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**UNIVERSITY EXAMINATIONS
2016/2017 ACADEMIC YEAR**

**FOURTH YEAR SECOND SEMESTER
MAIN EXAMINATIONS**

FOR THE DEGREE OF B.ED (SCIENCE)

COURSE CODE: SCH 400

COURSE TITLE: INDUSTRIAL CHEMISTRY

DURATION: 2 HOURS

DATE: 27TH SEPTEMBER 2017 TIME: 3 – 5PM

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of 5 printed pages. Please Turn Over



Question One (30 Marks)

- a) What are petrochemicals? [01]
- b) State any FOUR industrial uses of petro chemicals [02]
- c) Using a suitable diagram/schematic chart, show how primary petrochemicals are produced in an oil refinery. [04]
- d)
- i. Describe the composition of crude oil. [01]
 - ii. What are the environmental implications of oil exploration. [03]
- e) Ethylene is widely used in petrochemical industry as raw material for the production of plastics and industrial chemicals.
- i. Ethylene is produced industrially by **cracking**. Explain the meaning of cracking. [01]
 - ii. Differentiate between Thermal cracking and catalytic cracking. [02]
 - iii. Explain the advantages of catalytic cracking over steam cracking. [02]
- f) Ethanol and Ethan-1,2-diol (Ethylene glycol) are some of the chemicals that can be produced from ethylene.
- i. Write the chemical equations to show how ethanol and glycol are produced clearly indicating the conditions. [02]
 - ii. State One industrial use for
 - Ethanol [01]
 - Ethylene glycol. [01]
- g)
- i) Ethylene can, treated differently form the following key monomers in industry.
 - Vinyl chloride
 - StyreneDraw structures for the two monomers. [02]
 - ii) Why are additives added to polymers? Differentiate between stabilizers and plasticisers. [03]
 - iii) State two forms of polystyrene [02]
 - iv) The development of polymers have had a huge impact on society and environment; including manufacture of plastic bottles, disposable medical instruments and packaging materials. State any TWO advantages and disadvantages of plastics [03]

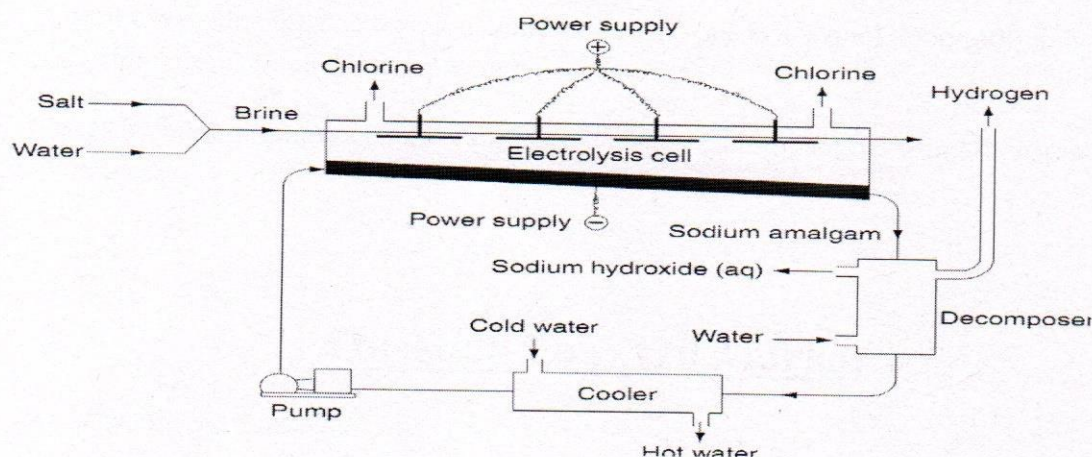
Question Two (20 marks)

- a) Define the following terms
- i. A dye [01]
 - ii. A pigment [01]
 - iii. Chromophore [01]
 - iv. Auxochrome [01]
- b) State any four properties of a good dye. [02]
- c) State any seven different classes of dyes. [01]
- d) Differentiate between an acid dye and a basic dye. Give examples of each. [02]
- e) Methyl orange is a typical Azo dye.
- i. What are Azo dyes [01]
 - ii. State any two properties of MO [02]
 - iii. State one key use of MO [01]
 - iv. Why is MO not used as a fabric dye. [01]
- i) What is the structure of a molecule of Methyl orange [02]
 - ii) Propose a mechanism for the synthesis of MO starting with benzene. [04]
 - iii) How can the colour of an Azo dye be modified? [01]

Question Three (20 Marks)

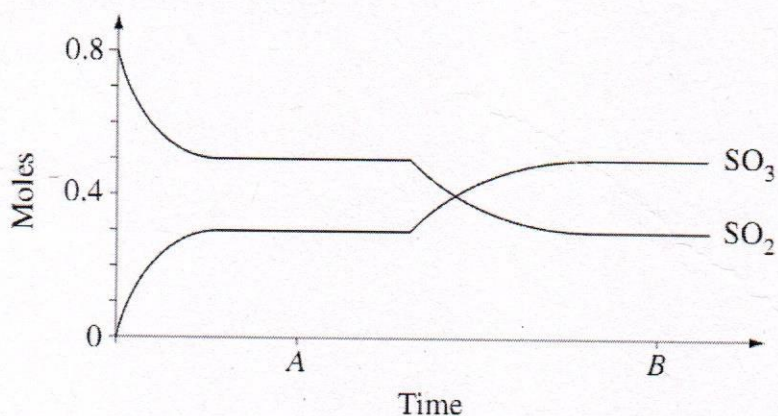
(a)

- i) Sodium carbonate (soda ash) is among top 10 important inorganic chemicals in industry. Describe **TWO** industrial large scale processes of producing soda ash. [05]
- ii) State **SIX** industrial uses of soda ash ? [03]
- iii) Identify the type of cell shown and outline the process used in the extraction of sodium hydroxide. [01]



b) Compare the electrolysis of molten sodium chloride and aqueous sodium chloride. Write the relevant half equations and overall reaction for each process. [02]

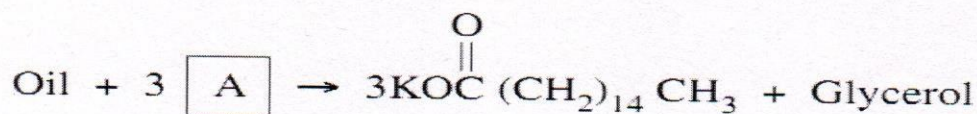
c) At room temperature 0.80 moles of SO_2 and 0.40 moles of O_2 were introduced into a sealed 10 L vessel and allowed to come to equilibrium.



d) Write the equilibrium constant expression and calculate the value for the equilibrium constant at time A. [02]

e) Explain why a new equilibrium position was established at time B. [01]

f) The equation represents a reaction that can be performed in a school laboratory.



Identify both this type of reaction and the reactant A. [02]

(ii) Describe how this type of reaction could be carried out in a school laboratory including specific safety precautions for this process. [02]

(e) Assess both the importance and resulting environmental impacts of using limestone in the Solvay process. [02]

Question Four (20 Marks)

- a) What are pesticides? [01]
- b)
- i. State any **Four** classes of pesticides by target. [04]
 - ii. State any **three** types of pesticides according to chemical families. [03]
 - iii. Explain briefly how a pesticides works. [02]
- c)
- i) What are '**carriers**' as used in pesticides and pest control? [01]
 - ii) Examples of pesticide carriers [02]
- d) Discuss the environmental impact of using pesticides. [03]
- e) Different techniques are employed by industry to recover priority pollutants during pesticide manufacturing. Explain any FOUR techniques of controlling pollutants by pesticides at source. [04]