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**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2020/2021 ACADEMIC YEAR FOUR**

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF SCHOOL OF PURE AND APPLIED SCIENCES**

**FOR THE DEGREE OF BACHELOR OF EDUCATION**

**COURSE CODE: CHE 401**

**COURSE TITLE: INDUSTRIAL CHEMISTRY I**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 09/10/2021 TIME: 12.00-2.00 PM**

**INSTRUCTION TO CANDIDATES**

* **The examination has FIVE (5) questions**
* **Question ONE (1) is COMPULSORY**
* **Choose any other TWO (2) questions from the remaining FOUR (4) questions**
* **Use sketch diagrams to illustrate your answer whenever necessary**
* **Do not carry mobile phones or any other written materials in examination room**
* **Do not write on this paper**

**This paper consists of FOUR (4) printed pages *please turn over***

**QUESTION ONE (COMPULSORY)**

1. Define the following as used in industrial and applied chemistry **(5marks)**
2. Pilot plants
3. Feedstock
4. Unit processes
5. Batch operations
6. Saponification
7. Distinguish between the following
8. Classical and Industry chemistry (**2marks)**
9. Catalytic cracking and Catalytic reforming (**2marks)**
10. Explain any four (4) significance of carrying out pilot plant projects **(4marks)**
11. What factors are used to classify an industry as heavy or light **(4marks**)
12. Give four reasons why the pulp and paper industry was located in Webuye, Western Kenya **(4marks)**
13. State any four major challenges facing pulp and paper industries in Kenya (**4marks)**
14. (I) Define Monomer **(1mark)**

**(**II**)** Vinylchloride undergoes copolymerization with 1,1-dichloroethylene to form a polymer, commercially known as saran, write equation for the polymerization (**4marks)**

**QUESTION TWO (20 MARKS)**

1. Define Portland cement (**2marks)**
2. Name and explain the role played by various constituents of clinker during manufacture of Portland cement (**8marks)**
3. Describe the reactions that takes place in a cement kiln at various temperature (**10marks)**

**QUESTION THREE (20 MARKS)**

1. What is meant by the term “ Chlor-alkali? **(1mark**)
2. Brine usually contains soluble calcium and magnesium salts. Explain how sodium carbonate is used to purify brine (**2marks**)
3. The set-up below can be used to produce sodium hydroxide by electrolyzing brine

**Membrane**

**Brine**

**Aqueous sodium hydroxide**

**Water**

**Y**

**Hydrogen**

1. Identify gas Y (**1mark**)
2. State two functions of the membrane (**2marks)**
3. Describe how aqueous sodium hydroxide is formed in the above set-up (**3marks)**
4. One of the uses of sodium hydroxide is in the manufacturing of soaps. State two other use of sodium hydroxide (**2marks)**
5. State any two advantages of membrane cells over diaphragm cells in the manufacture of Caustic soda (**2marks)**
6. Describe the process of extracting Aluminium from its chief ore **(5marks)**
7. Name two environmental effects caused by the extraction of aluminium **(2marks)**

**QUESTION FOUR (20 MARKS)**

1. In the Haber process, the optimum yield of ammonia is obtained when a temperature of 450oC a pressure of 2 atmospheres and a catalyst are used.
2. Name the catalyst **(1mark)**
3. How would the yield of ammonia be affected if the temperature was raised to 600oC? **(2 marks)**
4. Give one use of ammonia (**1mark)**
5. Nitrogen is one of the reactants used in the production of Ammonia, Name and state two sources of other reactant **(3marks)**
6. The first step in the industrial manufacture of Nitric (V) acid is the catalytic oxidation of Ammonia gas
7. What is the name of catalyst used? (**1mark)**
8. Write equation for the catalytic oxidation of Ammonia gas (**2marks)**
9. Nitric (V) acid is used to make ammonium nitrate. State two uses of Ammonium nitrate (**2marks)**
10. Why is Nitric (V) acid stored in dark bottles  **(1marks)**
11. A factory uses Nitric (V) acid and ammonia gas in the preparation of fertilizer. If the daily production of the fertilizer is 4800kg. Calculate the mass of ammonia gas used (N=14.0, O=16.0, H=1) **(3marks)**
12. When fuels burn in internal combustion engine at high temperature, one of the products formed is Nitrogen (II) oxide
13. Write the equation for the formation of Nitrogen (II) oxide (**1marks)**
14. Give reason why Nitrogen (II) oxide is not formed at room temperature **(2marks)**
15. State how Nitrogen (II) oxide affects the environment (**1mark)**

**QUESTION FIVE (20 MARKS)**

1. (i) Define petrochemicals **(1mark)**

 (ii) State any two examples of a petrochemical **(2marks)**

1. Explain how petroleum refining has evolved over the years as product specifications changed (**9 marks)**
2. Why is sulphur undesirable in fuel and how is it removed by hydrodesulphurization (4**marks)**
3. What is meant by the term “octane number**” (1mark)**
4. Explain why iso-alkanes are more preferred than the n-alkanes for use as internal combustion of engine **(2marks)**
5. Give one advantage of using petrol containing tetraethyl lead in motor vehicles **(1marks)**