll \rho_{air}$$

Initially, it will rise. After a certain height, it expands and the weight of air displaced will be just equal to the weight of helium gas, and the balloon halts.

6. d

$$Q = ms\Delta\theta$$

$$420 = 10 \times 10^{-3} \times 4200 \times \Delta\theta$$

$$\Rightarrow \Delta\theta = 10K$$

7. d

$$mgh = msd\theta$$

$$\text{using } g = 10 \text{ m/s}^2 \text{ and } s = 4,200 \text{ J/kg}^\circ C$$

$$\text{we get, } d\theta = 0.12^\circ C$$

8. c

When the object lies beyond 2f, the image will be formed between f and 2f (i.e. 1.5f) and image will be real, inverted and smaller in size.

9. b

Chromatic aberration : Inability of a lens to form images of different color at the same point on the principal axis .

10. a

$$\text{Radius of big drop } R = 2r$$

$$\left[ \frac{4}{3}\pi R^3 = 8 \times \frac{4}{3}\pi r^3 \right]$$

$$\text{As, } C = 4\pi\epsilon_0 R; C \propto R$$

$$\text{Capacitance of big drop ( } C ) = 2C .$$

**Big Drop Small Drop**

$$Q \quad nq$$

$$R \quad n^{1/3}r$$

$$C \quad n^{1/3}C$$

$$\sigma \quad n^{1/3}\sigma$$

$$U' \text{ (P.E)} \quad n^{5/3}U$$

$$C' = n \frac{1}{3} C = 8 \frac{1}{3} C = 2C$$

11. a

$$\theta_n = \frac{\theta_i + \theta_o}{2} \rightarrow \theta_i = 2\theta_n - \theta_o$$

$$\theta_i = 2 \times 300 - 10 = 590^\circ C$$

12. c

Since, only direction of charge particle is changed inside magnetic field. And kinetic energy is scalar quantity. So, it remains unchanged.

13. d

$$\phi = 6t^2 - 5t + 1$$

$$E = -\frac{d\phi}{dt} = -12t + 5$$

at  $t=0.25$  sec

$$E = -12 \times 0.25 + 5 = 2$$

$$i = \frac{E}{R} = \frac{2}{10} = 0.2A$$

14. c

Distance between first two dark bands on each side of central maximum is the width of central maximum

$$= \frac{2\lambda D}{d} = 4.68mm$$

15. c

$$Y_1 = a \sin \omega t, \phi_1 = \omega t$$

$$Y_2 = a \cos \omega t$$

$$= a \sin \left( \omega t + \frac{\pi}{2} \right), \phi_2 = \omega t + \frac{\pi}{2}$$

$$\text{Phase difference} = \phi_2 - \phi_1 = \omega t - \frac{\pi}{2} - \omega t = \frac{\pi}{2}$$

16. a

The transverse deflection in electric field

$$y = \frac{1}{2}at^2$$

$$a = \frac{eE}{m} \quad \& \quad t = \frac{x}{v}$$

$$y = \frac{eEx^2}{2mv^2}$$

$$y \propto \frac{1}{m}$$

Since mass of electron is least, it has maximum deflection

17. b

18. d

For  $\log_e(a^2 - x^2)$  to be valid  $a^2 - x^2 > 0$  This only valid for  $x \in (-a, a)$

19. b

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

$$|A| = 1$$

$$\text{adj}(A) = \begin{bmatrix} 1 & 2 & -1 \\ -2 & 1 & 1 \\ 7 & -2 & 1 \end{bmatrix}^T$$

$$A^{-1} = \frac{\text{adj}(A)}{|A|}$$

$$A^{-1} = \begin{bmatrix} 1 & -2 & 7 \\ 2 & 1 & -2 \\ -1 & 1 & 1 \end{bmatrix}$$

20. a

$$\text{Let } z = x + iy$$

$$|z + i| = |z - i|$$

$$|x + iy + i| = |x + iy - i|$$

$$|x + iy + i|^2 = |x + iy - i|^2$$

$$x^2 + (y + 1)^2 = x^2 + (y - 1)^2$$

$$\implies y = 0 \text{ i.e. purely real numbers.}$$

21. b

22. d

$$\cos \left[ x \cos^{-1} \left( -\frac{1}{2} \right) \right] = -\frac{1}{\sqrt{2}}$$

$$\cos \left[ x \frac{2\pi}{3} \right] = -\frac{1}{\sqrt{2}}$$

$$x \frac{2\pi}{3} = \frac{3\pi}{4}$$

$$x = \frac{9}{8}$$

23. d

$$\frac{\tan 3x - \tan 2x}{1 + \tan 3x \tan 2x} = 1$$

$$\tan x = 1 = \tan \frac{\pi}{4} [\tan x = \tan \alpha]$$

$$x = n\pi + \frac{\pi}{4}$$

$$\text{But at } x = \frac{\pi}{4}$$

$$\frac{\tan 3x - \tan 2x}{1 + \tan 3x \tan 2x} = \frac{-\infty}{\infty} \neq 1$$

24. c

$$\frac{(a + b + c)(c + a - b)(a + b - c)(b + c - a)}{4b^2c^2}$$

$$= \frac{2s(2s - 2b)(2s - 2c)(2s - 2a)}{4b^2c^2}$$

$$= \frac{16s(s - b)(s - c)(s - a)}{4b^2c^2}$$

$$= \frac{4s(s - b)(s - c)(s - a)}{b^2c^2}$$

$$= \frac{4\Delta^2}{b^2c^2}$$

$$= \frac{4\left(\frac{abc}{4R}\right)^2}{b^2c^2}$$

$$= \frac{4a^2}{16R^2}$$

$$= \frac{4(2R \sin A)^2}{16R^2}$$

$$= \sin^2 A$$

25. b

$\vec{a}, \vec{b}, \vec{c}$  are mutually perpendicular to each other from first case.

$$\vec{a} \cdot (\vec{b} \times \vec{c})$$

$$\vec{a} \cdot (bc \sin 90^\circ \hat{a})$$

$$\pm abc$$

26. d

$$m_1 + m_2 = m_1 m_2$$

$$-\frac{2h}{b} = \frac{a}{b}$$

$$-a = 2h$$

$$-4 = 2h$$

$$h = -2$$

27. b

Radius of circle touching x-axis = |y-coordinate| = 4

$$\text{Equation of circle is } (x - 3)^2 + (y + 4)^2 = 4^2$$

28. c

$$4x^2 + 9y^2 = 36$$

$$\frac{x^2}{9} + \frac{y^2}{4} = 36$$

$$a = 3, b = 2$$

$$e = \sqrt{1 - \frac{b^2}{a^2}} = \sqrt{1 - \frac{4}{9}} = \frac{\sqrt{5}}{3}$$

29. b

$$16x^2 - 9y^2 = -144$$

$$\frac{x^2}{9} - \frac{y^2}{16} = -1$$

$$e = \sqrt{1 + \frac{a^2}{b^2}} = \sqrt{1 + \frac{9}{16}} = \frac{5}{4}$$

30. a

If  $l_1, m_1, n_1$  are direction ratios of  $L_1$

$$3l_1 + 2m_1 + n_1 = 0$$

$$l_1 + m_1 - 2n_1 = 0$$

$$\therefore \frac{l_1}{-4-1} = \frac{m_1}{1+6} = \frac{n_1}{3-2}$$

$$\frac{l_1}{-5} = \frac{m_1}{7} = \frac{n_1}{1}$$

$$\therefore l_1 : m_1 : n_1 = -5 : 7 : 1$$

If  $l_2, m_2, n_2$  are the direction ratios of  $L_2$ ,

$$2l_2 - m_2 - n_2 = 0$$

$$7l_2 + 10m_2 - 8n_2 = 0$$

$$\frac{l_2}{8+10} = \frac{m_2}{-7+16} = \frac{n_2}{20+7}$$

$$\frac{l_2}{18} = \frac{m_2}{9} = \frac{n_2}{27}$$

$$\therefore l_2 : m_2 : n_2 = 2 : 1 : 3$$

Since,  $l_1l_2 + m_1m_2 + n_1n_2 = -10 + 7 + 3 = 0$ , angle is  $90^\circ$ .

31. a

$$\lim_{x \rightarrow \pi/2} \frac{\sec 3x}{\sec x} = \lim_{x \rightarrow \pi/2} \frac{\cos x}{\cos 3x} =$$

Applying L'hospitals' rule

$$\lim_{x \rightarrow \pi/2} \frac{-\sin x}{-\sin 3x \times 3} = -\frac{1}{3}$$

32. b

$$\frac{d}{dx}[x^3 \sin(y) + \cos(x)y^3] = 0$$

$$3x^2 \sin(y) + x^3 \cos(y) \frac{dy}{dx} - \sin(x)y^3 + 3y^2 \frac{dy}{dx} \cos(x) = 0$$

$$\frac{dy}{dx} = -\frac{[3x^2 \sin(y) - y^3 \sin(x)]}{[x^3 \cos(y) + 3y^2 \cos(x)]}$$

33. d

$$\text{Let } y = \tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$$

Putting  $x = \tan \theta$  we get

$$y = \tan^{-1}\left(\frac{\sqrt{1+\tan^2 \theta}-1}{\tan \theta}\right)$$

$$= \tan^{-1}\left(\frac{\sec \theta - 1}{\tan \theta}\right)$$

$$= \tan^{-1}\left(\frac{1 - \cos \theta}{\sin \theta}\right)$$

$$= \tan^{-1}\left(\frac{2 \sin^2 \theta/2}{2 \sin \theta/2 \cos \theta/2}\right)$$

$$= \tan^{-1}(\tan \theta/2)$$

$$= \theta/2 = \frac{1}{2} \tan^{-1} x$$

Now,

$$\frac{d \tan^{-1} \frac{\sqrt{1+x^2}-1}{2}}{d \tan^{-1} x}$$

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

34. b

$$y = 2x^2 - 3x - 1$$

$$\frac{dy}{dx} = 4x - 3$$

$$\frac{dy}{dx}|_1 = 4 \times 1 - 3 = 1$$

$$y - y_1 = m(x - x_1)$$

$$y + 2 = 1(x - 1)$$

$$x - y - 3 = 0$$

35. a

$$y = \left(\frac{1}{x}\right)^x$$

$$\log y = x \log\left(\frac{1}{x}\right)$$

$$\frac{1}{y} \frac{dy}{dx} = \log\left(\frac{1}{x}\right) + x \frac{1}{\frac{1}{x}} \left(-\frac{1}{x^2}\right)$$

$$\frac{1}{y} \frac{dy}{dx} = \log\left(\frac{1}{x}\right) - 1$$

$$\frac{1}{x} = e$$

$$x = \frac{1}{e}$$

$$y = \left(\frac{1}{\frac{1}{e}}\right)^{\frac{1}{e}}$$

$$y = e^{1/e}$$

36. d

$$\int_0^{\pi/4} \frac{\tan^2 \theta}{\sin^2 \theta} d\theta$$

$$\int_0^{\pi/4} \sec^2 \theta d\theta$$

$$\tan \theta \Big|_0^{\pi/4}$$

1

37. c

Required area(A):

$$= \int_0^2 [2^x - (2x - x^2)] dx$$

$$= \left[ \frac{2^x}{\log 2} - x^2 + \frac{x^3}{3} \right]_0^2$$

$$= \frac{4}{\log_e 2} - 4 + \frac{8}{3} - \frac{1}{\log_e 2}$$

$$= \frac{3}{\log_e 2} - \frac{4}{3}$$

38. a

The best example of an anti-knocking agent is Tetraethyl lead (T.E.L).

39. a

Gobar gas is mostly composed of methane and carbon dioxide, with trace quantities of hydrogen sulfide (H<sub>2</sub>S), moisture, and siloxanes.

40. a

Rhombic sulphur is the most stable allotropic form of sulphur.



41. d

Red phosphorus react with nitric acid to produce phosphoric acid, nitrogen dioxide and water.



42. d

$\text{Na}^+$  ion is surrounded by six  $\text{H}_2\text{O}$  molecules i.e., hydrated.

43. b

Copper matte =  $\text{Cu}_2\text{S} + \text{FeS}$

44. a

It is annealing which is performed to toughen the iron.

45. d

$$\text{C}_6\text{H}_{12}\text{O}_6 = 6x + 12 - 12 = 0 \rightarrow x = 0$$

$$\text{C}_{11}\text{H}_{22}\text{O}_{11} = 11x + 22 - 22 \rightarrow x = 0$$

$$\text{CH}_2\text{F}_2 = x + 2 - 2 \rightarrow x = 0$$

where x is the O.N. of carbon

46. b

$$x + 4 \times (0) = 0$$

$$\therefore x = 0$$

Note: In complex compound O.N. of compound is zero.

47. a

According to Fajan's rule smaller the size of cation and larger the size of anion, higher will be the covalent character in an ionic bond.

So most favourable condition for ionic bonding is when the size of cation is large and size of anion is small.

48. d

$$\text{Mn} = [\text{Ar}] 4s^2 3d^5$$

$$\text{Cr} = [\text{Ar}] 4s^1 3d^5$$

$$\text{Cu} = [\text{Ar}] 4s^2 3d^9$$

49. b

50. d

51. c

52. a

53. d

54. b

55. b

56. c

57. c

58. c

The meaning of NOVICE is a person admitted to probationary membership in a religious community.

The meaning of RECRUIT is to fill up the number of with new members

The meaning of APPRENTICE is one bound by indenture to serve another for a prescribed period with a view to learning an art or trade.

The meaning of VETERAN is a former member of the armed forces.

The meaning of AMATEUR is one who engages in a pursuit, study, science, or sport as a pastime rather than as a profession.

59. c

60. d

61. b

$$\begin{aligned}\vec{V}_1 \cdot \vec{V}_2 &= 0 \\ \text{or, } (u_1\hat{i} - gt\hat{j}) \cdot (-u_2\hat{i} - gt\hat{j}) &= 0 \\ \text{or, } -u_1u_2 + g^2t^2 &= 0 \\ \text{or, } t &= \frac{\sqrt{u_1u_2}}{g}\end{aligned}$$

62. b

$$\begin{aligned}\Delta mg &= mR\omega^2 = 0.4N \\ \text{Again, } \Delta mg' &= mg - mg\left(1 - \frac{R\omega^2}{g} \cdot \cos^2 45^\circ\right) \\ &= mR\omega^2 \times \frac{1}{2} = \frac{0.4}{2} = 0.2 N\end{aligned}$$

63. d

$$\begin{aligned}E &= \frac{1}{2}m\omega r^2 \\ \text{or, } E &= \frac{1}{2}m\omega(r^2 - y^2) \\ \text{or, } E &= \frac{1}{2}m\omega\left(r^2 - \frac{r^2}{4}\right) = \frac{3E}{4}\end{aligned}$$

64. c

$$\begin{aligned}\text{Loss in wt} &= \text{upthrust} \\ \text{or, } 30 - 25 &= V\sigma_w \\ \text{or, } V &= 5cc\end{aligned}$$

$$\text{or, } \rho = \frac{30}{5} = 6g/cc$$

65. b

$$n = \frac{w}{M} = \frac{1gm}{28gm} = \frac{1}{28}$$

$$KE = \frac{3}{2}nRT = \frac{3}{2} \times \frac{1}{28} \times 8.314 \times (127 + 273) = 178.15J$$

66. b

Field of vision of fish or man inside water to see the world outside is circular and its radius when observer is at depth 'h' is

$$\begin{aligned}r &= \frac{h}{\sqrt{\mu^2 - 1}} \text{ and area } A = \pi \left[ \frac{h}{\sqrt{\mu^2 - 1}} \right]^2 \\ \therefore r &= \frac{1}{\sqrt{\mu^2 - 1}}\end{aligned}$$

67. c

$$\begin{aligned}\text{For unlike plates join together } V_{\text{common}} &= \frac{C_1V_1 - C_2V_2}{C_1 + C_2} = \\ \frac{6 \times 500 - 2 \times 200}{6 + 2} &= 325 V\end{aligned}$$

68. c

$$\begin{aligned}i_g &= 100 \text{ divisions} \times 1\mu A / \text{division} \\ &= 100\mu A = 10^{-4} A \\ \text{Series resistance required} \\ R &= \frac{V}{i_g} - G \\ &= \frac{10}{10^{-4}} - 10 = 99990\Omega\end{aligned}$$

69. a

$$r = \frac{mv}{Bq} = \frac{\sqrt{2mK}}{Bq}$$

$$r \propto \frac{\sqrt{m}}{q} \text{ at constant } \{K\}$$

$$\frac{r_p}{r_\alpha} = \frac{\frac{\sqrt{m_p}}{q_p}}{\frac{\sqrt{m_\alpha}}{q_\alpha}}$$

$$= \sqrt{\frac{m_p}{m_\alpha}} \times \frac{q_\alpha}{q_p}$$

$$= \sqrt{\frac{m}{4m}} \times \frac{2e}{e} = 1 : 1$$

$$T = \frac{2\pi m}{Bq} \propto \frac{m}{q}$$

$$\frac{T_p}{T_\alpha} = \frac{\frac{m_p}{q_p}}{\frac{m_\alpha}{q_\alpha}} = \frac{m_p}{m_\alpha} \times \frac{q_\alpha}{q_p} = \frac{m}{4m} \times \frac{2e}{e} = 1 : 2$$

70. a

$$E = L \frac{dl}{dt} = 5 \times 10^{-3} \times \frac{(3-2)}{0.001}$$

$$\text{or, } E = 5 \times 10^{-3} \times 100$$

$$\therefore E = 0.5V$$

71. d

$$N_1 = \frac{v}{4L} = \frac{320}{4} \times 1 = 80 \text{ Hz}$$

$$N_2 = 3n_1 = 3 \times 80 = 240 \text{ Hz}$$

$$N_3 = 5n_1 = 5 \times 80 = 400 \text{ Hz}$$

72. b

$$f' = 504Hz$$

$$v_s = 108km/hr = 108 \times \frac{5}{18} m/s = 30m/s$$

$$V = 330m/s$$

$$f' = \frac{v}{v - v_s} \times f$$

$$f = 458.18Hz$$

73. a

$$I = \frac{q}{t}$$

$$i = \frac{ne}{t}$$

$$\frac{n}{t} = \frac{i}{e} = 1.25 \times 10^{17}$$

74. b

$$\frac{a}{b} = \frac{1}{e^3}$$

$$\frac{a_0 e^{-5\lambda t}}{b_0 e^{-2\lambda t}} = \frac{1}{e^3}$$

$$-3\lambda t = -3$$

$$\text{or, } t = \frac{1}{\lambda} \text{ sec}$$

75. b

In the function  $y = \frac{1}{x}$ ,  $x$  can take all the values of  $x \in R$  except 0.

Hence domain of  $f(x)$  is  $R - \{0\}$

In the function  $f^{-1}(x) = \frac{1}{x}$ ,  $x$  can take all the values of  $x \in R$  except 0.

Hence range of  $f(x)$  is  $R - \{0\}$

76. b

$$C_{33} = (-2)3 + 2.5 + 0.0 = -6 + 10 = 4$$

77. d

$$\left( \frac{\cos \theta + i \sin \theta}{\sin \theta + i \cos \theta} \right)^4$$

$$\left( \frac{\cos \theta + i \sin \theta}{\sin \theta + i \cos \theta} \times \frac{\sin \theta - i \cos \theta}{\sin \theta - i \cos \theta} \right)^4$$

$$\left[ \frac{\cos \theta \sin \theta - i \cos^2 \theta + i \sin^2 \theta + \cos \theta \sin \theta}{\sin^2 \theta + \cos^2 \theta} \right]^4$$

$$\left[ \frac{2 \cos \theta \sin \theta - i(\cos^2 \theta - \sin^2 \theta)}{1} \right]^4$$

$$(\sin 2\theta - i \cos 2\theta)^4$$

$$[-i(\cos 2\theta + i \sin 2\theta)]^4$$

$$i^4(\cos 2\theta + i \sin 2\theta)^4$$

$$(\cos 2\theta + i \sin 2\theta)^4$$

$$\cos 8\theta + i \sin 8\theta$$

78. b

$b^2, a^2, c^2$  are in A.P.

$$\text{or, } a^2 - b^2 = c^2 - a^2$$

$$\text{or, } (a - b)(a + b) = (c + a)(c - a)$$

$$\text{or, } \frac{a - b}{c + a} = \frac{c - a}{a + b}$$

$$\text{or, } \frac{a - b}{(b + c)(c + a)} = \frac{c - a}{(b + c)(a + b)}$$

$$\text{or, } \frac{1}{b - c} - \frac{1}{c + a} = \frac{1}{a + b} - \frac{1}{b + c}$$

$$\text{or, } \frac{2}{(b + c)} = \frac{1}{a + b} + \frac{1}{c + a}$$

i.e.  $\frac{1}{a + b} \cdot \frac{1}{b + c} \cdot \frac{1}{c + a}$  are in A.P.

$\therefore (a + b), (b + c), (c + a)$  are in H.P.

79. c

$$\frac{(x - y)}{x} + \frac{(x - y)^2}{2x^2} + \frac{(x - y)^3}{3x^3} + \dots$$

$$= -\log\left(1 - \frac{(x - y)}{x}\right)$$

$$= -\log \frac{y}{x}$$

$$= \log \frac{x}{y}$$

80. c

$$\sin^{-1}\left(\frac{1}{\sqrt{5}}\right) + \cot^{-1}(3)$$

$$\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right)$$

$$\tan^{-1} \frac{\frac{1}{2} + \frac{1}{3}}{1 - \frac{1}{2} \cdot \frac{1}{3}} = \tan^{-1} 1 = \frac{\pi}{4}$$

81. d

$$A + B + C = 180^\circ$$

$$A + B = 180^\circ - 45^\circ = 135^\circ$$

$$\tan(A + B) = \tan(135^\circ) = -1$$

$$\frac{\tan A + \tan B}{1 - \tan A \tan B} = -1$$

$$\tan A + \tan B = -1 + \tan A \tan B$$

$$\tan A + \tan B - \tan A \tan B = -1$$

82. d

83. c

Equation of the bisectors of the angle between the lines  
 $ax^2 + 2hxy + by^2 + \lambda(x^2 + y^2) = 0$

$$\frac{x^2 - y^2}{(a + \lambda) - (b + \lambda)} = \frac{xy}{h}$$

$$\frac{x^2 - y^2}{a - b} = \frac{xy}{h}$$

Which is same as the equation of the bisectors of the angles  
between the lines  $ax^2 + 2hxy + by^2 = 0$

Equation of the bisectors of the angle between these lines  
doesn't depend on  $\lambda$ .

84. b

$$\text{or, } \frac{l \times 0 + m \times 0 - 1}{\sqrt{l^2 + m^2}} = a$$

$$\text{or, } l^2 + m^2 = \frac{1}{a^2}$$

clearly, (l,m) lies in  $x^2 + y^2 = \frac{1}{a^2}$

85. c

Slope of  $x + y = k$  is  $-1$ .

$$y^2 = 12x$$

$$2y \frac{dy}{dx} = 12$$

$$\frac{dy}{dx} = \frac{6}{y}$$

Slope of normal =  $-\frac{1}{dy/dx} = -\frac{y}{6}$

$$-\frac{y}{6} = -1$$

$$y = 6$$

When  $y = 6, x = 3$

Hence  $k = x + y = 6 + 3 = 9$

86. a

87. a

$$\lim_{x \rightarrow 0} \frac{x \sin x - \log(1 + x^2)}{x^2}$$

$$\lim_{x \rightarrow 0} \frac{x \sin x}{x^2} - \frac{\log(1 + x^2)}{x^2}$$

$$= 1 - \lim_{x^2 \rightarrow 0} \frac{\log(1 + x^2)}{x^2} = 1 - 1 = 0$$

88. a

$$\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{\sinh t}{\cosh t} = \tanh t$$

89. a

$$\int \frac{1}{\cos x \sqrt{\cos 2x}} dx$$

$$= \int \frac{\sec x}{\sqrt{1 - \tan^2 x}} dx$$

$$= \int \frac{\sqrt{1 + \tan^2 x}}{\sec^2 x} dx$$

$$= \int \frac{1}{\sqrt{1 - \tan^2 x}} dx$$

$$\text{Put, } y = \tan x$$

$$dy = \sec^2 x dx$$

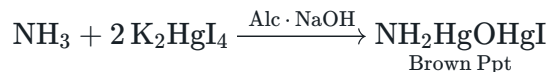
$$= \int \frac{dy}{\sqrt{1 - y^2}} = \sin^{-1} y + c = \sin^{-1}(\tan x) + c$$

90. b

Aryl halide and alkyl halide couple in presence of sodium metal / dry ether to form alkyl benzene.

For example, bromobenzene reacts with methyl bromide in presence of sodium. dry ether to form toluene.

91. d



92. a

93. d

The masses of Cu reacting with a fixed masses of oxygen bear a simple ration of 1:2.

94. b

$$\text{Strength of acid} = \frac{10 \times 0.5}{10} = 0.5N$$

$$\text{Normality} = \frac{\text{wt in g per liter}}{\text{eq wt}}$$

$$\text{Eq. wt} = \frac{3.15 \times 10}{0.5} = 63$$

$$\text{Mol} \cdot \text{Wt} = \text{eq} \cdot \text{wt} \times \text{basicity} = 63 \times 2 = 126$$

95. b

$$\text{a. } Q_1 = 0.5 \times 10^{-4} \times (0.5 \times 10^{-4})^2 = 1.25 \times 10^{-13}$$

$$\text{b. } Q_2 = 0.5 \times 10^{-2} \times (0.5 \times 10^{-3})^2 = 1.25 \times 10^{-9}$$

$$\text{c. } Q_3 = 0.5 \times 10^{-5} \times (0.5 \times 10^{-3})^2 = 1.25 \times 10^{-12}$$

$$\text{d. } Q_4 = 0.5 \times 10^{-3} \times (0.5 \times 10^{-5})^2 = 1.25 \times 10^{-14}$$

since  $Q_2 > K_{sp}$ , it will precipitate.

96. c



To deposit 9g of Al, 96500 C is required

To deposit  $5.12 \times 1000$  g of Al,  $5.49 \times 10^7$  C is required

97. c

98. d

99. b

100. c















































