

QUAID-I-AZAM UNIVERSITY ISLAMABAD
DEPARTMENT OF CHEMISTRY

For MPhil admission in Physical Chemistry

40 MCQs from all branches of physical chemistry

Time allowed 1 h.

Sample questions!

Tick the correct answer!

- The vibrational frequency of C-C, C=C, C≡C can be arranged as:
C-C < C=C < C≡C, (b) C-C > C=C > C≡C, (c) C-C = C=C = C≡C, (d) C-C > C=C = C≡C
- The number of ¹H-NMR signals obtained in CH₃COCH₃ will be
(a) 1, (b) 2 (c) 6, (d) 0
- What will be the absorbance if % transmittance, T= 80?
(a) 0.5, (b) 0.05, (c) 0.097, (d) 0.97
- What is the Correspondence Principle?
(a) It is the same as Steady-State Principle, (b) For every action, there is an equal but opposite reaction, (c) In the limits of the large quantum numbers, the quantum mechanics predicts the classical behavior, (d) Same as Pauli-Exclusion Principle
- Using the de Broglie relation, calculate the wavelength of an electron (m_e 9.11 x 10⁻³¹ kg) with kinetic energy 3 eV.
(a) 7.1 nm, (b) 8.1 nm, (c) 0.71 nm, (d) 0.81 nm
- The Born interpretation of the wave function refers to:
(a) The wave function could be both real and imaginary, (b) the amplitude represents the intensity of the wave function, (c) the square of the amplitude gives the probability density, (d) the wave function is the solution of the Schrodinger wave equation.
- The rate constant for the substitution reaction
C₄H₉Cl + H₂O → C₄H₉OH + HCl

increases by a factor of 10.6 when the temperature is increased from 298 K to 308 K. Calculate the activation energy of the reaction.

(a) 180kJ mol^{-1} , (b) 78.2 kJ mol^{-1} , (c) 809 kJ mol^{-1} , (d) 2.14 kJ mol^{-1}

8. Thermal decomposition of a compound is of first order. If 50% of a sample of the compound is decomposed in 120 min. show how long will it take for 90% of the compound to decompose?
(a) 399 min, (b) 410 min, (c) 250 min, (d) 120 min
9. The difference between the potential energy of reactants and that of the products is called as
(a) Activation energy, (b) Heat of reaction, (c) Free energy, (d) Surplus energy
10. The highest electrical conductivity of the following aqueous solutions is of
(a) 0.1 M acetic acid,
(b) 0.1 M chloroacetic acid
(c) 0.1 M fluoroacetic acid
(d) 0.1 M difluoroacetic acid
11. Which of the following statements is NOT true in relation to the triple point on a single component phase diagram?
(a) The point at which the solid, liquid and gaseous phases for a substance co-exist
(b). The triple point exists for a substance occurs at a specific temperature and pressure
(c). The triple point exists at a single temperature and is independent of pressure
(d). The system must be closed so that no vapor can escape
12. Is it possible to construct a heat engine free from thermal pollution?
(a) Yes, (b) No, (c) cannot predict
13. An electric refrigerator transfers heat from low temperature to the surroundings at high temperature. Does this violate second law of thermodynamics?
(a) Yes, (b) No, (c) cannot predict

14. If $\Delta G^\circ(298\text{ K})$ for a reaction is -8.5 kJ mol^{-1} , what will be the corresponding value of the equilibrium constant K ?
(a) 0.032, (b) 1.0, (c) 3.4, (d) **31**
15. With the addition of detergents, the surface tension of liquid will
(a) decrease (b) increase (c) remains constant (d) None of a, b, c.
16. In good solvents where solvent molecules have an affinity for polymer molecule, the polymer coil will
(a) Expands (b) Contracts (c) Expands or contracts (d) no change in size
17. Plasticizer are often used to decrease
(a) T_g (b) T_m (c) solubility (d) Crystallinity
18. The number average and weight average molar mass of a polymer sample is 20000 and 30000 g/mol. The polydispersity is (a) >1 (b) 1, (c) <1 , (d) -1
19. Thermosetting polymer, Bakelite is formed by the reaction of phenol with
(a) HCOOH , (b) $\text{CH}_3\text{CH}_2\text{CHO}$, (c) CH_3CHO , (d) HCHO