P. P. SAVANI UNIVERSITY

Fifth Semester of B.Sc. Examination

December-2021

SSCH3210–Applied Chemistry- Microscopy Techniques

15.12.2021, Wednesday Time: 12:30 p.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 Ratio of diameter of lens to its focal length

A Numerical Aperture

B Resolution

C Definition

D Magnification

1.1b Definition of contrast

A Differences in intensity between two objects

B Differences in intensity between object and background

C Differences in intensity between objects and surface

D Both A & B are correct

1.1c Metal which is used for electron beam generation in SEM?

A W

B Mg

C Hg

D Zn

1.1d Full form of PMT

A Photo multiplier tube

B Photo Magnitude tube

C Photo multi-layer tube

D Pure metal transistor

1.1e Full form of SEI

A Secondary electron Imaging

B Secondary energy Intensity

C Scanning Electron Imaging

D Surface Energy Imaging

1.1f BSE are

A High energy electron
B Low energy electron
C Moderate energy electron
D Auger electron

1.1g What is Cryo-SEM
A Allows samples to be viewed in the frozen state
B Allows samples to be viewed in the normal state
C Allows samples to be viewed in the hot state
D Both B & C are correct

1.1h Required treatment of biological specimen in SEM
A Removing and cleaning of tissues
B Fixation
C Dehydration and drying
D All are correct

1.1i Bright-field microscope
A Produces a dark image against a brighter background
B Produces a dark image against a darker background
C Produces a bright image against a brighter background
D Produces a bright image against a darker background

1.1j Types of Optics
A 3
B 2
C 1
D 5

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

1.2a The study of light as rays is called _____

1.2b Define the term DIC?

1.2c _____ Source is usually used in DIC?

1.2d Full form of AFM_____? (atomic force microscope)

1.2e Give one advantages and disadvantages of SEM microscope?

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

A State the comparison between SEM and TEM?

B Discuss about the different types of Microscopes?

C What is magnification? Calculate the total magnification of a microscope, if the magnification of eye piece and objective are 20X and 30X?

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

A Discuss and draw the secondary electron generation, back scatter electron generation and X-ray generation of SEM?

B Describe the Dark field microscope with proper diagram and labeling?

C State about the magnetic lens system and vacuum system of SEM?

Section-II (Total Marks - 30)

Q.1 Short Questions [10]

1.1 Objectives [05]

1.1a Full form of TEM

A Transmission electron microscopy
B Transfer electron microscopy
C Targeted electron microscopy
D Transmission atomic microscopy

1.1b Properties of TEM

A Electrons illuminate the specimen through a condenser lens system.
B A thin specimen is irradiated with an electron beam
C Objective lens provides the formation of either image
D All of the above are correct

1.1c Properties of condenser lens

A Illuminates the specimen
B Relatively weak lens
C Longer focal length than objective
D All of the above are correct

1.1d Types of vacuum pump are used for TEM

A 2
B 3
C 4
D 1

1.1e In Tapping mode

A Cantilever is driven to oscillated up and down
B Tip almost touches the surface
C Force on tip is repulsive
D Tip does not contact the surface

1.1f Lateral force microscopy

A Scanned sideways
B Scanned perpendicularly
C Scanned horizontally
D Scanned vertically

1.1g In constant force of mode of imaging

A Move the cantilever up and down
B Cantilever is dragged across the surface of the sample
C Tip is free to move up and down
D All of the above are correct

1.1h Tapping mode of AFM needs
- A Better Resolution
- B Lower Resolution
- C High Resolution
- D All of the above are correct

1.1i Tip-surface separation in contact mode of AFM
- A < 0.5 nm
- B 0.5-2 nm
- C 0.1-10 nm
- D 20 nm

1.1j Fabrication of Tip of AFM
- A sharp
- B not sharp
- C soft
- D High sensitive

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

1.2a Name the different components of TEM?
1.2b Screen emits _____ light when bombarded with electrons.
1.2c Write one disadvantages of TEM?
1.2d Name the material which is used for fabrication of cantilever of AFM?
1.2e Write down the advantages of non-contact mode of AFM?

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

A Discuss about advantages and disadvantages of TEM
B Discuss about Non-contact mode of AFM?
C Explain the topography of AFM?

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

A How does AFM work? Discuss about fabrication of tip and cantilever of AFM?
B Draw the schematic diagrams of main components of AFM with proper labelling? Discuss about the application of TEM in biomedical field?
C Draw the schematic diagram of Beam and Specimen Interaction of TEM? State the principle of TEM?