

(36)

SARDAR PATEL UNIVERSITY
B.Sc. IIIrd Semester
Monday 26th November, 2012
Subject Code: US03CICH01
Heavy and Fine Chemicals
Industrial Chemistry

Time: 10.30 pm to 1.30 pm

Total Marks: 70

Q1. Write appropriate answer of the following.

[10]

1. ____ gas is used as bleaching agent in textile industry.
a. O₂ b. H₂ c. SO₂ d. CO₂
2. Dry ice is ____
a. CO₂ b. CO c. H₂O d. None of these
3. The super saturated SO₃ in water is called as ____
a. Oleum b. H₂SO₄ c. HNO₃ d. HCl
4. Soda ash is ____
a. NaOH b. Na₂CO₃ c. NaHCO₃ d. NaOCl
5. NaOCl is strong ____ agent.
a. Oxidizing b. bleaching c. reducing d. none of these
6. The common salt has the chemical formula ____
a. Na₂CO₃ b. NaHCO₃ c. NaCl d. NaOH
7. Electric furnace are mainly preferred as it can give as high temperature as ____ °C
a. 2000 b. 5000 c. 4100 d. 8000
8. H₂O₂ is used as ____.
a. Bleaching agent b. Reducing agent c. solvent d. None of these
9. The chemical formula of N,N-Dimethyl formamide is ____
a. (CH₃)₂NCHO b. (CH₃)₂-NCH₂ c. (CH₃)₂CONH₂
d. (CH₃)₂NHCO₂
10. The chemical formula of tetra hydro furan is ____
a. (CH₂)₄O b. (CH₃)₂NCOH c. C₄H₈O₂ d. (C₂H₅)₂O

- Q2.** Answer **ANY TEN** of the following. [20]
1. Write industrial uses of hydrogen.
 2. Write uses of carbon dioxide.
 3. Write chemical properties of H_2SO_4 .
 4. What are the sources of common salt?
 5. Write uses of NaOH .
 6. Enlist the different electrolyte cells used in manufacturing of NaOH .
 7. What are the advantages of electric furnace?
 8. Write uses of synthetic graphite.
 9. Write uses of KMnO_4 .
 10. Write properties of DMSO .
 11. Write uses of DMF .
 12. Write uses of Dioxane.
- Q3. (a).** Explain manufacture of oxygen and nitrogen by Linde's process. [06]
(b). Discuss physical and chemical properties of Nitric acid. [04]
- OR**
- Q3. (a).** Explain manufacture of Sulphuric acid by lead chamber process. [06]
(b). With the help of flow diagram discuss manufacture of CO_2 [04]
- Q4. (a).** Write manufacture of caustic soda by Lime soda process. [06]
(b). Write a short note on manufacture of sodium hypochlorite [04]
- OR**
- Q4. (a).** Explain manufacturing of caustic soda using Diaphragm cell. [06]
(b). Write a note on Solvay's ammonia soda process. [04]
- Q5.** Explain properties, manufacture and uses of Silicon Carbide. [10]
- OR**
- Q5.** Explain classification of electric furnace and the criteria for their selection. [10]
- Q6.** Write manufacturing of the following. [10]
1. THF 2. DMF
- OR**
- Q6.** Write manufacturing of the following. [10]
1. Dioxane 2. DMSO

- v. Write any two differences between purge and bypass operation.
- vi. Explain excess reactant and % conversion.
- vii. Explain spontaneous combustion.
- viii. Write about Net and Gross Calorific Value of the fuel.
- ix. Write energy balance equation.
- x. Draw different types of adsorption isotherms.
- xi. Define: Humidity and Humid heat.
- xii. Explain the terms: Adsorbent, Adsorbate
- Q.3 a)** List and explain different methods used to express composition of solution and mixtures. [5]
- b)** A flue gas has the composition CO_2 -80%, CO -16% and N_2 - 4% .All the % are by volume. Find the mole%, weight % and average molecular weight. [5]
- OR
- Q.3 a)** Write a note on: Critical Properties and its estimation. [5]
- b)** Define density and specific gravity .Also discuss about different specific gravity scales. [5]
- Q.4 a)** Discuss about different steps used to solve the material balance problems. [5]
- b)** A single effect evaporator is fed with 12,000 Kg/hr of weak liquor containing 15 % caustic by weight and is concentrated to get thick liquor containing 40 % caustic by weight. Calculate i) Kg/h of water evaporated ii) Kg/hr of thick liquor obtained. [5]
- OR
- Q.4 a)** Write a note on: Recycle Operation and its Industrial Applications. [5]
- b)** The spent acid is containing 33% H_2SO_4 , 35% HNO_3 , and rest water. This acid is to be strengthened by addition of concentrated sulphuric acid containing 95% H_2SO_4 and nitric acid containing 78% HNO_3 .The desired acid contains 40% H_2SO_4 ,43% HNO_3 and rest water. Calculate the quantities of spent acid and concentrated acids that should be mixed to yield 1500 kg of desired mixed acid. [5]
- Q.5 a)** Derive an equation of first law of thermodynamics for steady state steady flow process [5]
- b)** Find the minimum amount of air needed for complete combustion of one kg of coal which contains C kg carbon ,H kg hydrogen, S kg sulphur and O kg oxygen is given by $100/23[2.67 C+ 8H+ S - O]$. [5]
- OR
- Q.5 a)** Write a note on combustion reactions. [4]
- b)** Discuss about different types of energy. Also write the difference between the point function and path function. [6]
- Q.6 a)** Explain humidification and dehumidification. [4]
- b)** Write the difference between physical and chemical adsorption. Also discuss industrial applications of adsorption. [6]
- OR
- Q.6 a)** The dry bulb temperature and wet bulb temperature of air were found to be 29°C and 18°C respectively .The barometer reading was 750mmHg.Calculate
 i) Absolute Humidity ii) Molal Humidity iii) % Relative saturation.
 iv) Humid Volume v) Humid Heat.
 Vapor pressure at 29°C =30 mm Hg Vapor pressure at 18°C =15.5 mm Hg.
- b)** Write a note on: Langmuir adsorption isotherm. [5]