

Science (Physics + Chemistry)

1. In which process the PV indicator diagram is a straight line parallel to volume axis
 (a) Isothermal (b) Isobaric
 (c) Irreversible (d) Adiabatic

Sol. (b)

2. A body executes simple harmonic motion under the action of force F_1 with a time period $\frac{4}{5}$ sec. If the force is changed to F_2 it executes simple harmonic motion with time period $\frac{3}{5}$ sec. If both forces F_1 and F_2 act simultaneously in the same direction on the body, its time period will be

- (a) $\frac{12}{25}$ sec. (b) $\frac{24}{25}$ sec.
 (c) $\frac{35}{24}$ sec. (d) $\frac{15}{12}$ sec.

Sol. (a)

3. A diatomic gas is heated at constant pressure. What fraction of the heat energy is used to increase the internal energy
 (a) $\frac{3}{5}$ (b) $\frac{3}{7}$
 (c) $\frac{5}{7}$ (d) $\frac{5}{9}$

Sol. (c)

4. In interference pattern, the energy is
 (a) Created at the maximum
 (b) destroyed at the minimum
 (c) Conserved but redistributed
 (d) All the above

Sol. (c)

5. A red flower kept in green light will appear
 (a) Red (b) Yellow
 (c) Black (d) White

Sol. (c)

6. A band playing music at a frequency f is moving towards a wall at a speed v_b . A motorist is following the band with a speed v_m . If v be the speed of the sound, the expression for beat frequency heard by motorist is

- (a) $\frac{v + v_m}{v + v_b} f$ (b) $\frac{v + v_m}{v - v_b} f$
 (c) $\frac{2v_b(v + v_m)}{v^2 - v_b^2} f$ (d) $\frac{2v_m(v + v_b)}{v^2 - v_m^2} f$

Sol. (c)

7. An eye specialist prescribes spectacles having a combination of a convex lens of focal length 40 cm in contact with a concave lens of focal length 25 cm. The power of this lens combination will be

- (a) +1.5D (b) -1.5D
 (c) +6.67D (d) -6.67D

Sol. (b)

8. When light wave suffer reflection at the interface between air and glass, the change of phase of reflected wave is equal to
 (a) zero (b) $\pi/2$
 (c) π (d) 2π

Sol. (c)

9. A lens behaves as a converging lens in air and diverging lens in water. The refractive index of the material of the lens is
 (a) equal to that of water (b) less than that of water
 (c) greater than that of water (d) nothing can be predicted

Sol. (b)

10. The work function of a substance is 4.0 eV. The longest wavelength of light that can cause photoelectron emission from this substance is approximately
 (a) 540 nm (b) 400 nm
 (c) 310 nm (d) 220 nm

Sol. (c)

11. The electron emitted in beta radiation originates from
 (a) inner orbits of atoms
 (b) free electron existing in nuclei
 (c) decay of neutron in the nucleus
 (d) photon escaping from the nucleus

Sol. (c)

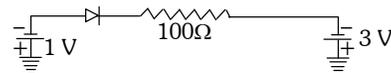
12. If elements with principal quantum number $n > 4$ were not allowed in nature, then, the number of possible elements would be
 (a) 32 (b) 60
 (c) 18 (d) 4

Sol. (b)

13. The magnifying power of telescope is high if
 (a) both objective and eye-piece have short focal length
 (b) both objective and eye-piece have long focal length
 (c) the objective has a long focal length and the eye piece has a short focal length.
 (d) the objective has a short focal length and the eye piece has a long focal length.

Sol. (c)

14. What is the current through an ideal PN-junction diode shown in figure below ?



- (a) Zero (b) 10 mA
 (c) 20 mA (d) 50 mA

Sol. (c)

15. The output form of a full wave rectifier is

- (a) an AC voltage
- (b) a DC voltage
- (c) zero
- (d) a pulsating unidirectional voltate

Sol. (d)

16. Suitable impurities are added to a semiconductor depending on its use. This is done to

- (a) increase its life
- (b) enable it to withstand high voltage
- (c) increase its electrical conductivity
- (d) increase its electrical resistivity

Sol. (c)

17. Absorption of X-Rays is maximum in which of the following material sheet of same thickness ?

- (a) *Cu*
- (b) *Au*
- (c) *Be*
- (d) *Pb*

Sol. (d)

18. Lenz's law is a consequence of the law of Conservation of

- (a) Charge
- (b) Mass
- (c) Momentum
- (d) Energy

Sol. (d)

19. A magnetic needle is kept in a non-uniform magnetic field. It experiences

- (a) A force only but not a torque
- (b) a force and torque both
- (c) a torque only but not a force
- (d) neither a torque nor a force

Sol. (b)

20. The magnitude of magnetic induction for a current carrying toroid of uniform cross-section is

- (a) uniform over the whole cross-section
- (b) maximum on the outer edge
- (c) maximum on the inner edge
- (d) maximum at the center of cross-section

Sol. (a)

21. Isogonic lines are those for which

- (a) declination is the same at all places on the line
- (b) angle of dip is the same at all places on the line
- (c) the value of horizontal component of earth's magnetic field is the same
- (d) All of the above.

Sol. (a)

22. An electric current passes through a long straight wire. At a distance 5 cm from the wire, the magnetic field is B. The field at 20 cm from the wire would be

- (a) 2B
- (b) B/4
- (c) B/2
- (d) B

Sol. (b)

23. An ammeter and a voltmeter of resistance R are connected in series to an electric cell of negligible internal resistance. Their readings are A and V respectively. If another resistance R is connected in parallel with the voltmeter, then

- (a) both A and V will increase
- (b) both a and V will decrease
- (c) A will decrease and V will increase
- (d) A will increase and V will decrease

Sol. (d)

24. The core of transformer is laminated to reduce the effect of

- (a) Copper losses
- (b) Flux leakage
- (c) Hysteresis loss
- (d) Eddy current

Sol. (d)

25. The average power dissipation in pure inductance is

- (a) $\frac{1}{2}LI^2$
- (b) $2LI^2$
- (c) $\frac{1}{4}LI^2$
- (d) Zero

Sol. (d)

26. The charge given to any conductor resides on its outer surface, because

- (a) the free charge tends to be in its minimum potential energy state
- (b) the free charge tends to be in its minimum kinetic energy state
- (c) the free charge tends to be in its maximum potential energy state
- (d) the free charge tends to be in its maximum kinetic energy state

Sol. (a)

27. n identical mercury droplets charged to the same potential V coalesce to form a single bigger drop. The potential of new drop will be

- (a) $\frac{V}{n}$
- (b) nV
- (c) nV^2
- (d) $n^{2/3}V$

Sol. (d)

- 28.** For protecting sensitive equipment from external magnetic field, it should be
- wrapped with insulation around it when passing current through it
 - placed inside an iron can
 - surrounded with Cu sheet
 - placed inside aluminium can

Sol. (b)

- 29.** The potential difference across the terminals of a battery is 50V when 11A current is drawn and 60V when 1A current is drawn. The *e.m.f.* and the internal resistance of the battery are
- 62V, 2Ω
 - 63V, 1Ω
 - 61V, 1Ω
 - 64V, 2Ω

Sol. (c)

- 30.** Four resistance 10Ω, 5Ω, 7Ω and 3Ω are connected so that they form the sides of a rectangle AB, BC, CD, and DA respectively. Another resistance of 10Ω is connected across the diagonal AC. The equivalent resistance between A and B is
- 2Ω
 - 5Ω
 - 7Ω
 - 10Ω

Sol. (b)

- 31.** The potential energy of a charged parallel plate capacitor is U_o if a slab of dielectric constant k is inserted between the plates, then the new potential energy will be
- $\frac{U_o}{k}$
 - $U_o k^2$
 - $\frac{U_o}{k^2}$
 - U_o^2

Sol. (a)

- 32.** Two similar heater coils separately take 10 minutes to boil a certain amount of water. If both coils are connected in series, time taken to boil the same amount of water will be
- 15 minutes
 - 20 minutes
 - 7.5 minutes
 - 25 minutes

Sol. (b)

- 33.** Same current is being passed through a copper voltmeter and a silver voltmeter. The rate of increase in weights of the cathode of the two voltmeters will be proportional to
- Atomic masses
 - Atomic number
 - Relative densities
 - None of the above

Sol. (a)

- 34.** Two equal and opposite charge (+q and -q) are situated at x distance from each other, the value of potential at very far point will depend upon
- only on q
 - only on x
 - on qx
 - on $\frac{q}{x}$

Sol. (c)

- 35.** In a potentiometer of one metre length, an unknown *e.m.f.* voltage source is balanced at 60 cm length of potentiometer wire, while a 3 volt battery is balanced at 45 cm length. Then the *e.m.f.* of the unknown voltage source is
- 3V
 - 2.25V
 - 4V
 - 4.5V

Sol. (c)

- 36.** A car travelling on a straight path moves with uniform velocity V_1 for some time and with velocity V_2 for next equal time, the average velocity is given by
- $\sqrt{V_1 V_2}$
 - $\left(\frac{V_1 + V_2}{2}\right)$
 - $\left(\frac{1}{V_1} + \frac{1}{V_2}\right)^{-1}$
 - $2\left(\frac{1}{V_1} + \frac{1}{V_2}\right)^{-1}$

Sol. (b)

- 37.** A particle of mass m moves in a circular path radius r under the action of a force $\frac{mv^2}{r}$. The work done during its motion over half of the circumference of the circular path will be

- $\left(\frac{mv^2}{r}\right) \times 2\pi r$
- $\left(\frac{mv^2}{r}\right) \times \pi r$
- $\frac{(2\pi)}{\left(\frac{mv^2}{r}\right)}$
- Zero

Sol. (d)

- 38.** Dimensions of self inductance are

- $MLT^{-2}A^{-3}$
- $ML^{-2}T^{-1}A^{-2}$
- $ML^2T^{-2}A^{-2}$
- $ML^2T^{-2}A^{-1}$

Sol. (c)

- 39.** A car of mass m is moving with momentum p. If μ be the coefficient of friction between the tyres and the road, what will be stopping distance due to friction alone

- $\frac{p^2}{2\mu g}$
- $\frac{p^2}{2m\mu g}$
- $\frac{p^2}{2m^2\mu g}$
- $\frac{p^2}{2mg}$

Sol. (c)

- 40.** A neutron is moving with velocity u. It collides head on and elastically with an atom of mass number A. If the initial kinetic energy of the neutron be E. how much kinetic energy will be retained by the neutron after collision

- $\left(\frac{A}{A+1}\right)^2 E$
- $\frac{A}{(A+1)^2} E$
- $\left(\frac{A-1}{A+1}\right)^2 E$
- $\frac{A-1}{(A+1)^2} E$

Sol. (c)


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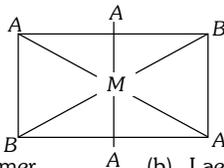
51. Natural rubber is
- A polymer of 1, 3-butadiene
 - A polymer of ethylene
 - A polymer of 2-methyl-1, 3-butadiene
 - A polymer of styrene
- Sol. (c)**
52. In the reaction $Cl_2 + CH_4 \xrightarrow{h\nu} CH_3Cl + HCl$, presence of a small amount of oxygen
- Increases the rate of reaction for a brief period of time
 - Decreases the rate of reaction for a brief period of time
 - Does not affect the rate of reaction
 - Completely stops the reaction
- Sol. (d)**
53. An example of a lipid is
- Lard
 - Keratin
 - Glutathione
 - Oxytocin
- Sol. (a)**
54. Which of the following reagents can be used for distinguishing the three classes of alcohols
- Fenton's reagent
 - Lucas reagent
 - Schiff's reagent
 - Tollen's reagent
- Sol. (b)**
55. The monomer of cellulose is
- Fructose
 - Galactose
 - Glucose
 - None of these
- Sol. (c)**
56. Test for an ester is
- Biuret test
 - Hydroxamic acid test
 - Mulliken test
 - Liebermann nitroso test
- Sol. (b)**
57. Number of resonating structures for Dewar's benzene will be
- One
 - Two
 - Three
 - Four
- Sol. (c)**
58. Which of the following reactions can be used for the synthesis of an alkene
- Chugaev reaction
 - Dakin reaction
 - Reimer-Tiemann reaction
 - Wurtz-Fitting reaction
- Sol. (a)**
59. The reaction $R_2C = N NH_2 \xrightarrow{C_2H_5ONa} R_2CH_2 + N_2$ is called
- Clemmensen reduction
 - Hunsdiecker reaction
 - Tischenko reaction
 - Wolff-Kishner reduction
- Sol. (d)**
60. Which one of the following cations gives a brick red flame by flame test
- Ba^{2+}
 - Sr^{2+}
 - Ca^{2+}
 - Zn^{2+}
- Sol. (c)**
61. Glauber's salt is
- $Na_2SO_4 \cdot 10H_2O$
 - $Na_2S_2O_3 \cdot 5H_2O$
 - $CuSO_4 \cdot 5H_2O$
 - $Na_2B_4O_7 \cdot 10H_2O$
- Sol. (a)**
62. The most basic element is
- Fluorine
 - Iodine
 - Chlorine
 - Bromine
- Sol. (b)**
63. Ammonia is a Lewis base and it forms complexes with many cations. Which one of the following cations does not form a complex with ammonia
- Ag^+
 - Cu^{2+}
 - Cd^{2+}
 - Pb^{2+}
- Sol. (d)**
64. Which of the following substances consists of only one element
- Marble
 - Sand
 - Diamond
 - Glass
- Sol. (c)**
65. The compound which does not show paramagnetism, is
- $[Cu(NH_3)_4]Cl_2$
 - $[Ag(NH_3)_4]Cl$
 - NO
 - NO_2
- Sol. (b)**
66. For which element of first transition series the oxidation potential value ($M \rightarrow M^{2+} + 2e^-$) is lowest
- Mn
 - Fe
 - Ni
 - Cu
- Sol. (d)**

67. A compound of Zinc which is white in cold state and yellow in hot state, is

- (a) ZnS (b) ZnO
(c) $ZnCl_2$ (d) $ZnSO_4$

Sol. (b)

68. The isomer is



- (a) Dextro isomer (b) Laevo isomer
(c) Cis-isomer (d) Trans-isomer

Sol. (d)

69. Lead nitrate on heating gives lead oxide, nitrogen dioxide and oxygen. This reaction is known as

- (a) Combustion (b) Combination
(c) Displacement (d) Decomposition

Sol. (d)

70. The equivalent weight of potassium permanganate ($KMnO_4$) in neutral medium will be

- (a) Atomic weight (b) $\frac{\text{Atomic weight}}{2}$
(c) $\frac{\text{Atomic weight}}{3}$ (d) $\frac{\text{Atomic weight}}{5}$

Sol. (c)

71. An element forms a solid oxide which when is dissolved in water forms an acidic solution. The element is

- (a) Neon (b) Sodium
(c) Phosphorus (d) Sulphur

Sol. (c)

72. What is the product obtained when $MnSO_4$ in solution is boiled with PbO_2 and concentrated HNO_3

- (a) MnO_2 (b) $HMnO_4$
(c) Mn_3O_4 (d) $PbMnO_4$

Sol. (b)

73. Which one of the following is an example of a true peroxide

- (a) NO_2 (b) MnO_2
(c) BaO_2 (d) SO_2

Sol. (c)

74. The number of d-electrons in $[Cr(H_2O)_4]^{3+}$ is

- (a) 2 (b) 3
(c) 4 (d) 5

Sol. (b)

75. Co-ordination number for copper (Cu) is

- (a) 1 (b) 6
(c) 8 (d) 12

Sol. (d)

76. Silver nitrate on heating gives

- (a) AgO and NO_2 (b) AgO, NO and O_2
(c) Ag and NO_2 (d) Ag, NO_2 and O_2

Sol. (d)

77. Which emits β -particles

- (a) ${}_1H^3$ (b) ${}_6C^{14}$
(c) ${}_{19}K^{40}$ (d) All

Sol. (d)

78. The molarity of 98% H_2SO_4 ($d = 1.8 \text{ g/ml}$) by weight is

- (a) 6 M (b) 18 M
(c) 10 M (d) 4 M

Sol. (b)

79. 20 ml of 10 N HCl are mixed with 10 ml of 36 N H_2SO_4 and the mixture is made one litre. Normality of the mixture will be

- (a) 0.56 N (b) 0.50 N
(c) 0.40 N (d) 0.35 N

Sol. (a)

80. The energy of an electron in the 3rd orbit of an atom is $-E$. The energy of an electron in the first orbit will be

- (a) $-3E$ (b) $-\frac{E}{3}$
(c) $-\frac{E}{9}$ (d) $-9E$

Sol. (d)

81. For the chemical reaction $A \rightarrow E$ it is found that the rate of the reaction doubles when the concentration of A is increased four times. The order in A for this reaction is

- (a) Two (b) One
(c) Zero (d) Half

Sol. (d)

82. What is X in the nuclear reaction ${}_{7}^{14}N + {}_{1}^{1}H \rightarrow {}_{8}^{15}O + X$

- (a) ${}_{1}^1H$ (b) ${}_{0}^1n$
(c) γ (d) ${}_{-1}^0e$

Sol. (c)

83. Which of the following is related with the colloidal solution

- (a) Tyndall effect (b) Fajan's rule
(c) Le Chatelier's principle (d) Aufbau principle

Sol. (a)

84. Who discovered that cathode rays are made up of electrons

- (a) William Crookes (b) G.J. Stoney
(c) R.A. Millikan (d) J. J. Thomson

Sol. (d)

85. The valency of the element having atomic number 9 is

- (a) 1 (b) 2
(c) 3 (d) 4

Sol. (a)

86. One mole of N_2O_4 is heated in a flask with a volume of 10 dm^3 . At equilibrium 1.708 mole of NO_2 and 0.146 mole of N_2O_4 were found at 134°C . The equilibrium constant will be

- (a) 250 mol dm^{-3} (b) 300 mol dm^{-3}
(c) 200 mol dm^{-3} (d) 230 mol dm^{-3}

Sol. (w)

87. Which one of the following is paramagnetic

- (a) O_2 (b) N_2
(c) He (d) NH_3

Sol. (a)

88. The compound which is non-linear:

- (a) CO_2 (b) CS_2
(c) $HgCl_2$ (d) H_2O

Sol. (d)

89. The end product of 4n series is

- (a) ${}_{82}Pb^{208}$ (b) ${}_{82}Pb^{207}$
(c) ${}_{82}Pb^{209}$ (d) None of the above

Sol. (a)

90. From the knowledge of the position of radium in the periodic table, which of the following statements would you expect to be false

- (a) $RaSO_4$ is insoluble in water.
(b) $RaSO_4$ is insoluble in HNO_3 .
(c) $RaSO_4$ is a white solid.
(d) $RaSO_4$ is a colourless liquid.

Sol. (d)

91. Hexa - 2ene - 4 - yne is

- (a) $CH_3 - CH_2 - C \equiv C - CH = CH_2$
(b) $CH_3 - C \equiv C - CH = CH - CH_3$
(c) $CH_3CH_2 - CH = CH - C \equiv CH$
(d) $CH_3 - C \equiv C - CH_2 - CH = CH_2$

Sol. (b)

92. The number of unpaired electrons in carbon atom is

- (a) One (b) Two
(c) Three (d) Four

Sol. (b)

93. Towards electrophilic reagents

- (a) Ethene is more reactive than ethyne
(b) Ethene is less reactive than ethyne
(c) Both have equal reactivity
(d) The reactivity of both cannot be predicted

Sol. (a)

94. Which statement is correct

- (a) Ethanol is more acidic than phenol
(b) Phenol is more acidic than ethanol
(c) Phenol is more acidic than benzoic acid
(d) Acidity of phenol and benzoic acid is about equal

Sol. (b)

95. Which Chloride is least reactive with the hydrolysis point of view

- (a) CH_3Cl (b) CH_3CH_2Cl
(c) $(CH_3)_3CCl$ (d) $CH_2 = CH - Cl$

Sol. (d)

96. The reaction of acetone with PCl_5 gives

- (a) CH_3COCH_2Cl (b) $CH_3COCHCl_2$
(c) $CH_3 - \overset{Cl}{\underset{Cl}{C}} - CH_3$ (d) $ClCH_2COCH_2Cl$

Sol. (c)

97. In the preparation of Nylon-6 from cyclohexanone oxime use is made of a rearrangement reaction. This rearrangement reaction is called

- (a) Wolff rearrangement (b) Amadori rearrangement
(c) Curtius rearrangement (d) Beckmann rearrangement

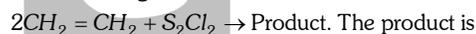
Sol. (d)

98. On heating a mixture of sodium benzoate and sodalime, is formed

- (a) Toluene (b) Phenol
(c) Benzene (d) Benzoic acid

Sol. (c)

99. In the following reaction :



- (a) Mustard gas (b) Lewisite
(c) Polythene (d) Teflon

Sol. (a)

100. What is the initial product of the acidic hydrolysis of a cyanide

- (a) A primary amide (b) An isocyanide
(c) An isocyanate (d) A nitrile

Sol. (a)