

SARDAR PATEL UNIVERSITY

M. Sc. (Chemistry) (Third Semester) Examination (CBCS)

Tuesday, 5th January, 2021

10.00 A.M. To 12.00 P.M.

Subject: Separation Methods Course: PS03EANC21

N.B. Figures to the right of each of the question indicate marks

[Total marks 70]

Q.1 [A] Choose the appropriate answer:**[08]**

- i. Depending on the form of resin, cation resins (strong acid) and anion resins (strong base) are stable to a temperature of

(a) 150, 70	(b) 100, 50
(c) 250, 150	(d) 500, 400
- ii. Paper chromatography is more suited to

(a) adsorption	(b) partition
(c) molecular sieving	(d) ion exchange
- iii. Helium gas has a conductivity of

(a) $36.0 \text{ cal} \cdot \text{s}^{-1} \cdot \text{cm}^{-1} \cdot \text{deg}^{-1}$	(b) $44.5 \text{ cal} \cdot \text{s}^{-1} \cdot \text{cm}^{-1} \cdot \text{deg}^{-1}$
(c) $11.6 \text{ cal} \cdot \text{s}^{-1} \cdot \text{cm}^{-1} \cdot \text{deg}^{-1}$	(d) $3.68 \text{ cal} \cdot \text{s}^{-1} \cdot \text{cm}^{-1} \cdot \text{deg}^{-1}$
- iv. The source of light of the simple UV photometers is generally a mercury lamp which provides working at a wavelength of

(a) 254 nm	(b) 200nm	(c) 300nm	(d) 360nm
------------	-----------	-----------	-----------
- v. Which of the following gels is most porous?

(a) Sephadex G-25	(b) Sephadex G-50
(c) Sephadex G-75	(d) Sephadex G-100
- vi. In HPLC which of the following detector will give a non-selective response?

(a) UV/vis absorption	(b) Mass spectrometry
(c) Fluorometry	(d) Amperometry
- vii. When Carbowax 20M (polyethylene glycol) is used as a solvent, which of the following can be separated?

(a) Hydrocarbons	(b) High boiling hydrocarbons, esters and ethers
(c) Alcohols, amines and other nitrogen containing compounds	(d) Aldehydes and ketones
- viii. Which of the following adsorbent used for column adsorption chromatography has maximum adsorptive power?

(a) Silica gel	(b) Magnesium oxide
(c) Aluminium oxide	(d) Calcium carbonate

Q.1 [B] Answer the followings (attempt all):

[16]

1. GSC is quite limited in applicability. Why?
2. Derivatization tends to make all the solutes less alike and hence potentially less difficult to separate.
(a) True (b) False
3. The columns in ion exchange chromatography may be operated by elution, frontal analysis and _____ analysis.
4. Inert solvent system generally extract _____ species.
5. GLC, TLC and HPLC are commonly used chromatographic methods for quantitative drug analysis.
(a) True (b) False
6. What are the important characteristics of an adsorbent?
7. The best separation of proteins has been obtained in the pH range of 6.0 - 8.0
(a) True (b) False
8. It is essential to _____ all types of detectors for use in quantitative analysis.
9. What is the most extensive application of TCD?
10. Where does an gradient elution frequently used?
11. In HPLC, the maximum temperature is about _____ °C for silica columns.
12. What is a gel filtration?
13. Staining method is used for measuring proteins in gel.
(a) True (b) False
14. Polarity decreases with an increase in number of functional groups and increases with increase in carbon content.
(a) True (b) False
15. What is visualization?
16. Why refractive index detectors cannot be used in gradient elution systems.

Q. 2 Attempt any SEVEN of the followings:

[14]

- i. Write about the papers used in electrophoresis.
- ii. What is the principle of partition (liquid-liquid) chromatography?
- iii. What is the effect of temperature on HPLC?
- iv. How does the (a) type and amount of stationary phase and (b) the rate of flow of carrier gas, affects the separation?
- v. State the important functions to be performed by the solvent used in adsorption or column chromatography.
- vi. Helium is by far the most common carrier gas in spite of its cost, Why?
- vii. What are anion exchange resins?
- viii. Write about the slurry packing technique when smaller particles are used.
- ix. Write about the two important methods through which gels can be prepared.

Q. 3 Explain in detail about the factors that affects the extraction. Also write about the important factors through which the rate and selectivity of an extraction process is promoted. **[08]**

OR

Q. 3 What is paper chromatography? Write about the different types of paper chromatography. **[08]**

Q. 4 Write about the theory and principle of gas liquid chromatography. **[08]**

OR

Q. 4 What are the general requirements of a gas chromatographic detector? Write a note on (i) TCD and (ii) FID **[08]**

Q. 5 Write about column and column packing in HPLC. **[08]**

OR

Q. 5 What is the principle of HPLC? Explain the followings for the HPLC instrumentation: (i) mobile phase reservoir (ii) solvent degasser (iii) solvent injection port and (iv) Pneumatic pump **[08]**

Q. 6 Write about the principle of ion exchange chromatography and also explain about the steps used for the same. **[08]**

OR

Q. 6 What is size exclusion chromatography? Write about the theory of size exclusion chromatography. **[08]**

~~————— ✕ —————~~

100

101

102

103

104

105

106

107

108

109

110

111

112