الاجابه النموذجيه لامتحان ماده البترول والبوليمرات-**الفرقة**

الرابعة

(ورقه امتحانيه **كامله**)

اليوم: الاحد الموافق الثانى والعشرون من شهر يناير ٢٠١٧

٢٢-٠١-٢٠١٧

أستاذ المادة : د. **أحمد حمدي طنطاوي عبد المنعم**

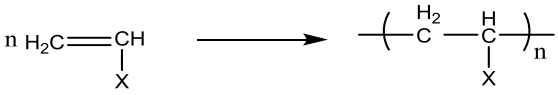
زمن الامتحان: ساعتين

Section A (petroleum) *24 marks*

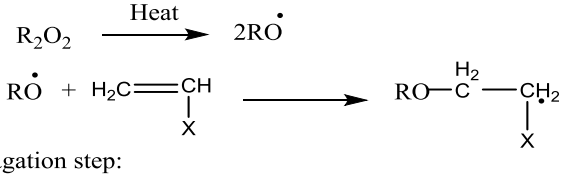
[1]- a) Complete:

1) Polymer
2) Homopolymer
3) Monomer
4) Copolymer
5) Polymerization reactions

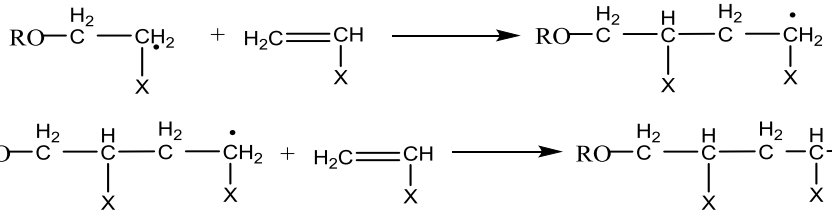
b) Give the mechanism of free radical polymerization of vinyl mnonmers



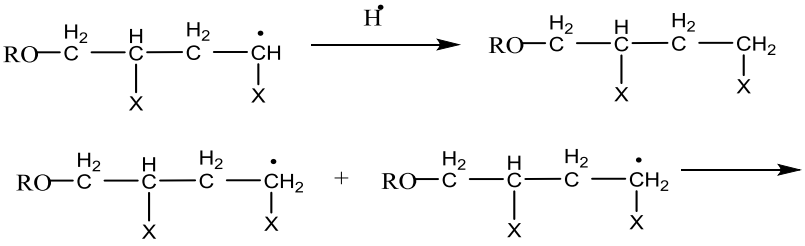
Initiation step:



Propagation step:

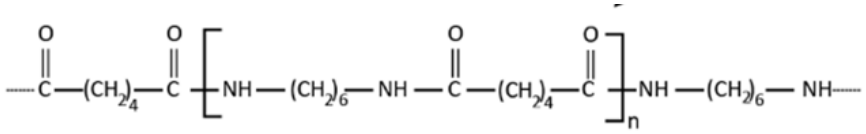


Termination step:



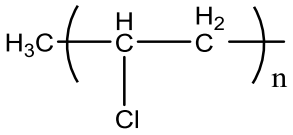
c) Give the structure for the following:

(i)

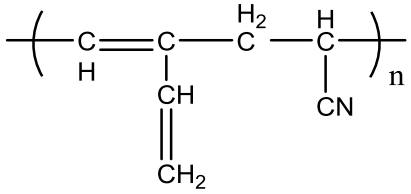


poly (hexamethylene adipamide), called nylon 6,6

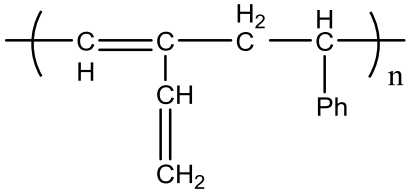
(ii)



(ii)



(iv)



[2]

a) identify the repeating unit in the following polymer and dteremnie the structure of the monomer:

i) Ethylene $CH_2=CH_2$

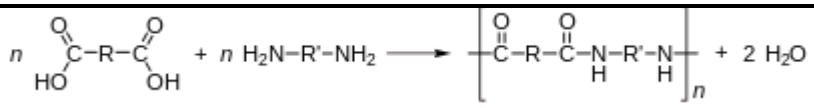
ii) methylmethacrylate CH_3-CH=CH-$COOCH_3$

iii) Acrylonitril $CH_2=CH-CN$

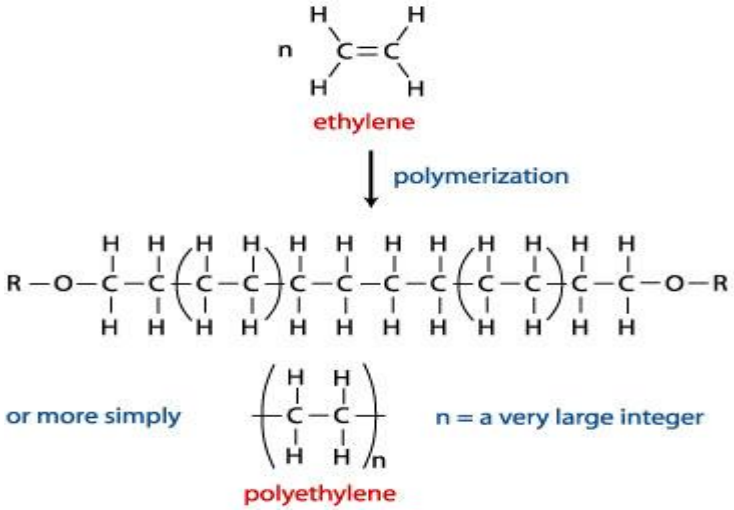
iv) Butadiene $CH_2=CH-CH=CH_2$

b) Define: (give examples in each case)

i) condensation polymers: are any kind of polymers formed through a condensation reaction—where molecules join together—*losing* small molecules as by-products such as water or methanol

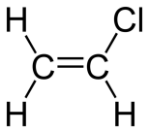


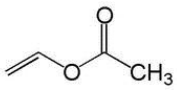
ii) Organic polymers: is a polymer which is formed by an addition reaction, where many monomers bond together via rearrangement of bonds without the loss of any atom or molecule under specific condition of heat, pressure, catalyst. This is in contrast to a condensation polymer which is formed by a condensation reaction where a molecule, usually water, is lost during the formation



iii) Vinyl monomer:

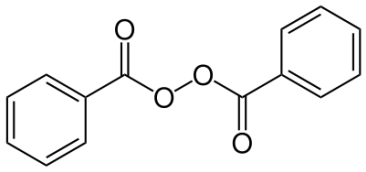
vinyl or ethenyl is the functional group $-CH=CH_2$, namely the ethylene (IUPAC ethene) molecule ($H_2C=CH_2$) minus one hydrogen atom. The name is also used for any compound containing that group, namely $R-CH=CH_2$ where R is any other group of atoms





iv) Initiator:

Benzoyl peroxide



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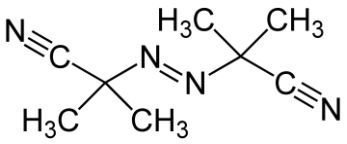
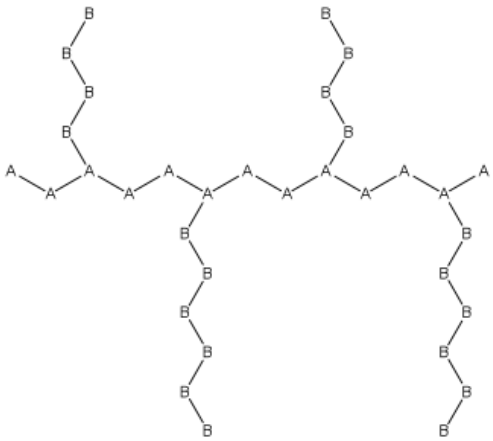


c) What is the difference between :

i) Graft and block polymers

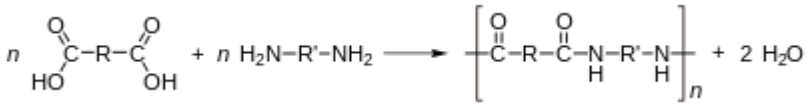
Graft Polymers are segmented copolymers with a linear backbone of one composite and randomly distributed branches of another composite. The picture labeled "graft polymer" shows how grafted chains of species B are covalently bonded to polymer species A.



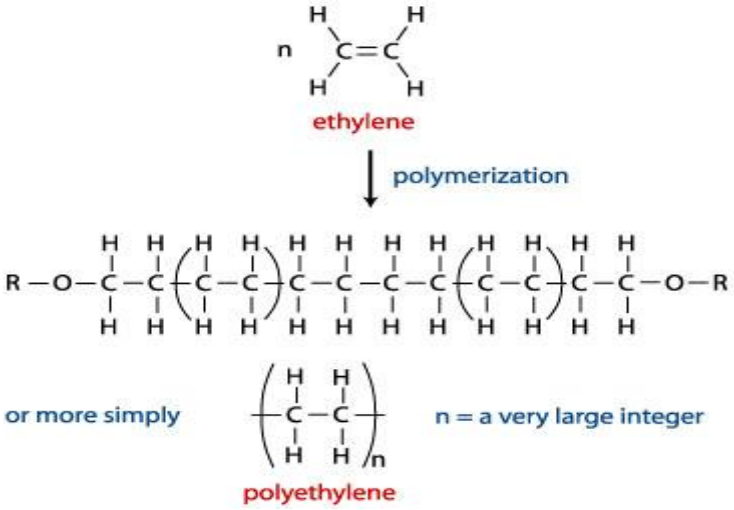
Block copolymers comprise two or more homopolymer subunits linked by covalent bonds . The union of the homopolymer subunits may require an intermediate non-repeating subunit, known as a junction block. Block copolymers with two or three distinct blocks are called diblock copolymers and triblock copolymers, respectively.

A-A-A-A-A-A-B-B-B-B-B-B

ii) condensation polymers: are any kind of polymers formed through a condensation reaction—where molecules join together—*losing* small molecules as by-products such as water or methanol



<u>Addition polymers:</u> is a polymer which is formed by an addition reaction, where many monomers bond together via rearrangement of bonds without the loss of any atom or molecule under specific condition of heat, pressure, catalyst. This is in contrast to a condensation polymer which is formed by a condensation reaction where a molecule, usually water, is lost during the formation.



Part (B): Petroleum 24 marks

Answer the following questions:

[1]- Choose the correct answer: *(12 marks)*

1. **The octane number of n-hexane is……**
   a) Zero b) 100 c) 50 d) None of them
2. **The inorganic theory of origin of petroleum is based on the presence of ……compounds**
   a) Paraffinic gases b) Organic nitrogen c) Optically active d) all of them
3. **Pyrridine has basicity ……pyrrole.**
   a) Higher than. b) Lower than. c) Equal to. d) None of them.
4. **Refractive index is the ……of light in vacuum to the light in the substance of the same wave length.**
   a) Viscosity b) Density. c) Volume d) Velocity
5. **Aniline point value indicated to the fraction of ……. present in the crude oil.**
   a) Aromatics. b) Naphthens c) Olefins. d) Alkane.
6. **The calculation of diesel index depends on…….. point.**
   a) Cloud b) Freezing c) Boiling d) Aniline.
7. **Petroleum in water emulsion type means the higher amount of ……part**
   a) Hydrophilic b) Hydrophobic c) Petroleum d) None of them
8. **Separation processes are based on the difference in the…….properties of hydrocarbons**
   a) Physical b) Chemical c) Physicochemical d) Boiling.
9. **Gasoline can be separated at boiling point up to …….^{o}C**
   a) 150 b) 200 c) 250 d) 300
10. **The organic theory is depended on the presence of…….. compounds**
    a) Paraffinic. b) Olefinic. c) Aromatic. d) Organic nitrogen.
11. **Solvent extraction is used to remove…….... compounds from kerosene.**
    a) Alkanes b) Olefins c) Sulphur d) Aromatics
12. **The aim of cracking process is used to improve the quality of …….**
    a) Kerosene b) Diesel c) Solar d) Gasoline
13. **…… compounds are obtained by pyrolysis process.**
    a) Alkanes b) Olefins c) Naphthens d) All of them
14. **Octane number is used to measure the quality of…….**
    a) Kerosene b) Gasoline c) Diesel fuel d) Lubricating oil
15. **…….is used to raise the octane number.**
    a) Lead acetate b) Tetraethyl lead c) Ethyl lead d) Methyl lead
16. **…….. is used to elevate the octane number.**
    a) Isoalkanes b) Olefins c) Aromatics d) All of them
17. **Cetane number is used to evaluate the quality of……...**
    a) Gasoline b) Kerosene c) Solar d) Diesel
18. **Cetane number is the volume fraction (in%) of cetane in a mixture with……. Equivalent in its self ignition properties.**
    a) 1-methyl-2-naphthol b) 2-methyl-1-naphthalene c) Naphthalene d) 1-methyl naphthalene
19. **The cetane number of hexadecane is……**
    a) one b) Zero c) 100 d) None of them
20. **……. is used to improve the cetane number**.
    a) Sodium nitrate b) Potassium nitrate c) Methyl nitrate d) All of them

21. The calculation of molecular weight of petroleum depended on the difference in….point.
a) Boiling b) Kraft. c) Freezing. d) Cloud.

22. Carbides compounds under action of steam gave……compounds
a) Aromatic. b) Paraffinic. c) Olefinic. d) b, c.

23. Coking process is used to obtain ……
a) Coke b) Gasoline c) Gases (up to C_4) d) all of them

24. Catalytic cracking is proceeded by …….mechanism
a) Free radical b) SN^1 c) SN^2 d) Carbonium

[2]- a) Give a comparison between thermal and catalytic cracking, and show in details the mechanism of thermal cracking? ***(6 marks)***

Thermal cracking	Catalytic cracking
1- The cleavage of hydrocarbon molecules is done by the action of high temperature	The cleavage takes place at low temperature in the presence of catalysts
2- It is classified into liquid phase and vapour phase	It is done only in the liquid phase.
3- It is no apply on large scale, since it needs expensive equipments	It is applied on a large scale
4- The produced gasolines contain more olefins and coke	The gasolines contain less olefins and coke.
5- It takes place by free radical chain mechanism	It proceeds by a carbonium ion mechanism

b) Define the emulsion and how can you destroy it by different methods? ***(6 marks)***

Petroleum emulsions and their destruction :

Emulsions are disperse systems of two liquids which are insoluble in each others; one of the liquid is dispersed in the other in the form of fine droplets. Emulsions are known in two kinds : petroleum in water (hydrophilic) and water in-petroleum (hydrophobic). Petroleum emulsions are mostly emulsions of water in oil type.

The stability of emulsions depends on the presence of emulsifying agents, i.e.,-substances soluble in one of the liquids which form films on droplets and thus prevent these from coalescing. Another reason why emulsions may be stable is that water droplets and solid particles can store charges of static electricity; these charges cause mutual repulsion of water droplets.

The removal of water from, and destruction of emulsion in, crude petroleum can be effected by mechanical, thermal, chemical, thermochemical, and electric methods.

The mechanical method of demulsification is based on settling centrifuging and filtering. The setting process in most cases is in the first stage of demulsification. Centrifuging and filtering are resorted to in laboratories for determining the water content in petroleum.

The thermal method of demulsification of petroleum is based on heating. During heating of an emulsion the films of emulsifying agents expand and break, and water droplets can thus coalesce.

The chemical method : is quite popular for destroying emulsions. It consists in treatmen with demulsifiers, substances that weaken the structural and mechanical strength of the layers enveloping the water droplets.

In the thermochemical method, a demulsifying agent is introduced into petroleum during heating.

The electric method : has found application at oil wells and especially at petroleum-processing plants. In this method an emulsion is acted up on by an electric field formed by a high voltage alternating current. the field oestroys emulsion film and increase the collisions of water globule.