

c) Define MEMs. What are the applications of MEMs ?

$1\frac{1}{2}+1\frac{1}{2}+1\frac{1}{2}$

7. a) Explain the mechanical ball milling process for the synthesis of nano-structured materials. Give one example of it. Explain their catalytic behavior towards hazardous chemicals.

b) Define Janus particle. How it differs from core-shell nanoparticles?

c) What is “electron-beam” damage? Why Au or Pt coatings are necessary for biological samples during SEM studies?

$1\frac{1}{2}+1\frac{1}{2}+1\frac{1}{2}$

M. SC. CHEMISTRY EXAMINATION, 2019

(4th Semester)

INORGANIC CHEMISTRY SPECIAL

PAPER - XVI-I

Time : Two hours

Full Marks : 50

(25 marks for each unit)

Use a separate answerscript for each unit.

UNIT - I - 4161

1. Answer **any two** of the following questions :

a) Illustrate the mechanism of Buchwald-Hartwig C-N coupling reaction using a palladium catalyst, and explain each step. Identify the organometallic species involved in the catalytic cycle. 6+2

b) Explain the basic strategies for a catalytic enantioselective hydrogenation of a pro-chiral olefin. Give a specific example of such a reaction. 5+3

c) What is olefin metathesis ? Describe the Grubbs' catalyst, and show how it catalyzes the olefin metathesis. .2+2+4

2. Answer the following : 3× 3

a) What are N-heterocyclic carbenes ? Comment on their stability and binding mode to metal centers.

[Turn over

[2]

- b) Describe the structure and stability of $[\text{Ru}(\text{C}_6\text{Me}_6)_2]^{2+}$. Highlight the structural differences (s), if any, on two-electron reduction of the metal center.
- c) Hydroformylation of olefin is a kinetically controlled reaction. Explain with an example.

UNIT - I - 4162A

3. a) What do you mean by flexible and rigid bridging ligand ?
- b) How SHAB principle has been exploited in the design of coordination polymers ?
- c) Why will be the general structural transformation in metal organic framework if the ligand to metal ratio is increased from 1:1 to 1.5:1?
- d) What are the common physicochemical techniques utilized for the characterization of porous coordination polymers ?
- e) Why dendrimers are found very suitable as a drug delivery agent ? 1×5
4. a) How the coordination number and the oxidation state of the metal ions directs the formation of an overall structure in metal organic frameworks ? 2+2

[3]

- b) What is second generation porous material ? How does it differ from first generation porous material? Name two unique application of third generation porous material which may not be applicable for second generation porous material.

1+1+2

UNIT - I - 4162B

5. Answer **any three** from the following : 1×3
- a) Why resolution power of an electron microscope (EM) is higher than optical microscope (OM)?
- b) What are photo-switchable molecules ?
- c) Write the Scherrer's equation and how it relates to dislocation density of a particular sample.
- d) Why an electrochemical sensing is the promising method for the detection of different biological fluids in recent years?
- e) What are the basic differences between FESEM and HRTEM studies ?
6. a) What are the functionalized metal nanoparticles ? How Au-NPs help to enhance the fluorescence of pyrene or other macromolecular systems ?
- b) What are wet and dry methods for the synthesis of nanomaterials ? What are false positive and false negative sensors ? Give one examples of each. [Turn over