Use separate answer scripts for each group

B.Sc. (Honours) Examination, 2017

Semester-VI

Chemistry (Honours)

Course: BCHE-61

Time: Three Hours **Full Marks: 40**

Questions are of value as indicated in the margin.

Answer ***any two*** Groups.

Group-A

Answer ***any two*** questions.

1. Answer ***any four*** questions: 4x2.5
   a) Using Euler's theorem for polyhedra derive the minimum number of pentagonal faces must be present in C_{60} molecules.
   b) Give detailed bonding features of C_{60} molecules.
   c) Discuss the membrane based synthesis of metal-polymer core-shell structure.
   d) What are organic-inorganic hybrid materials? Compare class-I and class-II hybrids.
   e) Sketch the density of states versus energy diagram for 3D (bulk), 2D (quantum well), 1D (quantum wire) and 0D (quantum dot) and briefly mention the genesis of their variation.
   f) What is the difficulty to coat Au nanoparticle with SiO_2? How can you solve the problem?

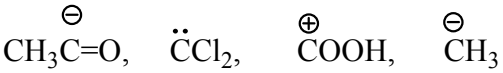
2. Answer ***any four*** questions: 4x2.5
   a) Discuss different sources of electrical resistivity and *Matthiessen's rule*.
   b) What are surface Plasmon and surface Plasmon resonance?
   c) Write down the Brus equation and mention different terms involved.
   d) What is band edge fluorescent emission in semiconductor quantum dot?
   e) In a quantum dot the absorption spectrum is broad whereas the fluorescent emission is sharp: why?
   f) Why core-shell quantum dots exhibits higher quantum efficiency?

3. Answer ***any four*** questions: 4x2.5
   a) Mention different types of core-shell semiconductor nanocrystals with proper relevance to their band gap.
   b) How unlike a paramagnetic material, a superparamagnetic material exhibits magnetic saturation at low field?
   c) What is energy dispersive x-ray analysis and its usefulness?
   d) How can you tune the electron wave length?
   e) How does scanning tunneling microscope works?
   f) Mention some applications of nanomaterials in different fields.

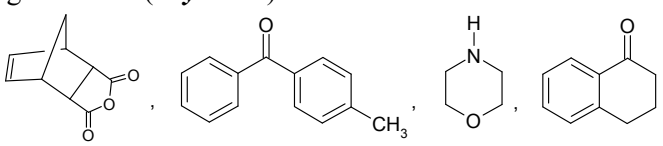
Group-B

Answer ***any two*** questions.

1. a) Write down the reagent system of the following synthons: 2

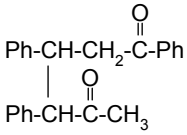


   b) Outline the synthesis and retrosynthesis (disconnection) of the following molecules from suitable starting materials (***any three***): 3x2

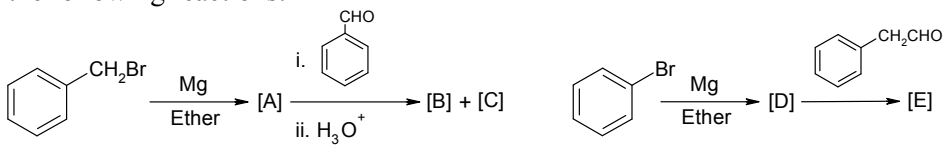


P.T.O.

c) Show by disconnection the synthons and their corresponding reagents to synthesize the following molecule by using Michael addition reaction: 2

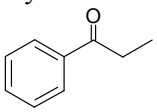


2. a) In the following reactions:



[B] and [E] are same product but there is a side product [C] in the first reaction. Explain all the products. 2.5

b) Write down the logical and illogical synthesis of the following molecule: 2



c) Differentiate rubber and plastic based on elementary idea. 2

d) What is polymer could you consider chlorophyll as polymer. Justify your statement. 2

e) Give an example of biodegradable polymer. 1

3. a) What is octane number? In this context explain the role of TEL. 3

b) Mention different forms of formaldehyde. Comment on their suitability as a source of formaldehyde in the laboratory. 1+2

c) What is Bakelite? Discuss the mechanism involved in the acid catalysed phenol formaldehyde condensation. 1+3

Group-C

Answer ***any two*** questions.

1. a) Write down the characteristic of Fluid mosaic model of biological membranes. 2.5

b) Write down the difference between integral protein and peripheral protein. 2

c) Write down the characteristic of lipid-linked membrane proteins. 2.5

d) What is the reason of flexibility nature of biological membrane? 1

e) Write down the features of two states of bilayer of lipids in membrane. 2

2. a) What is caveolins? It define a special class of membrane raft – explain the statement. 1+2

b) Explain the statement – passive transport is facilitated by membrane proteins. 2.5

c) Write down the difference between carriers and channels. 2

d) Write down the mechanism of Na^+ and K^+ transport by the Na^+K^+ ATPase. 2.5

3. a) What is ionophores? 2

b) What is second messengers? How receptor Guanylyl cyclases generate the second messenger cGMP? 2+3

c) Write down the role of voltage-gated and ligand gated ion-channels in neural transmission. 3

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