P. P. SAVANI UNIVERSITY

Fifth Semester of B.Sc. Examination
December-2021
SSCH3210–Applied Chemistry- Microscopy Techniques
15.12.2021, Wednesday Time: 12:30 a.m. to 03:00 p.m. Maximum Marks: 60

Instructions:
1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

Section-I (Total Marks - 30)

Q.1 Short Questions **[10]**

1.1 Objectives **[05]**

1.1a Magnification depends on
- A length,
- B breadth
- C diameter
- D All of the above

1.1b How many types of aberration are there
- A 2
- B 3
- C 1
- D 4

1.1c How many types of Light microscope
- A 4
- B 3
- C 1
- D 2

1.1d For bright field microscope
- A Staining is required
- B Staining is not required
- C Staining not destroys the biological sample
- D B & C are correct

1.1e Properties of TEM microscope
- A Stream of electrons is formed
- B Accelerated using a positive electrical potential
- C Focused by metallic aperture and Electro magnets
- D All of the above are correct

1.1f For SEM
- A Specimen must be very thin
- B Wide range of specimens allowed

C Broad, static beams
D Electrons must pass through and be transmitted by the specimen

1.1g Properties of Polarizing Microscope
A Uses two Polariser
B Gives information about Birefringence of a body
C Used in Crystallography
D All of the above are correct

1.1h DIC uses
A IR light
B UV light
C Visible light
D Far-IR light

1.1i Geometrical optics
A the study of light as rays
B the study of light as waves
C the study of light as particles
D All of the above are correct

1.1j the study of the wave properties of light involves
A Interference
B Diffraction
C Polarization
D All of the above

1.2 **Answer the Following: (MCQ/Short Question/Fill in the Blanks)** **[05]**

1.2a The surface features of an abject is called _____ ?

1.2b What is auger effect?

1.2c Name the detector used in SEM microscope?

1.2d Write the one application of SEM?

1.2e What is BSE?

Q.2 **Short Notes (Attempt any two)** **[06]**

A Discuss about the secondary electron generation of SEM?

B What is resolution and Numerical aperture of a microscope and discuss how they are related to each other?

C Write about the advantages and disadvantages of compound microscope?

Q.3 **Explain in detail (Attempt any two)** **[14]**

A Explain, what happens when electron beam strikes the specimen with diagrams?

B Define the term magnification, resolution, definition, law of reflection and optics of microscope? Calculate the total magnification of a microscope, if the magnification of eye piece and objective are 20X and 30X?

C Discuss the principle, application of DIC microscopy and draw the diagram showing the journey of light in DIC?

Section-II (Total Marks - 30)

Q.1 Short Questions **[10]**

1.1 Objectives **[05]**

1.1a Full form of LFM

A Lateral force microscopy
B Atomic force microscopy
C Longitudinal force microscope
D B & C are correct

1.1b Tapping mode of AFM

A High Resolution
B Slower speed
C Constant force between tip and surface
D All are correct

1.1c Non-contact mode of AFM

A Lower resolution
B Slower Speed
C No damage to tip
D All are correct

1.1d The difference between tip and sample in contact mode of AFM

A < 0.5 nm
B 0.5- 2 nm
C 0.1-10 nm
D B and C are correct

1.1e Application of AFM

A Material science
B Polymer Science
C Data storage
D All are correct

1.1f Name the material which is used for photographic screen of TEM

A Zinc Sulphide
B Manganese dioxide
C Copper Oxide
D Titanium dioxide

1.1g In AFM, Fabrication of cantilever requires

A Soft and high sensitive
B Hard and high sensitive
C Soft and low sensitive
D Hard and low sensitive

1.1h Objective lens of TEM is

A Strong lens
B Weak lens
C Moderate lens
D Both B & C are correct

1.1i In AFM, Fabrication of Tip

A Si_3N_4
B ZnO
C TiO_2
D Fe_2O_3

1.1j TEM consists of

A Electron source
B Condenser lens
C Objective lens with aperture
D All are correct

1.2 Answer the Following: (MCQ/Short Question/Fill in the Blanks) **[05]**

1.2a Give one difference between light microscope and electron microscope?
1.2b Calculate the total magnification of a microscope?
1.2c In TEM, screen emits _____ when bombarded with electrons.
1.2d What is the full form of TEM?
1.2e What is the full form of SEM?

Q.2 Short Notes (Attempt any two) **[06]**

A Discuss about lateral force Microscopy?
B Discuss about working mode of TEM?
C Discuss about contact mode of AFM?

Q.3 Explain in detail (Attempt any two) **[14]**

A Draw the schematic diagram of Beam and Specimen Interaction of TEM? State the principle of TEM?
B Discuss about the working mode of AFM? Discuss about its mode of imaging of constant height and constant force of AFM?
C Describe the tapping and non-contact mode of AFM?