الإجابة النموذجية لامتحان الصناعات الصغيرة

210 ك

(ورقة امتحانية كاملة)

الفرقة : الثانية

الشعبة : كيمياء تطبيقية

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الممتحن : د/ عبد المتعال عبدالمجيد الشيخ

قسم : الكيمياء

كلية : العلوم

Question No	*Answer*
1	**a**
2	**b**
3	**c**
4	**a**
5	**b**
6	**d**
7	**d**
8	**c**
9	**c**
10	**c**
11	**d**
12	**a**
13	**c**
14	**b**
15	**b**
16	**a**
17	**b**
18	**a**
19	**c**
20	**a**
21	**c**
22	**c**
23	**c**
24	**a**
25	**b**
26	**b**
27	**d**

Question No	*Answer*
28	**c**
29	**d**
30	**d**
31	**d**
32	**b**
33	**d**
34	**c**
35	**d**
36	**c**
37	**c**
38	**a**
39	**c**
40	**d**
41	**b**
42	**a**
43	**d**
44	**b**
45	**b**
46	**a**
47	**c**
48	**a**

Section II (24 Mark)

1. Mention :

a. The different types of paints and coatings? (8 Mark)

- Oil- based coatings
- Cellulose-based coatings
- Organic Cellulose ester coatings
- Chlorinated rubber coatings
- Vinyl coatings
- Acrylic coatings
- Alkyd coating
- Saturated polyester coating
- Unsaturated polyester coatings
- Polyurethane coatings
- Epoxy coatings
- Silicone coatings
- Phenolic resin for coatings
- Asphalt, bitumen, and pitch coatings

b. The main composition of paints (4 Mark)

Paints are made of various components, depending on the method of application.

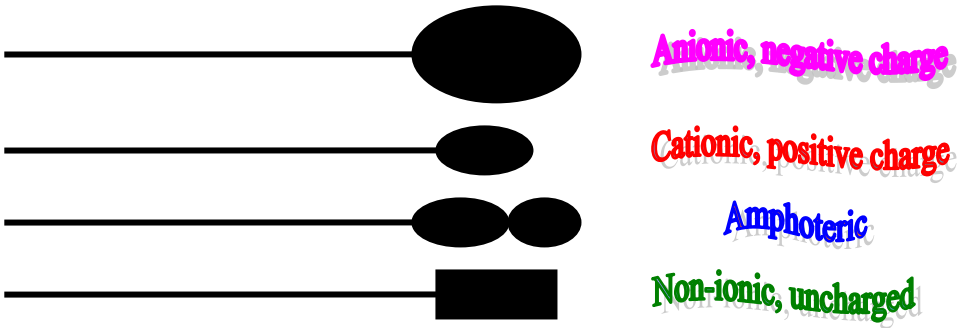
The main components can be listed as the following.

- Binders and Resins.
- Plasticizers.
- Pigments.
- Solvents.
- Additives.

2. Discuss (with examples) the classification of :

a. Surfactants according to the polar head group? (6 Mark)

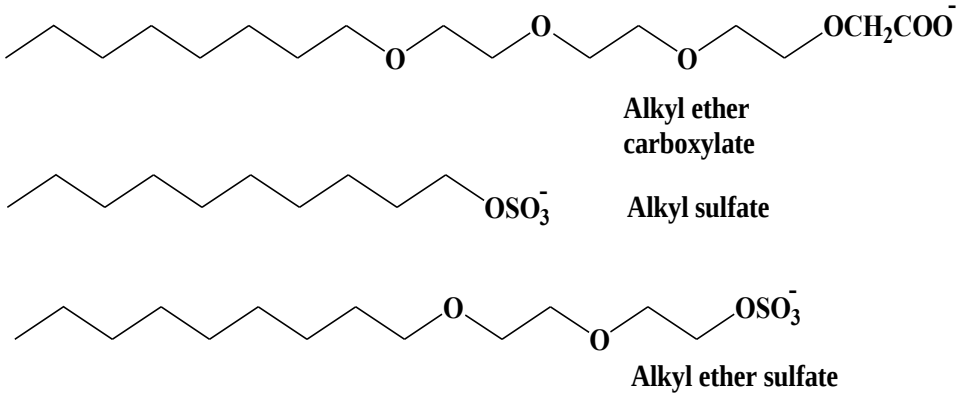
The primary classification of surfactants is made on the basis of the charge of the polar head group. It was divided into four different main types, anionics, cationics, non ionics and amphoteric surfactants. Anionic and cationic surfactants carry negative and positive charges on their head groups, respectively; the non ionics are uncharged head group, and amphoteric surfactants which may be anionic or cationic depending on the pH of the solution.

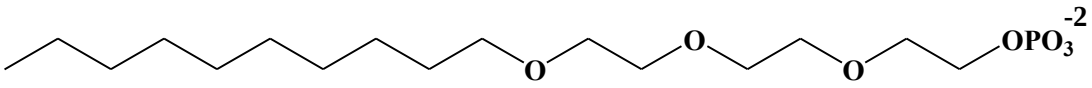


1. Anionic surfactants:

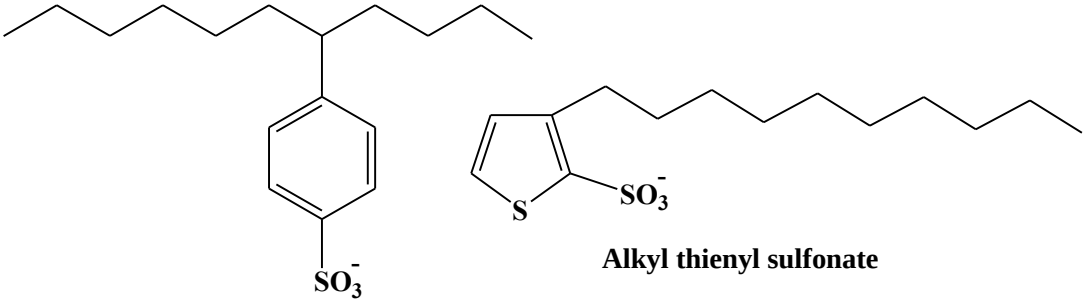
These are consisting of a linear or branched chain with polar negative group (carboxylate, sulfate, sulfonate or phosphate) which is response for surface character.

They are capable of undergoing ionization in solution to oil soluble anion and metallic cation. The most common cation used are sodium and potassium. Examples of anionic surfactants.





Alkyl ether phosphate

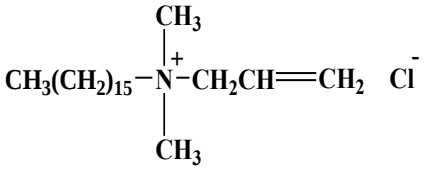


Alkyl thienyl sulfonate

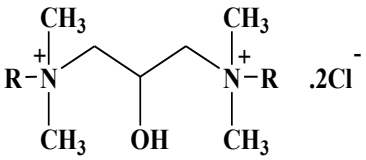
Alkyl benzene sulfonate

2. Cationic surfactants:

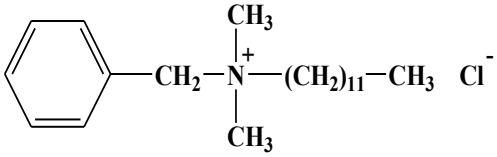
They are consist of a hydrophobic hydrocarbon group and one or more hydrophilic groups which dissociate in aqueous medium. Most of their hydrophilic groups have a nitrogen atom carrying the positive charge which is the carrier of the surface active properties of this type. Examples of cationic surfactants.



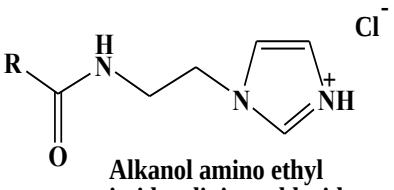
Alkyl amine salt



Alkyl diamine salt



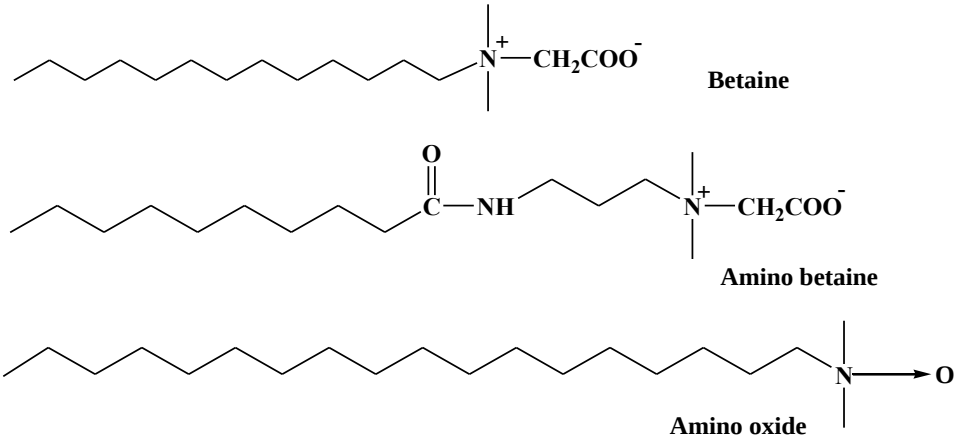
Benzyl alkyl amine salt



Alkanol amino ethyl imidazolinium chloride

3. Amphoteric surfactants:

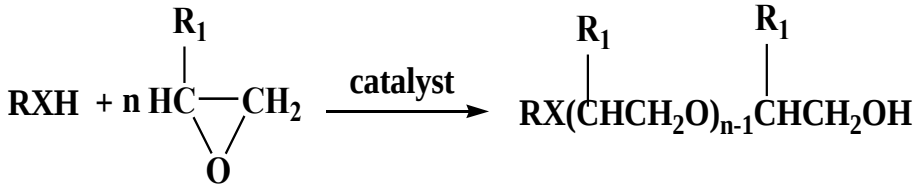
They are surfactants which in aqueus solutions contain a positive and a negative charge in the same molecule depending on composition and conditions of the medium, i.e pH of the medium affects on the behaviour of the substrate. Most amphoteric surfactants are able to behave as cationic surfactant in acidic media and as anionic surfactants in alkaline media. Examples of amphoteric surfactants.



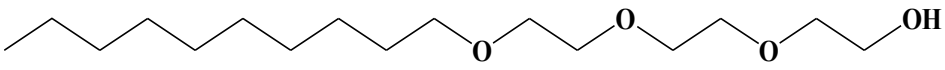
4. Nonionic surfactants:

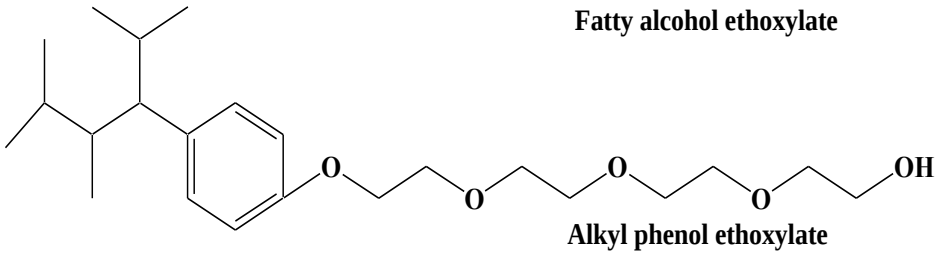
Alkylene oxide (Ethylene oxide and propylene oxide) is one of the principal process employed to introduce hydrophilic functional into the molecular structure of hydrophobic compound. The ultimat objective of the process is the production of the surface active agents having the desired hydrophile-hydrophobe balance for such commercial applications as detergency, emulsification, wetting textile processing.

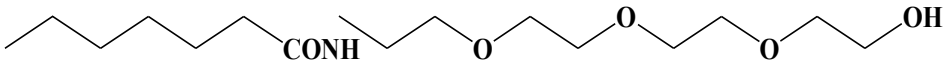
Alkylene oxide is characterized by great reactivity, this is due to their structure contains three membered ring undergo great strain and can readily be opened, result to fast added to the compounds having active hydrogen atom in their functional group to form hydroxyethyl or hydroxypropyl derivatives.



Where R=alkyl fatty chain, X= O, N or S, R_1=H or CH_3, n= moles of EO or PO


Fatty alcohol ethoxylate


Alkyl phenol ethoxylate


Fatty amide ethoxylate

b. Dyes according to their application (6Mark)

i. Direct Dyes

This type of dye come in intimate contact with the material, they are divided into acidic and basic dyes depending on their chemical nature. These dyes are fixed to the material through reaction of their acidic or basic groups with an appropriate reactive center on the fibre structure.

These dyes are almost used for Wool, Silk, Leather and Paper.

ii. Mordant Dyes

These dyes are fixed to the material by aid of intermediary substance of colloidal nature as the metallic hydroxides (such as iron, aluminum, chromium, etc…), such mordants becomes strongly adsorbed to the fibre surfaces and react with the acidic portions of the dye giving coloured complexes known as lakes.

The use of different metallic mordants introduces some variation in the colour even when the same dye molecule is used.

Tannic acid is used as a mordant for basic dyes but is should be attached to the fibre using metallic hydroxides.

iii. Substantive Dyes

These dyes are a type of direct dyes, but they are fixed by adsorption owing to their colloidal nature. Cotton, rayon acetate, rayon fibres could be dyed in this way.

iv. Vat Dyes

These dyes are similar to the ingrain dyes in that the final dye molecule is prepared within the network of macromolecule of the fiber. The difference is that the vat dyes are fixed within the fiber structure by on oxidation process. Several dyes of this class were known to the ancients, such as indigo.

In applying a vat dye to the fabric, the dye must at first be reduced with sodium hydrosulphite ($\mathbf{Na_2}S_2O_4$), or there suitable reducing agents, in tank out of contact with air. The reduced product which is known as the " leuco form " is soluble and is either colourless or at least, less coloured than the final dye and has a distinct affinity for textile fibres. the fiber is then impregnated with the soluble leuco from of the dye. Upon exposure to the air or other oxidizing agents, an insoluble and

more highly coloured molecule is obtained which becomes trapped in the fiber structure. The name vat dyes is derived from the fact that in the early dye industry , the leuco form was prepared in the vats used for fermentation.

v. Ingrain Dyes (developed)

These dyes are produced in the fiber. Such dyes are assembled within the network of macromolecule which make up the fiber. This is the case of dyes obtained by the coupling reaction of the diazonium salts. In thiscase the fiber is first soaked in a substance capable of undergoing a coupling reaction (phenol or amine) with the diazonium salt, here upon azo-dye is produced, or vice versa.

All the Best wishes,

Dr. Abdelmotaal El-Sheikh