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**END SEMESTER EXAMINATION – 2022**

Semester : 4th

Branch : Chemical Engineering

Subject Code : Ch-402

**INDUSTRIAL CHEMICAL PROCESS – I**

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

**Instructions :**

1. *All* questions of PART – A are compulsory.
2. Answer any *five* questions from PART – B.

**PART – A**

Marks – 25

1. Fill in the blanks :

1×5=5

(a) Unit process is \_\_\_\_\_ conversion leading to synthesis of various useful products.

(b) Hardness of water is of \_\_\_\_\_ types.

[Turn over

- (c) The yield % of sulphuric acid for contact process is \_\_\_\_\_.
- (d) The removal of fine particles and dissolved solids called \_\_\_\_\_.
- (e) Unit operation involves a \_\_\_\_\_ change such as separation, filtration, evaporation.

2. State in the following statements which is True and which is False : 1×5=5

- (a) Sulphuric acid is used in the manufacture of fertilizers.
- (b) Boiler feed water should be hard in nature.
- (c) HCL can be manufactured by frash process.
- (d) In hard water, cleansing quality of soap is depressed.
- (e) Sodium carbonate is also known as baking soda.

3. Choose the correct option : 1×5=5

- (a) Water is
- (i) polar solvent
- (ii) non-polar solvent
- (iii) non-polar uncharge solvent
- (iv) an amphiphatic solvent

- (b) Pollution of water is responsible for
- (i) oil refineries
  - (ii) paper factories
  - (iii) sugar mills
  - (iv) All of these
- (c) Hardness of water is due to the presence of salts of
- (i) potassium
  - (ii) chlorine
  - (iii) magnesium
  - (iv) boron
- (d) Raw materials used in solvay process are
- (i) salt
  - (ii) limestone
  - (iii) coke
  - (iv) All of these
- (e) The acid used in lead storage battery cell is
- (i) phosphoric acid
  - (ii) sulphuric acid
  - (iii) nitric acid
  - (iv) hydrochloric acid.

4. Answer the following questions : 1×5=5

- (a) What is the full form of BOD ?
- (b) What is used as oxidizing agent in the determination of COD ?
- (c) What do you mean by polymerization ?
- (d) Write one application of caustic soda.
- (e) Which is faster and most accurate analysis method BOD or COD ?

5. Match the subjects of Column-I with the subjects of Column-II following : 1×5=5

COLUMN - I	COLUMN - II
(a) Contact process	(i) Nitric acid
(b) Electrolytic process	(ii) Sulphuric acid
(c) Ostwald process	(iii) Soda ash
(d) Solvay process	(iv) Caustic soda
(e) Frasch process	(v) Sulfur

PART - B

Marks - 45

6. (a) Write the two uses of Sulphuric acid. 2
- (b) Draw a neat flow chart and explain the contact process used in the manufacture of Sulphuric acid. 7

7. Write in details about the preparation of industrial process water with the help of a proper diagram. 9

8. (a) Which process is used in the manufacture of sodium carbonate and what is the other name of sodium carbonate? 2

(b) Draw a neat flow chart and explain the manufacturing process of sodium carbonate.

9. Draw a neat flow chart and explain the manufacturing process of nitric acid. 9

10. Differentiate between : 3×3=9

(a) Unit processes and Unit operations

(b) Nitration and Chlorination

(c) Hard water and Soft water.

11. Write short notes on : 3×3=9

(a) Physical and Chemical properties of HCl  
Acid

(b) Lagooning

(c) Bad effects of natural water on boilers.