

## Physics and Chemistry

1. A stone is released from an elevator going up with acceleration 'a'. The acceleration of the stone after the release is
  - A. a upward
  - B. (g-a) upward
  - C. (g-a) downward
  - D. g downward.
2. In a projectile motion the velocity
  - A. is always perpendicular to the acceleration
  - B. is never perpendicular to the acceleration
  - C. is perpendicular to the acceleration for one instant only
  - D. is perpendicular to the acceleration for two instants.
3. As the acceleration of a vibrating particle executing simple harmonic motion increases its time period
  - A. increases
  - B. decreases
  - C. remains unchanged
  - D. first increases and then decreases.
4. The pressure P of a gas and its mean kinetic energy per unit volume, E are related as :
  - A.  $P=1/2E$
  - B.  $P=E$
  - C.  $P=3/2E$
  - D.  $P=2/3E$ .
5. A simple pendulum is taken at a place where its separation from the earth's surface is equal to the radius of the earth. The time period of oscillation if the length of the string is 1.0m, will be (take  $g=\pi^2 \text{ m/s}^2$  at the surface of the earth)
  - A. 3s
  - B. 4s
  - C. 2s
  - D. none of the above
6. Evening Star is in fact
  - A. Mars
  - B. Mercury
  - C. Venus
  - D. None of these

7. If the acceleration due to gravity at the surface of the earth is  $g$ , the work done in slowly lifting a body of mass  $m$  from the earth's surface to a height  $R$  equal to the radius of the earth is
- A.  $\frac{1}{4} mgR$
  - B.  $mgR$
  - C.  $2mgR$
  - D.  $\frac{1}{2} mgR$
8. The time-period of an earth satellite in circular orbit is independent of
- A. The mass of the satellite
  - B. Radius of the orbit
  - C. None of them
  - D. Both of them
9. Two wires A and B are made of the same material. The wire A has a length  $l$  and diameter  $r$  while the wire B has length  $2l$  and diameter  $r/2$ . If the two wires are stretched by the same force, the ratio of elongation in A to the elongation B is
- A.  $1/8$
  - B.  $1/4$
  - C.  $4$
  - D.  $8$
10. A ball is dropped from a height of 5 m. onto a sandy floor and penetrates the same up to 10 cm before coming to rest. The retardation of the ball in the sand assuming it to be uniform is (given  $g = 9.8\text{m/s}^2$ )
- A.  $98\text{m/s}^2$
  - B.  $490\text{m/s}^2$
  - C.  $430\text{m/s}^2$
  - D.  $670\text{m/s}^2$
11. A galvanometer has a coil of resistance 100 ohm showing a full-scale deflection at 50 micro-amp. What resistance should be added to use it as an ammeter of range 10 mA ?
- A. 0.1 ohm
  - B. 0.01 ohm
  - C. 0.5 ohm
  - D. 0.05 ohm
12. An  $\alpha$ -particle is bombarded on  $^{14}\text{N}$ . As a result, a  $^{17}\text{O}$  nucleus is formed and a particle is emitted. This particle is a
- A. neutron
  - B. proton
  - C. electron
  - D. positron.

13. The SI unit of electric flux is

- A. joule x coulomb
- B. joule/coulomb
- C. joule x coulomb/metre
- D. joule x metre/ coulomb

14. A T.V. tower has height of 100 m. How much population is covered by the T.V. broadcast if the average population density around the tower is 1000/sq km? (Given radius of the earth= $6.37 \times 10^6$  m)

- A. 40 lakhs
- B. 50 lakhs
- C. 60 lakhs
- D. 70 lakhs

15. A wheel rotates with a constant acceleration of  $2.0 \text{ rad/s}^2$ . If the wheel starts from rest, the number of revolutions it will make in the first ten seconds is

- A. 12
- B. 6
- C. 16
- D. 18

16. Which of the sets given below may represent the magnitude of three vectors adding to zero?

- A. 2, 4, 8
- B. 1, 2, 1
- C. 4, 8, 16
- D. 0.5, 1, 2

17. Which of the following equations represents a wave traveling along y-axis?

- A.  $x = a \sin(ky - \omega t)$
- B.  $y = a \sin(kx - \omega t)$
- C.  $y = a \sin(ky) \cos(\omega t)$
- D.  $y = a \cos(ky)$

18. Newton : Force :: Poise : ?

- A. Elasticity
- B. Surface tension
- C. Viscosity
- D. Friction.

19. The distance at which a boy should stand from a convex mirror of focal length 2.5m so that his image has a height equal to half the original height is
- A. 4.5 m
  - B. 5.5 m
  - C. 3.5 m
  - D. 2.5 m
20. A double convex lens has two surfaces of equal radii R and refractive index  $\mu = 1.5$ . We have,
- A.  $f = R/2$
  - B.  $f = R$
  - C.  $f = -R$
  - D.  $f = 2R$
21. If the source of light used in a Young's double slit experiment is changed from red to violet,
- A. the fringes will become brighter
  - B. consecutive fringes will come closer
  - C. the intensity of minima will increase
  - D. the central bright fringe will become a dark fringe.
22. Which of the following properties show that light is a transverse wave?
- A. Reflection
  - B. Interference
  - C. Diffraction
  - D. Polarization.
23. Two rectangular strips, one of copper and the other of steel, are riveted together to form a bimetallic strip ( $\alpha_{\text{Copper}} > \alpha_{\text{steel}}$ ). On heating, this strip will
- A. remain straight
  - B. get twisted
  - C. bend with steel on convex side
  - D. bend with copper on the convex side.
24. Let  $C_v$  and  $C_p$  denote the molar heat capacities of an ideal gas at constant volume and constant pressure respectively. Which of the following is a universal constant ?
- A.  $C_p/C_v$
  - B.  $C_v C_p$
  - C.  $C_p - C_v$
  - D.  $C_p + C_v$

25. The electric field and the electric potential at a point are  $E$  and  $V$  respectively. Then
- A. If  $E = 0$ ,  $V$  must be zero
  - B. If  $V = 0$ ,  $E$  must be zero
  - C. If  $E \neq 0$ ,  $V$  cannot be zero
  - D. If  $V \neq 0$ ,  $E$  cannot be zero
26. A point charge  $q$  is rotated along a circle in the electric field generated by another point charge  $Q$ . The work done by the electric field on the rotating charge in one complete revolution is
- A. zero
  - B. positive
  - C. negative
  - D. zero if the charge  $Q$  is at the center and nonzero otherwise.
27. 12 J of work is done against an existing electric field to take charge of 0.01C from A to B. The potential difference is
- A. 0.12V
  - B. 1200V
  - C. 12V
  - D. 120V
28. Electric charges are distributed in a small volume. The flux of the electric field through a spherical surface of radius 10 cm surrounding the total charge is 25 V-m. The flux over a concentric sphere of radius 20 cm will be
- A. 25 V-m
  - B. 50 V-m
  - C. 100 V-m
  - D. 200 V-m
29. A dielectric slab is inserted between the plates of an isolated charged capacitor. Which of the following quantities will remain the same?
- A. the electric field in the capacitor
  - B. the charge on the capacitor
  - C. the potential difference between the plates
  - D. the stored energy in the capacitor.
30. A metallic resistor is connected across a battery. If the number of collisions of the free electrons with the lattice is somehow decreased in the resistor, the current will
- A. increase
  - B. decrease
  - C. remain constant
  - D. becomes zero.

31. A capacitor of capacitance  $500\mu\text{F}$  is connected to a battery through a  $10\text{ K}\Omega$  resistor. The charge stored on the capacitor in the first 5 s is larger than the charge stored in the next
- A. 5 s
  - B. 50 s
  - C. 500 s
  - D. all of the above.
32. The heat developed in a system is proportional to the current through it. Then
- A. It cannot be Thomson heat.
  - B. It cannot be Peltier heat.
  - C. It cannot be Joule heat.
  - D. It can be any of the three heats mentioned above.
33. An electrolysis experiment is stopped and the battery terminals are reversed.
- A. The electrolysis will stop.
  - B. The rate of liberation of material at the electrodes will decrease.
  - C. The rate of liberation of material at the electrodes will remain the same.
  - D. Heat will be produced at a greater rate.
34. A circular loop of area  $10\text{cm}^2$ , carrying a current of 10 A, is placed in a magnetic field of 0.1 T perpendicular to the plane of the loop. The torque on the loop due to the magnetic field is
- A. zero
  - B.  $10^{-4}\text{ N}\cdot\text{m}$
  - C.  $10^{-2}\text{ N}\cdot\text{m}$
  - D.  $1\text{ N}\cdot\text{m}$
35. A charged particle moves along a circle under the action of possible constant electric and magnetic fields. Which of the following are possible?
- A.  $E = 0, B = 0$
  - B.  $E = 0, B \neq 0$
  - C.  $E \neq 0, B = 0$
  - D.  $E \neq 0, B \neq 0$
36. Two parallel wires carry currents of 20 A and 40 A in opposite directions. Another wire carrying a current antiparallel to 20 A is placed midway between the two wires. The magnetic force on it will be
- A. towards wire carrying 20 A
  - B. towards wire carrying 40 A
  - C. zero
  - D. perpendicular to the plane of the currents.

37. The permanent magnetic moment of the atoms of a material is not zero. The material
- must be paramagnetic
  - must be diamagnetic
  - must be ferromagnetic
  - may be paramagnetic
38. Electromagnets are made of soft iron because soft iron has
- high retentivity and high coercive force
  - high retentivity and low coercive force
  - low retentivity and high coercive force
  - low retentivity and low coercive force.
39. If the distance between a long linear charge distribution and a point (outside the distribution) is doubled, then the electric field at that point will be
- halved
  - one fourth
  - one eighth
  - doubled
40. A conducting rod is moved with a constant velocity  $v$  in a magnetic field. A potential difference appears across the two ends
- if  $\vec{v} \parallel \vec{l}$
  - if  $\vec{v} \parallel \vec{B}$
  - if  $\vec{l} \parallel \vec{B}$
  - none of these
41. A capacitor acts as an infinite resistance for
- DC
  - DC as well as AC
  - AC
  - Neither AC nor DC.
42. An alternating current is given by  $I = i_1 \cos \omega t + i_2 \sin \omega t$ . The rms current is given by
- $(i_1 + i_2)/\sqrt{2}$
  - $i_1 + i_2/\sqrt{2}$
  - $[(i_1^2 + i_2^2)/2]^{1/2}$
  - $[(i_1^2 + i_2^2)/\sqrt{2}]^{1/2}$

43. A series AC circuit has a resistance of  $4\ \Omega$  and a reactance of  $3\ \Omega$ . The impedance of the circuit is
- A.  $5\ \Omega$
  - B.  $7\ \Omega$
  - C.  $12/7\ \Omega$
  - D.  $7/12\ \Omega$
44. The peak voltage in a 220 V AC source is
- A. 220 V
  - B. about 160 V
  - C. about 310 V
  - D. 440 V.
45. Dimensions of  $1/(\mu_0 \epsilon_0)$  is
- A. L/T
  - B. T/L
  - C.  $L^2/T^2$
  - D.  $T^2/L^2$
46. The work function of a metal is  $h\nu_0$ . Light of frequency  $\nu$  falls on this metal. The photoelectric effect will take place only if
- A.  $\nu \geq \nu_0$
  - B.  $\nu > 2\nu_0$
  - C.  $\nu < \nu_0$
  - D.  $\nu < \nu_0/2$ .
47. In which of the following situations the heavier of the two particles has smaller de Broglie wavelength? The two particles
- A. move with the different speed
  - B. move with the different linear momentum
  - C. move with the same kinetic energy
  - D. have fallen through the same height.
48. X-ray beam can be deflected
- A. by an electric field
  - B. by a magnetic field
  - C. by an electric field as well as by a magnetic field
  - D. neither by an electric field nor by a magnetic field.
49. When an impurity is doped into an intrinsic semiconductor, the conductivity of the semiconductor
- A. decreases
  - B. increases
  - C. remains the same
  - D. becomes zero.

50. In a radioactive decay neither the atomic number nor the mass number changes. Which of the following particles is emitted in the decay?
- A. proton
  - B. neutron
  - C. electron
  - D. photon.
51. The name of the organic compound  $\text{CH}_3\text{OC}_2\text{H}_5$  on the basis of IUPAC system is-
- A. ethoxy methane
  - B. ethyl methyl ether
  - C. methyl ethyl ether
  - D. ethyl acetate
52. A sample of a solid organic compound can easily be made volatile, it can be separated from a non-volatile impurity by
- A. sublimation
  - B. crystallization
  - C. distillation
  - D. steam distillation
53. A hydrocarbon contains 85.8% carbon, if its vapour density is 14, what is its molecular formula-?
- A.  $\text{CH}_4$
  - B.  $\text{C}_2\text{H}_6$
  - C.  $\text{C}_2\text{H}_4$
  - D.  $\text{C}_4\text{H}_{10}$
54. Which of the following exhibit geometrical isomerism-
- A.  $\text{CH}_2(\text{OH})\text{CH}_3\text{COOH}$
  - B.  $\text{HOOCHC}=\text{CHCOOH}$
  - C.  $\text{CH}_2=\text{CH}_2$
  - D.  $\text{CH}_3\text{CH}=\text{CH}_2$
55. Reaction between an alkyl halide and Zn in ether to produce alkane is called-
- A. Clemenson's reduction
  - B. Sabatier and Senderin's reaction
  - C. Kolbe's reaction
  - D. Frankland's reaction
56.  $\text{C}_2\text{H}_4$  dissolves in
- A. water
  - B. NaOH solution
  - C. KOH solution
  - D. ethyl alcohol

57. Which of the following gases is detected by ammonical  $\text{Cu}_2\text{Cl}_2$  Solution?

- A. acetylene
- B. methane
- C. ethylene
- D. acetaldehyde

58. Two immiscible solvents having same boiling points can be separated using :

- A. different extraction process
- B. distillation process
- C. fractional distillation process
- D. ion exchange process

59. Aluminium Hydroxide gel is used as

- A. an anesthetic
- B. an antacid
- C. solvent
- D. bleaching powder

60. Which of the following compounds can form diazonium salt?

- A. benzene
- B. phenol
- C. aniline
- D. benzoic acid

61. Cannizzaro reaction will be given by

- A. propionaldehyde
- B. benzaldehyde
- C. acetaldehyde
- D. acetone

62. A mixture of benzene and benzoic acid could be separated by using one of the following reagents

- A. toluene
- B.  $\text{NaHCO}_3$
- C. diethyl ether
- D. ethyl alcohol

63. The conversion of an amide into the corresponding amine in the presence of  $\text{Br}_2 + \text{KOH}$  is known as

- A. Perkin reaction
- B. Hofmann Hypobromite reaction
- C. Friedel Craft reaction
- D. None.

64. Benzene on treatment with ozone produces
- A. benzene diozonide
  - B. benzene triozonide
  - C. benzene monoozonide
  - D. none of them
65. Toluene on oxidation with chromyl chloride in carbon tetrachloride produces
- A. benzamide
  - B. phenol
  - C. benzonitrile
  - D. benzaldehyde
66. The number of sodium atoms in 2 moles of sodium ferrocyanide is
- A. 2
  - B.  $6.02 \times 10^{23}$
  - C.  $8 \times 6.02 \times 10^{23}$
  - D.  $4 \times 6.02 \times 10^{23}$
67. NO reacts with O<sub>2</sub> to form NO<sub>2</sub>. When 10 gram of NO<sub>2</sub> is formed during the reaction, the mass of O<sub>2</sub> consumed is
- A. 1.90 g
  - B. 5.0 g
  - C. 3.48 g
  - D. 13.9 g
68. 60 g of a compound on analysis gave 24 g C, 4 g H and 32 g O. The empirical formula of the compound is
- A. C<sub>2</sub>H<sub>4</sub>O<sub>2</sub>
  - B. C<sub>2</sub>H<sub>2</sub>O<sub>2</sub>
  - C. CH<sub>2</sub>O<sub>2</sub>
  - D. CH<sub>2</sub>O
69. Cathode rays have the same charge to mass ratio as
- A.  $\alpha$ - particles
  - B.  $\beta$ - particle
  - C. Anode ray
  - D. Protons
70. The average distance of electron from the nucleus in an atom is of order of
- A. 1 cm
  - B.  $10^{-23}$  cm
  - C.  $10^{-10}$  m
  - D. 1 nm

71. The shape of orbital with value  $l = 1$  and  $m = 0$  is

- A. spherical
- B. dumb – bell
- C. trigonal planar
- D. square planar

72. The concentration of a reactant changes from 0.04m to 0.03 m in 25 minutes, for the reaction  $R \rightarrow P$ . The average rate of reaction in seconds is

- A.  $0.066 \times 10^{-4} \text{ molL}^{-1} \text{ S}^{-1}$
- B.  $0.4 \times 10^{-3} \text{ molL}^{-1} \text{ S}^{-1}$
- C.  $0.034 \times 10^{-4} \text{ molL}^{-1} \text{ S}^{-1}$
- D.  $0.2 \times 10^{-3} \text{ molL}^{-1} \text{ S}^{-1}$

73. Which one of the following order is the correct order as per increasing strength of oxidizing agent?

- A.  $\text{Zn}^{2+} < \text{Cu}^{2+} < \text{Fe}^{2+} < \text{Pb}^{2+}$
- B.  $\text{Pb}^{2+} < \text{Fe}^{2+} < \text{Cu}^{2+} < \text{Zn}^{2+}$
- C.  $\text{Zn}^{2+} < \text{Fe}^{2+} < \text{Pb}^{2+} < \text{Cu}^{2+}$
- D.  $\text{Zn}^{2+} < \text{Pb}^{2+} < \text{Fe}^{2+} < \text{Cu}^{2+}$

74. In which of the following pairs, the ionization energy of the first species is less than that of the second

- A. N, P
- B.  $\text{Be}^{+2}$ , Be
- C. N,  $\text{N}^-$
- D. S, P

75. Which among the following is not iso-electronic?

- A.  $\text{NO}^+$
- B.  $\text{CN}^-$
- C.  $\text{N}_2$
- D.  $\text{S}^{2-}$

76. Which of the following have the least electron affinity?

- A. O
- B. N
- C. Ar
- D. F

77. Which factors is most responsible for the increase in the boiling point of the noble gases from He to Xe?

- A. decrease in Ionisation energy
- B. monoatomic nature
- C. decrease in polarisability
- D. increase in polarisability

78. Which of the following has a trigonal bipyramidal shape?

- A.  $\text{BrF}_3$
- B.  $\text{IF}_7$
- C.  $\text{SF}_6$
- D.  $\text{PF}_3\text{Cl}_2$

79. A bond formed between two similar atoms with high electronegativity will be

- A. ionic
- B. metallic bond
- C. covalent
- D.  $\pi$ - bond

80. Which of the following arrangement of molecule is correct on the basis of their dipole moment?

- A.  $\text{BF}_3 > \text{NF}_3 > \text{NH}_3$
- B.  $\text{NF}_3 > \text{BF}_3 > \text{NH}_3$
- C.  $\text{NH}_3 > \text{BF}_3 > \text{NF}_3$
- D.  $\text{NH}_3 > \text{NF}_3 > \text{BF}_3$

81. Which law of the thermodynamics introduces the concept of entropy?

- A. First law
- B. Zeroth law
- C. Third law
- D. Second law

82. Which of the following indicator should be used in titrating KOH against oxalic acid?

- A. Litmus
- B. Methyl orange
- C. Methyl red
- D. Phenolphthalein

83. The pH of  $10^{-10}$  M HCl solution at  $25^\circ\text{C}$  is approximately

- A. 7
- B. 10
- C. between 10 and 11
- D. between 6 and 7

84. At what temperature would the volume of a given mass of a gas at constant pressure be twice its volume at  $0^\circ\text{C}$

- A.  $100^\circ\text{C}$
- B.  $273^\circ\text{C}$
- C.  $373^\circ\text{C}$
- D.  $546^\circ\text{C}$

85. The specific rate constant of a first order reaction depends on the
- A. concentration of the reactant
  - B. concentration of the product
  - C. time
  - D. temperature
86. At high altitudes, the boiling point of water lowers because
- A. atmospheric pressure is low
  - B. temperature is low
  - C. atmospheric pressure is high
  - D. none of these
87. Oxidation number of oxygen atom in  $O_2$  molecule is
- A. 0
  - B. -2
  - C. +2
  - D. -1/2
88. Which of the following turn blue when placed in copper vessel?
- A.  $AgNO_3$
  - B.  $NaCl$
  - C.  $ZnSO_4$
  - D.  $KNO_3$
89. The metal extracted by electrolysis of its fused salt is
- A. Iron
  - B. Sodium
  - C. Copper
  - D. Lead
90. Hydrogen combines with other elements by
- A. losing an electron
  - B. gaining an electron
  - C. sharing an electron
  - D. losing, gaining or sharing electron
91. Epsom salt is
- A.  $MgSO_4 \cdot 7H_2O$
  - B.  $CaSO_4 \cdot H_2O$
  - C.  $MgSO_4 \cdot 2H_2O$
  - D.  $BaSO_4 \cdot 2H_2O$

92. Aluminium powder is used

- A. in extraction of gold
- B. in calico - printing
- C. in sizing paper
- D. in flash bulbs

93. Thallium shows the different oxidation number states because

- A. of its high reactivity
- B. of inert pair of electron
- C. of its amphoteric nature
- D. it is a transition metal

94. A radioactive substance has a half life of 10 minutes. How much of this substance remains after 30 minutes

- A.  $\frac{1}{2}$  the amount
- B.  $\frac{1}{4^{th}}$  of the amount
- C.  $\frac{1}{8^{th}}$  of the amount
- D.  $\frac{1}{10^{th}}$  of the amount

95. When sucrose is hydrolysed the following products are formed :

- A. Glucose
- B. Fructose
- C. Both 'A' & 'B'
- D. None of these

96. Which one of the following of nitrogen is a white solid?

- A. NO
- B. NO<sub>2</sub>
- C. N<sub>2</sub>O<sub>3</sub>
- D. N<sub>2</sub>O<sub>5</sub>

97. Oxygen will directly react with each of the following elements except

- A. P
- B. Cl
- C. Na
- D. S

98. Which of the following does not form precipitate with AgNO<sub>3</sub>?

- A. HF
- B. HCl
- C. HBr
- D. HI

99. Which of the following properties is not correct for ozone?

- A. it oxidizes lead sulphide
- B. it oxidizes potassium iodide
- C. it oxidizes mercury
- D. it cannot act as bleaching agent

100. Thermite is a mixture of

- A. Fe and Al
- B. Ferric oxide and aluminium powder
- C. Barium peroxide and magnesium powder
- D. Cu and Al