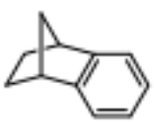
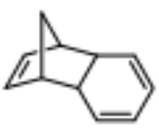
# H: CHEMISTRY (COMPULSORY)

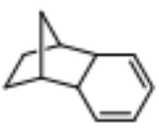
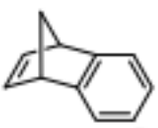
## Q. 1 – Q. 5 carry one mark each.

Q.1 The molecule having net 'non-zero dipole moment' is

(A) $CCl_4$ (B) $NF_3$ (C) $CO_2$ (D) $BCl_3$

Q.2 The Diels-Alder adduct from the reaction between cyclopentadiene and benzyne is

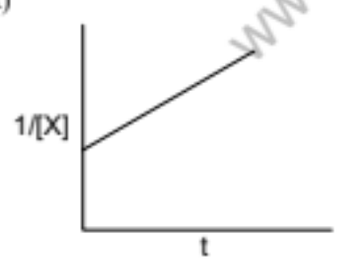
(A)  (B) 

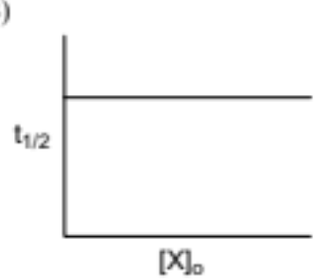
(C)  (D) 

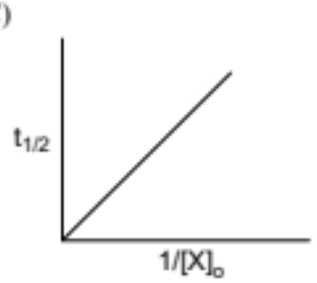
Q.3 The number of possible enantiomeric pair(s) in HOOC–CH(OH)–CH(OH)–COOH is_____

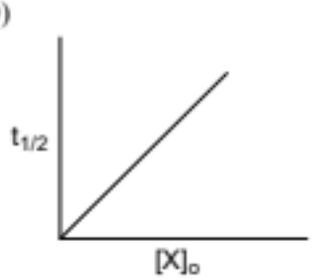
Q.4 For the electrochemical reaction, $Cu^{2+}(aq) + Zn(s) \rightleftharpoons Cu(s) + Zn^{2+}(aq)$ the equilibrium constant at 25 °C is $1.7 \times 10^{37}$. The change in standard Gibbs free energy ($\Delta G^{o}$) for this reaction at that temperature will be _____ kJ $mol^{-1}$ (up to one decimal place).
(**Given:** R = 8.314 $JK^{-1}mol^{-1}$)

Q.5 Among the following diagrams, the one that correctly describes a zero order reaction (X → product) is
(**Given:** $[X]_o$ = initial concentration of reactant X; [X] = concentration of reactant X at time *t* and $t_{1/2}$ = half-life period of reactant X)

(A) 


(B) 


(C) 


(D) 

**Q. 6 – Q. 15 carry two marks each.**

Q.6 If the radius of first Bohr orbit is 0.53 Å, then the radius of the third Bohr orbit is

(A) 2.12 Å (B) 4.77 Å (C) 1.59 Å (D) 3.18 Å

Q.7 If 50 mL of 0.02 M HCl is added to 950 mL of $H_2O$, then the pH of the final solution will be_____

Q.8 Stability of $[CrCl_6]^{3-}$ (**X**), $[MnCl_6]^{3-}$ (**Y**) and $[FeCl_6]^{3-}$ (**Z**) follows the order
(**Given:** Atomic numbers of Cr = 24, Mn = 25 and Fe = 26)

(A) **X** > **Y** > **Z** (B) **X** < **Y** < **Z** (C) **Y** < **X** < **Z** (D) **X** < **Y** = **Z**

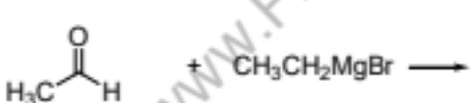
Q.9 Among the following pairs, the paramagnetic and diamagnetic species, respectively, are

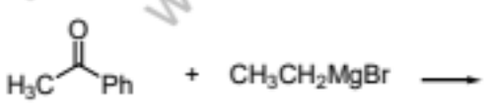
(A) CO and $O_2^-$ (B) NO and CO (C) $O_2^{2-}$ and CO (D) $NO^+$ and $O_2^-$

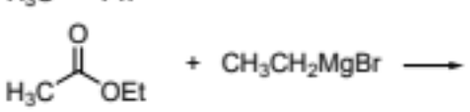
Q.10 In compounds $K_4[Fe(CN)_6]$ (**P**) and $Fe(CO)_5$ (**Q**), the iron metal centre is bonded to

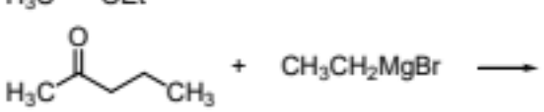
(A) C of $CN^-$ in **P** and C of CO in **Q**
(B) N of $CN^-$ in **P** and C of CO in **Q**
(C) C of $CN^-$ in **P** and O of CO in **Q**
(D) N of $CN^-$ in **P** and O of CO in **Q**

Q.11 Among the following reactions, the one that produces achiral alcohol (after hydrolysis) is

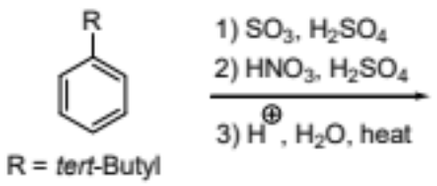
(A) 


(B) 

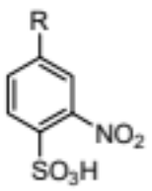

(C) 

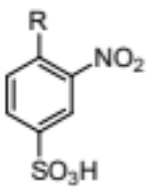

(D) 

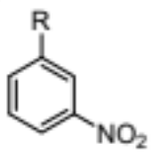
Q.12 The major product from the following reaction is

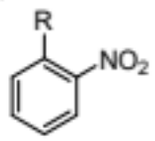



R = *tert*-Butyl

(A) 


(B) 


(C) 


(D) 


Q.13 The order of resonance energy for the following molecules is


(1) (2) (3) (4)

(A) (1) > (3) > (2) > (4)

(B) (1) > (3) > (4) > (2)

(C) (1) > (4) > (2) > (3)

(D) (1) > (4) > (3) > (2)

Q.14 The molar enthalpy of vaporization for a liquid (normal boiling point = 78.3 °C) is 39 kJ $mol^{-1}$. If the liquid has to boil at 25 °C, the pressure must be reduced to _____Torr (up to one decimal place).

(**Given:** R = 8.314 $JK^{-1}mol^{-1}$; 1 atm = 760 Torr)

Q.15 For the process, $H_2O(l) \rightleftharpoons H_2O(s)$ at 0 °C and 1 atm, the correct statement is

(A) $\Delta S_{system} = 0$ (B) $\Delta S_{total} > 0$ (C) $\Delta S_{total} = 0$ (D) $\Delta S_{total} < 0$

**END OF THE QUESTION PAPER**