RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. SIXTH SEMESTER EXAMINATION, MAY-JUNE 2013

THIRD YEAR

Date : 3/5/2013 **INDUSTRIAL CHEMISTRY (Honours)**

Time : 11 am – 1 pm Paper : VII (Gr. A) Full Marks : 50

[Use separate Answer Books for each Unit]

Unit - I

1. Choose the correct alternative (**any four**) : [4×1]

a) In contact process SO_3 is absorbed in 98% H_2SO_4 and not in water because—
   i) SO_3 is sparingly soluble in water
   ii) Water forms an acid mist which is difficult to absorb
   iii) the purity of acid is affected
   iv) to avoid scale formation absorber

b) Silicon is —
   i) thermoplastic
   ii) an inorganic polymer
   iii) a monomer
   iv) none of these

c) Mercury electrolytic cells are preferred over diaphragm electrolytic cell for the production of NaOH as it—
   i) has larger production capacity per unit cell
   ii) consumes less power per ton of Cl_2 produced
   iii) produces high purity caustic soda directly
   iv) all 'a' , 'b' and 'c' or none

d) Which of the following may be viewed as a catalyst in the manufacture of soda ash in Solvay process?
   i) NH_3 ii) NaCl iii) CaO iv) Coke

e) Silicon carbide
   i) is an adhesive ii) is an abrasive iii) is a type of glass iv) is brittle

f) The temperature in the calcium carbide furnace is
   i) 200 – 300°C ii) 700 – 8500°C iii) 2000 – 2200°C iv) 4000 – 4500°C

g) Urea auto clave is made of—
   i) cast iron ii) refractory blocks iii) Stainless steel iv) lead lined vessel

h) Fertiliser value of a nitrogeneous fertiliser is expressed in terms of its ..... content
   i) N_2 ii) KNO_3 iii) NO_2 iv) HNO_3

i) Phosphoric acid is produced in wet process from phosphate rock and
   i) dil. H_2SO_4 ii) conc. H_2SO_4 iii) conc. HNO_3 iv) conc. HCl

2. Write down the reactions involved in the production of **any three** of the following materials. Give examples of their uses (one) for each compound. [3×2]
   a) Ammonium nitrate
   b) Superphosphate
   c) Calcium Carbide
   d) Plaster of Paris
   e) Chloramine T
   f) Carbon black

3. Answer **any three** of the following questions : [3×10]
   a) i) What are the different types of electrolytic cells used for the manufacture of caustic soda and chlorine?
      ii) What is the difference between Membrane cell and Mercury cell?
      iii) Write the chemical reactions occurring in the membrane cell and briefly describe the process.
      iv) Draw a sketch of the membrane cell. [2+2+4+2]

b) i) Write down the manufacturing process with chemical reactions for the production of sulphuric acid by Contact Process.
ii) What are the basic differences between Contact Process and Chamber Process? Give materials of construction.
iii) Draw a flow sheet of the Process
iv) What is the effect of temperature in the conversion of Sulphuric acid by Contact process? [4+2+2+2]

c) i) Describe the manufacturing process for the production of Soda Ash by Solvay Process and modified Solvay process.
ii) Give the chemical reactions involved in the process.
iii) Give process flow sheet of Solvay Process.
iv) Mention two important uses of Soda Ash in industry. [4+2+2+2]

d) i) How Urea is manufactured starting from liq. CO_2 and liq. NH_3?
ii) Briefly describe the process giving chemical reactions.
iii) State the conditions for a good yield and a flow sheet of the production process.
iv) Explain with reactions the action of urea as fertilizer. [1+3+2+2+2]

e) i) How triple Superphosphate is prepared from Phosphate rock? [2]
ii) Give chemical reactions and flow sheet of the manufacturing process. State its uses. [4]
iii) What is NPK? How combination fertilizers are prepared? [1+3]

f) Give an outline of the method of manufacture of
i) Graphite from petroleum coke stating conditions of reactions. [3]
ii) Uses of Graphite in Industry. [2]
iii) Briefly describe the process of manufacture of Silicon Carbide. Give a flow sheet of the process with chemical reactions and its uses in the industry. [2+2+1]

Unit - IV

4. Answer **any two** questions : [2×5]

a) Write a simple flow diagram of paint manufacturing process.
b) Discuss the definition, functions, characteristics and examples of pigment.
c) Write a note on (**any two**)
i) Emulsion paints
ii) Varnish
iii) Lacquers

d) i) Define PVC (Pigment Volume Concentration) of a paint. [1]
ii) A seablue paint for automobile parts was prepared with following composition : [4]

	(Lit)
Pigment – Extender	
TiO_2 (Rutile)	8·0
Zinc Oxide	4·0
Copper Phthalocyanine Blue	2·0
Carbon Black	1·0
Barytes (Mineral)	20·0
Vehicle	
Butylated U-F resin in Xylol (50% solid)	100·0
D.C.O Alkyl Resin (60% solid)	500·0
Thinner	
N-Butanol	165·0
White Spirit (Petroleum)	100·0
Toluol	100·0

Calculate % PVC of the paint and comment whether it is a Primer or an Enamel.

e) Fill in the blanks : [5×1]

i) A lacquer dries by _____ of _____ A resin commonly employed in Lacquer Formulation is ____.

ii) Iron (Prussian) Blue is an _____ pigment but copper phthalocyanine is an _____ pigment.

iii) Oleoresinous varnish is made of _____, _____ and _____.

iv) A commonly used paint thinner (diluent) is _____.

v) Linseed oil and Tung (china wood) oil are _____ oils but coconut and castor are _____ oils.