clamphook

# ClampHook CBT Mock Test, 24th June, Shift 4

## Tribhuvan University

## 2080

**Full Marks:** 140 **Time:** 2 hours **Pass Marks:** 56

**1. If the current in the electric bulb drops by one percent the power decreases by:**

a. $10\%$ b. $2\%$

c. $\frac{1}{2}\%$ d. $4\%$

**2. The frictional force on a block of weight 10 N of area 0.1 $m^2$ is 5 N. If the area of the block is increased to 0.2 $m^2$ keeping same weight, the frictional force on the new block would be:**

a. 5 N b. 10 N

c. 20 N d. 15 N

**3. If a body weighs x N on the surface of earth, its weight half way down to the center of the earth, assuming earth to be of uniform is:**

a. $2xN$ b. $\frac{x}{2}N$

c. $\frac{x}{3}N$ d. $2x^2N$

**4. The radius of gyration of a solid disc of mass 1kg and radius 50 cm about an axis through center of mass and perpendicular to its face is**

a. $25\ cm$ b. $25\sqrt{2}\ cm$

c. $50\ cm$ d. $25\sqrt{6}\ cm$

**5. Two soap bubbles of the same soap solution have radius in the ratio 1 :2. What is the ratio of work done to blow these bubbles? [IOE 2078]**

a. $4:1$ b. $1:4$

c. $1:2$ d. $2:1$

**6. The upper and lower fixed points on a thermometer are separated by 160 mm. The length of a mercury thread above lower fixed point is 40 mm, then temperature will be:**

a. $40^\circ C$ b. $120^\circ C$

c. $32^\circ C$ d. $25^\circ C$

**7. A body cools from $100^\circ C$ to $80^\circ C$ in $t$ ime $t_1$, from 8-$^\circ C$ to $60^\circ C$ in time $t_2$ and 60 $^\circ C$ to $40^\circ C$ in time $t_3$. If the temperature of surrounding is $27^\circ C$ then**

a. $t_1 = t_2 = t_3$ b. $t_1 > t_2 > t_3$

c. $t_1 < t_2 < t_3$ d. $t_1 > t_2 < t_3$

**8. Which wavelength of the light falls under visible wavelength ?**

a. 900 $A^\circ$

b. 640 nm

c. 640 $A^\circ$

d. 9000 $A^\circ$

**9. Two prisms are combined as shown. First has angle 4 and is made with glass of refractive index 1.54 while the second prism has angle A and made with glass of refractive index 1.72. the combination provides dispersion without deviation. The value of A will be**

a. $1^o$

b. $2^o$

c. $3^o$

d. $4^o$

**10. Three charges each of $+1\mu C$ are placed at the corners of an equilateral triangle . If the force between any two charges be F , then the net force on either charge will be :**

a. $\sqrt{2}F$

b. $\sqrt{3}F$

c. $2F$

d. $3F$

**11. A charge of $4.8 \times 10^5$ coul passes through an electrolyte solution of copper sulphate. The number of $Cu^{++}$ ions liberated from the electrolyte is?**

a. $3 \times 10^{24}$

b. $1.5 \times 10^{24}$

c. $7.68 \times 10^{-14}$

d. $1.25 \times 10^{13}$

**12. Two magnets of equal magnetic moments M are placed with 60° inclination with each other such that their unlike poles are touched at the point of contact. Then the resultant magnetic moment is:**

a. $M$

b. $\sqrt{2}M$

c. $\sqrt{3}M$

d. $2M$

**13. The average power of LCR circuit dissipated through AC circuit is**

a. $I_{rms}E_{rms}\cos\phi$

b. $I_{rms}E_{rms}$

c. $I_0E_0\cos\phi$

d. 0

**14. Young's experiment is performed inside water , the fringe width will**

a. decrease

b. remains same

c. increase

d. none

**15. The ratio of velocity of sound in hydrogen gas $(\lambda = \frac{7}{5})$ to that in helium gas $(\lambda = \frac{5}{3})$ at the same temperature is**

a. $\frac{\sqrt{21}}{5}$

b. $1:1$

c. $\frac{\sqrt{42}}{5}$

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

**16. In Millikan's oil drop experiment , an oil drop is held stationary by a potential difference of 400 V . If the another drop of double the radius , but carry the same charge is to be held stationary , the potential difference required is**

a. 3200 V

b. 1600 V

c. 800 V

d. 400 V

**17. A nucleus ruptures into two nuclear parts which have their velocity ratio equal to 2: 1. What will be the ratio of their nuclear radius?**

a. $4^{(1/3)}:1$

b. $1:4^{(1/3)}$

c. $2^{(1/3)}:1$

d. $1:2^{(1/3)}$

**18. The domain of the function $y = \sqrt{a^2 - x^2}$ is:**

a. $R$

b. $\{-a, a\}$

c. $[-a, a]$

d. $R - \{\pm a\}$

**19.** The matrix $\begin{bmatrix} 1 & -3 & -4 \\ -1 & 5 & 4 \\ 1 & -3 & -4 \end{bmatrix}$ is nilpotent of index

a. 2 b. 3

c. 1 d. 4

**20.** The absolute value of $(3+4i)(4+3i)$ is

a. $5$ b. $25$

c. $\sqrt{5}$ d. $1$

**21.** If $1+6+11+..+n=148$, then $n=$

a. $8$ b. $36$

c. $30$ d. None

**22.** If $2\sin^2\theta - 3\sin\theta - 2 = 0$, then $\theta$ is equal to

a. $n\pi + (-1)^n \frac{7\pi}{6}$ b. $n\pi + (-1)^n \frac{\pi}{6}$

c. $n\pi + (-1)^n \frac{5\pi}{6}$ d. $n\pi - (-1)^n \frac{\pi}{2}$

**23.** $\cos^{-1}(-\frac{1}{2}) + \sin^{-1}(-\frac{\sqrt{3}}{2}) =$ **[IOE 2077]**

a. $\frac{2\pi}{3}$ b. $\frac{\pi}{2}$

c. $\frac{\pi}{3}$ d. $\frac{\pi}{6}$

**24.** In any triangle $\Delta ABC$ , the value of $a\cot A + b\cot B + c\cot C$ is :

a. $R+r$ b. $2R+r$

c. $R+2r$ d. $2(R+r)$

**25.** If D is the midpoint of BC in $\Delta ABC$, then which of the following is true ? [IOE 2076]

a. $\overrightarrow{AD} = \frac{\overrightarrow{AB} + \overrightarrow{AC}}{2}$ b. $\overrightarrow{AD} = \frac{\overrightarrow{AB} - \overrightarrow{AC}}{2}$

c. $\overrightarrow{AD} = \frac{\overrightarrow{AB} + \overrightarrow{AC}}{3}$ d. None

**26.** The equation of the lines which are parallel to the lines represented by $2x^2 - 5xy + 3y^2 = 0$ and passing through the point (1, 2) is :

a. $2x^2–5xy + 3y^2–6x–7y–4 = 0$ b. $2x^2–5xy + 3y^2 + 6x–7y + 4 = 0$

c. $2x^2–5xy + 3y^2 + 6x + 7y–4 = 0$ d. $2x^2–5xy + 3y^2 + 6x + 7y + 4 = 0$

**27.** The line $x\cos\theta - y\sin\theta = a$ cuts the circle $\mathrm{x}^2 + \mathrm{y}^2 = \mathrm{a}^2$ at

a. Two distinct points b. Two coincident points

c. No point d. Depends on value of a

**28.** Eccentricity of an ellipse is

a. 1 b. <1

c. 1 d. 0

**29.** Eccentricity of an ellipse is

a. 1 b. <1

c. 1 d. 0

**30.** The planes $bx - ay = 1, cy - bz = 1, az - cx = -2$ intersect in a common line where $a, b, c$ are positive

numbers; then, the minimum value of $ab + bc + ca$ is

a. $abc$ b. $3ac$

c. $0$ d. $1$

**31.** The value of $\lim_{n\to\infty} \frac{1}{(1\times 4)} + \frac{1}{(4\times 7)} + \frac{1}{(7\times 10)} + \ldots\ldots + \frac{1}{((3n-2)\times(3n+2))}$ is equal to

a. $\frac{1}{2}$ b. $\frac{1}{3}$

c. $\frac{1}{4}$ d. None of these

**32.** The derivative of $f(x) = (7x-4)(3x+8)^4$ is [IOE 2075]

a. $7(3x-8)^2 + (84x - 48)(3x+8)^3$ b. $7(3x+8)^2 + (84x - 48)(3x-8)^3$

c. $7(3x+8)^4 + (84x - 48)(3x+8)^3$ d. $7(3x+8)^2 + (84x - 48)(3x+8)^3$

**33.** If $y = a\sin mx + b\cos mx$, then $\frac{d^2y}{dx^2}$ is equal to

a. $-m^2x$ b. $m^2x$

c. $m^2y$ d. $-m^2y$

**34.** The distance of a particle in time t is given by $s = t^3 - 6t^2 - 4t - 8$. Its acceleration vanishes at t =

a. 1 b. 2

c. 3 d. 4

**35.** If the rate of change of area of circle is equal to the rate of change of its diameter, then its radius is [IOE 2074]

a. $\frac{1}{\pi}$ b. $\frac{1}{2\pi}$

c. $\pi$ d. $2\pi$

**36.** $\int \frac{1}{\sqrt{1-x^2}\sin^{-1}x}dx =$ [IOE 2076]

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

c. $-\log(\sin^{-1}x) + c$ d. $-\log(\cos^{-1}x) + c$

**37.** The area bounded by the curve $y = \ln x$, the x-axis and the straight line $x = e$ is:

a. $e$ b. $e^2$

c. $1 - e$ d. $1$

**38.** By which of the following methods propane can be obtained from propene?

a. catalytic hydrogenation b. Wurtz reaction

c. dehydrogenation d. Frankland reaction

**39.** By the action of water on methyl magnesium bromide, we get

a. $C_2H_4$ b. $CH_4$

c. $C_2H_5OH$ d. $CH_3OH$

**40.** Which of the following is the shape of $S_8$ molecule?

a. Octagonal b. Pyramidal

c. Tetrahedral d. Crown

**41.** In water molecule oxygen shows _____ hybridization.

a. $sp^2$ b. $sp$

c. $sp^3$ d. $dsp^3$

**42. Sodiums extracted by the electrolysis of its fused chloride. The process is called**

a. Castner process
b. Down process
c. Kellner process
d. Solvay process

**43. Which of the following metal gives no amphoteric oxide**

a. Zn
b. Sn
c. Al
d. Cu

**44. During smelting, an additional substance is added which combines with impurities to form a fusible product. It is known as: [IOE 2077]**

a. Flux
b. Slag
c. Gangue
d. Mud

**45. Neutralization of an acid with a base invariably results in the production of [IOE 2075]**

a. $H_3O^+$
b. $H_2O$
c. $H^+$ and $OH^-$
d. $OH^+$

**46. Iron rusts because of**

a. Oxidation
b. Reduction
c. Hydrogenation
d. Redox

**47. The energy of the electron of the hydrogen atom orbiting in a stationary orbit of radius $r_n$ proportional to**

a. Hydrogen atom
b. Deuterium ion
c. singly ionized helium
d. doubly ionized lithium

**48. The elements having electronic configuration $[Kr]\ 4d^{10}\ 4f^{14}\ 5s^2\ 5p^6\ 5d^1\ 6s^2$ belongs to**

a. s-block
b. p-block
c. d-block
d. f-block

**49. ....., students, are having a holiday tomorrow.**

a. Them
b. Us
c. We
d. Theirs

**50. The blind ..... jobs.**

a. need
b. needs
c. is needing
d. has needed

**51. The man lives _____ the 4th floor of the building.**

a. on
b. in
c. by
d. at

**52. They sent her some CDs. Its structure is [IOE 2075]**

a. S + V + DO + IO
b. S + V + N + O
c. S + V + IO +DO
d. S + V + SC +O

**53. He ..... Bring his book yesterday.**

a. Didn't
b. hadn't
c. hasn't
d. doesn't

**54. What is the passive of 'I did it.'?**

a. It is done.
b. It is being done.
c. It was done.
d. It has been done.

**55. The word consists of /w/ sound in the initial position.**

a. whom
b. while
c. sweet
d. wrath

**56. Everyone laughed when he got a pie smashed in his face.**

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

**57. The police pursued the thief.**

a. went into
b. went out
c. went after
d. went over

**58. Antonym of 'luminous' is:**

a. clear
b. dim
c. brittle
d. clever

**59. He would rather ..... at his office than stayed at home last week.**

a. have worked
b. work
c. had worked
d. working

**60. Synonym of abandon is**

a. Forsake
b. Keep
c. Cherish
d. Enlarge

**61. The displacement time graph for two bodies A and 'B' are straight line inclined at $30^\circ$ and $60^\circ$ respectively with the time axis. This Ratio of $v_A$ and $v_B$ will be**

a. $\sqrt{3}:1$
b. $1:\sqrt{3}$
c. 3 : 1
d. 1 : 3

**62. A particle falls from a height h upon a fixed horizontal plane and rebounds. If e is the coefficient of restitution, the total distance travelled before rebounding has stopped is**

a. $h(\frac{1+e^2}{1-e^2})$
b. $h(\frac{1-e^2}{1+e^2})$
c. $\frac{h}{2}(\frac{1+e^2}{1-e^2})$
d. $\frac{h}{2}(\frac{1-e^2}{1+e^2})$

**63. When an elastic material with Young's modulus Y is subjected to starching stress S, the elastic energy stored per unit volume of material is [IOE 2075]**

a. $\frac{YS}{2}$
b. $\frac{S^2}{2Y}$
c. $\frac{2S^2}{Y}$
d. $\frac{S^2}{Y}$

**64. A U-tube contains water on one side and rectified spirit on another, they are separated by mercury and the height of liquid column containing water is 8cm while spirit is 10cm, find specific gravity of spirit. [IOE 2077]**

a. 1.25
b. 1.2
c. 0.8
d. 0.75

**65. The rms speed of oxygen molecule at $16^\circ C$ is $474 m/s$ then $rms$ speed of hydrogen molecule at $127^\circ C$ is:**

a. $1603 m/s$
b. $1896 m/s$
c. $2230 m/s$
d. $2730 m/s$

**66. A light ray is incident on a slab of thickness 5 cm with an angle 85° to normal such that it is refracted in the slab with refraction angle of 45°. The lateral shift is [IOE 2074]**

a. 4.5 cm
b. 5.5 cm
c. 4 cm
d. 5 cm

**67. The electric field between the two spheres of a charged spherical condenser [ ]**

a. 0
b. constant
c. increases with distance
d. decreases with distance

**68. Four cell each 2 V , 2Ω are connected in parallel and connected to an external resistor of 2 Ω. The current through external resistor is [IOE 2076]**

a. 0.2 A
b. 0.4 A
c. 0.6 A
d. 0.8 A

**69. An alpha particle of mass $6.65 \times 10^{-27}$ kg travels at right angle magnetic field of $0.2$ T with a speed of $6 \times 10^5$ m/s. the acceleration the particle will be**

a. $5.77 \times 10^{12} m/s^2$
b. $5.77 \times 10^{10} m/s^2$
c. $5.77 \times 10^{8} m/s^2$
d. $5.77 \times 10^{6} m/s^2$

**70. Induced EMF when coil having no. of turns 100, Area of cross-section $200cm^2$ is suddenly removed from magnetic field of 2T in 0.5s. [IOE 2078]**

a. 1 V
b. 2 V
c. 4 V
d. 8 V

**71. Frequency of vibration of sonometer wire gets doubled if :**

a. tension is doubled
b. tension is halved
c. length is doubled
d. length is halved

**72. Two cars moving with same velocity produce sound of frequency $'f'$. if $'f1'$ is the apparent frequency if they move in same direction, which relation is correct ? [IOE 2078]**

a. $f = f_1$
b. $f > f_1$
c. $f_1 > f$
d. $f_1 \geq f$

**73. Photons of energy 5eV get incident on metal surface of work function 2eV . The value of stopping potential will be [IOE 2074]**

a. 7V
b. 5V
c. 3V
d. 2V

**74. In terms of the Bohr radius a the raidus of the second Bohr orbit of a hydrogen atom is given by**

a. $4a_0$
b. $8a_0$
c. $\sqrt{2}a_0$
d. $2a_0$

**75. $\log(\frac{a^2}{bc}) + \log(\frac{b^2}{ca}) + \log(\frac{c^2}{ab}) =$ [IOE 2077]**

a. $a^2b^2c^2$
b. $0$
c. $abc$
d. $1$

**76. If A and B are non-singular square matrices of same order, then $adj.(AB)$ is equal to**

a. $(adj\ A)(adj\ B)$
b. $(adj\ B)(adj\ A)$
c. $(adj\ B^{-1})(adj\ A^{-1})$
d. $(adj\ A^{-1})(adj\ B^{-1})$

**77. If $\alpha = \frac{1+i}{\sqrt{2}}$, then $\alpha^6 + \alpha^4 + \alpha^2 + 1 =$**

a. 0
b. 1
c. 4
d. -1

**78. In an infinite GS, each term is equal to 3 times the sum of all the terms which follow it and the sum of the $1^{st}$ two terms is 15. Then the sum to infinity of the series is**

a. 20
b. 24
c. 18
d. 16

**79. The term free form $x$ in the expansion of $\left(\frac{3x^2}{2} - \frac{1}{3x}\right)^9$, is [IOE 2074]**

a. $\frac{7}{18}$ b. $\frac{5}{18}$

c. $\frac{5}{17}$ d. $\frac{7}{17}$

**80. The general solution of $\sin\theta = 1$ is [IOE 2077]**

a. $n\pi + \frac{\pi}{2}$ b. $n\pi + \frac{\pi}{2}$

c. $2n\pi + (-1)^n\frac{\pi}{2}$ d. $2n\pi + \frac{\pi}{2}$

**81. If $\Delta ABC$ , $\frac{a}{\cos B} = \frac{b}{\cos A}$ , $< c =$ [IOE 2075]**

a. $\frac{\pi}{3}$ b. $\frac{\pi}{4}$

c. $\frac{\pi}{2}$ d. $\pi$

**82. If $\vec{a} = \vec{i} - \vec{j} + \vec{k}$ and $\vec{b} = \vec{i} + \vec{j} - \vec{k}$ , find the angle between them. [IOE 2078]**

a. $0^\circ$ b. $90^\circ$

c. $\cos^{-1}\frac{1}{3}$ d. $\cos^{-1} -\frac{1}{3}$

**83. The equation of pair of lines perpendicular to pair of lines represented by equation $4x^2 + 2hxy + y^2 = 0$ is $mx^2 - 2hxy + ny^2 = 0$. The value of 'm' and 'n' are respectively [IOE 2077]**

a. $1, 4$ b. $4, 1$

c. $1, 2$ d. $2, 1$

**84. The centre of the circle $2x^2 + 2y^2 + 5x + 5y + 7 = 0$ lies in which quadrant: [IOE 2077]**

a. 1st b. 2nd

c. 3rd d. 4th

**85. The equation of directrix of $2x^2 + 8x + 8y - 1 = 0$ is [IOE 2076]**

a. 9y – 17 = 0 b. 9y + 17 = 0

c. 8y – 17 = 0 d. 8y + 17 = 0

**86. Equation of a plane passing through the point (2,1,-1) and (1,1,-2) and perpendicular to the plane x + 2y + 3z =4, is [IOE 2078]**

a. x + 2y + z -3 = 0 b. x + y – z -4 = 0

c. 2x -y + z -4 = 0 d. 2x + y - z -5 =0

**87. $\lim_{x\to\infty}(1 + \frac{4}{x-1})^{x+3} =$ [IOE 2074]**

a. $e^2$ b. $e^3$

c. $e^4$ d. $e^6$

**88. If $f(x)$ is an odd function and $f'(4) = -4$ then $f'(-4) =?$ [IOE 2078]**

a. 0 b. 4

c. -4 d. 1

**89. $\int e^{x+\frac{1}{x}}(1 - \frac{1}{x^2})dx$ is equals [IOE 2078]**

a. $e^{x+\frac{1}{x}}$ b. $e^{x-\frac{1}{x}}$

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

**90. Which of the following is an aromatic compound?**

a. Benzene hexachloride b. Anthracene

c. Cyclohexane d. Cyclobutadiene

**91. When glucose is mixed with sulphuric acid , which of the following is obtained ? [IOE 2076]**

a. $CO$, $H_2O$
b. $C$, $H_2O$
c. $CO$, $CO_2$, $H_2O$
d. $CO_2$, $H_2O$

**92. Froth floatation process is based on**

a. Specific gravity of the ore particles.
b. Magnetic properties of the ore particles.
c. Wetting properties of the ore particles.
d. Electrical properties of the ore particles.

**93. 71 g of chlorine combines with a metal giving 111 g of its chloride. The chloride is isomorphous with $MgCl_2 \cdot 6\,H_2O$. The atomic mass of the metal is**

a. 20
b. 40
c. 30
d. 69

**94. $100\,ml$ of $0.4\,N$ $HCl$ is mixed with $100\,ml$ of $0.6\,N$ of $H_2SO_4$. What is the normality of the resulting solution?**

a. 0.5
b. 0.2
c. 0.3
d. 0.4

**95. The percentage of pyridine ($C_5H_5N$) that forms pyridinium ion ( $C_5H_5NH$) in 0.10 M aqueous pyridine solution is ( $K_b$ for $C_5H_5N = 1.7 \times 10^{-9}$ ) [IOE 2076]**

a. 0.006 %
b. 0.013 %
c. 0.770 %
d. 1.600 %

**96. In which one of the following one faradays of electricity will liberate $0.5$ gram-atom of the metal?**

a. $AuCl_3$
b. $FeCl_3$
c. $CuSO_4$
d. $NaCl$

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

In the growth of modern towns and cities, an important factor to be remembered is the density of population. Mr. JP Orr, the Hon'ble Chairman of the Bombay Improvement Trust, pointed out in a recent lecture on the subject, how it affected the health and prosperity of the inhabitants. Life in most thriving towns is intimately connected with the local trades and industries.

Unhealthy conditions in factories and workshops, offensive trades, have been prevented in important towns and this had led to better health. The question of density is more difficult to deal in India because the older towns have been built on different principles. People not only want to live in health but in such form as gives them greater social convenience, comforts and safety. They care for the health, comfort and beauty of the town, and these conditions of a well-built and well-arranged town are still insisted on by the people. So long as individuals obey the laws of health and their habits and customs are free from insanitary effects, mere density of population does not perhaps tend to increase death rate and harbour diseases. But in the present day, it is apparent that the habits of the people have greatly changed and they do not

obey the laws of health and cleanliness as well as their forefathers used to do in days when cities expanded and people flourished. It is, therefore, necessary to modify the old plans of city building in the light of modern sanitary laws and requirements.

Mr. Orr in his lecture spoke mainly of the density of the city of Bombay. But his observations are of considerable interest to all others whose population is huddled, in narrow quarters without adequate air and light.

**97. The density of population does not increase death rate and harbour diseases as long as**

a. unhealthy conditions in factories and workshops are prevented.
b. people obey the laws of health and their habits are free from insanitary effects.
c. towns are well-built and well-arranged.
d. the older towns are properly expanded.

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**98. The word 'thriving' used in the above passage means**

a. populated
b. modern
c. growing
d. well-planned

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**99. Select from answer choices a suitable synonym to 'huddle' used in this passage.**

a. grow
b. heaped together
c. scatter
d. sporadic

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**100. Which of the following statements is incorrect according to the passage?**

a. Life in most thriving towns is intimately connected with the local trades and industries.
b. It is necessary to modify the old plans of city building.
c. The question of density is more difficult to deal in India because the older towns have been built on different principles.
d. The density of population tends to increase death rate and harbour diseases.

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Answer Key

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1.b | 2.a | 3.b | 4.b | 5.b | 6.d | 7.c | 8.b |
| 9.c | 10.b | 11.b | 12.a | 13.a | 14.a | 15.c | 16.a |
| 17.d | 18.c | 19.a | 20.b | 21.a | 22.a | 23.c | 24.d |
| 25.a | 26.b | 27.b | 28.b | 29.b | 30.b | 31.b | 32.c |
| 33.d | 34.b | 35.a | 36.b | 37.d | 38.a | 39.b | 40.d |
| 41.c | 42.b | 43.d | 44.a | 45.b | 46.d | 47.d | 48.d |
| 49.c | 50.a | 51.a | 52.c | 53.a | 54.c | 55.b | 56.c |
| 57.c | 58.b | 59.c | 60.a | 61.d | 62.a | 63.b | 64.c |
| 65.c | 66.a | 67.d | 68.d | 69.a | 70.d | 71.d | 72.a |
| 73.c | 74.a | 75.b | 76.b | 77.a | 78.d | 79.a | 80.d |
| 81.c | 82.d | 83.a | 84.c | 85.c | 86.b | 87.c | 88.c |
| 89.a | 90.a | 91.b | 92.c | 93.b | 94.a | 95.b | 96.c |
| 97.b | 98.c | 99.b | 100.d | | | | |

## Solutions

1. b

We have,

Power $(P) = I^2R$

If $\%$ change is less than $10\%$ then

$$\frac{\Delta P}{P}\% = 2 \times \frac{\Delta I}{I}\% = 2 \times 1\% = 2\%$$

2. a

Frictional Force is independent to area so Frictional force = 5 N

3. b

$$mg' = mg(1 - \frac{d}{R}) = \left(1 - \frac{R/2}{R}\right) = \frac{x}{2}N$$

4. b

$$MK^2 = \frac{1}{2}MR^2$$

$$\therefore K = \frac{R}{\sqrt{2}} = \frac{50}{\sqrt{2}} = 25\sqrt{2}\, cm$$

5. b

$$\frac{W_1}{W_2} = \left(\frac{r_1}{r_2}\right)^2$$

6. d

Temp = $\frac{100}{160} \times 40 = 25^\circ C$

7. c

$T_1 = 90^\circ C$
$T_2 = 70^\circ C$
$T_3 = 50^\circ C$

i. e
$T_0 = 27^\circ C$

$(T_1 - T_0) > (T_2 - T_0) > (T_3 - T_0)$
As $\frac{dT}{dt} \propto \Delta T$

$$\left(\frac{dT}{dt}\right)_1 > \left(\frac{dT}{dt}\right)_2 > \left(\frac{dT}{dt}\right)_3$$

$t_1 < t_2 < t_3$

8. b

- The range of visible spectrum ranges from 4200 $A^\circ$ to 7800 $A^\circ$
- 640 nm = 6400 $A^\circ$ lies within this visible range .

9. c

10. b

As charges are like, they repel each other, along with AP and AQ. So, the net force is along with AR.

$F_{net} = \vec{F}_1 + \vec{F}_2$
$= \vec{F} + \vec{F}$
$= \sqrt{F^2 + F^2 + 2F \cdot F\cos 60^\circ}$

$$= \sqrt{2F^2 + 2F^2 \cdot \frac{1}{2}}$$

$= \sqrt{3F^2}$
$= \sqrt{3}F$

11. b

$Q = N\,(2e)\ \ for\ Cu^{++}$ ions$

$$N = \frac{Q}{2e} = \frac{4.8 \times 10^5}{2 \times 1.6 \times 10^{-19}} = 1.5 \times 10^{24}$$

12. a

$M_r = \sqrt{M^2 + M^2 + 2MM\cos 120^\circ} = M$

13. a

14. a

Fringe width ($\beta$) = $\frac{\lambda D}{d}$

Inside water $\beta_w = \frac{D\lambda_{water}}{d}$

Since , $\lambda_{water} = \frac{\lambda}{\mu}$ ( $\lambda$ decreases ) so fringe width decreases inside water .

15. c

$$\frac{V_{H2}}{V_{He}} = \sqrt{\frac{\lambda_{H2}}{\lambda_{He}} \times \frac{M_{He}}{M_{H2}}} = \sqrt{\frac{\frac{7}{5}}{\frac{5}{3}} \times 2} = \frac{\sqrt{42}}{5}$$

16. a

From Millikan's oil drop experiment
mg = qE [ For stationary drop ]

4/3 πr^3 ρg=q V/d

i.e V ∝ r^3

so, V'/400=(2R/R )^2

V′ = 8 ×400=3200V

17. d

18. c

$a^2 - x^2 \geq 0$

$a^2 \geq x^2$

$a \geq |x|$

$|x| \leq a$

$x \in [-a, a]$

19. a

$A^2 = O$

and 2 is the least +ve integer for which $A^2 = O$.

Thus, A is nilpotent of index 2.

20. b

$z = (3 + 4i)(4 + 3i)$

$| z | = | ((3 + 4i)(4 + 3i)) |$

$= | (3 + 4i) || (4 + 3i) |$

$= 5 \times 5$

$= 25$

21. a

$S_n = \frac{n}{2}[2a + (n-1)d]$

$$S_n = \frac{n}{2}[2 \times 1 + (n-1)5]$$

$$148 = \frac{n}{2}[2 + 5n - 5]$$

$$296 = 5n^2 - 3n$$

$$5n^2 - 3n - 296 = 0$$

$$n = 8$$

22. a

$$2\sin^2\theta - 3\sin\theta - 2 = 0$$

$$2\sin^2\theta - 4\sin\theta + \sin\theta - 2 = 0$$

$$2\sin\theta(\sin\theta - 2) + 1(\sin\theta - 2) = 0$$

$$(2\sin\theta + 1)(\sin\theta - 2) = 0$$

$$(\sin\theta - 2) \neq 0 \rightarrow (2\sin\theta + 1) = 0$$

$$\sin\theta = -\frac{1}{2} = \sin\frac{7\pi}{6}$$

$$\theta = n\pi + (-1)^n \frac{7\pi}{6}$$

23. c

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

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

24. d

$$a\cot A + b\cot B + c\cot C$$

$$a\frac{\cos A}{\sin A} + b\frac{\cos B}{\sin B} + c\frac{\cos C}{\sin C}$$

We know:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R$$

$$= 2R\cos A + 2R\cos B + 2R\cos C$$

$$= 2R(\cos A + \cos B + \cos C)$$

$$= 2R(1 + 4\sin(\frac{A}{2})\sin(\frac{B}{2})\sin(\frac{C}{2}))$$

$$= 2R(1 + \frac{r}{R})$$

$$= 2(R + r)$$

25. a

It is mid point theorem in a triangle.

26. b

$$2x^2 - 5xy + 3y^2 = 0$$

$$2x^2 - 3xy - 2xy + 3y^2 = 0$$

$$x(2x - 3y) - y(2x - 3y) = 0$$

$$(x - y)(2x - 3y) = 0$$

The lines are: $x - y = 0$ and $(2x - 3y) = 0$

Line parallel to $x - y = 0$ is $x - y + k = 0$ and passes through (1,2) $k = 1$ so, $x - y + 1 = 0$

Line parallel to $2x - 3y = 0$ is $2x - 3y + k = 0$ and passes through (1,2) $k = 4$ so, $2x - 3y + 4 = 0$

The pair of line is $(x - y + 1)(2x - 3y + 4) = 0 \rightarrow$
$2x^2 – 5xy + 3y^2 + 6x – 7y + 4 = 0$

27. b

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

$y = x \cot\theta - a \operatorname{cosec}\theta$

$\mathrm{x}^2 + \mathrm{y}^2 = \mathrm{a}^2$

$x^2 + (x \cot\theta - a \operatorname{cosec}\theta)^2 = a^2$

$x^2 + x^2 \cot^2\theta - 2xa \cot\theta \operatorname{cosec}\theta + a^2 \operatorname{cosec}^2\theta = a^2$

$x^2(1 + \cot^2\theta) - 2xa \cot\theta \operatorname{cosec}\theta + a^2(\operatorname{cosec}^2\theta - 1) = 0$

$x^2 \operatorname{cosec}^2\theta - 2xa \cot\theta \operatorname{cosec}\theta + a^2 \cot^2\theta = 0$

$(x \operatorname{cosec}\theta - a \cot\theta)^2 = 0$

28. b

29. b

30. b

Equation of the plane through the intersection of $bx - ay = 1$ and $cy - bz = 1$ is of the form

$(bx - ay - 1) + \lambda(cy - bz - 1) = 0$

$bx + (-a + c\lambda)y - b\lambda z + (-1 - \lambda) = 0$

Comparing with $az - cx = -2$, we get

$$\frac{b}{-c} = \frac{-a + c\lambda}{0} = \frac{-b\lambda}{a} = \frac{+1 + \lambda}{-2}$$

$\Rightarrow \lambda = \frac{a}{c}$ and $\frac{b}{-c} = \frac{1 + \frac{a}{c}}{-2}$ or $a + c = 2b$

We know, that for any two positive number $AM \geq HM$

$\Rightarrow AM(a, c) \geq HM(a, c)$

$\Rightarrow b \geq \frac{2ac}{a + c}$

$\Rightarrow ab + bc + ca \geq 3ac$

Minimum value of $ab + bc + ca = 3ac$.

31. b

$\lim_{n\to\infty} \frac{1}{(1 \times 4)} + \frac{1}{(4 \times 7)} + \frac{1}{(7 \times 10)} + ..... + \frac{1}{((3n - 2) \times (3n + 2))}$

$\lim_{n\to\infty} \frac{1}{3}[\frac{1}{1} - \frac{1}{4}] + \frac{1}{3}[\frac{1}{4} - \frac{1}{7}] + \frac{1}{3}[\frac{1}{7} - \frac{1}{10}] \cdots \frac{1}{3}[\frac{1}{3n - 2} - \frac{1}{3n + 2}]$

$\lim_{n\to\infty} \frac{1}{3}[\frac{1}{1} - \frac{1}{3n+2}]$

$\frac{1}{3}$

32. c

$f'(x) = 6(3x+8)^4 + (7x-4)(4)(3)(3x+8)^3$

$= 7(3x+8)^4 + 12(7x-4)(3x+8)^3$

$= 7(3x+8)^4 + (84x-48)(3x+8)^3$

33. d

$y = a\sin mx + b\cos mx$

$\frac{dy}{dx} = a\cos mx \cdot m - b\sin mx \cdot m$

$= m(a\cos mx - b\sin mx)$

$\frac{d^2y}{dx^2} = m^2(-a\sin mx - b\cos mx)$

$= -m^2 y$

34. b

$s = t^3 - 6t^2 - 4t - 8$

$\frac{ds}{dt} = 3t^2 - 12t - 4$

$\frac{d^2t}{dt^2} = 6t - 12$

$0 = 6t - 12$

$t = 2$

35. a

$A = \pi\frac{d^2}{4}$

$\frac{dA}{dt} = \frac{\pi}{4}2d \times \frac{d(d)}{dt}$

$1 = \frac{\pi}{2}d$

$1 = \frac{\pi}{2}2r$

$r = \frac{1}{\pi}$

36. b

$y = \sin^{-1} x$

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

Then,

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

37. d

$\ln x = 0 \Rightarrow x = 1$

$\therefore$ Area $(A) = \int_1^e y dx = \int_1^e \ln x dx$
$= [x\ln x - x]_1^e$
$= (e\ln e - e) - (0-1)$
$= e.1 - e + 1 = 1$

38. a

Propane is obtained from propene by catalytic hydrogenation.

$$\underset{\text{propene}}{CH_3-CH=CH_2} + H_2 \xrightarrow[300^\circ C]{Ni} \underset{\text{Propane}}{CH_3-CH_2-CH_3}$$

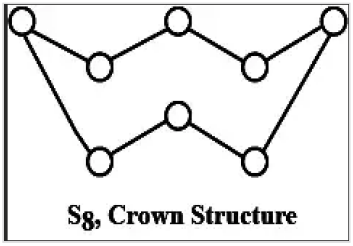
39. b

The Reaction of methyl Magnesium Bromide with water will give methane.

$$CH_3-MgBr + H_2O \longrightarrow CH_4 + Mg(OH)Br$$

40. d

$S_8$ is crown shaped.



**$S_8$, Crown Structure**

41. c

The oxygen in water undergoes $sp^3$ hybridization.

42. b

In Down's process, sodium metal is prepared by the electrolysis of fused NaCl.

43. d

Copper is not amphoteric in nature as it does not react with base as well as acid to give salt and water.

44. a

flux is an additional substance which is added during smelting, which combines with impurities to form a fusible product.

45. b

Neutralization is a chemical reaction in which acid and base react to form salt and water. Hydrogen (H+) ions and Hyroxide (OH-) reacts with each other to form water.

46. d

Oxidation of iron

$$2\,Fe \longrightarrow 2\,Fe^{2+} + 4\,e^-$$

Reduction of oxygen

$$O_2 + 2\,H_2O + 4\,e^- \longrightarrow 4\,OH^-$$

Hence, rusting of iron is an example of redox reaction.

47. d

$r_n \propto \frac{n^2}{Z}$

For the same value of the principal quantum number the radius decreases as the atomic number increases. For H, Z= 1 $D^+$, Z= 1
$He^+$ Z= 2 $Li^{++}$ Z= 3
For $Li^{2+}$ the first Bohr orbit is the smallest one.

48. d

The last 4f subshell in which the electrons are filled in the electronic configuration of element states that the element belongs to f block.

49. c

50. a

51. a

52. c

53. a

54. c

55. b

56. c

57. c

58. b

luminous means radiating or reflecting light, or glowing; dim means dark or dull

59. c

60. a

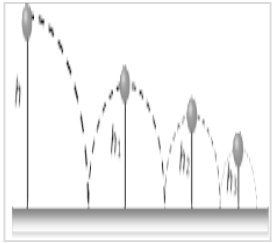
61. d

$\frac{v_A}{v_B} = \frac{\tan\theta_1}{\tan\theta_2}$

$= \frac{\tan 30^\circ}{\tan 60^\circ} = 1 \times \frac{1}{\sqrt{3}} \times \sqrt{3} = \frac{1}{3}$

62. a

Particle falls from height h then formula for height covered by it in nth rebound is given by $h_n = he^{2n}$



where e = coefficient of restitution, n = No. of rebound Total distance travelled by particle before rebounding has stopped

$H = h + 2h_1 + 2h_2 + 2h_3 + 2h_n + \ldots\ldots = h + 2he^2 + 2he^4 + 2he^6 + 2he^8 + \ldots\ldots$

$h + 2h(e^2 + e^4 + e^6 + e^8 + \ldots\ldots)$

$h + 2h(\frac{e^2}{1-e^2})$

$h(\frac{1+e^2}{1-e^2})$

63. b

64. c

$\rho_w g h_w = \rho_s g h_s$

$1000 \times g \times 0.08 = \rho_s \times g \times 0.1$

$\rho_s = 800$

Specific Gravity $=0.8$

65. c

66. a

Here, $i = 85^o, r = 45^o$ and $t = 5cm$

$\therefore$ lateral shift $(d) = \frac{t\sin(i-r)}{\cos r} = \frac{5 \times \sin(85^\circ - 45^\circ)}{\cos 45^\circ}$

$= 4.54$ cm

67. d

68. d

$I_{parallel} = \frac{E}{R + \frac{r}{n}} = \frac{2}{2 + \frac{2}{4}} = 0.8$ A

69. a

$F = Bqvsin\theta$
Or,$ma = 0.2 \times 2e \times 6 \times 10^5 \times \sin 90^\circ$
Or, $a = \dfrac{0.2 \times 2 \times 1.6 \times 10^{-19} \times 6 \times 10}{6.65 \times 10^{-27}}$
$a = 5.77 \times 10^{12} m/s^2$

70. d

$$V = \frac{NBA - 0}{t} = \frac{100 \times 2 \times 200 \times 10^{-4}}{0.5} = 8V$$

71. d

72. a

73. c

Here, $K.E. = E - \phi = 5 - 2 = 3eV$

$\therefore$ stopping potential $= \dfrac{K.E.}{e} = \dfrac{3eV}{e} = 3V$

74. a

75. b

$\log(\frac{a^2}{bc}) + \log(\frac{b^2}{ca}) + \log c^2ab$
$= \log(\frac{a^2}{bc} \times \frac{b^2}{ca} \times \frac{c^2}{ab})$
$= \log(1) = 0$

76. b

$adj.(AB) = (adj\ B)(adj\ A)$

77. a

$\alpha = \dfrac{1+i}{\sqrt{2}}$

Squaring we get

$(\sqrt{2}\alpha)^2 = (1+i)^2$

$2\alpha^2 = 1 + 2i + i^2 = 1 + 2i - 1$

$\alpha^2 = i$

$\alpha^6 + \alpha^4 + \alpha^2 + 1$
$= i^3 + i^2 + i + 1$
$= -i - 1 + i + 1 = 0$

78. d

Let $a, ar, ar^2, ar^3, \ldots \infty$ be in G.P

Then $a = 3\left(ar + ar^2 + ar^3 + \ldots.\right)$

or, $1 = 3\left(r + r^2 + r^3 + \ldots\ldots\right)$

or, $1 = \dfrac{3.x}{1-r}$

or, $1 - r = 3r$

or, $1 = 4r$

or, $\quad r = \dfrac{1}{4}$

Also given, $a + a \cdot r = 15$ or, $a(1+r) = 15$

or, a $\left(1 + \dfrac{1}{4}\right) = 15$

or, $a\left(\dfrac{5}{4}\right) = 15$

or, $a = 12$

$$\text{Sum} = \frac{a}{1-r} = \frac{12}{1-\frac{1}{4}} = \frac{12}{\frac{3}{4}} = 16$$

79. a

: General terms is $T_{r+1} = {}^9C_r \left(\frac{3x^2}{2}\right)^{9-r} \left(-\frac{1}{3x}\right)^r = {}^9C_r 3^{9-r} x^{18-2r} \frac{1}{2^{9-r}} \times \frac{(-1)^r}{3^r x^r}$

$= {}^9C_r \left(\frac{3}{2}\right)^{9-r} x^{18-3r} \frac{(-1)^r}{3^r}$

$r = 6$

${}^9C_6 \frac{3^3}{2^3} \times \frac{1}{3^6} = \frac{7}{18}$

80. d

$\sin\theta = 1 = \sin\frac{\pi}{2}$

$\theta = 2n\pi + \frac{\pi}{2}$

81. c

$a\cos A = b\cos B$

$\sin 2A = \sin 2B$

$\sin 2A = \sin(\pi - 2B)$

$2A + 2B = \pi$

$A + B = \frac{\pi}{2}$

Then $C = \frac{\pi}{2}$

82. d

83. a

The pair of lines perpendicular to $ax^2 + 2hxy + by^2 = 0$ are represented by $bx^2 - 2hxy + ay^2 = 0$

So, lines perpendicular to $4x^2 + 2hxy + y^2 = 0$ is given by $x^2 - 2hxy + 4y^2 = 0.$

Comparing this with $mx^2 - 2hxy + ny^2 = 0$

$m = 1, n = 4$

84. c

85. c

$2x^2 + 8x + 8y – 1 = 0$

or, $x^2 + 4x + 4y – \frac{1}{2} = 0$

or, $(x+2)^2 + 4y – 4 – \frac{1}{2} = 0$

or, $(x+2)^2 = -4(y – \frac{9}{8})$

Comparing with $(x-h)^2 = 4a(y-k)$

$h = -2, a = -1$ and $k = 9/8$ equation of directrix is:

$y = -a$

$y - \frac{9}{8} = 1$

$8y - 17 = 0$

86. b

87. c

$\lim_{x \to \infty} (1 + \frac{4}{x-1})^{x+3}$

$\lim_{x \to \infty} (\frac{x+3}{x-1})^{x+3} = \lim_{x \to \infty} (\frac{x+3}{x-1})^{x} (\frac{x+3}{x-1})^{3} = e^{3-(-1)}.1 = e^4$

88. c

89. a

90. a

91. b

Dehydration property of

$\mathrm{H_2SO_4} + \mathrm{C_6H_{12}O_6} \xrightarrow{\mathrm{Conc \cdot H_2SO_4}} 6\,\mathrm{C} + 6\,\mathrm{H_2O}$

92. c

The froth floatation process is based on the principle of the wetting properties of the ore particles. Froth floatation process is nothing but the purification of metallic sulphide ore in the wet form. This wet of the metallic sulphide ore is due to the oil and gangue of water.

93. b

94. a

Milliequivalent of $\mathrm{HCl} = 40$

Milliequivalent of $\mathrm{H_2SO_4} = 60$

Total number of moles= $100$

$\mathrm{Normality} = \frac{\mathrm{No \cdot of\ moles\ left}}{\mathrm{Total\ Volume}} = \frac{100}{200} = 0.5$

95. b

$\mathrm{C_5H_5N} + \mathrm{H_2O} \longrightarrow \mathrm{C_5H_5NH} + \mathrm{OH^-}$

$\alpha = \sqrt{\frac{k_b}{M}} = \sqrt{\frac{1.7 \times 10^{-9}}{0.1}} = 1.3 \times 10^{-4}$

So, percentage = $1.3 \times 10^{-4} \times 100 = 0.013\%$

96. c

$\mathrm{Cu^{+2}} + 2\,\mathrm{e^-} \longrightarrow \mathrm{Cu}$

1 gram atom=2F

97. b

98. c

99. b

100. d