

1. If the Stationary Phase in a chromatographic system is composed of a non-volatile liquid held on an inert solid support, the underlying separation principle is defined as:
  - a. Adsorption
  - b. Partition
  - c. Affinity
  - d. Size exclusion
  
2. The Retention Factor ( $R_f$  value) used to identify components separated by techniques like Paper Chromatography is calculated as the ratio of:
  - a. Distance travelled by the solvent front to the distance travelled by the component
  - b. Ratio of distance travelled by the component to the distance travelled by the solvent front
  - c. Concentration of the component to the concentration of the mobile phase.
  - d. Time spent in the stationary phase to time spent in the mobile phase.
  
3. In Gas Chromatography (GC), which component always exists in the gaseous state, carrying the analyte through the column?
  - a. Stationary Phase
  - b. Support
  - c. Liquid Phase
  - d. Mobile phase
  
4. Which type of High Performance Liquid Chromatography (HPLC) uses a polar column packing (e.g., silica) and a non-polar mobile phase?
  - a. Reverse phase
  - b. Size exclusion
  - c. Ion exchange
  - d. Normal phase
  
5. Which statement accurately describes a common limitation of Ion Exchange Chromatography?
  - a. It is limited to separating only non-polar molecules
  - b. It can only be used for gaseous samples.
  - c. Only charged molecules can be separated
  - d. Large quantities of sample cannot be applied.
  
6. In Gas Chromatography (GC), which specific carrier gas is often preferred when using thermal conductivity detectors?
  - a. Nitrogen ( $N_2$ )
  - b. Hydrogen ( $H_2$ )
  - c. Argon
  - d. Helium

7. The classification of Paper Chromatography into Ascending, Descending, and Radial types depends entirely on which characteristic?
  - a. The solvent front's  $R_f$  value
  - b. The type of filter paper used
  - c. The direction of flow of the mobile phase
  - d. The complexity of the mixture being separated
  
8. The choice of both the stationary phase and the mobile phase for any given chromatographic process depends mainly upon which factor?
  - a. The availability of gases used
  - b. The nature of the components to be separated
  - c. The temperature of the laboratory
  - d. The complexity of the required detector
  
9. In Gas Chromatography (GC), a key limitation for a compound being analyzed is that it must satisfy which condition regarding stability?
  - a. It must be highly non-polar.
  - b. It must be stable under GC operation conditions
  - c. It must be an ionic substance
  - d. It must be detected using only Helium
  
10. A mixture of amino acids is applied to a column packed with a stationary phase containing positively charged groups. The amino acids that flow through most rapidly are most likely to be:
  - a. Positively charged
  - b. Negatively charged
  - c. Neutral
  - d. Large and hydrophobic
  
11. A lab is setting up a system to continuously analyze low concentrations of ionic contaminants in drinking water. The most effective and common method for this application is:
  - a. Affinity Chromatography
  - b. Ion Exchange Chromatography
  - c. Gas Chromatography
  - d. None of the above
  
12. A manufacturer wants to produce deionized water by removing all solute cations and anions. The most effective method for this is:
  - a. Using a cationic exchanger only
  - b. Using an anionic exchanger only
  - c. A process involving both cationic and anionic exchangers
  - d. Filtering through an affinity column

13. The process of 'elution' in column chromatography specifically refers to:
- Packing the adsorbent into the column.
  - Dissolving the sample in the mobile phase
  - The method of detecting components as they leave the column
  - The process of separating and removing components from the stationary phase.
14. In GC, a 'partition coefficient' ( $K_d$ ) describes the distribution of an analyte between the stationary and mobile phases. A component with a higher  $K_d$  will:
- Move faster through the column with a shorter retention time
  - Move slower through the column with a longer retention time.
  - Not be detected by the system
  - Decompose in the heated column.
15. A degasser is a crucial component in a modern HPLC system. Its main function is to:
- Heat the mobile phase to improve separation
  - Remove dissolved gases to prevent baseline noise
  - Filter out particulate matter from the solvents
  - Mix different solvents for gradient elution.
16. In Reverse Phase HPLC, the stationary phase is non-polar (like C18). What would be a typical mobile phase for this technique?
- A pure non-polar solvent like hexane
  - A mixture of water and a polar organic solvent like methanol.
  - A buffer solution of high ionic strength.
  - A pure polar solvent like water.
17. In Paper Partition Chromatography, the stationary phase is:
- The silica impregnated on the paper.
  - The moisture/water trapped within the cellulose fibers.
  - The organic solvent used for development.
  - The dye used to visualize spots.
18. When preparing a development chamber for Paper Chromatography, saturating the atmosphere with solvent vapor is important to:
- Prevent the paper from drying out.
  - Ensure the solvent moves faster.
  - Achieve a uniform and better resolution by preventing evaporation from the paper
  - Make the spots more visible.
19. A key advantage of Paper Chromatography is that it is excellent for the separation of:
- Very large quantities of sample

- b. Colored mixtures, as bands can be seen directly
- c. Non-polar volatile compounds
- d. Inorganic gases

20. In Thin Layer Chromatography (TLC), the mobile phase moves up the plate due to:

- a. Gravity
- b. Electrical Current
- c. Capillary action
- d. High pressure from a pump

21.  $S_4N_4$  possesses ..... structure

- a. Cradle like
- b. Tetrahedral
- c. Octahedral
- d. Trigonal bipyramidal

22. Tetrasulphur tetranitride when passed through silver wool results in the formation of

- a. Disulphide dinitride
- b. Polythiazyl
- c. Sulphur dioxide
- d. Sulphuric acid

23. Cyclothiazenium cations are

- a. Antiaromatic
- b. Quasiaromatic
- c. Homoaromatic
- d. Non aromatic

24. The starting material for the preparation of  $P_4S_3$  is

- a. White phosphorus
- b. Red phosphorus
- c. Tetrasulphur tetranitride
- d. Phosphoric acid

25. The chemicals that helps in the production of flame in matchsticks is

- a.  $P_4S_3 + KCl$
- b.  $P_2S_2 + KClO_3$
- c.  $P_4S_4 + KClO_3$
- d.  $PCl_5 + KCl$

26. The number of P-S-P bonds present in  $P_4S_{10}$  are
- 7
  - 8
  - 6
  - 3
27. The number of P-S-P bonds present in the alpha and beta forms of  $P_4S_5$  respectively are
- 4,5
  - 4,4
  - 5,4
  - 3,4
28. The hybridization of boron in borazine is
- $sp^2$
  - Sp
  - $Sp^3$
  - $dsp^3$
29. Borazine is isoelectronic with
- Pyridine
  - Pyrrole
  - Indole
  - Benzene
30. Borazine is produced from diborane by ..... Method
- Clemmenson reduction
  - Distillation
  - Duncan's method
  - Stock and pohlands method
31. Icosahedral carboranes are derivatives of
- $[B_{12}H_{12}]^{2-}$
  - $B_4H_{10}$
  - $[B_{12}H_{10}]^{2-}$
  - $B_2H_6$
32. . Which of the following molecules is chiral?
- $CH_4$
  - $CH_3Cl$
  - $CH_2Cl_2$
  - $CHClBrF$

33. The Cahn-Ingold-Prelog sequence rules prioritize substituents based on:
- Atomic mass
  - Atomic number
  - Electronegativity
  - Boiling point
34. A molecule with two chiral centers and a plane of symmetry is:
- Always chiral
  - A meso compound
  - A racemic mixture
  - An enantiomer
35. The maximum number of stereoisomers possible for a molecule with 3 chiral centers is:
- 3
  - 4
  - 6
  - 8
36. The spatial arrangement of atoms in a molecule that can be interconverted by rotation about single bonds is called:
- Configuration
  - Conformation
  - Constitution
  - Stereoisomerism
37. A sample that rotates plane-polarized light is said to be:
- Chiral
  - Optically active
  - Racemic
  - Achiral
38. How are the following two compounds related?  
(2R,3R)-2,3-dichlorobutane and (2S,3S)-2,3-dichlorobutane
- Identical
  - Enantiomers
  - Diastereomers
  - Constitutional isomers
39. How are the following two compounds related?  
(2R,3R)-2,3-dichlorobutane and (2R,3S)-2,3-dichlorobutane
- Identical
  - Enantiomers
  - Diastereomers
  - Constitutional isomers

40. A racemic mixture is:
- a) Optically active
  - b) A 50:50 mixture of enantiomers
  - c) A meso compound
  - d) A single enantiomer