

2020

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 atleast **one** question from each Group.

1. Choose the correct answer of the following :

1×15 = 15

(a) Which of the following is state function ?

- (i) Work
- (ii) Heat
- (iii) Internal energy
- (iv) None of these

(b) Ostwald dilution law is applicable for :

- (i) Strong electrolyte
- (ii) Weak electrolyte
- (iii) Both (i) and (ii)
- (iv) None of these

(c) Which of the following is an extensive property ?

- (i) Resistivity
- (ii) Refractive index
- (iii) Density
- (iv) Mass

(d) Consider the given reaction in equilibrium
 $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g}) ; \Delta H^\circ = -198 \text{ KJ}$. On the basis of Le-Chatelier principle, the condition favourable for the forward reaction is :

- (i) Decreasing the temperature and increasing pressure
- (ii) Increasing temperature as well as pressure

(iii) Any value of temperature and pressure

(iv) Lowering the temperature and pressure

(e) The relation between K_p & K_c for the reaction $2\text{NO}(\text{g}) + \text{Cl}_2(\text{g}) \rightleftharpoons 2\text{NOCl}(\text{g})$ is :

(i) $K_p = K_c / RT$

(ii) $K_p = K_c (RT)$

(iii) $K_p = K_c / (RT)^2$

(iv) $K_p = K_c$

(f) If H^+ ion concentration of a solution is increased by 10 times, its pH will :

(i) Increase by one

(ii) Remain unchanged

(iii) Decrease by one

(iv) Increase by 10

(g) When ammonium chloride is added to ammonia solution, the pH of the resulting solution :

(i) Increase

(ii) Become seven times

(iii) Not changed.

(iv) Decrease

(h) Which of the following species is used in the nitration of Benzene ?

(i) NO_2^-

(ii) NO_2^+

(iii) NO_3^-

(iv) NO_2

(i) Carbylamine test involves heating a mixture of :

(i) Alcoholic KOH, Methyl iodide and sodium metal

(ii) Alcoholic KOH, Methyl iodide and 1° amine

(iii) Alcoholic KOH, Chloroform and 1° amine

(iv) Alcoholic KOH, Methyl alcohol and 1° amine

(i) The SN^1 reaction is :

(i) One step reaction

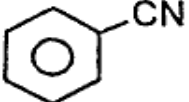
(ii) Two step reaction

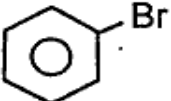
(ii) Three step reaction

(iv) None of these

(k) In Sandmeyer reaction, the final product is :

(i) CHCl_3

(ii) 

(iii) 

(iv) All of these

(l) Picric acid is :

(i) Inorganic acid

(ii) Strong acid

(iii) Weak acid

(iv) Having $-\text{COOH}$ functional group

(m) The pH of an aqueous solution of 10^{-8} HCl is :

(i) 8

(ii) 9.54

(iii) 7

(iv) 6.96

(n) Which of the following alcohols is the most reactive towards Sodium metal ?

(i) Methanol

(ii) Propan - 2 - ol

(iii) 2 - methylpropan - 2 - ol

(iv) Neopentyl alcohol

(o) For the conversion of ethyl bromide to nitroethane, which of the following reagent is suitable ?

(i) KNO_2

(ii) NaNO_2

(iii) AgNO_2

(iv) All of these

Group - A

2. Write notes on any two of the following :

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

(a) Hess' law

(b) Buffer solution

(c) Dissociation constant

3. (a) Define law of chemical equilibrium. How can it be derived thermodynamically? 10

(b) Write the application of solubility product. 5

4. Derive thermodynamically Kirchhoff's equation giving the variation of heat of reaction with temperature. 15

Group – B

5. Answer the following :

(a) Why phenol is more acidic than ethanol. 3

(b) Why ethanol is less acidic than water. 3

(c) Explain the mechanism of Sandmeyer reaction. <https://www.bbmkuonline.com> 5

(d) How does ethyl alcohol reacts with the following? $2 \times 2 = 4$

(i) NA

(ii) Acetic acid

6. Answer the following :

(a) Explain the term Nucleophilicity and basicity with suitable example. 5

(b) Explain why aryl halides have low reactivity during the nucleophilic substitution reaction. 5

(c) How alkyl halides are prepared from alcohol? Give two different methods. 5

7. (a) How benzene is prepared from acetylene? 3

(b) What is electrophilic substitution reaction? Discuss the mechanism of nitration of benzene. 7

(c) Discuss side chain oxidation of alkyl benzene. 5



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