VUG (2)–Chem (GE/Gen)

2020-23

Full Marks : 60

Time : 3 hours

Answer any **four** questions in which **Q.No.1** is compulsory.

The figures in the right-hand margin indicate marks.

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

1. Select the correct answer from the option given below : 1.5×10

(*a*) The solution with lowest pH value

(*i*) $CaCO_3$

(*ii*) $CaCl_2$

(*iii*) CH_3COONa

(*iv*) $Ca(OH)_2$

(*b*) In which of the following does the reaction go farthest ?

(*i*) $K = 10$

(*ii*) $K = 1$

(*iii*) $K = 10^{3}$

(*iv*) $K = 10^{-2}$

(*c*) A process which proceeds infinitesimally slowly is called

(*i*) Irreversible

(*ii*) Reversible

(*iii*) Isothermal

(*iv*) Adiabatic

(*d*) The mathematical form of first law of thermodynamics is

(*i*) $dq = du + dw$

(*ii*) $du = dq + dw$

(*iii*) $dq = du - dw$

(*iv*) None of these

(*e*) The heat constant of a system is called

(*i*) Entropy

(*ii*) Internal energy

(*iii*) Free energy

(*iv*) Enthalpy

(*f*) When ethylene glycol is heated with concentrated HNO_3 it forms

(*i*) Oxalic acid

(*ii*) Ethylene oxide

(*iii*) Diethylene glycol

(*iv*) Dioxane

(*g*) When phenol is treated with neutral $FeCl_3$ solution it develop

(*i*) Yellow colour

(*ii*) Violet colour

(*iii*) Green colour

(*iv*) No reaction

(*h*) 2-Bromo butane reacts with alcoholic KOH to give

(*i*) 2-Butene

(*ii*) 2-Butanol

(*iii*) 1-Butene

(*iv*) 1-Butanol

(*i*) Benzene reacts with benzoyl chloride in the presence of an hydrous aluminium chloride to form

(*i*) Benzal chloride

(*ii*) Benzyl chloride

(*iii*) Benzaldehyde

(*iv*) Benzophenone

(*j*) Sodium phenoxide reacts with CO_2 at 125 °C under pressure to give salicylic acid. This reaction is called

(*i*) HVZ reaction

(*ii*) Wurtz reaction

(*iii*) Kolbe-Schmidt reaction

(*iv*) Reimer-Tiemann reaction

2. (*a*) Deduce the relationship between Kp, Kc and Kx. 10

(*b*) State Le-Chatelier's principle. 5

3. What do you mean by solubility product ? How does the concept of solubility product principle help in

(*i*) Calculating solubility of sparingly soluble salts ?

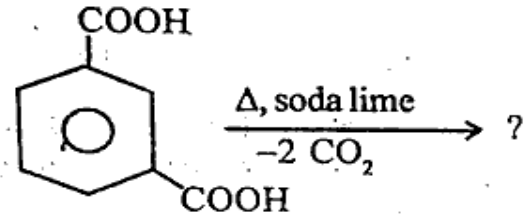
(*ii*) Predicting the precipitation of a salt ? 15

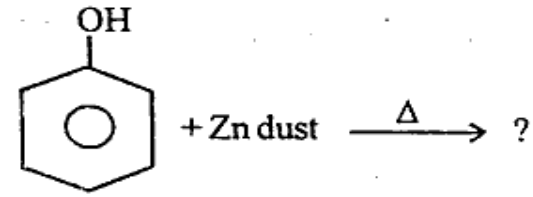
4. (*a*) What are bond energy, bond dissociation energy and resonance energy. 8

(*b*) Calculate the bond energy of C–C bond from the following data :
C–H bond energy = 413 kJ $mole^{-1}$, Enthalpies of formation of $C_2H_6(g)$, C(g) and H(g) are –85 kJ $mole^{-1}$, 716 kJ $mole^{-1}$ and 216.5 kJ $mole^{-1}$ respectively. 7

5. (*a*) What is Friedel Crafts reaction ? Discuss the mechanism of acylation of benzene. 7.5

(*b*) Complete the following : 7.5

(*i*) 

(*ii*) 

6. (*a*) What are Alkanols and how are they classified ? Give one example of each type. 5

(*b*) What are SN^1 and SN^2 reactions ? In what respects SN^2 reactions differ from SN^1 reaction. 5

(*c*) What is the action of the following on methyl iodide ? 5

(*i*) AgCN

(*ii*) KCN

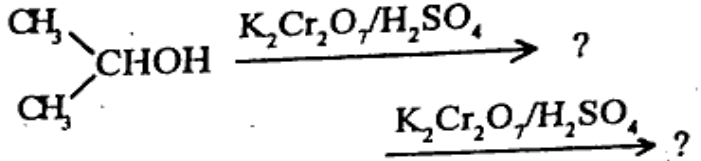
7. (*a*) What happen when : 7.5

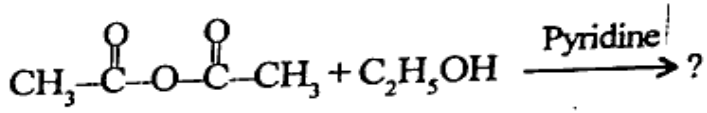
(*i*) Chlorine is passed through boiling toluene in the presence of sunlight.

(*ii*) Benzene reacts with ozone

(*iii*) Benzene is treated with acid chloride in the presence of Anhydrous $AlCl_3$.

(*b*) Complete the following : 7.5

(*i*) 

(*ii*) 

(*iii*) $CH_3OH + Na \longrightarrow$?

8. Write short notes on any *three* of the following : 5×3

(*a*) Reimer-Tiemann reaction

(*b*) Pinacol-Pinacolone rearrangement

(*c*) Lucas test

(*d*) Buffer solution

(*e*) Ionic product of water