

2019

Time : 3 hours

Full Marks : 60

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer any four questions in which

Q. No. 1 is compulsory and answer

at least **one** question from each Group.

1. Choose the correct answer of the **five** following :

1×15 = 15

(a) For the reaction $C + 2H_2 = CH_4$, $\Delta H - \Delta U$ is :

- (i) RT
- (ii) -RT
- (iii) 2RT
- (iv) -2RT

(b) The entropy of the system is a irreversible process :

- (i) Increased
- (ii) Decreased
- ~~(iii) Remains Constant~~
- (iv) None of the above

(c) A process is carried out at constant pressure and temperature. It will be spontaneous if :

- (i) $\Delta G < 0$
- ~~(ii) $\Delta H < 0$~~
- (iii) $\Delta U < 0$
- (iv) $\Delta S < 0$

(d) Select the correct relation :

- (i) $\Delta G^\circ = RT \ln K_p$
- (ii) $K_p = e^{-\Delta G^\circ / RT}$
- (iii) $K_p = e^{\Delta H^\circ / RT}$
- ~~(iv) $K_p = \Delta G^\circ / RT$~~

(e) The mathematical form of first law of thermodynamics is :

(i) $dq = du + dw$

(ii) $dq = du - dw$

~~(iii) $du = dq + dw$~~

(iv) None of the above

(f) $\text{CaCO}_3 \rightleftharpoons \text{CaO (S)} + \text{CO}_2(\text{g})$, the pressure of $\text{CO}_2(\text{g})$ in the above equilibrium increases when :

~~(i) A catalyst is added~~

(ii) T is increased

(iii) T is decreased

(iv) An inert gas is introduced, keeping T constant

(g) The pH of an aqueous solution of 10^{-8} M HCl will be :

(i) 8

~~(ii) 7~~

(iii) 9.54

(iv) 6.96

(h) When ethanol is treated with sodium metal ?

(i) Sodium ethoxide is formed

(ii) The sodium is oxidised

(iii) The acidic hydrogen is reduced

~~(iv) All these occur~~

(i) The role of AlCl_3 in alkylation of benzene with CH_3Cl is :

(i) The produce CH_3^{\oplus}

(ii) To produce Cl^{\oplus}

~~(iii) To produce AlCl_4^{\ominus}~~

(iv) None of the above

(j) The compound which reacts most readily with Lucas reagent is :

(i) $\text{CH}_3\text{CH}_2\text{Cl}$

~~(ii) $(\text{CH}_3)_2\text{CHOH}$~~

(iii) $\text{CH}_3\text{CH}_2\text{OH}$

(iv) $(\text{CH}_3)_3\text{COH}$

- (k) SN^1 reaction involves the formation of :
- (i) Carbon ion
 - (ii) Free radical
 - (iii) Carbocation
 - (iv) None of the above
- (l) When ethyl chloride is heated with AgCN, the main product is :
- (i) Ethyl cyanide
 - (ii) Ethyl amine
 - (iii) Ethyl isocyanide
 - (iv) None of the above
- (m) When ethyl methyl ether is treated with HI, the resulting iodide will be :
- (i) Ethyl iodide
 - (ii) Methyl iodide
 - (iii) Both (i) and (ii)
 - (iv) None of the above
- (n) Phenol is acidic because of :
- (i) Resonance

- (ii) Electromeric effect
 - (iii) Inductive effect
 - (iv) Peroxide effect
- (o) Ethanol on heating with conc. H_2SO_4 at 170°C gives :
- (i) Ethylene
 - (ii) Ethyl hydrogen sulphate
 - (iii) Diethyl ether
 - (iv) Diethyl sulphate

Group – A

- 2 (a) What do you understand by the terms Internal energy (ΔU) and Enthalpy change (ΔH) of a system ? Derive the relation between ΔU and ΔH . $7\frac{1}{2}$
- (b) State and explain the terms :
- (i) Heat capacity of a system
 - (ii) Molar heat capacity at constant volume and constant pressure i.e. C_v and C_p . $3+3\frac{1}{2} = 7\frac{1}{2}$

3. (a) What is the Buffer Solution ? Derive the Henderson's equation for determination of pH of Buffer mixture. $7\frac{1}{2}$

(b) Determine the pH of the following :

(i) 10^{-3} (N) H_2SO_4

(ii) 10^{-6} (M) NaOH

$$3 + 3\frac{1}{2} = 7\frac{1}{2}$$

4. Write short notes on any **two** of the following :

$$7\frac{1}{2} \times 2 = 15$$

(a) Strong moderate and weak electrolyte

(b) Ostwald's dilution law

(c) Common ion effect

Group - B

5. (a) Explain SN^1 and SN^2 reaction and also write the mechanism. $7\frac{1}{2}$

(b) Explain Saytzeff's rule with example. $7\frac{1}{2}$

6. (a) Discuss the mechanism of Reimer-Tiemann reaction. $7\frac{1}{2}$

(b) Write note on Electrophilic substitution reaction. $7\frac{1}{2}$

7. (a) How will you distinguish among 1° , 2° and 3° - alcohol ? 5

(b) How will you distinguish among ethanol and phenol ? 5

(c) p - nitrophenol is more soluble in water than o-nitrophenol why ? 5



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