QUAID-I-AZAM UNIVERSITY ISLAMABAD
DEPARTMENT OF CHEMISTRY

For PhD admission in Physical Chemistry

60 MCQs from all branches of Physical Chemistry

Time allowed 1.5 h

Sample Questions!

(1)   Predissociation takes place when the transition occurs to:

(a) an unstable upper state, (b) a stable upper state intersected by an unstable energy state, (c) a stable upper state having energy greater than the dissociation energy, (d) a stable upper state having energy equal to the dissociation energy.

(2)   HCN molecule belongs to the symmetry point group:

(a) C_{3v}, (b) $C_{\infty v}$, (c) $C_{\infty h}$, (d) none of the above

(3)   In IR spectra of an-harmonic oscillator the observable bands are:

(a) Fundamental only, (b) overtones only, (c) hot bands only, (d) all above

(4)   When microwave spectrum of non-linear molecule is measured in an applied field: (a) Only line splitting occurs, (b) only line-shift takes place, (c) both (a) and (b), (d) all of the above are incorrect

(5)   Q-Switched pulsed laser is used in;

(a) Microsecond flash photolysis, (b) nanosecond flash photolysis, (c) Picosecond flash photolysis, (d)Femtosecond flash photolysis

(6)   The rate law for the multistep chain reaction
$$H_2 + Br_2 \rightarrow 2HBr$$
is

$$\text{Rate} = \frac{d[HBr]}{dt} = \frac{k_{T1}[H_2][Br_2]^{3/2}}{[Br_2] + k_{T2}[HBr]}$$

Which of the following expresses the rate law in the limit of high pressures of bromine, Br_2?

(a) Rate $= k_{r1}[Br_2]^{3/2}$, (b) Rate $= k_{r1}[H_2][Br_2]^{3/2}$, (c) Rate $= k_{r1}[H_2][Br_2]^{1/2}$, (d) Rate $= k_{r1}[H_2][Br_2]$

(7) $\hat{L}_z \ Y_l^m =$ ………….   (a) $l^2\hbar Y_l^m$ (b) $m\hbar Y_l^m$ (c) $l(l+1)\hbar \ Y_l^m$ (d) $m(m+1)\hbar \ Y_l^m$

(8)   if $\hat{A} \ and \ \hat{B}$ are two operators, then $[\hat{A}, \ \hat{B}] =$ ……. (a) $\hat{A}\hat{B} - \hat{B}\hat{A}$, (b)) $\hat{A}\hat{B} + \hat{B}\hat{A}$, (c))

$\hat{B}\hat{A} - \hat{B}\hat{A}$ (d) $\hat{B}\hat{A} + \hat{B}\hat{A}$

(9)   Monoatomic ideal gas has neither

(a) rotational, (b) vibrational, (c) rotational nor vibrational degree of freedom (d) both

rotational and vibrational degree of freedom

(10)   Bose-Einstein Statistic is used for

(a) distinguishable particles (b) indistinguishable, (c) indistinguishable and follow Pauli

exclusion principle, (d) indistinguishable and do not follow Pauli exclusion principle

(11)   A given system undergoes a change in which work done by the system equals decrease
in internal energy. The system must have undergone a change named as
(a) isothermal   (b) adiabatic   (c) isobaric   (d) isochoric

(12)   Can water be boiled without heating?

(a) Yes,   (b) No   (c) cannot predict

(13)   Carothers derived an equation for the prediction of gelation point, $P_G = \frac{2}{f_{av}}$. A polycondensatin
reaction between 1.2 moles of diacid, 0.4 moles of glycerol (tirol) and 0.6 moles of ethylene glycol
(diol) is taking place. The critical extent of reaction for gelation will be:

(a) 0.917   (b) 0.817   (c) 1.0   (d) 0.99994