

## SECTION – I

### STRAIGHT OBJECTIVE TYPE

This section contains 9 multiple choice questions. Each question has four choices (a), (b), (c), (d), out of which **only one** is correct. **3 Marks** will be awarded for correct answer. **1 Mark** will be deducted for wrong answer.

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- The oxidation state of copper in the compound  $\text{YBa}_2\text{Cu}_3\text{O}_7$ , which shows super conductivity. Assume that the rare earth element yttrium is in its usual +3 oxidation state.
  - +2
  - +1/3
  - +7/3
  - +11/3
- The molecular weight of benzoic acid in benzene as determined by depression in freezing point method corresponds to :
  - Ionization of benzoic acid
  - Dimerization of benzoic acid
  - Salvation of benzoic acid
  - Trimerization of benzoic acid
- Schottky defect is found in
  - NaCl
  - KCl
  - $\text{MgCl}_2$
  - TiCl
- The critical temperature of water is higher than that of  $\text{O}_2$  because the  $\text{H}_2\text{O}$  molecule has
  - Fewer electrons than  $\text{O}_2$
  - Two covalent bonds
  - V-shape
  - Dipole moment
- What is the standard cell potential for the cell?  
 $\text{Zn}; \text{Zn}^{2+} (1\text{M}) \parallel \text{Cu}^{2+} (1\text{M}); \text{Cu}$   
 $(E^0 \text{ for } \text{Zn}^{2+}/\text{Zn} = -0.76; E^0 \text{ for } \text{Cu}^{2+}/\text{Cu} = +0.34)$ 
  - $-0.76 + (-0.34) = -0.42$
  - $0.34 - (-0.76) = 1.10$
  - $-0.34 + 0.76 = +0.42$
  - $-0.76 - (+0.34) = -1.10$
- Anti-Markonikoff's addition of HBr is **not** observed in

- (a) Propene
  - (b) 1-Butene
  - (c) 2-Butene
  - (d) 2-Pentene
7.  $P_4O_{10}$  on reacting with water does **not** form
- (a) Tetra metaphosphoric acid
  - (b) Phosphorus acid
  - (c) Orthophosphoric acid
  - (d) Pyrophosphoric acid
8. The joule-Thomson experiment is an example of which of the following processes?
- (1) Isothermal process
  - (2) Isenthalpic process
  - (3) Adiabatic process
  - (4) Isochoric process
- Select the correct answer using the codes given below:
- (a) 1 and 2
  - (b) 2 and 3
  - (c) 1 and 4
  - (d) 2 and 4
9. Which one among the following has the highest catenation power?
- (a) O
  - (b) S
  - (c) Se
  - (d) Te

## SECTION II

### ASSERTION-REASON TYPE

This section contains 4 reasoning type questions. Each question has 4 choices (a), (b), (c), and (d), out of four only one is correct. 3 Marks will be awarded for correct question and 1 Mark will be deducted for wrong answer. No Marks will be deducted if not attempted.

10. **ASSERTION (A):** When 2-chloro-3-methylbutane is treated with alcoholic potash, 2-methyl-2-butene is the main product.
- REASON (R):** According to saytzeff rule, hydrogen atom is removed from the carbon atom having the least no. of hydrogen atoms (s).
- (a) Both A and R are individually true and R is the correct explanation of A
  - (b) Both A and R is individually true and R is **not** the correct explanation of A
  - (c) A is true but R is false
  - (d) A is false but R is true
11. **ASSERTION (A):** Hybridization has an effect on the stability of bonds.

**REASON (R):** Hybrid orbitals can overlap better and provide greater bond angles with the result repulsions between pairs of electrons is minimized which in turn increases the stability of the bond.

- (a) Both A and R are individually true and R is the correct explanation of A
- (b) Both A and R is individually true and R is **not** the correct explanation of A
- (c) A is true but R is false
- (d) A is false but R is true

12. **ASSERTION (A):** For a weak electrolyte, the plot of molar conductivity ( $A_m$ ) against  $\sqrt{c}$  ( $c$  is concentration in  $\text{mol lit}^{-1}$ ) is nearly linear.

**REASON (R):** The molar conductivity at infinite dilution ( $A_m^0$ ) for an electrolyte can be considered equal to the sum of the limiting molar conductivities of the individual ions.

- (a) Both A and R are individually true and R is the correct explanation of A
- (b) Both A and R is individually true and R is **not** the correct explanation of A
- (c) A is true but R is false
- (d) A is false but R is true

13. **ASSERTION (A):** In the addition of Grignard reagent to carbonyl compound, the R group of  $\text{RMgX}$  attacks carbonyl carbon.

**REASON (R):** The carbon-magnesium bond of the Grignard reagent is highly polar, carbon being negative relative to electropositive magnesium.

- (a) Both A and R are individually true and R is the correct explanation of A
- (b) Both A and R is individually true and R is **not** the correct explanation of A
- (c) A is true but R is false
- (d) A is false but R is true

### SECTION III

This section contains two paragraphs. Based on each paragraph 3 multiple questions have to be answered. Each question has four (a), (b), (c), and (d), out which **only one** is correct. 4 marks will awarded for each correct answer and 1 mark will be deducted if it is wrong answer. No marks will be deducted if a question is not attempted.

A compound X doesn't give  $\text{N}_2$  on heating. Its aqueous solution when heated with caustic soda liberates a gas Y only which turns red litmus blue. Heating of alkaline solution of X is continued to expel gas Y completely. However the residual solution again liberates the gas Y when heated with zinc powder. Gas Y gives a brown precipitate with alkaline solution of Z.

14. Identify the compound X

- (a)  $\text{NH}_4\text{HCO}_3$   
 (b)  $\text{NH}_4\text{NO}_3$   
 (c)  $\text{NH}_4\text{NO}_2$   
 (d)  $\text{NH}_4\text{OH}$
15. Identify the compound Y  
 (a)  $\text{CO}_2$   
 (b)  $\text{N}_2\text{O}$   
 (c)  $\text{NH}_3$   
 (d)  $\text{NO}_2$
16. Identify the compound Z  
 (a)  $\text{K}_2\text{HgI}_4$   
 (b)  $[\text{Cu}(\text{NH}_3)]\text{SO}_4$   
 (c) Nickel salts with dimethyl glyoxime  
 (d) Cu

An organic acid A, containing C=40%, H=6.6% and the rest being oxygen, gave on chlorination a monochloro derivative B containing 37.56% chlorine. The compound B was esterified and treated with KCN. The product thus obtained gave on hydrolysis another acid C, containing C=34.6%, H=3.86%, and O=61.54%. On heating to  $150^\circ$ , the acid C lost  $\text{CO}_2$  and gave the first acid.

17. Identify the compound A  
 (a)  $\text{H}_2\text{C}=\text{O}$   
 (b)  $\text{CH}_3-\underset{\text{OH}}{\text{CH}}-\text{COOH}$   
 (c)  $\text{CH}_3-\text{COOH}$   
 (d)  $\text{CH}_3-\underset{\text{OH}}{\text{CH}}-\underset{\text{OH}}{\text{CH}}-\text{COOH}$
18. Identify the compound B  
 (a)  $\text{H}_2\text{CCl}_2$   
 (b)  $\text{CH}_3-\text{CHCl}-\text{COOH}$   
 (c)  $\text{CH}_2\text{Cl}-\text{COOH}$   
 (d)  $\text{CH}_3-\text{CHCl}-\text{CHCl}-\text{COOH}$
19. Identify the compound C  
 (a)  $\text{H}_2\text{C}(\text{COOH})_2$   
 (b)  $\text{CH}_3-\text{CH}(\text{COOH})_2$   
 (c)  $\text{CH}_3(\text{COOH})_2$   
 (d)  $\text{CH}_3\text{CH}(\text{COOH})\text{CH}(\text{COOH})_2$

#### SECTION IV

20. Match the following:

1. phenol	a. Anti-knocking agent
2. $\text{Na}_2\text{SO}_3$	b. Antichlor
3. Tetra ethyl lead	c. General anaesthetic
4. Ethylene	d. Antiseptic

21. Match the following

1. Oppenauer oxidation	a. Peracids
2. Baeyer-villiger oxidation	b. $\text{CrO}_2\text{Cl}_2$

3. Etard reaction	c. Red P +Br <sub>2</sub>
4. Hell-vohlardt-Zelinsky reaction	d. Acetone/Al-isopropoxide

22. Match the following

1. Ionic strength	a. $\frac{1}{2} \sum C_i Z_i^2$
2. Chemical potential	b. $\left( \frac{\delta G}{\delta n_i} \right)_{T,P,n_j}$
3. Entropy of mixing	b. $nRT \sum X_i \ln X_i$
4. Free energy of mixing	d. $-nR \sum n_i \ln X_i$