Physical Chemistry (Paper -VII)

Choose the correct answer of the following

1. The energy of a photon is given by the relation ----------

   a) $E = \frac{h\nu}{\lambda}$ **b)** $\mathbf{E = \frac{hC}{\lambda}}$ c) $E = \frac{hC}{\nu}$ d) $E = \frac{\lambda C}{h}$

2. When a beam of light of sufficiently high frequency is allowed to strike on a metal Surface in vacuum, electrons are ejected from the metal surface. This phenomenon is called as ----------

   a) black body radiation b) Zeeman effect

   c) Compton effect **d) Photoelectric effect**

3. In photoelectric effect, the kinetic energy of the photoelectrons increases linearly with the ----------

   a) Wavelength of the incident light **b) Frequency of the incident light**

   c) Velocity oh the incident light d) None of these

4. The kinetic energy of the photoelectrons emitted by the metal surface is given by the relation (is the threshold frequency and ν is the frequency of the incident light) --------

   a) $\frac{1}{2}mv^2 = h\nu$ **b)** $\mathbf{\frac{1}{2}mv^2 = h\nu + h\nu_0}$

   c) $\frac{1}{2}mv^2 = h\nu - h\nu_0$ d) $\frac{1}{2}mv^2 = h\nu_0$

5. According to de-Broglie's equation, the momentum of a particle is ---------- proportional to wavelength.

   a) Inversely b) Directly c) is not d) None of these

6. The wavelength of the large objects is of no significance as it is too ---------- to be measurable by instrument.

   a) large b) heavy **c) small** d) None of these

7. de-Broglie's equation is ----------

   a) $\lambda = \frac{h\nu}{m}$ b) $\lambda = \frac{mv}{h}$ c) $\lambda = hmv$ **d)** $\mathbf{\lambda = \frac{h}{mv}}$

8. It is impossible to determine simultaneously the position and momentum (velocity) with accuracy of a particle like electron. This statement is ----------

   a) Heisenberg's uncertainty principle b) de-Broglie's principle

   c) Aufbau's principle d) Planck's law

9. The relation $\Delta x.\Delta p \geq \frac{h}{4\pi}$ represents ----------

   a) de-Broglie's equation b) Pauli's exclusion principle

   c) Schrodinger's wave equation d) **Heisenberg's uncertainty principle**

10. In Schrodinger's wave equation, the symbol 'Ψ' represents the ----------

    a) wavelength of standing wave b) frequency of standing wave

    c) Amplitude of standing wave d) None of these

11. The magnitude of quantum or photon of energy is ---------- proportional to the frequency of radiant energy or is ---------- proportional to the wavelength.

    a) inversely, directly **b) directly, inversely**

    c) directly, directly d) inversely, inversely

12. According to Planck, atoms or molecules absorb or emits radiant energy in the

Form of discrete units of wave called as ----------

a) proton b) electron c) radiation **d) photon.**

13. According to Compton, when x-rays of wavelength 'λ' struck on a sample of graphite an electron was ejected and x-ray scattered had ----------wavelength.

a) smaller **b) longer** c) equal d) None of these

14. Compton calculated the shift of wavelength by using the equation ----------

a) $\lambda = \frac{2h}{mc}\cos^2\frac{\theta}{2}$ b) $\lambda = \frac{2h}{m}\sin^2\frac{\theta}{2}$ **c)** $\boldsymbol{\lambda = \frac{2h}{mc}\sin^2\frac{\theta}{2}}$ d) $\lambda = \frac{2h}{m}\cos^2\frac{\theta}{2}$

15. Schrodinger's equation for a particle in one direction is given by ----------

a) $\frac{d^2\Psi}{dx^2} + \frac{8\pi^2 m}{h}(E - V)\Psi = 0$ b) $\frac{d^2\Psi}{dx^2} + \frac{8\pi^2 m}{h^2}(E)\Psi = 0$

c) $\frac{d^2\Psi}{dx^2} + \frac{8\pi m}{h^2}(E - V)\Psi = 0$ **d)** $\boldsymbol{\frac{d^2\Psi}{dx^2} + \frac{8\pi^2 m}{h^2}(E - V)\Psi = 0}$

16. The wavefunction ' Ψ' is finite, single valued and continuous, these requirements meet if 'E' is given certain characteristic values called as ----------

a) de-Broglie values **b) Eigen values** c) Schrodinger values d) None of these

17. The Schrodinger equation for energy when particle in a one dimensional box is ----

a) $\boldsymbol{E = \frac{n^2h^2}{8ma^2}}$ b) $E = \frac{h^2}{8ma^2}$ c) $E = \frac{n^2h^2}{8ma}$ d) $E = \frac{nh^2}{8ma^2}$

18. The Davisson and Germer experiment gives solid support to the ---------- of dual nature of matter.

a) Heisenberg's uncertainty principle b) Pauli's exclusion principle

c) Schrodinger's wave concept **d) de-Broglie's concept**

19. Which of the following is Laplacian operature?

a) Δ^2 **b)** $\boldsymbol{\nabla^2}$ c) δ^2 d) Ψ^2

20. According to Planck, hot body radiates energy in a ----------

a) continuous waves b) continuous and discontinuous waves

c) discontinuous waves d) None of these

1. The first law of Thermodynamics is

a) the total energy of an isolated system remains constant though it may change from one form to another

b) total energy of system and surrounding remains constant.

c) whenever energy of one type disappears, equivalent amount of another type is produced

d) All of these.

2. The mathematical relation for the first law of thermodynamics is

a) $\boldsymbol{\Delta E = qw}$ b) $\Delta E = w$ c) $\Delta E = q$ d) All of these

3. The phenomenon of lowering of temp. when a gas is made to expand from a region of High pressure into a region of low pressure is known as

a) first law of Thermodynamics b) second law of Thermodynamics

c) Joule Thomson effect d) Le Chatlier's principle

4. The efficiency of heat engine is given by ----------

a) $\frac{w}{q_2} = \frac{(T2-T1)}{T1}$ **b)** $\boldsymbol{\frac{w}{q_2} = \frac{(T2-T1)}{T2}}$ c) $\frac{w}{q_2} = \frac{(T1-T2)}{T1}$ d) $\frac{w}{q_2} = \frac{(T1-T2)}{T2}$

5. The entropy of system increases in the order ----------

a) gas < liquid < solid b) gas < solid < liquid **c) solid < liquid < gas** d) none of these

6. The efficiency of heat engine operating between 400 K to 300 K is ----------
a) 1.0 b) 0.75 c) 0.50 **d) 0.25**

7. The efficiency of heat engine operating between 1000 K to 300 K is ---------- the engine operating between 1000 K to 500 K
a) greater than b) less than c) is equal to d) none of these

8. Which of the following is true for a cyclic process ----------
a) $\Delta E = 0$ b) $\Delta E = q - w$ c) $q = w$ **d) All of these**

9. The cycle of processes which occurs under reversible conditions is referred to as ----------
a) Cyclic process b) closed process **c) Carnot cycle** d) reversible cycle

10. Which of the following is correct unit of entropy?
a) KJmol b) JK^{-1} mol **c) JK^{-1} mol^{-1}** b) None of these

11. The efficiency of heat engine is maximum when ----------
a) Temperature of source and sink is maximum
b) Temperature of source and sink is minimum
c) Temperature of source is minimum and sink is maximum
d) Temperature of source is maximum and sink is minimum

12. Formula for inversion temperature is ----------
a) $Ti = \frac{2a}{nb}$ **b) $Ti = \frac{2a}{Rb}$** c) $Ti = \frac{a}{2b}$ d) $Ti = \frac{a}{b}$

13. Entropy is a measure of ----------
a) definite order **b) disorder** c) both a & b d) none of these

14. In spontaneous processes there is ----------
a) Increase in entropy and disorder b) decrease in entropy and increase in disorder
c) decrease in entropy and disorder d) increase in entropy and decrease in disorder

15. Entropy change in an isothermal and reversible expansion of an ideal gas is ----------
a) $\Delta E = nRT \log \frac{V1}{V2}$ b) $\Delta E = nRT \log \frac{V2}{V1}$ **c) $\Delta E = nR \log \frac{V2}{V1}$** d) $\Delta E = nR \log \frac{V1}{V2}$

16. Machines working reversibly between the same two temperature have the ----------
a) more efficiency b) less efficiency c) both a & b **d) same efficiency**

17. In Carnot cycle net heat absorbed is ----------
a) $q = R(T2 - T1) \log \frac{V2}{V1}$ b) $q = R(T2 - T1) \log \frac{V1}{V2}$
c) $q = R(T1 - T2) \log \frac{V2}{V1}$ d) $q = R(T1 - T2) \log \frac{V1}{V2}$

18. Inversion temperature depends upon ----------
a) Vander Waal's constant 'a' b) Vander Waal's constant 'b'
c) Vander Waal's constant 'a' & 'b' d) None of these

19. Joule Thomson coefficient is given by ----------
a) $\mu = -\frac{(\frac{\partial H}{\partial P})_T}{C_v}$ **b)$\mu = -\frac{(\frac{\partial H}{\partial P})_T}{C_p}$**
c) $\mu = \frac{(\frac{\partial H}{\partial P})_T}{C_v}$ d) $\mu = \frac{(\frac{\partial H}{\partial P})_T}{C_p}$

20. When H_2 gas expands from high pressure region to low pressure region ----------
a) H_2 gas get cooled **b) H_2 gas get warmed**
c) H_2 gas remains in the same state d) All of these

21. For an ideal gas, Joule Thomson effect is ----------
a) Positive b) Negative **c) Zero** d) None of these

22. Joule Thomson coefficient depends upon ----------
a) Temperature b) Pressure c) Volume d) None of these

23. Inversion temperature of a gas is that temperature ---------- which the gas on expansion gives cooling effect.
a) above **b) below** c) both a & b d) None of these

24. Entropy change of an Isochoric process is given by ----------
a) $\Delta S = C_p \log \frac{T2}{T1}$ b) $\Delta S = C_p \log \frac{P1}{P2}$ c) $\Delta S = C_v \log \frac{P1}{P2}$ **d) $\Delta S = C_v \log \frac{T2}{T1}$**

25. Calculate entropy change when 42 gm of N_2 gas expands isothermally & reversibly from 5 dm^3 to 25 dm^3 at 300 K. (R = 8.314 J/k/mol)
a) 30.07 J/k/mol b) 28.07 J/mol **c) 20.07 J/k/mol** d) 20.07 J/mol

1. The energy of photon of wavelength 400 nm is ----------
a) 0.496 x 10^{-19} Joule b) 0.0496 x 10^{-19} Joule **c) 4.96 x 10^{-19} Joule** d) None of these
2. Uncertainty in position is 10^{-8} m, uncertainty in momentum is ----------
a) 0.526 x 10^{-27} Kg.m **b) 5.26 x 10^{-27} Kg.m** c) 0.0526 x 10^{-27} Kg.m d) None of these
3. The phenomenon of lowering of temp. when a gas is made to expand from a region of High pressure into a region of low pressure is known as
a) first law of Thermodynamics b) second law of Thermodynamics
c) Joule Thomson effect d) Le Chatlier's principle
4. The efficiency of heat engine is given by ----------
a) $\eta = \frac{(T2-T1)}{T1}$ **b)** $\eta = \frac{(\mathbf{T2-T1})}{\mathbf{T2}}$ c) $\eta = \frac{(T1-T2)}{T1}$ d)$\eta = \frac{(T1-T2)}{T2}$
5. The de Broglie's wavelength of an electron moving with velocity of 5 x 10^6 m/sec is ----------
a) 1.456 x 10^{-10} m b) 0.1456 x 10^{-8} m c) 14.56 x 10^{-8} m d) None of these
6. The energy of photon is given by ----------
a)$E = h\nu$ b) $E = \frac{hc}{\lambda}$ c) $E = hc\bar{\nu}$ **d) All of these**
7. The energy of photon associated with light of wavelength 3800 A° is ----------
a) 5.2 x 10^{-19} Joule b) 0.52 x 10^{-19} Joule c) 52 x 10^{-19} Joule d) None of these
8. According to de-Broglie's equation, the wavelength of a particle is ---------- proportional to velocity.
a) Directly **b) Inversely** c) is not d) None of these
9. A photon of wavelength 4000 A° strikes a metal surface with work function 2.12 x 10^{-19} Joule and with kinetic energy is ----------
a) 28.4 x 10^{-19} Joule b) 0.284 x 10^{-19} Joule **c) 2.84 x 10^{-19} Joule** d) None of these
10. The wavelength of a particle having mass 6.62 x 10^{-27} Kg moving with speed 10^3 m/sec is ----------
a) 2 x 10^{-10} m **b) 1 x 10^{-10} m** c) 1 x 10^{-10} cm d) 2 x 10^{-10} cm
11. Heisenberg's uncertainty principle is given by ----------
a) $\Delta x.\Delta p \geq \frac{h}{4\pi}$ b) $\Delta x.\Delta v \geq \frac{h}{4\pi m}$ c) $\Delta x.m\Delta v \geq \frac{h}{4\pi}$ d) **All of these**
12. The uncertainty in position & velocity of a particle are 10^{-10} m & 5.27 x 10^{-24} m/sec, The mass of particle is ----------
a) 0.01 kg b) 1 kg **c) 0.10 kg** d) 10 kg
13. The magnitude of quantum or photon of energy is ---------- proportional to wavelength.
a) directly **b) inversely** c) is not d) none of these
14. The decomposition of calcium carbonate is represented by the equation
$CaCO_{3\,(s)} \rightarrow CaO_{(s)} + CO_{2\,(g)}$, with number of phases equal to ----------
a) 0 b) 1 c) 2 **d) 3**
15. A saturated solution of NaCl is a ----------
a) one phase system **b) two phase system** c) three phase system d) None of these
16. Mathematically phase rule can be expressed as ----------
a) $\mathbf{F = C - P + 2}$ b) $F = C - P + 1$ c) $F = P - C + 1$ d)) $F = P - C + 2$
17. A mixture of three gases O_2, N_2, CO_2 is ----------
a) one phase system b) two phase system c) three phase system d) None of these
18. For a pure gas & mixture of two gases, the degree of freedom are
a) 2 & 2 b) 3 & 2 **c) 2 & 3** d) 3 & 3
19. Water system has three phases ice, liquid water & water vapour. The number of components in the system are ----------
a) 0 **b) 1** c) 2 d) 3

20. For one component system the phase rule is ----------
a) $F = 2 - P$ b) $F = 1 - P$ c) $F = 3 + P$ **d)) $F = 3 - P$**

21. At triple point ----------
a) Temperature is fixed b) Pressure is fixed
c) Both Temperature & Pressure are fixed d) None of these

22. In a one phase, two component system the degree of freedom is ----------
a) 0 b) 1 c) 2 **d) 3**

23. A drop of water is placed in a stoppered bottle, how many phases are present in the system?
a) 0 b) 1 **c) 2** d) 3

24. A system with zero degree of freedom is known as ----------
a) invariant b) monovariant c) bivariant d) None of these

25. The transition temperature of a substance is that temperature at which ----------
a) one enantiomer changes into another **b) one allotropic form changes two another**
c) all the phases can co-exist in equilibrium d) None of these

26. The reduced phase rule for a condensed system is ----------
a) $F' = C - P + 2$ b) $F' = C - P$ c) $F' = P - C + 3$ **d)) $F' = C - P + 1$**

27. Sulphur system has four phases rhombic, monoclinic, liquid & vapour sulphur. It is ----------
a) one componennt system b) two componennt system
c) three componennt system d) None of these

28. For a bivriant system, the degree of freedom is ----------
a) 0 b) 1 **c) 2** d) 3

29. Temperature of triple point of CO_2 system is ----------
a) $-57K$ **b) $-$ 57 °C** c) 57 °C d) $57K$

30. In Pb – Ag system, pure Pb melts at 327 °C, as % of Ag increases in Pb solution the melting point of lead ----------
a) decreases b) increases c) remains constant d) None of these

31. Upper consulate temperature of Nicotine – water system is ----------
a) 68.5 °C b) 61°C c) 18.5 °C **d) 208 °C**

32. In phenol - water system, inside the curve number of liquid layers existing is ----------
a) 1 **b) 2** c) 3 d) 4

33. An engine operating between 150 °C & 25 °C takes 500 Joule heat from a high Temperature Reservoir, the workdone by this system is ----------
a) 150.5 Joule b) 142.7 Joule c) 174.5 Joule **d) 147.7 Joule**

34. Entropy change of two mole of an ideal gas expands isothermally & reversibly from 6 m^3 to 60 m^3 is ----------
a) 38.92 Joule**/**K/mol b) 38.69 Joule**/**K/mol **c) 38.29 Joule/K/mol** d) 38.09 Joule**/**K/mol

35. Entropy change of two mole of an ideal gas expands isothermally at 293 K from pressure 10 atm. to 2 atm. at 27 °C is ----------
a) 26.76 Joule/K/mol b) 26.16 Joule**/**K/mol c) 27.76 Joule/K/mol d) 25.76 Joule**/**K/mol

36. Inversion temperature depends upon ----------
a) Vander Waal's constant 'a' b) Vander Waal's constant 'b'
c) Vander Waal's constant 'a' & 'b' d) None of these

37. Entropy is a measure of ----------
a) concentration b) velocity c) zig - zag motion **d) randomness**

38. A process which proceeds of its own accord without any assistance is ----------
a) Reversible process **b) spontaneous process**
c) non spontaneous process d) irreversible process

39. Entropy is measured in ----------
a) cal K^{-} mol^{-} b) Joule K^{-} mol^{-} c) entropy unit **d) All of these**

40. Standard entropy, S° of a substance is----------
a) entropy at 0 °C & 1 atm. pressure b) entropy at 0 K & 1 atm. pressure
c) entropy at 25 °C & 1 atm. pressure d) entropy at 25 K & 1 atm. pressure