

M.Sc. 4th Semester Examination, 2021

CHEMISTRY

(Inorganic Chemistry Special)

Paper : CHEM 403E

Course ID : 41453

Time: 2 Hours

Full Marks: 40

*The figures in the right-hand side margin indicate full marks.
Candidates are required to give their answers in their own words
as far as practicable.*

1. Answer *any five* of the following questions: 2×5=10

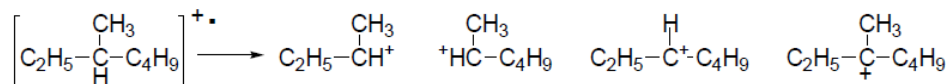
- (a) Give two differences between ionic and electronic conductivity.
- (b) What is vacancy conduction?
- (c) What is a fuel cell? Give one example of solid oxide fuel cell (SOFC).
- (d) Explain Seebeck effect with an example.
- (e) Provide two examples of anticancer drug with structures.
- (f) Name the diseases caused by the deficiency of Fe and Zn.
- (g) What is Wilson's and Minamata disease?

2. Answer *any four* of the following questions: 5×4=20

- (a) (i) What is interstitial conduction? Discuss interstitial conduction in BaF₂.
- (ii) Discuss the structure of β-alumina. 2.5+2.5=5

(b) (i) What is McLafferty rearrangement?

(ii) Discuss the stability order of the following fragments in mass spectrometry



2.5 + 2.5 = 5

(c) (i) *Cis*-platin is used as an anti-cancer drug but *trans*-platin is not- Explain.

(ii) *Cis*-platin binds with DNA. How can one understand this from the NMR experiment?

2.5 + 2.5 = 5

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(d) (i) Write the redox activities of the flavin and disulfide/thiol centers which are involved in mercury(II) reductase.

(ii) Discuss the intensity ratio of M, M+2, and M+4 peaks in mass spectrometry of Br₂.

$$2.5 + 2.5 = 5$$

(e) (i) Name mass spectrometric techniques as per the source of ionization.

(ii) Write the principle of magnetic sector analyzer in mass spectrometry. $3 + 2 = 5$

(f) (i) Write the point group of BF₃, C₆H₆, and H₂O.

(ii) Describe the principle of auger electron spectroscopy. $3 + 2 = 5$

3. Answer *any one* of the following questions: $10 \times 1 = 10$

(a) (i) What is the principle of Atomic Absorption Spectroscopy? What is the difference between atomic absorption and emission spectroscopy?

(ii) Why diatomic molecules are IR inactive but Raman active? Why spherical molecules are Raman inactive? Calculate the number of vibrational modes in CO₂ and NH₃.

$$(2+2) + (2+2+2) = 10$$

(b) What is Stevenson's rule in mass spectrometry? Why mass is a spectrometric method and not spectroscopic technique? Discuss the fragmentation scheme of cinnamaldehyde in *Figure 1*. Discuss the fragmentation scheme of ethyl acetate in *Figure 2*.

$$2 + 2 + 3 + 3 = 10$$

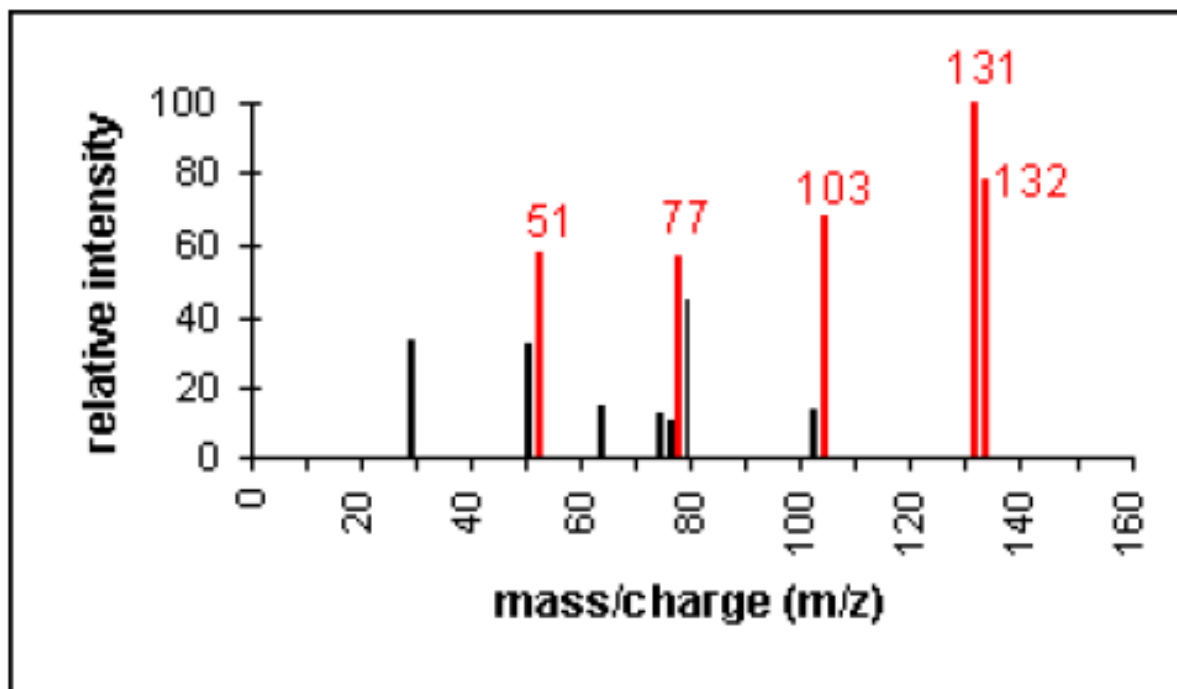


Figure 1

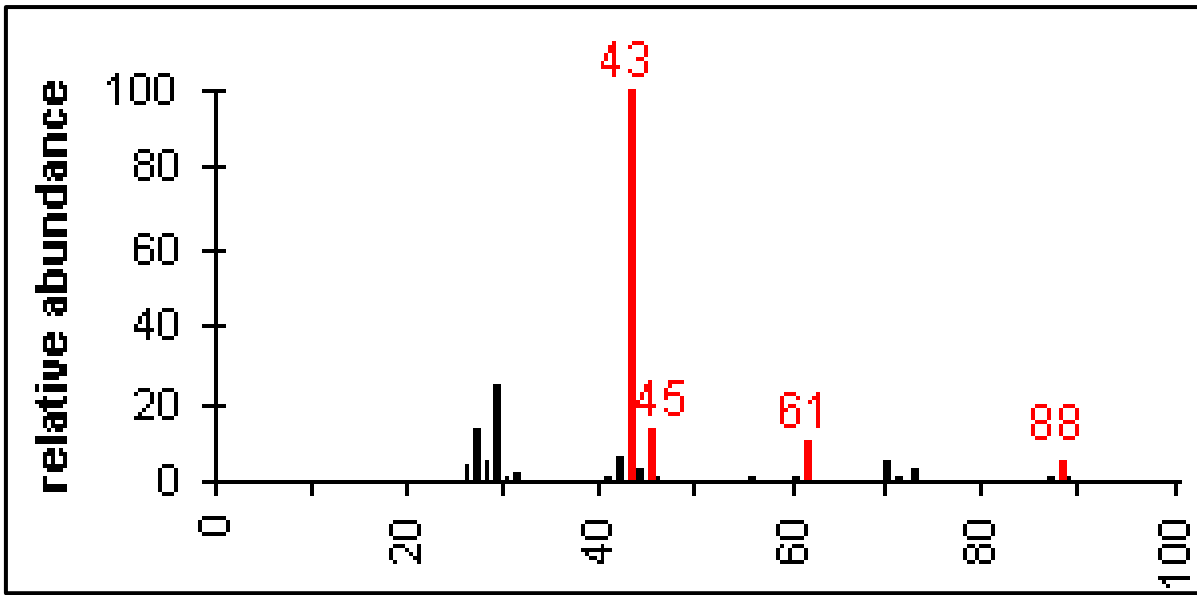


Figure 2
