

Shift 1 | July 8
Clamphook CBT
2080

Full Marks: 140

Time: 2 hours

Pass Marks: 56

1. The magnitude of any physical quantity

- | | |
|--|--|
| a. Depends on the method of measurement | b. Does not depend on the method of measurement |
| c. Is more in SI system than in CGS system | d. Directly proportional to the fundamental units of mass, length and time |

2. A block of 2 kg slides at constant velocity of 20m/s on a horizontal surface if it is pulled horizontally by 8 N . Then coefficient of sliding friction will be :

- | | |
|--------|--------|
| a. 0.2 | b. 0.4 |
| c. 0.5 | d. 1 |

3. What is true for a satellite orbiting around the earth?

- | | |
|---|--|
| a. Speed is maximum when it is near the earth because of constant angular momentum. | b. Sweeps out equal mass in equal interval as energy constant. |
| c. Sweeps out maximum when it is near because angular momentum is variable. | d. Constant linear momentum. |

4. The breaking force for a wire of radius r of given material is F . The breaking force for the wire of same material of radius $2r$ is

- | | |
|---------|------------------|
| a. F | b. $2F$ |
| c. $4F$ | d. $\frac{F}{4}$ |

5. The work done in blowing a soap bubble of surface tension, T , to increase its diameter from d to D is

- | | |
|---------------------|---------------------|
| a. $\pi(D^2-d^2)T$ | b. $2\pi(D^2-d^2)T$ |
| c. $4\pi(D^2-d^2)T$ | d. $8\pi(D^2-d^2)T$ |

6. What is the temperature of the body?

- | | |
|--|---|
| a. Sum of kinetic energy of vibration of molecules of the body | b. Relative measure of speed of the atoms of the body |
| c. Sum of the potential energy of vibration of atoms of the body | d. Average kinetic energy of vibration of the molecules of the body |

7. Air in a cylinder is suddenly compressed by a piston, which is then maintained at the same position. With the passage

of time

- a. The pressure decreases b. The pressure increases
- c. The pressure remains the same. The pressure may increase or decrease depending upon the nature of the gas

8. The rays of light from a luminous object are focused at a point A. If a convex lens focal length 30 cm is put at a distance 30 cm from the point A such that the rays upon the lens before focusing at the point A. If now, the rays are focused at point B, what is the distance AB?

- a. 45 cm b. 15 cm
- c. 22.5 cm d. 30 cm

9. When white light passes through the achromatic combination of prism, then what is observed

- a. Dispersion b. Deviation
- c. Dispersion and deviation d. No Dispersion and no deviation

10. Two charges $+10\mu C$ and $+50\mu C$ kept at a certain distance. The electric intensity at the location of $+10\mu C$ is E . Then the electric intensity at the location of $50\mu C$ is

- a. $5E$ b. $\frac{1}{5}E$
- c. $-5E$ d. $-\frac{1}{5}E$

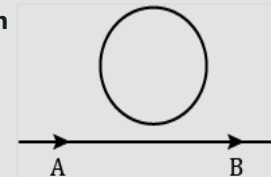
11. A current of 10A, deposits 10.8 gram of silver in 900s. The mass of the copper deposited by 9A of current in 1200s will be [$E_{ca} = 31.5$ and $E_{ag} = 108$].

- a. 3.78g b. 6.35g
- c. 7.56g d. 10.80g

12. A magnetic material aligns perpendicular to uniform magnetic field then the substance is

- a. Diamagnetic b. Paramagnetic
- c. Ferro magnetic d. Anti ferro magnetic

13. In the arrangement shown in given figure current from A to B is increasing in magnitude. Induced current in the loop will



- a. have clockwise direction b. have anticlockwise direction
- c. be zero d. oscillate between clockwise and anticlockwise

14. A beam of electron is used in Young's double slit experiment. When the velocity of electron is increased then

- a. no. of interference is observed b. fringe width increases
- c. fringe width decreases d. fringe width remains same

15. Speed of sound is maximum in [IOE 2075]

- a. Monoatomic gas b. Diatomic gas
- c. Polyatomic gas d. Equal in all

16. The beam of electrons passes through the region of uniform electric field $E = 7.2 \times 10^6 V/m$ and magnetic

field $B = 2.4T$. If the beam of electrons undeviated from its original path, then the velocities electron will be

- a. $27.28 \times 10^6 m/s$ b. $3.0 \times 10^6 m/s$
c. $2.0 \times 10^6 m/s$ d. $7.2 \times 10^6 m/s$

17. If $\alpha = 0.6$ then value of β for the transistor will be [IOE 2077]

- a. 1.5 b. 2.5
c. 0.5 d. 1.75

18. The number of non-empty subset of $A = \{1, 2, 3, 4\}$ is

- a. 14 b. 15
c. 16 d. 17

19. If $A = \begin{bmatrix} \lambda & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, then value of λ for which $A^2 = B$, is

- a. No real value of α b. 1
c. -4 d. 4

20. If $\left(\frac{1+i}{1-i}\right)^x = 1$ then

- a. $x = (2n + 1)$ where n is any positive integer b. $x = 4n$, where n is any integer
c. $x = 2n$, where n is any positive integer d. $x = 4n + 1$ where n is any positive integer

21. The number of terms whose value depends on x in the expansion of $\left(x^2 - 2 + \frac{1}{x^2}\right)^n$ is: [IOE 2075]

- a. n b. $(2n + 1)$
c. $2n$ d. $4n$

22. The two angles of a triangle are $\cot^{-1}(2)$ and $\cot^{-1}(3)$. Then third angle is:

- a. $\frac{\pi}{4}$ b. $\frac{3\pi}{4}$
c. $\frac{\pi}{6}$ d. $\frac{\pi}{3}$

23. $\cos^{-1} \left[\cos \left(-\frac{17}{15\pi} \right) \right]$ is equal to:

- a. $-\frac{17\pi}{15}$ b. $\frac{17\pi}{15}$
c. $\frac{2\pi}{15}$ d. $\frac{13\pi}{15}$

24. In a triangle ABC, if $a + b = 3c$, then the value of $\cot \frac{A}{2} \cdot \cot \frac{B}{2}$ is:

- a. 1 b. 2
c. 3 d. 4

25. $|\vec{a} \times \vec{b}|^2 =$

- a. $a^2 b^2$ b. 0
c. $a^2 b^2 - (\vec{a} \cdot \vec{b})^2$ d. None

26. The equation of the parallel to x-axis at a distance of 3 units on the up side from the origin [IOE 2075]

- a. $x = 3$ b. $x = -3$

c. $y = 3$

d. $y = -3$

27. The equation of pair of tangent drawn from the point $(3, 4)$ to the circle $x^2 + y^2 = 9$ is :

a. $7x^2 - 24xy + 54x + 72y + 225 = 0$

b. $7x^2 + 24xy + 54x - 72y + 225 = 0$

c. $7x^2 - 24xy + 54x + 72y - 225 = 0$

d. $7x^2 + 24xy + 54x + 72y + 225 = 0$

28. Which one of the following does not represent a hyperbola? [IOE 2075]

a. $xy = 1$

b. $x^2 - y^2 = 5$

c. $(x - 1)(y - 3) = 3$

d. $x^2 - y^2 = 0$

29. If S and S' are two fixed points then the locus of a point P such that $PS - PS' = a$ constant is :

a. Parabola

b. Circle

c. Ellipse

d. Hyperbola

30. Find the direction cosines of the line passing through the following points $(-2, 4, -5)$ and $(1, 2, 3)$.

a. $\frac{3}{\sqrt{77}}, -\frac{2}{\sqrt{77}}, \frac{8}{\sqrt{77}}$

b. $\frac{3}{\sqrt{77}}, -\frac{2}{\sqrt{77}}, -\frac{8}{\sqrt{77}}$

c. $\frac{3}{\sqrt{77}}, \frac{2}{\sqrt{77}}, \frac{8}{\sqrt{77}}$

d. $-\frac{3}{\sqrt{77}}, -\frac{2}{\sqrt{77}}, \frac{8}{\sqrt{77}}$

31. The value of $\lim_{x \rightarrow \infty} \frac{(x+2)(x+3)}{(x+4)(x+7)}$ is equal to

a. 1

b. 0

c. 2

d. None of these

32. If $y = \log_{\sqrt{e}} \sin x$, then $\frac{dy}{dx} =$

a. $\cot x$ b. $\tan x$ c. $2 \cot x$ d. $2 \tan x$

33. The derivative of $|x - 1| + |x - 3|$ at $x = 2$ is

a. 1

b. Doesnt Exist

c. 0

d. 2

34. Two numbers whose sum is 16 and the sum of whose square is minimum is

a. 12, 4

b. 14, 2

c. 8, 8

d. 10, 6

35. The normal to a given curve is parallel to x-axis if [IOE 2075]

a. $\frac{dy}{dx} = 0$

b. $\frac{dy}{dx} = 1$

c. $\frac{dx}{dy} = 0$

d. $\frac{dx}{dy} = 1$

36. $\int \sqrt{1 + \cos 6x} dx$ [IOE 2075]

a. $\frac{4}{3} \sin 3x + c$

b. $\frac{\sqrt{2}}{3} \sin 3x + c$

c. $\frac{3}{2} \sin 3x + c$

d. $\frac{3}{\sqrt{2}} \sin 3x + c$

37. The area bounded by the curve $y = \sec^2 x$, x-axis and the line $x = \frac{\pi}{4}$ is:

- a. 1 b. 2
c. 3 d. 4

38. Tetraethyl lead is added to petrol

- a. as an anti-knock agent b. to prevent freezing of petrol
c. to increase the boiling point of petrol d. to precipitate an organic material

39. Benzene when treated with Cl_2 in direct sunlight gives

- a. BHC b. Oil of wintergreen
c. Oil of mirabane d. Oil of bitter almond

40. Sulphur dioxide can be used as

- a. Bleaching agent b. Antichlor
c. Disinfectant d. All of these

41. The ammonia is dried over

- a. The slaked lime b. Quick lime
c. Calcium chloride d. Phosphorous pentoxide

42. Sodium is made by the electrolysis of a molten mixture of about 40 % NaCl and 60 % CaCl_2 because

- a. Ca^{2+} ion can reduce NaCl to Na b. CaCl_2 helps in a conduction of electricity.
c. This mixture has a lower melting point than NaCl . d. Ca^{2+} can displace Na from NaCl

43. The tough cake copper is the copper obtained after purification of blister copper by

- a. Electrorefining b. Poling
c. Liquation d. distillation

44. The word 'spelter' is [IOE 2078]

- a. Granulated Zinc b. Zinc dust
c. Impure Zinc d. pure Zinc

45. In the system $\text{CN}^- + \text{H}_2\text{O} \rightleftharpoons \text{HCN} + \text{OH}^-$, the conjugate- pairs are

- a. CN/HCN , $\text{H}_2\text{O}/\text{HCN}$ b. $\text{CN}^-/\text{H}_2\text{O}$, HCN/OH^-
c. CN^-/HCN , $\text{H}_2\text{O}/\text{OH}^-$ d. Only CN^- and OH^-

46. The oxidation state of phosphorous in $\text{Ca}_3(\text{PO}_4)_2$ is

- a. +1 b. +2
c. +3 d. +5

47. Which of these molecules is nonpolar although having a polar bond?

- a. CO_2 b. NaCl
c. NH_3 d. H_2O

48. Which of the following statements about an electron in an atom is false?

- a. It is a particle b. It has wave properties
c. Its path is bent by a magnet d. It gives out energy while moving in orbitals

49. There is no end to

- a. Those b. this
c. No one d. such

50. A herd of cattle.....grazing.

- a. are b. is
c. were d. are

51. Animals are taken zoo [IOE 2076]

- a. from b. to
c. at d. for

52. 'I sent her a gift.' The equivalent sentence pattern is [IOE 2077]

- a. S+V+O b. S+V+IO+DO
c. S+V+DO+IO d. S+V+O+C

53. He Bring his book yesterday.

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

54. "Why do you waste time ?" Its passive is [IOE 2074]

- a. Why has time wasted by you ? b. Why is time been wasted by you ?
c. Why is time wasted by you ? d. Why is time wasted ?

55. The word 'heterogeneous' has its primary ... syllable. [IOE 2077]

- a. 2nd b. 3rd
c. 4th d. 6th

56. All his impatience leaves him, and he sits under and oak tree.

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

57. ____care or else you will fail . [2078]

- a. take b. don't take
c. shall take d. must take

58. Something that becomes outdated

- a. Obsolete b. Useless
c. Ancient d. Old

59. I completed the work, I would have left earlier.

- a. Had b. Have had
c. Were d. Have

60. What is the term for a collection of historical documents or records providing information about a place, institution, or group of people?

- a. Archives b. Libraries
c. Museums d. Records

61. A body rolls down a star case of 5 steps. Each step has height 0.1 m and width 0.1 m then velocity of body at bottom will be:

- a. $5\sqrt{2}\text{m/s}$ b. $\left(\frac{5}{\sqrt{2}}\right)\text{m/s}$
c. $2\sqrt{2}\text{m/s}$ d. $\frac{1}{\sqrt{2}}\text{m/s}$

62. A vehicle is moving with a velocity v on a curved road of width 'b' and radius of curvature 'R'. For counteracting the centrifugal force on the vehicle the difference elevation required in between the outer and inner edge of the road is

- a. $\frac{v^2 b}{Rg}$ b. $\frac{vb}{Rg}$
c. $\frac{vb^2}{Rg}$ d. $\frac{vb}{R^2 g}$

63. Force requires to increase the length of wire by 2 mm is 30 N then force needed to increase the length by 3 mm is:

- a. 10 N b. 30 N
c. 45 N d. 60 N

64. Two parallel square plates of length of 10cm and moving with velocity 10cm/s pass in liquid of viscosity 0.01 poise. If the force between the two plates in liquid of 200 dyne then the separation between the plate is:

- a. 5cm b. 0.5cm
c. 0.05cm d. 0.005cm

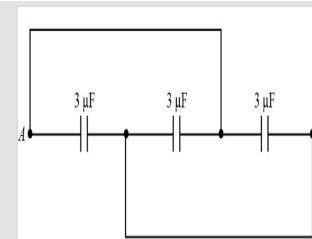
65. The volume of gas is reduces adiabatically to $1/4$ of its volume at $27^\circ C$. The new temperature of gas if value of γ is 1.4

- a. 126.23K b. 235.9K
c. 912K d. 522.3K

66. A monochromatic beam of light passes from a denser medium into a rarer medium. As a result []

- a. Its velocity increases b. Its velocity decreases
c. Its frequency decreases d. Its wavelength decreases

67. In figure, if capacitance of each capacitor is $3 \mu F$, the equivalent capacitance between points A and B is:



- a. $18 \mu F$ b. $9 \mu F$
c. $6 \mu F$ d. $4 \mu F$

68. The length of potentiometer wire is 100 cm and the emf of the standard cell is E volt. It is employed to measure the emf of a battery of internal resistance 0.5Ω . If the balance point is obtained at length $l = 30$ cm from the positive end, the emf of the battery is:

- a. $\frac{300E}{100.5}$ b. $\frac{30E}{100} - 0.5$
c. $\frac{30(E - 0.5i)}{100}$ d. $\frac{30E}{100}$

69. Ratio of magnetic field induction at the centre of a current carrying coil of radius r and at a distance $3R$ on its axis is

- a. $\sqrt{10}$ b. $2\sqrt{10}$
c. $10\sqrt{10}$ d. 10

70. The turn ratio of a transformer is given as 2 : 3. If the current through the primary coil is 3 A, then calculate the current through load resistance:

- a. 1 A b. 4.5 A

c. 2 A

d. 1.5 A

71. A hollow metallic tube of length L and closed at one end produce resonance with tuning fork of frequency n . the entire tube at equilibrium temperature its length change by l . if the change in velocity V of sound is v , the resonance will now be produced by tuning fork of frequency

a. $\frac{V + v}{4(L + l)}$

b. $\frac{V + v}{4(L - l)}$

c. $\frac{V - v}{4(L + l)}$

d. $\frac{V - v}{4(L - l)}$

72. A rocket is going towards moon with speed ' v '. the astronauts in the rocket sends signal of frequency ' f ' towards moon and receives then back on reflection from the moon. The frequency of signal received by astronaut is [IOE 2075]

a. $\frac{cf}{c - v}$

b. $\frac{cf}{c - 2v}$

c. $\frac{2vf}{c}$

d. $\frac{2cf}{v}$

73. . Electron is accelerated with maximum velocity 7×10^6 m/ sec get strike on an anode. What retarding potential is required to decelerate electron (to stop the electrons)?

a. 120 volt

b. 130 volt

c. 136 volt

d. 140 volt

74. The mean lives of a radioactive material for α and β radiations are 1620 & 520 yrs respectively. The material decays simultaneously for α and β radiations The time after which one fourth of the material remain undecayed is:

a. 546 yrs

b. 324 yrs

c. 720 yrs

d. 840 yrs

75. A relation $f : R \rightarrow R$ is defined by $y = x^2 \forall x \in R$, then f is :

a. One-to-one and into

b. One-to-one and onto

c. Many to one and onto

d. Many to one and into

76. $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ and I is the unit matrix of order 2, then A^2 equals

a. $4A - 3I$

b. $4I - 3A$

c. $I + A$

d. $I - A$

77. The harmonic mean of the roots of the equation $(5 + \sqrt{2})x^2 - (4 + \sqrt{5})x + 8 + 2\sqrt{5} = 0$ is:

a. 2

b. 4

c. 6

d. 8

78. The sum of ' n ' terms of series: $1 + (1 + 2) + (1 + 2 + 3) + \dots$ is [IOE 2077]

a. $\frac{n(n+1)(n+2)}{3}$

b. $\frac{n(n+1)(2n+5)}{12}$

c. $\frac{n(n+1)(n+2)}{6}$

d. $\frac{n(n+1)(2n+1)}{6}$

79. $(a^2 - b^2) + \left(\frac{a^4 - b^4}{2!}\right) + \left(\frac{a^6 - b^6}{3!}\right) + \dots =$ [IOE 2076]

a. $e^{a^2} + e^{b^2}$

b. $e^a + e^b$

c. $e^{a^2} - e^{b^2}$

d. $e^a - e^b$

80. Value of θ if $\cos \theta + \cos 2\theta + \cot 3\theta = 0$ is [IOE 2078]

a. $\theta = 2n\pi \pm \frac{\pi}{4}$

b. $\theta = n\pi + (-1)^n \frac{2\pi}{3}$

c. $\theta = n\pi + (-1)^n \frac{\pi}{3}$

d. $\theta = 2n\pi \pm \frac{2\pi}{3}$

81. In triangle ABC, angles A,B and C are on AP.

If $b : c = \sqrt{3} : \sqrt{2}$, Find A. [IOE 2078]

a. 30°

b. 60°

c. 45°

d. 75°

82. $\vec{A} + \vec{B} + \vec{C} = 0$, and \vec{A}, \vec{B} and \vec{C} are unit vectors then $\vec{A} \cdot \vec{B} + \vec{B} \cdot \vec{C} + \vec{C} \cdot \vec{A} = ?$ [IOE 2078]

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

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

c. $\frac{3}{2}$

d. 0

83. The lines bisecting the angle between the bisectors of the angle between the lines $ax^2 + 2hxy + by^2 = 0$ are :

a. $(a+b)(x^2 + y^2) + 4hxy = 0$

b. $(a+b)(x^2 - y^2) + 4hxy = 0$

c. $(a+b)(x^2 - y^2) + 4hxy = 0$

d. $(a-b)(x^2 - y^2) + 4hxy = 0$

84. The equation of the circle passing through the intersections of circle

$x^2 + y^2 - 8x - 2y + 7 = 0$ and $x^2 + y^2 - 4x + 10y + 8 = 0$ and passing through the point $(-1, -2)$ is :

a. $9x^2 + 9y^2 - 40x + 78y + 72 = 0$

b. $9x^2 - 9y^2 - 40x + 78y + 72 = 0$

c. $9x^2 + 9y^2 - 40x + 78y - 72 = 0$

d. $9x^2 + 9y^2 + 40x + 78y + 72 = 0$

85. The equation of parabola having vertex at (2,3) and focus at (2,5) is [IOE 2076]

a. $x^2 - 4x - 8y + 28 = 0$

b. $x^2 - 4x - 8y + 20 = 0$

c. $x^2 - 4x - 8y - 28 = 0$

d. $x^2 - 4x - 8y - 20 = 0$

86. If a plane passes through $P(a, a, a)$ and is perpendicular to OP. The sum of intercepts made by plane on the coordinate axes is [IOE 2074]

a. 3a

b. 9a

c. $\frac{1}{3a}$

d. $\frac{1}{9a}$

87. $\lim_{x \rightarrow 0} \frac{\log(\cos x)}{x^2}$ [IOE 2076]

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

b. $-\frac{1}{2}$

c. 1

d. -1

88. $\frac{d}{dx} \left(\frac{u}{v} \right)$ is equal to [IOE 2078]

a. $\frac{u''v - uv''}{v^2}$

b. $\frac{u'v - uv'}{v^2}$

c. $\frac{uv' - vu'}{v^2}$

d. $vu' + uv'$

89. $\int_0^{\frac{\pi}{2}} x - x \sin^2 x dx =$ [IOE 2074]

- a. $\frac{\pi^2 - 2}{16}$ b. $\frac{\pi^2 - 4}{16}$
 c. $\frac{\pi^2 - 8}{16}$ d. $\frac{\pi^2 - 16}{16}$

90. Ethene reacts with hydrogen in presence of Ni at 200°C to give ethane. This reaction is known as

- a. Henderson reaction b. Sabatier Senderen's reaction
 c. Rosenmund's reaction d. Kolbe's reaction

91. Excess of Cl_2 react with ammonia product formed are

- a. $\text{N}_2 + \text{NH}_3$ b. $\text{N}_2 + \text{NH}_4\text{Cl}$
 c. $\text{HCl} + \text{NCl}_3$ d. $\text{NCl}_3 + \text{NH}_4\text{Cl}$

92. Hydrogen is not obtained when zinc reacts with

- a. Cold water b. Dilute H_2SO_4
 c. Dilute HCl d. Hot 20 % NaOH

93. A compound with haemoglobin like structure contain one atom of iron per molecule. If it contain 4.6% of iron, its approx. molecular mass is

- a. 1000 b. 1200
 c. 1600 d. 1400

94. The weight of NaOH in 250ml of 0.2N solution is [IOE 2077]

- a. 1gm b. 0.1gm

c. 2gm

d. 0.2gm

95. 200ml of HCl of pH 2 is mixed with 300ml of NaOH of pH 12, then pH of resulting solution is: [IOE 2078]

- a. 2.69 b. 5.7
 c. 7 d. 11.3

96. Electrolysis of diluted aqueous NaCl solution was carried out by passing 10 mA current. The time required to liberate 0.1 mole of H_2 gas at cathode is

- a. 9.65×10^4 sec b. 19.3×10^3 sec
 c. 28.95×10^4 sec d. 38.6×10^4 sec

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. |

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

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

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

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

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. |

Answer Key

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

Solutions

1. b

Because magnitude is absolute.

2. b

$$F - f_K = ma$$

Or, $F - f_K = m \times 0$ [Body moves with constant velocity $a = 0$]

$$f_K = 8N$$

$$\text{Normal reaction } R = mg = 20N \mu_K = \frac{f_K}{R} = 0.4$$

3. a

According to law of area of Kepler's law ,

the radius vector drawn from the sun to the planet sweeps out equal ar

$$\text{i.e. } \frac{dA}{dt} = \frac{L}{2m} = \text{constant}$$

here,

$$\frac{L}{M} = \frac{mvr}{2m} = \frac{1}{2}rv = \frac{1}{2}r^2 \frac{d\theta}{dt}$$

So, speed of the moon is maximum when it is close to the sun and minimum when it is farthest from the planet.

4. c

Since, breaking force $\propto A \propto r^2$

As r becomes twice, F becomes 4 times

5. b

$$W = T \Delta A = T \times 2 \times 4\pi \left(\frac{D^2}{4} - \frac{d^2}{4} \right) = 2\pi(D^2 - d^2)T$$

6. d

7. a

Due to compression the temperature of the system increases to a very high value. This causes the flow of heat from system to the surroundings, thus decreasing the temperature. This decrease in temperature results in decrease in pressure.

8. b

For lens $u = -30 \text{ cm}$, $f = 30 \text{ cm}$

$$\text{so, } \frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$$\text{or, } \frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{30} - \frac{1}{(-30)} = \frac{1}{15}$$

$$\therefore v = 15 \text{ cm}$$

$$\text{Distance } AB = 30 - 15 = 15 \text{ cm}$$

9. b

10. b

At the location of $+10\mu\text{C}$, the electric field intensity is given as:

$$E = \frac{50}{4\pi\epsilon_0 r^2} \text{ where } r \text{ is distance between those charges.}$$

similarly, at location of $+50\mu\text{C}$, the EFI is given as:

$$E' = \frac{10}{4\pi\epsilon_0 r^2} = \frac{E}{5}$$

11. a

$$\frac{m_{Cu}}{m_{Ag}} = \frac{E_{Cu} I_{Cu} t_{Cu}}{E_{Ag} I_{Ag} t_{Ag}}$$

$$\text{or, } m_{Cu} = \frac{m_{Ag} E_{Cu} I_{Cu} t_{Cu}}{E_{Ag} I_{Ag} t_{Ag}} \\ = \frac{10.8 \times 31.5 \times 9 \times 1200}{108 \times 10 \times 900} = 3.78g$$

12. a

Diamagnetic material aligns perpendicular to uniform magnetic field.

Paramagnetic and ferromagnetic material aligns parallel to uniform magnetic field.

13. a

According to Lenz's law generated current flows always in such a direction as to oppose the change which is giving rise to it.

As the current is increasing, the magnetic field due to straight wire is also increasing. The flux through the loop is outwards and increasing. Flux due to generated current should be inwards, So direction of current flow should be clockwise.

14. c

$$\beta = \frac{\lambda D}{d}$$

$$\beta \propto \lambda$$

$$\text{Also, for electron, } \lambda = \frac{h}{mv}$$

$$\lambda \propto \frac{1}{v}$$

As the velocity of the electron is increased, its wavelength decreases thus fringe width decreases.

15. a

16. b

$$eE = Bev$$

$$E = Bv$$

17. a

$$\beta = \frac{\alpha}{1 - \alpha} = \frac{0.6}{1 - 0.6} = \frac{0.6}{0.4} = 1.5$$

18. b

19. a

$$A^2 = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} \alpha^2 & 0 \\ \alpha + 1 & 1 \end{bmatrix}$$

Clearly, no real value of α .

20. b

$$\left(\frac{1+i}{1-i}\right)^x = 1$$

$$\text{or, } \left(\frac{1+i}{1-i} \times \frac{1+i}{1+i}\right)^x = 1$$

$$\text{or, } \left(\frac{1+2i-1}{2}\right)^x = 1$$

$$\text{or, } i^x = i^{4n}$$

$$\Rightarrow x = 4n, \text{ where } n \text{ is any integer.}$$

21. c

$$\left(x^2 - 2 + \frac{1}{x^2}\right)^n$$

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

$$\text{Total no. of terms} = (2n + 1)$$

$$\text{no of term independent of } x = 1$$

$$\text{no of terms dependent of } x = (2n + 1) - 1 = 2n$$

22. b

$$\cot^{-1}(2) \text{ and } \cot^{-1}(3)$$

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

We know, sum of angles of triangle is π

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

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

$$\tan^{-1} 1 + x = \pi$$

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

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

23. d

$$\cos^{-1}\left[\cos\left(-\frac{17}{15\pi}\right)\right] \text{ is equal to:}$$

$$\cos^{-1}\left[\cos\left(-\pi - \frac{2\pi}{15}\right)\right]$$

$$\cos^{-1}\left[\cos\left(\pi + \frac{2\pi}{15}\right)\right] [\cos(-x) = \cos x]$$

$$\cos^{-1} \left[-\cos \left(\frac{2\pi}{15} \right) \right]$$

$$\pi - \frac{2\pi}{15} = \frac{13\pi}{15}$$

24. b

$$\cot \frac{A}{2} \cdot \cot \frac{B}{2}$$

$$= \sqrt{\frac{s(s-a)}{(s-b)(s-c)}} \cdot \sqrt{\frac{s(s-b)}{(s-a)(s-c)}}$$

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

$$= \frac{s}{s-c}$$

$$= \frac{2s}{2s-2c}$$

$$= \frac{a+b+c}{a+b-c}$$

$$= \frac{3c+c}{3c-c}$$

$$= 2$$

25. c

$$|\vec{a} \times \vec{b}|^2 = (ab \sin \theta)^2 = a^2 b^2 \sin^2 \theta = a^2 b^2 (1 - \cos^2 \theta) = a^2 b^2 - a^2 b^2 \cos^2 \theta = a^2 b^2 - (\vec{a} \cdot \vec{b})^2$$

26. c

At top from origin, parallel to x - axis is y = a. so, it is y = 3 as a = 3

27. c

$$S = x^2 + y^2 - 9$$

$$S_1 = x_1^2 + y_1^2 - 9 = 3^2 + 4^2 - 9 = 16$$

$$T = 3x + 4y - 9 = 0$$

$$T^2 = 9x^2 + 24xy + 16y^2 - 2 \times (3x + 4y)(9) + 81 = 0$$

$$\text{or, } T^2 = 9x^2 + 24xy + 16y^2 - 54x - 72y + 81 = 0$$

The equation of pair of tangent is given by

$$SS_1 = T^2$$

$$\text{or, } (x^2 + y^2 - 9)16 = 9x^2 + 24xy + 16y^2 - 54x - 72y + 81$$

$$\text{or, } 7x^2 - 24xy + 54x + 72y - 225 = 0$$

28. d

$$x^2 - y^2 = 0$$

$$\text{or, } (x - y)(x + y) = 0$$

$$\text{or, } x - y = 0, x + y = 0$$

It represents a pair of lines.

29. d

If S and S' are two fixed points then the locus of a point P such that $PS - PS' = a$ constant is ellipse. The fixed points are called foci.

30. a

$$a = x_2 - x_1 = 3, b = -2, c = 8$$

$$\sqrt{3^2 + (-2)^2 + 8^2} = \sqrt{77}$$

$$\text{direction cosine are } \frac{3}{\sqrt{77}}, -\frac{2}{\sqrt{77}}, \frac{8}{\sqrt{77}}$$

31. a

$$\lim_{x \rightarrow \infty} \frac{(x+2)(x+3)}{(x+4)(x+7)}$$

$$= \lim_{x \rightarrow \infty} \frac{x^2 \left(1 + \frac{2}{x}\right) \left(1 + \frac{3}{x}\right)}{x^2 \left(1 + \frac{4}{x}\right) \left(1 + \frac{7}{x}\right)}$$

$$= \lim_{x \rightarrow \infty} \frac{\left(1 + \frac{2}{x}\right) \left(1 + \frac{3}{x}\right)}{\left(1 + \frac{4}{x}\right) \left(1 + \frac{7}{x}\right)}$$

$$= 1$$

32. c

$$y = \log_{\sqrt{e}} \sin x$$

$$= \log_{e^{1/2}} (\sin x) = \frac{1}{\left(\frac{1}{2}\right)} \log_e \sin x$$

$$= 2 \log_e \sin x$$

$$\begin{aligned} \frac{dy}{dx} &= 2 \cdot \frac{d \log_e \sin x}{d \sin x} \cdot \frac{d \sin x}{dx} \\ &= 2 \cdot \frac{1}{\sin x} \cdot \cos x \\ &= 2 \cot x \end{aligned}$$

33. c

$$f(x) = |x - 1| + |x - 3|$$

$$= \begin{cases} 1 - x + 3 - x & 0 < x \leq 1 \\ x - 1 + 3 - x & 1 < x \leq 2 \\ x - 1 + 3 - x & 2 < x < 3 \end{cases}$$

$$f(x) = \begin{cases} 4 - 2x & 0 < x \leq 1 \\ 2 & 1 < x \leq 2 \\ 2 & 2 < x < 3 \end{cases}$$

$$\Rightarrow f'(x) = \begin{cases} -2 & 0 < x < 1 \\ 0 & 1 < x < 2 \\ 0 & 2 < x < 3 \end{cases}$$

$$Lf'(2) = 0 = Rf'(2) \\ \Rightarrow f'(2) = 0$$

34. c

$$x + y = 16$$

$$y = 16 - x$$

$$S = x^2 + y^2$$

$$S = x^2 + (16 - x)^2$$

$$\frac{dS}{dx} = 2x - 2(16 - x)$$

$$0 = 2x - 2(16 - x)$$

$$x = 8$$

$$y = 16 - x = 8$$

35. c

The normal to a given curve is parallel to x-axis is $\frac{dx}{dy} = 0$

36. b

$$\int \sqrt{1 + \cos 6x} \, dx$$

$$= \int \sqrt{1 + \cos(2 \times 3x)} \, dx$$

$$= \int \sqrt{2 \cos^2 3x} \, dx$$

$$= \sqrt{2} \int \cos 3x \, dx = \sqrt{2} \frac{\sin 3x}{3} + c$$

37. a

$$\text{area (A)} = \int_0^{\pi/4} \sec^2 x \, dx$$

$$= [\tan x]_0^{\pi/4}$$

$$= \tan \frac{\pi}{4} - \tan 0$$

$$= 1 - 0$$

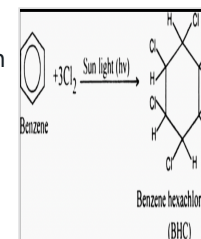
$$= 1$$

38. a

Tetraethyl lead acts as an anti knocking agent in gasoline and jet fuel and is added to petrol in order to reduce the ignition of vapors of petrol. Thus, tetraethyl lead is a petroleum additive.

39. a

The reaction proceeds via free radical mechanism and hence form gammexane with other minor isomers of $C_6Cl_6H_6$.



40. d

Although its chief uses are in the preparation of sulfuric acid, sulfur trioxide, and sulfites, sulfur dioxide also is used as a disinfectant, a refrigerant, a reducing agent, a bleach, and a food preservative, especially in dried fruits.

41. b

During the laboratory preparation, ammonia is dried by passing it through quick lime. It is then collected by the downward displacement of air in a gas jar.

42. c

Sodium is obtained by electrolytic reduction of its chloride. Melting point of chloride of sodium is high so in order to lower its melting point, calcium chloride is added to it.

43. b

Copper obtained after poling is called tough cake copper which is 99% pure.

44. c

The word 'spelter' is Impure Zinc.

45. c

the conjugate-pairs are CN^-/HCN , $\text{H}_2\text{O}/\text{OH}^-$

46. d

Let the O.S. of phosphorous = x

Then

$$3 \times (+2) + 2x + 2 \times (-2) \times 4 = 0$$

$$\text{or, } 6 + 2x - 16 = 0$$

$$\text{or, } 2x - 10 = 0$$

$$\therefore x = +5$$

47. a

Carbon dioxide CO_2 has polar bonds but is a nonpolar molecule. The structure of CO_2 is linear. The individual bond dipoles cancel each other as they point in opposite direction and are equal in magnitude.

48. d

49. b

50. b

51. b

52. b

53. a

54. c

55. c

56. b

57. a

58. a

59. a

60. a

61. b

$$\text{For vertical motion } V_y = \sqrt{2gh} = \sqrt{2 \times 10 \times 5 \times 0.1} \\ = \sqrt{10} \text{ m/s}$$

$$t = \sqrt{\frac{2h}{g}} = \sqrt{0.1} \text{ sec}$$

For horizontal motion

$$V_x = \frac{R}{t} = 5 \times \frac{0.1}{\sqrt{0.1}}$$

$$= \sqrt{\frac{5}{2}} \text{ m/s}$$

$$V = \sqrt{V_x^2 + V_y^2}$$

$$V = \sqrt{\frac{5}{2} + 10}$$

$$= \sqrt{\frac{25}{2}} = \frac{5}{\sqrt{2}} \text{ m/s}$$

62. a

$$\tan \theta = \frac{v^2}{Rg} = \frac{h}{b}$$

$$h = \frac{v^2 b}{Rg}$$

63. c

$$\frac{F_1}{F_2} = \frac{e_1}{e_2}$$

$$F_2 = \left(\frac{3}{2}\right) 30$$

64. c

$$F = \eta A \frac{dV}{dx}$$

$$dx = \frac{\eta A dV}{F} = \frac{0.001 \times 100 \times 10^{-4} \times 10 \times 10^{-2}}{200 \times 10^{-5}} = 0.05$$

cm

65. d

$$T_2 V_2^{\gamma-1} = T_1 V_1^{\gamma-1}$$

$$\text{or, } T_2 = 300 \left(\frac{V}{V/4} \right)^{1.4-1}$$

66. a

$$v \propto \frac{1}{\mu}$$

67. b

The capacitor in figure are parallel, so
 $C' = C + C + C$

$$= 3C = 3 \times 3\mu\text{F}$$

$$C' = 9\mu\text{F}$$

68. c

$$\text{Potential gradient } K = \frac{V_{AB}}{L_{AB}}$$

$$= \frac{E - ir}{100} \text{ v/cm}$$

$$E = KI = \frac{E - ir}{100} \times 30 = \frac{30(E - 0.5i)}{100}$$

69. c

$$B_1 = \frac{\mu_o NI}{2R} \text{ at the centre}$$

$$B_2 = \frac{\mu_o NI R^2}{2[R^2 + (3R)^2]^{3/2}} = \frac{10^{3/2} R^3}{R^3} = 10\sqrt{10}$$

70. c

71. a

72. b

This is similar to case of reflected sound from a cliff.

$$\begin{aligned} \text{i.e., } f' &= \frac{c+v}{c-v} \times f \\ &= \frac{c+v}{c-v} \times \frac{c-v}{c-v} \times f \\ &= \frac{c^2-v^2}{c^2-2vc+v^2} \times f \end{aligned}$$

$$\text{As } v \ll c, f' = \frac{c^2}{c^2-2vc} \times f = \frac{c}{c-2v} \times f$$

73. c

P.E. = K.E.

eVc = K.E.

$$Vc = \text{K.E.} / e = \frac{\frac{1}{2}mv_{max}^2}{e} = \frac{v_{max}^2}{2(e/m)}$$

74. a

75. d

Let $x_1, x_2 \in N$ and $f(x_1) = f(x_2)$. Then

$$x_1^2 = x_2^2$$

Hence, $x_1 = x_2$ or $x_1 = -x_2$

Hence, f is many to one.

And,

$$f^{-1}(x) = \sqrt{x}$$

For $x = -1$ in the range of $f(x)$, the pre-image doesn't exist in R .

Hence it is not an onto function.

76. a

$$A^2 = A \cdot A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix} \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & -4 \\ -4 & 5 \end{bmatrix}$$

$$4A - 3I = \begin{bmatrix} 8 & -4 \\ -4 & 8 \end{bmatrix} - \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix} = \begin{bmatrix} 5 & -4 \\ -4 & 5 \end{bmatrix}$$

77. b

$$HM = \frac{2\alpha\beta}{\alpha + \beta} = \frac{2 \left(\frac{8 + 2\sqrt{5}}{(5 + \sqrt{2})} \right)}{\frac{(4 + \sqrt{5})}{(5 + \sqrt{2})}} = 4$$

78. c

$$\text{Here, } t_n = \sum n = \frac{n(n+1)}{2}$$

$$S_n = \sum_{i=1}^n t_n = \sum_{i=1}^n \frac{n(n+1)}{2}$$

$$= \frac{1}{2} \sum_{i=1}^n (n^2 + n)$$

$$= \frac{1}{2} \left[\frac{n(n+1)(2n+1)}{6} + \frac{n(n+1)}{2} \right]$$

$$= \frac{n(n+1)(n+2)}{6}$$

79. c

$$(a^2 - b^2) + \left(\frac{a^4 - b^4}{2!} \right) + \left(\frac{a^6 - b^6}{3!} \right) + \dots$$

$$= \left[\frac{a^2}{1!} + \frac{a^4}{2!} + \frac{a^6}{3!} + \dots \right] - \left[\frac{b^2}{1!} + \frac{b^4}{2!} + \frac{b^6}{3!} + \dots \right]$$

$$= e^{a^2} - e^{b^2}$$

80. d

81. d

Let the angles be $a, a+d, a+2d$.

$$\text{Then, } a + a + d + a + 2d = 180^\circ$$

$$\text{or, } a + d = 60^\circ$$

$$\text{So } \angle B = 60^\circ$$

$$\text{Now, } \frac{b}{c} = \frac{\sin B}{\sin C} = \frac{3}{2}$$

$$\Rightarrow \sin C = \sqrt{\frac{2}{3}} \times \frac{\sqrt{3}}{2} = \frac{1}{\sqrt{2}}$$

$$\Rightarrow C = 45^\circ$$

$$\text{So, } \angle A = 75^\circ$$

82. b

83. d

Line bisecting $ax^2 + 2hxy + by^2 = 0$ is

$$h(x^2 - y^2) = (a - b)xy$$

$$hx^2 - (a - b)xy - hy^2 = 0$$

Now line bisecting $hx^2 - (a - b)xy - hy^2 = 0$ is

$$h'(x^2 - y^2) = (a' - b')xy$$

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

$$-(a - b)(x^2 - y^2) = 4hxy$$

$$(a - b)(x^2 - y^2) + 4hxy = 0$$

84. a

the circle passing through the intersections of circle $x^2 + y^2 - 8x - 2y + 7 = 0$ and $x^2 + y^2 - 4x + 10y + 8 = 0$ is

0

is

$$x^2 + y^2 - 8x - 2y + 7 + \lambda(x^2 + y^2 - 4x + 10y + 8) = 0$$

It passes through the point $(-1, -2)$:

$$1 + 4 + 8 + 4 + 7 + \lambda(1 + 4 + 4 - 20 + 8) = 0$$

$$\lambda = 8$$

The equation is

$$x^2 + y^2 - 8x - 2y + 7 + \lambda(x^2 + y^2 - 4x + 10y + 8) = 0$$

$$x^2 + y^2 - 8x - 2y + 7 + 8(x^2 + y^2 - 4x + 10y + 8) = 0$$

$$9x^2 + 9y^2 - 40x + 78y + 71 = 0$$

85. a

Observing the coordinates of vertex focus, Vertex $= (h, k) =$

$(2, 3)$ Focus $= (h, k + a) = (2, 5)$ i.e.,

$h = 2, k = 3$ and $a = 2$

the equation of parabola is: $(x - h)^2 = 4a(y - k)$

$$\text{or, } (x - 2)^2 = 4 \times 2 \times (y - 3)$$

$$x^2 - 4x - 8y + 28 = 0$$

86. b

$$\text{Dir's of OP} = (a - 0), (a - 0), (a - 0) = a, a, a$$

So equation of plane passing through (a, a, a) and \perp^r to OP is

$$a(x - a) + a(y - a) + a(z - a) = 0$$

$$\text{or, } ax - a^2 + ay - a^2 + az - a^2 = 0$$

$$\text{or, } x + y + z = \frac{3a^2}{a} = 3a$$

The intercepts are $3a, 3a, 3a$

Hence the sum is $9a$

87. b

$$\lim_{x \rightarrow 0} \frac{\log(\cos x)}{x^2} \left(\frac{0}{0} \right)$$

using L'hospital rule

$$\lim_{x \rightarrow 0} \frac{-\sin x}{\cos x \times 2x}$$

$$\lim_{x \rightarrow 0} \frac{-\tan x}{2x} \left(\frac{0}{0} \right)$$

using L'hospital rule

$$\lim_{x \rightarrow 0} \frac{-\sec^2 x}{2}$$

$$-\frac{1}{2}$$

88. b

89. b

$$\int_0^{\frac{\pi}{2}} x - x \sin^2 x dx$$

$$\int_0^{\frac{\pi}{2}} x(1 - \sin^2 x) dx$$

$$\int_0^{\frac{\pi}{2}} x \cos^2 x dx$$

$$\int_0^{\frac{\pi}{2}} x \left(\frac{1 + \cos 2x}{2} \right) dx$$

$$\int_0^{\frac{\pi}{2}} \left(\frac{x + x \cos 2x}{2} \right) dx$$

$$\frac{x^2}{4} \Big|_0^{\pi/2} + \frac{1}{2} \left[x \int \cos 2x dx - \int \left(\frac{dx}{dx} \int \cos 2x dx \right) dx \right]$$

$$\frac{\pi^2}{16} - 0 + \frac{1}{2} \left[x \frac{\sin 2x}{2} \Big|_0^{\pi/2} + \frac{\cos 2x}{4} \Big|_0^{\pi/2} \right]$$

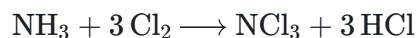
$$\frac{\pi^2}{16} - 0 + \frac{1}{2} \left[-\frac{1}{4} - \frac{1}{4} \right]$$

$$\frac{\pi^2 - 4}{16}$$

90. b

Sabatier-Senderens reaction is the process of nickel-based hydrogenation and converting the unsaturated hydrocarbons into the saturated hydrocarbons by passing through the vapour of organic molecules and hydrogen over hot Raney Ni solid particles.

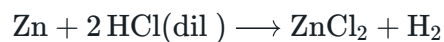
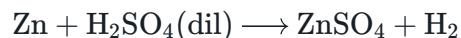
91. c



92. a

Zn does not react with cold water.

it reacts with hot water and yield H₂



93. b

4.6 g of iron contained in 100 g of haemoglobin

56 g of iron contained in 1217 g of haemoglobin

94. c

$$W = \frac{NVE}{1000} = \frac{0.2 \times 250 \times 40}{1000} = 2\text{gm.}$$

95. d

pH 2.0 of HCl corresponds to the hydrogen ion concentration of 0.01 M.

The number of moles of hydrogen ions present are $0.01 \times 0.2 = 0.0020$

pH 12.0 of NaOH corresponds to hydroxide ion concentration of 0.01 M.

The number of moles of hydroxide ions present are $0.01 \times 0.3 = 0.0030$

Out of 0.0030 moles of hydroxide ions, 0.0020 moles will be neutralized with 0.0020 moles of hydrogen ions.

Hence, the hydroxide ion concentration remaining is $\frac{0.0010}{0.5} = 0.0020M$

Hence, the pOH of the solution is
 $\text{pOH} = -\log[\text{OH}^-] = -\log 0.0020 = 2.699$

The pH of the solution is
 $\text{pH} = 14 - \text{pOH} = 14 - 2.699 = 11.301$

96. b

Mass of 0.01 mol $\text{H}_2 = 0.02\text{ g}$

$$W = \frac{itE}{96500}$$

$$0.02 = \frac{10 \times 10^{-3} \times t \times 1}{96500}$$

$$t = 19.3 \times 10^3 \text{ sec}$$

97. b

98. c

99. b

100. d