



الإجابة النموذجية لامتحان مادة كيمياء المنظفات

كود المادة: (414ch)

(ورقة امتحانية كاملة)

المستوى : الرابع

التاريخ : الاربعاء 2019 / 6 /12

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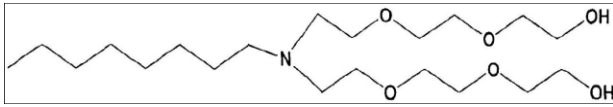
قسم : الكيمياء

كلية : العلوم

****Answer the following questions:-**

(48 Mark)

[Q1] Select and Copy the correct answer for each of the following (24X1 = 24 Mark)

1. Reaction of Ethylene oxide with.....produced **RO-[CH₂-CH₂-O]_n-H**
a. Fatty acid **b. Fatty alcohol** c. Fatty amine d. Fatty aldehyde
2. The best detergency of anionic surfactants is obtained with alkyl chain in range of
a. C₁₂-C₁₈ b. C₄-C₁₂ c. C₄-C₈ d. B & C
3. Nonionic surfactants bearing thiadiazole ring can be synthesized by reaction of fatty acid with thiosemicarbazide, then ethoxylate the product with
a. Propylene oxide b. Trimethylamine **c. Ethylene oxide** d. None of these
4. Cationic surfactants can be used as.....
a. Disinfectant b. fabric softeners c. Algacides for swimming pools **d. All of these**
5. Generally, CMC of ionic surfactants is.....than Non-ionic surfactants.
a. Higher b. Lower c. Moderate d. None of these
6. HLB value of addition of 10 moles of E.O to lauryl alcohol (CH₃-(CH₂)₁₀-CH₂-OH) equal.....
a. 12 b. 10 **c. 14** d. 18
7. The species pictured  is..... surfactant
a. Amphoteric. b. Anionic c. Cationic **d. Non-ionic**
8. When adding surfactants into a liquid composed of two immiscible phases such as oil and water, the main result is.....
a. Reduction in the interfacial tension between the phases
b. Increase in the interfacial tension between the phases
c. Catalysation of a chemical reaction between the phases d. Nothing happens
9. Because of high cost,surfactant is rarely employed as a laundry detergents.
a. Non-ionic b. Anionic c. Cationic **d. Amphoteric**
10. Eco- friendly detergent should be biodegradable within.....days ?
a. 10 **b. 7** c. 30 d. 60
11.is a type of **ion exchange builders**, which can form in soluble complexes with Ca²⁺ or Mg²⁺
a. Sodium tripolyphosphate b. Sodium succinate **c. Zeolites** d. a and b

12. A good surfactant will have a

- a. hydrophobic head and tail. **b. hydrophilic head and a long hydrophobic tail.**
c. hydrophilic head and tail. d. hydrophilic head and a short hydrophobic tail.

13. Cationic surfactants is a type of surfactant in which the polar head group is.....

- a. -ve (ly) charged b. Either +ve (ly) or -ve (ly) charged
c. Uncharged **d. +ve (ly) charged**

14. An appropriate use of a non-ionic detergent is a.....?

- a. Fire suppressing agent b. Liquid hand soap
c. Powder for front-loading washing machines d. None of these

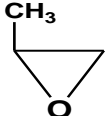
15. Which of the following parameters characterize the anionic surfactants?

- a. Cloud point b. Ca²⁺ Stability c. Kraft point **d. B & C**

16. Carboxy methyl cellulose (CMC), is a type of, which added to detergent.

- a. Alkali. **b. Anti-redeposition agents** c. Builders. d. Enzymes

17. Cationic surfuractant bearing pyridine ring can be prepared by reaction of pyridine with.....

- a.  **b. ClCH₂COOR** c. ClCH₂-CH(OH)-SO₃Na d. None of these

18.surfactant is a type of surfactant which contain more than one hydrophilic and hydrophobic group linked together by a spacer.

- a. Amphoteric **b. Gemini** c. Non-ionic d. Anionic

19. The hydrophilic groups in anionic surfactants may be

- a. Phosphates b. Carboxylates c. Sulphates or Sulphonates **d. All of these**

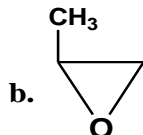
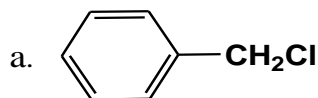
20. Which of the following are **water soluble builders**, which fall out from the solution when form complexes with Ca²⁺ or Mg²⁺ ?

- a. Precipitating** b. Sequestrating. c. Ion-exchange d. None of these

21. In Soap, the "water-loving" end of the soap molecule attracts water molecule and the "water-hating" end attracts:

- a. Other soap molecules **b. Grease or dirt.** c. Another water molecule. d. None of these

22. Amphoteric surfactants can be prepared by reaction of $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\overset{\text{H}}{\text{N}}-(\text{CH}_2)_3\overset{\text{I}}{\text{N}}$ with.....



c. **$\text{ClCH}_2\text{COONa}$**

d. None of these

23. A surfactant with a lower (HLB) value (e.g. 2) is expected to function as a:

a. Anti-foaming agent

b. Water in oil (w/o) emulsifier

c. Oil in water (o/w) emulsifier

d. Solubilizing agent

24. Which of the following would be an appropriate use of **Anionic surfactants**?

a. Fire suppressing agents.

b. Skin antiseptics

c. Detergents for front loaded machine

d. Biocides

[Q2] (A). Define each of the following Terms: (Select Only Six) [9 Mark]

i. Amphiphilic molecule

Certain molecules which contain two distinct components differing in their affinity for solutes, the part of molecule which has an affinity for polar solutes such as water and called (Hydrophilic) and part of the molecule which has an affinity for non-polar solutes called (Hydrophobic) and these compounds can act as emulsifiers, wetting agents,.....etc.

ii. Amphoteric surfactants

Is a type of surfactants, which carry both a negative and positive charge in their head group, so it has both acidic and basic properties depend on the media.

iii. HLB

It is called the hydrophile-lipophile balance, and it is the ratio of oil soluble and water-soluble portions of a molecule. A numerical scale from 0 to 20 is used to represent the balance between hydrophobic and hydrophilic properties of surfctants.

HLB- 0 (zero) implies 100% hydrophobic and 20 implies 100% hydrophilic. and nonionic surfactants fall in between the two extreme.

iv. Wetting time

It is the concentration of the surfactant at which a special purpose cotton fabric circle sinks after a time, nonionic surfactants are among the most powerful wetting agents. And it depend on several factors such as diffusion, surface tension, concentration and roughness of fiber surface

v. Kraft point

The temperature at which ionic surfactant separate from solution by cooling. or the minimum temperature at which a surfactant can form micelles, i.e. the surfactant solubility equals to its critical micelle concentration (CMC).

vi. CMC

The minimum concentration at which globe molecules from surfactant begin to form micells, and all additional surfactants added to the system go to micelles.

vii. Biodegradability

The capability of surfactant to be slowly destroyed and broken down into very small parts by natural processes, such as bacteria, fungi, or other biological means etc.

This means that biodegradable simply means to be consumed by microorganisms,

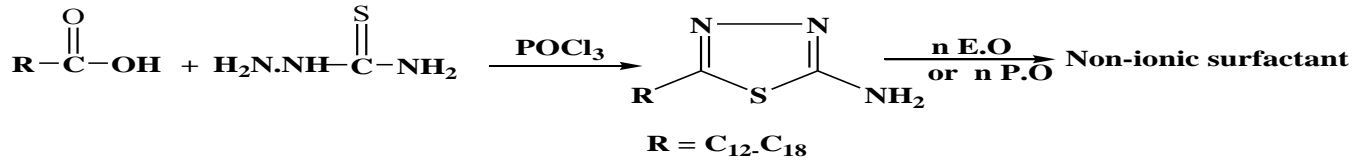
The term is often used in relation to ecology, waste management, biomedicine, and the natural environment (bioremediation) and is now commonly associated with environmentally friendly products that are capable of decomposing back into natural elements.

(B). Show how can you prepare **Only Three** of the following (**(i) is Obligatory**):**[15 Mark]**

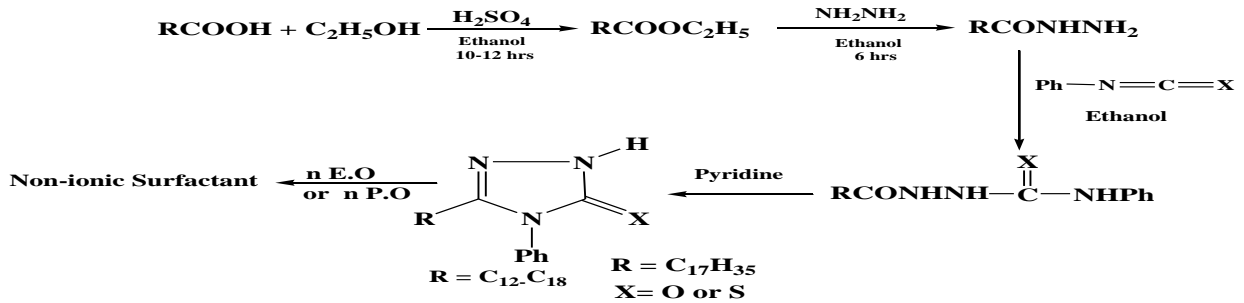
i) Non-ionic surfactant

[9 Mark]

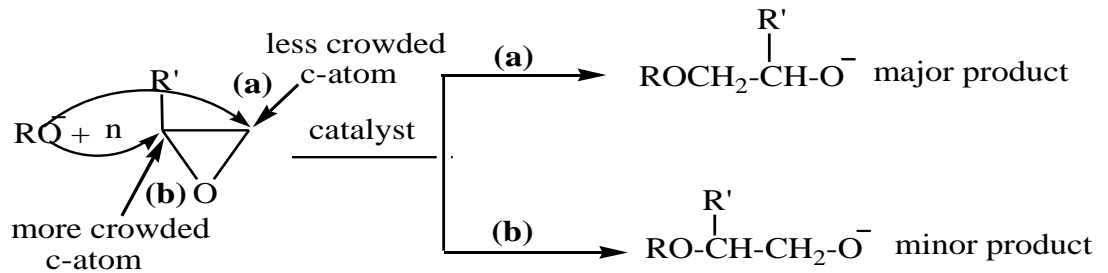
a) Bearing heterocyclic moiety



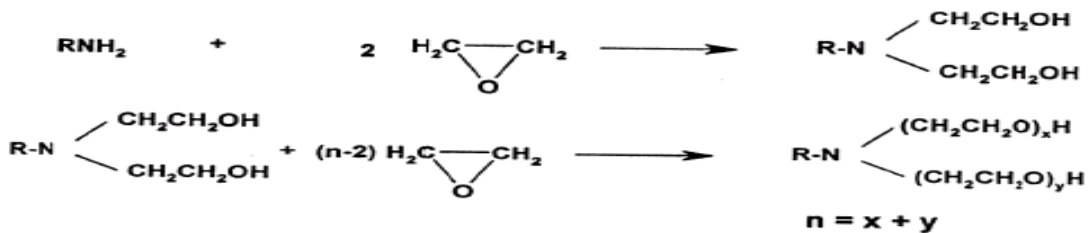
Another method



b) Using fatty alcohol as a substrate



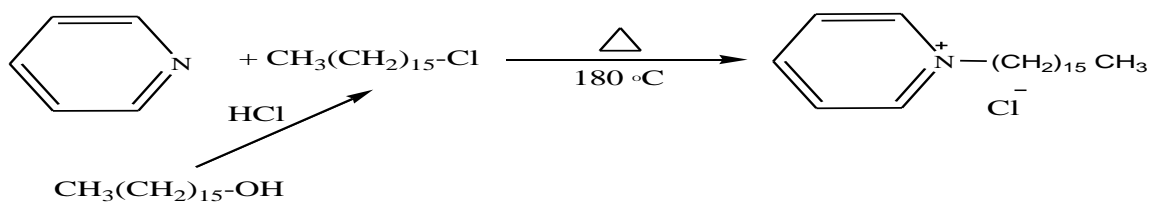
c) Using fatty amine as a substrate



ii) Cationic surfactant containing pyridine ring

[3 Mark]

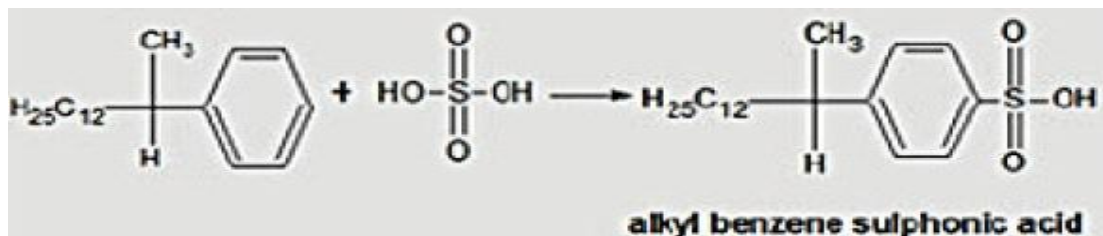
Cetyl pyridinium chloride



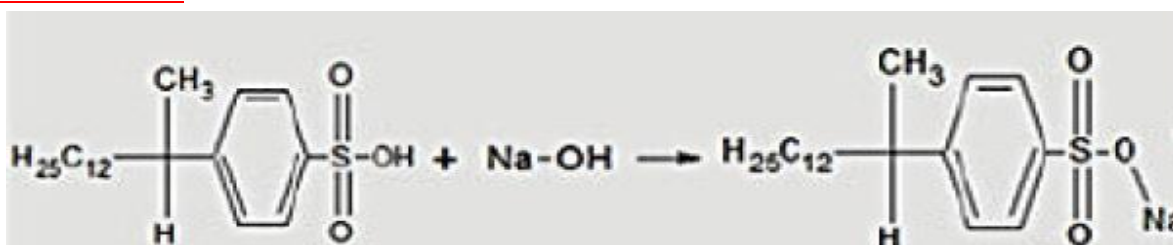
iii) Sulphonation of linear alkyl benzene

[3 Mark]

1. Sulphonation



2. Neutralization

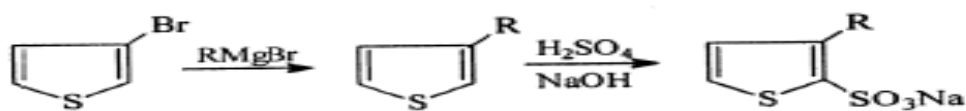


Sodium alkyl benzene sulphonate

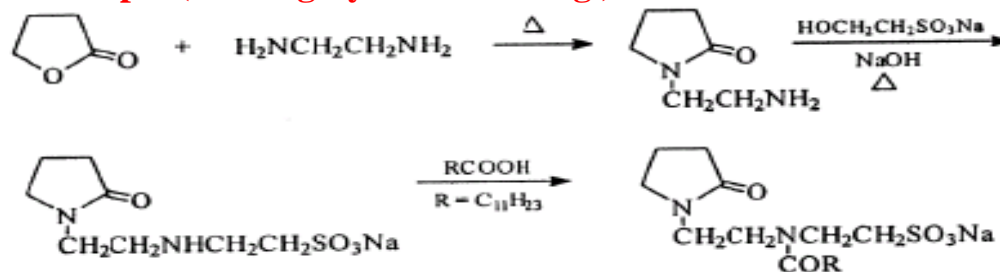
iv) **Anionic surfactant** bearing heterocyclic moiety

[3 Mark]

Thiophene ring



Another example (Bearing Pyrrolidone ring)



All the best wishes,
Dr. Abdelmotaal El-Sheikh