THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. DEGREE INSCIENCE

INDUSRIAL CHEMISTRY – CMU3232

FINAL EXAMINATION 2015/16

Duration: Three hours (03)

Date: 15.01.2017 **Time: 9.30 a.m. – 12.30 p.m.**

Part II (60 marks)

Answer **four (04)** out of **six** questions including the **compulsory question number one.**

1. a. i. What do you understand by the term "throwing power" of an electroplating solution?
   ii. Define the term "perfect throwing power" of an electroplating solution.
   iii. Give **two** main factors that determine the throwing power.
   iv. Describe the term "anodysing" of a metal?

   (20 marks)

   b. i. State the function of a ball mill in ceramic industry.

   ii. Why is the said function important?. **(20 marks)**

   c. In the manufacture of poly vinyl acetate, describe how vinyl acetate is produced from ethylene. Give the method and relevant conditions used.

   (20 marks)

   d. i. What is meant by the term "interesterification of oils?

   ii. What is the purpose of doing interesterification of oils?

   iii. What is meant by the term "flash point"? **(15 marks)**

   e. i. What are essential oils? Give **three** uses of essential oils.

   ii. Essential oils are extracted from plant materials by various methods. Give suitable extraction method for extracting essential oils from Cinnamon bark, Cumin seed and Orange rind.

   iii. Give the **major** component of the following essential oils?

   Clove oil and Citronella oil

   (25 marks)

2. a. i. Write down the essential raw materials used in the manufacture of Portland cement.

ii. Draw the rotary kiln for wet process showing the different temperature zones within it. Identify the type of reactions that take place within these temperature zones.

(40 marks)

b. i. Distinguish between 'flash setting' and 'false setting'.

ii. To which crystalline phase is flash setting linked? How do you prevent flash setting?

Given below is the composition of two types of cement:

Cement A (%): $C_3S = 55$, $C_2S = 22$. $C_3A = 14$, $C_4AF = 9$

Cement B (%): $C_3S = 38$, $C_2S = 42$, $C_3A = 6$, $C_4AF = 14$

iii. Giving reasons, explain which type of cement is suitable for:

(α) High long- term strength requirement

(β) High rate of hydration requirement

(γ) Low heat of hydration requirement

iv. Which cement would you select for the purpose of construction of a dam for hydro- power generation?

(60 marks)

3. a. What is/are the main cause/s of charge development in clay minerals?

(20 marks)

b. It is said that hydrogen bonding plays an important role in determining its suitability of kaolinite as a raw material for traditional ceramics. Giving reasons explain this statement.

(30 marks)

c. Glasses of different kinds are produced to suit different purposes. Explain how the following glass types are suitable for the expected application by referring to their composition.

i. Fused silica glass ii. Photo chromic glass iii. Borosilicate glass

(30 marks)

d. i. What is SiAlON?

ii. Briefly discuss its application in ceramic industry.

(20 marks)

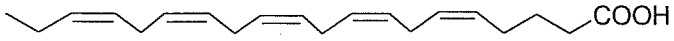
4. a. Describe the stages how is pure titanium dioxide manufactured from the ore using sulphate process.

(50 marks)

b. Explain the refining method of zircon (pure and less pure) into zirconium metal.

(50 marks)

5. a. i. Write down the IUPAC name of the following fatty acid



ii. Draw the fatty acid structure indicated by the short hand notation as 22:1(n-10)

iii. Briefly explain how the structure of fatty acids present in triglycerides affects the melting points of fats and oil.

(21 marks)

b. Define and state the significance of each of the following terms.

i. Acid value

ii. Saponification number/value

iii. Smoke point of fats and oils.

(25 marks)

c. Discuss the importance of the following processes during the refining process of vegetable oil.

i. Degumming ii. Neutralization

iii. Winterization iv. Bleaching

(20 marks)

d. Autoxidation is one of the most undesired processes that fats undergo.

i. Give a brief account of autoxidation

ii. Describe the mechanism for the formation of primary oxidation product (hydroperoxide) by autoxidation of methyl ester of oleic acid.

(34 marks)

6. a. i. What is thermal cracking?

ii. Describe how ethylene and branched hydrocarbons are formed during thermal cracking.

(40 marks)

b. i. Define the term "octane number".

ii. Briefly describe **two** ways in which the octane number may be enhanced.

(35 marks)

c. i. How is acrylonitrile produced from propylene?

ii. What are the industrial uses of acrylonitrile?

(25 marks)

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