Subject: **Chemistry**
Paper name: **Physical Chemistry-III**
Paper No: **XI**
Semester: **VI**

1. Energy possessed by one mole of photon is called
   a) Avogadro's number
   b) Planck's constant
   c) Einstein
   d) Faraday number of photons

2. Absorbance (A) of a solution and transmittance (T) are related as
   a) $A = - \log T$
   b) $A = \log T$
   c) $\log A = T$
   d) $\log A = - T$

3. The free energy change ($\Delta G$) of a thermochemical reaction
   a) is always positive
   b) is always negative
   c) is both positive and negative
   d) is neither positive nor negative

4. A photochemical reaction takes place by the absorption of
   a) Visible and ultraviolet radiation
   b) Infra-red radiation
   c) Heat energy
   d) X-ray

5. In photochemical reaction energy is
   (a) change from one chemical to another
   (b) given out as light
   (c) absorbed from light
   (d) neither absorbed nor given out

6. Rayleigh – Jeans formulae for energy density between wavelengths $\lambda$ and $\lambda + d\lambda$ in case of black body radiation is given by
   a) $E\lambda\, d\lambda = 8\pi kT / \lambda^4$
   b) $E\lambda\, d\lambda = 8\pi kT / \lambda^5$

c) $E\lambda\, d\lambda = 8\pi kT / \lambda^3$
d) $E\lambda\, d\lambda = 8\pi kT / \lambda^2$

7. According to quantum mechanics, the energy of a free particle is
   a) quantized
   b) not quantized
   c) arbitrary
   d) not arbitrary

8. The wavelength $\lambda_m$ for which the emittance of a black body is maximum is inversely proportional to its
   a) pressure
   b) volume
   c) velocity
   d) absolute temperature

9. The minimum energy possessed by a particle is not zero but has a definite value. This is called
   (a) Zero point energy
   (b) First point energy
   (c) Second point energy
   (d) Third point energy

10. Operators used in quantum mechanics must be
    (a) real
    (b) anti-Hermitian
    (c) Hermitian
    (d) None of the above

11. The relation between the entropy (S) of a system and the thermodynamic probability (W) is given by
    (a) $S = k \ln W$
    (b) $W = k \ln S$
    (c) $k = S \ln W$
    (d) $S = W \ln k$

12. In terms of molecular partition function q, the internal enrgy of a molecule is given by
    (a) $U = nRT [d \ln q / dV]_T$
    (b) $U = nRT^2 [d \ln q / dT]_V$
    (c) $U = nRT^2 [d \ln q / dV]_T$

(d) $U = nRT\,[d \ln q / dT]_V$

13. The relationship between work function in terms of partition function is
    (a) $A = - RT \ln Q$
    (b) $A = - RT \ln Q + PV$
    (c) $A = RT \ln Q$
    (d) $A = - RT (\ln Q)^{-1}$

14. The unit of molecular partition function is
    (a) $cm^{-1}$
    (b) $S^{-1}$
    (c) $JK^{-1}\,mol^{-1}$
    (d) dimensionless

15. In terms of partition function, the translational entropy is given by
    (a) $E_T = RT$
    (b) $E_T = 5RT$
    (c) $E_T = 5/2\ RT$
    (d) $E_T = 3/2\ RT$

16. Which of the following radiations has the highest wavelength
    (a) Microwave
    (b) Radiowave
    (c) Infrared
    (d) X-ray

17. The molecule which is IR-inactive bur Raman active is
    (a) HCl
    (b) $SO_2$
    (c) $N_2$
    (d) Protein

18. In pure rotational spectrum every two successive lines have a constant difference of wave number equal to
    (a) 1B
    (b) 2B
    (c) 3B
    (d) 4B

19. Raman spectrum may be obtained in
    (a) IR and Microwave regions
    (b) IR and visible regions
    (c) Visible and U.V regions
    (d) Visible regions only

20. For $\Delta J = \pm 1$, lines with frequency greater than the fundamental frequency are obtained. These lines are called
    (a) P branch
    (b) Q branch
    (c) R branch
    (d) S branch

21. The relationship between equilibrium constant and standard e.m.f of a cell is given by
    (a) $\ln k = RT / nFE^0$
    (b) $\ln k = nFE^0 / RT$
    (c) $\ln E^0 = nk / RT$
    (d) $\ln E^0 = RT / nk$

22. The relationship between electrical energy and free energy change of a cell reaction is
    (a) $- \Delta G = - nFE$
    (b) $\Delta G = nFE$
    (c) $- \Delta G = nFE$
    (d) $\Delta G = \Delta nFE$

23. The standard reduction potential of four elements are given below. Which of the following will be the most reducing agent
    (a) 1.9
    (b) – 1.9
    (c) 0
    (d) – 3.04

24. The electrode potential of hydrogen electrode in neutral solution and 298K is
    (a) Zero
    (b) – 0.41
    (c) – 0.49
    (d) + 0.41

25. A voltaic cell has an $E^0$ value = - 1.00 V. The reaction
    (a) is spontaneous

(b) has a positive $\Delta G^0$
(c) has a negative $\Delta G^0$
(d) has K = 1

FILL IN THE BLANKS

1. Internal conversion is _____ transition between states of same multiplicity
2. Molar extinction coefficient is the reciprocal of the _____ of the solution when the intensity of radiation falls to 1/10 of its initial value
3. The light emitted by glow worms is due to the oxidation of the protein _____ present in the glow worms
4. Certain minimum frequency needed for the ejection of electrons is called _____ frequency.
5. Radiant energy is emitted or absorbed discontinuously in the form of tiny bundles of energy known as _____
6. A _____ is an object that absorbs all the radiations falling on it
7. Partition function increases with _____ of temperature
8. The entropy of CO at absolute zero is _____
9. Vibration contribution to energy at low temperature is _____
10. Radiation scattered with frequency lower than that of the incident beam is referred to as _____ lines
11. At temperature near absolute zero gaseous molecules possess only _____ energy.
12. Raman spectrum is due to _____ collision
13. The potential set up at the junction of the two solutions because of the difference in the speeds of the ions moving across the boundary is called _____ potential
14. Cells in which the e.m.f produced is only due to the difference in the concentration of the electrolytes is called _____ concentration cells
15. For thermodynamic treatment of galvanic cells it is essential that the cells operate in a thermodynamically _____ manner

Key Answers

A. Multiple choice questions [replace x]

| | | | | |
|---|---|---|---|---|
| 1.(c) | 2.(a) | | 3.(b) | 4.(a) |
| 5.(c) | 6.(a) | 7.(b) | 8.(d) | 9.(a) |
| 10.(c) | 11.(a) | | 12.(b) | 13.(a) |
| 14. (d) | 15. (c) | | 16.(b) | 17.(c) |
| 18.(b) | 19.(c) | | 20.(c) | 21.(b) |
| 22.(c) | 23.(d) | | 24.(a) | 25.(b) |

B.. Fill up the blanks [replace x]

1. radiationless
2. thickness
3. luciferin
4. threshold
5. quanta
6. black body
7. increase

8. positive
9. negligible
10. stokes’
11. vibrational
12. inelastic
13. liquid-junction
14. electrolyte
15. reversible