

ST. JOSEPH'S COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

CUDDALORE – 607 001

ANALYTICAL BIOCHEMISTRY

SUBJECT CODE: BC304S

I) CHOOSE THE CORRECT ANSWER

- 1) The positively charged electrode is
 - a. Cathode
 - b. Voltage
 - c. Anode
 - d. Current
- 2) Which one of the following is used for pH determination
 - a. Glass electrode
 - b. GLC
 - c. Affinity chromatography
 - d. Centrifugation
- 3) Rotors are used in
 - a. Electrophoresis
 - b. GLC
 - c. Affinity chromatography
 - d. Centrifugation
- 4) Which one of the following is used in density gradient centrifugation
 - a. CsCl
 - b. silica
 - c. SDS
 - d. Carbon
- 5) RCF is
 - a. Rotational current factor
 - b. Relative centrifugal field
 - c. Rare carbon field
 - d. Relative control field
- 6) The solution obtained by dissolving gram equivalent weight in one liter is called
 - a. Normal solution
 - b. Formal solution
 - c. Molal solution
 - d. None
- 7) Phenolphthalein forms pink color in ----- medium
 - a. Acid
 - b. Alkaline
 - c. Neutral
 - d. None of the above
- 8) The buffer that works efficiently in acidic range is
 - a. Acetate buffer
 - b. Tris buffer
 - c. Borate buffer
 - d. All

- 9) The PH range of methyl orange indicator is between
- a. 3.1-4.4 b. 4.0-4.8 c. 5.0-5.6 d. 6.0-8.0
- 10) In isopycnic centrifugation, the separation of particle is based on
- a. Charge b. Size c. Density d. None
- 11) Which gradient substance is routinely used for rate zonal centrifugation
- a. Glycerol b. Sucrose c. Cscl d. All
- 12) The positively charged electrode is
- a. Cathode B. Voltage C. Anode d. Current
- 13) Which one of the following is used for pH determination
- a. Glass electrode b. GLS C. Affinity chromatography d. Centrifugation
- 14) Rotors are used in
- a. Electrophoresis b. GLC c. Affinity Chromatography d. Centrifugation
- 15). Which one of the following is used in density gradient centrifugation
- a. CsCl b. Silica c. SDS d. Carbon
- 16) RCF is
- a. Rotational current factor b. Relative centrifugal field
- c. Rare carbon field d. Relative control field

17)cell is a device that produces an electric current from energy released by a spontaneous redox reaction.

a. Electrochemical b. Chemical c. Plant d. Animal

18) _____ force can generally be any force directed outward relative to some origin

a. Stationary b. Kinetic c. Centrifugal d. Centripetal

19)makes use of high centrifugal force for studying properties of biological particles.

a. Ultracentrifugation b. Desktop c. Clinical d. Preparative

20) _____ is a measure of the acidity or basicity of an aqueous solution.

a. pH b. pKa c. pOH d. PPM

21) The solution obtained by dissolving gram equivalent weight in one liter is called _____

a. Normal solution b. Formal solution c. Molal solution D. none

22) The oxygen permeable membrane of oxygen electrode is made up of _____

a. Teflon B. PVC c. Lanthanum Fluoride D. All

.23) The centrifugal field developed by centrifuges depends on _____

A. Speed of the rotor b. Length of the tube holder c. Both d. None

24) The method by which the organelles are separated is _____

a. Rate Zonal technique b. Isopycnic technique c. Differential centrifugation d. None

25) In the Arrhenous model the acid- base relations are limited to solutions

a. Colloidal B. Aqueous c. Homogenous d. Suspension

26) The buffering range of phosphate buffer of between_____

a. 12-12.5 b. 8-9 c. 10-10.8 d. 2-3

27) The selectivity of the glass electrode is a function of the _____of The glass.

a. Composition b. Optical Property c. Presence of inert substance d. Maleability

28) The higher the viscosity of the medium, the _____ will be the particle movement in a centrifuge.

a. Stable b. Higher c. Slower D.faster

29) High speed centrifuges can operate with a maximum speed upto _____ Rpm.

a. 25,000 b. 50,000 c. 1,00,000 d. 10,00,000

30) In a buffer, when acidic and basic species are present in equal concentration.

a. $\text{pH} = \text{pKa}$ b. $\text{pH} > \text{pka}$ c. $\text{pH} < \text{pka}$ d. None

31) Which is the analyte solution in glass celectrode?

a. Ag b. AgCl c. 0.1 MHCl d. All the above

32) The principle of centrifugation is to create a large force than _____

a. Density b. Gravity c. Viscosity d. Specificity

33) The velocity of a particle per unit centrifugal field is called _____

- a. Sedimentation Co-efficient b. sedimentation rate c. svedberg d. rate constant

34) True sedimentation co-efficient can only be obtained at _____ at

_____ concentration

- a. Higher b. Lower c. Zero d. Neutral

35) Which is the buffer not present in the body

- a. phosphate buffer b. Bicarbonate buffer c. Hemoglobin buffer d. Tris buffer

36). The pH is measured by

- a. OH ions b. H ions c. Both d. None

37) One Svedberg unit is

- a. 10^{-11} sec b. 10^{-12} sec c. 10^{-13} sec d. 10^{-14} sec

38) Which is used most commonly to separate intracellular organelles from tissue homogenates?

- a. Differential centrifugation b. Rate zonal c. Isopycnic d. all the above

39) Positively charged electrode is

- a. Cathode b. Anode c. HCl d. None of the above

40) What is ρ in centrifugation

- a. Density B. Density of the particle c. Velocity D. Diameter

- 41) Subcellular organelles can be separated by
- a. Differential centrifugation
 - b. Affinity chromatography
 - c. Glass electrode
 - d. H₂ electrode
- 42) The oxygen permeable membrane of oxygen electrode is made up of
- a) Teflon
 - b. PVC
 - c. Lanthanum fluoride
 - d. All
- 43) The centrifugal field developed by centrifuges depends on
- a. Speed of the rotor
 - b. Length of the tube holder
 - c. Both
 - d. None
- 44) The method by which the organelles are separated
- a. Rate zonal techniques
 - b. Isopynic techniques
 - c. Differential centrifugation
 - d. None
- 45) What is the pH of the stacking gel
- a. 6.7
 - b. 7
 - c. 8.7
 - d. 9.7
- 46) Which buffer is not present in the body
- a. Phosphate buffer
 - b. Bicarbonate buffer
 - c. Hemoglobin buffer
 - d. Tris buffer
- 47) The pH is measured by
- a. OH⁻ ions
 - b. H⁺ ions
 - c. both
 - d. none
- 48) Which is used most commonly to separate Intracellular organelles from tissue homogenates?
- a. Differential centrifugation
 - b. Rate zonal
 - c. Isopynic
 - d. All the above
- 49) Who introduced cellulose acetate electrophoresis?
- a. Kohn
 - b. Tswett
 - c. Tiselius
 - d. Kallis
- 50) ----- cell is a device that produce an electric current from energy released by a spontaneous redox reaction.
- a. Electrochemical
 - b. Chemical
 - c. Plant
 - d. Animal

- 51) ----- force can generally be any force directed outward relative to some origin
a. Stationery b. Kinetic c. Centrifugal d. Centripetal
- 52) ----- makes use of high centrifugal force for studying properties of biological particles
a. Ultracentrifugation b. Desktop c. Clinical d. Preparative
- 53) ----- is a measure of the activity or basicity of an aqueous
a. pH b. pKa c. .pOH d. PPM
- 54) In the Arrhenius model the acid-base relations are limited to----- solution
a. Colloidal b. Aqueous c. Homogenous d. Suspensions
- 55) The buffering range of phosphate buffer is between
a. 12-12.5 b. 8-9 c. 10-10.8 d. 2-3
- 56) The selectivity of the glass electrode is a function of the ----- of the glass
a. Composition b. Optical property c. Presence of inert substance d. Malleability
- 57) ----- is a surface phenomenon which signifies a higher concentration at an interface as compared to that present in the surrounding medium
a. Surface tension b. Turbulence c. Adsorption d. Adherence
- 58) The higher the viscosity of the medium, the ----- will be the particle movement in a centrifuge
a. Stable b. Higher c. Slower d. Faster
- 59) The buffer that works efficiently in acidic ranges is
a. Acetate buffer b. Tris buffer c. Borate buffer d. All
- 60) The pH range of methyl orange indicator is between
a. 3.1-4.4 b. 4.0-4.8 c. 5.0-5.6 d. 6.0-8.0
- 61) In a buffer, when acidic and basic species are present in equal concentration
a. $\text{pH}=\text{pKa}$ b. $\text{pH}>\text{pKa}$ c. $\text{pH}<\text{pKa}$ d. none

- 62) Which is the analyte solution in glass electrode?
 a. Ag b. AgCl c. 0.1 M HCl d. All the above
- 63) The time taken by the solute at a given flow rate of the mobile phase is-----
 a. Elution rate b. Elution volume c. Retention time d. Retention volume
- 64) The principle of centrifugation is to create a larger force than-----
 a. Density b. Gravity c. Viscosity d. Specificity
- 65) The velocity of a particle per unit centrifugal field is called-----
 a. Sedimentation coefficient b. Sedimentation rate c. Svedberg d. Rate constant
- 66) True sedimentation coefficient can only be obtained at----- at ----- concentration
 a. Higher b. Lower c. Zero d. Neutral
- 67) The relationship existing between wavelength and frequency is-----
 a. Direct b. Inverse c. Unpredictable d. None of the above
- 68) For a solution exhibiting 100% transmittance at a particular wavelength, the absorbance is---
 a. Nebulizer b. Fuel gas chamber c. Monochromator d. None of the above
- 69) Which technique is used to measure metal ions?
 a. PCR b. Atomic absorption spectrophotometer c. Spectrofluorimetry
 d. Blotting techniques
- 70) In an element, the number of protons----- the number of electrons
 a. Is equal to b. Is greater than c. Is less than d. None of the above
- 71) Positively charged electrode is
 a. Cathode b. Anode c. HCl d. None of the above
- 72) What is ρ in centrifugation
 a. Density b. Density of the particle c. Velocity d. Diameter

- 73) Clarke's electrode is used for
 a. pH measurement b. CO₂ measurement c. O₂ measurement d. N measurement
- 74) Subcellular organelles can be separated by
 a. Differential centrifugation b. Affinity centrifugation c. Glass electrode d. H₂ electrode
- 75) The relationship existing between wavelength and frequency is-----
 a. Direct b. Inverse c. Unpredictable d. None of the above
- 76) For a solution exhibiting 100 percent transmittance at a particular wavelength, the absorbance is----
 a. 1 b. 0 c. ½ d. None of the above
- 77) The part of the flame photometer concerned with spraying of the sample in the flame is-----
 --
 a. Nebulizer b. Fuel gas chamber c. Monochromator d. None of the above

II) TRUE OR FALSE

1. Electrophoretic mobility of proteins is affected by shape of proteins.
2. Glass electrode is a type of ion selective electrode.
3. Buffer cannot resist the change in pH.
4. Bicarbonate buffer is present in our body fluids
5. Sucrose is used as density gradient.
6. Clarke's electrode is used for pH determination.
- 7.. Differential centrifugation is used for separation of sub cellular organelles.
8. Buffer solution allows changes in pH
9. One svedberg unit is 1×10^{-13} sec
10. Buffer solutions are necessary to keep the correct pH for enzymes in many organisms of proteins

11. Microcentrifuges are used to process small volumes of biological molecules , cells , or nuclei.
12. Rotors regulates temperature in cooling centrifuges
13. Glass electrode is a type of ion selective electrode.
14. One Svedberg unit represents 10^{-11} secs
15. Buffer solution is a mixture of weak acid and its conjugate base
16. When glass electrode and reference electrode are dipped in a solution a galvanic cell is set up
17. Bicarbonate buffer is present in our body fluids
18. Buffer capacity is the ability of buffer to resist change in pH
19. Microcentrifuges are used to process small volume of biological molecules, cells, or nuclei.
20. Rotors regulates temperature in cooling centrifuges.
21. Buffer capacity is the ability of buffer to resist change in pH.
22. Isopycnic centrifugation solely depends on viscosity.
23. Buffer solution allows changes in pH
24. Buffer solution is a mixture of weak acid and its conjugates base
25. When glass electrode and reference electrode are dipped in a solution a galvanic cell is set up
26. Mitochondria could be separated by centrifuging the sample at 100g
27. The monochromator used in spectrophotometer is prism.
28. The type of fluorescence exhibiting by thiamine is extrinsic.

III) ANSWER IN ONE SENTENCES (1 Mark)

1. Define normality
2. What is a buffer?
- 3..Define pH
- 4..What is a glass electrode?
- 5.What is sedimentation rate?
- 6..Write the principle of isopycnic density gradient centrifugation.
- 7.Define molality
- 8..Define pKa
- 9..What is major buffer system that operates in RBCs?
10. Define isotonic solution
- 11.Explain buffering capacity
- 12..List out any two density gradients.
- 13..What is the directions of centrifugal force?
- 14.. List out any two factors that influence sedimentation rate.
15. Define solution
16. Bring out the different type of rotors in centrifugation
17. What do you mean by sedimentation rate in centrifugation?
18. What is centrifugal force?
19. Define Svedberg unit
20. Define : p^{ka}
21. What is major buffer system that operators in RBCs?

22. List out any two density gradients
23. What is the direction of centrifugal force
24. What is the use of calomel electrode?
25. How the speed of centrifuge is measured?
26. Define sedimentation Coefficient
27. List few common acid base indicators
28. What are the components of pH meter?
29. What is the range of operation high speed centrifuges?
30. What is a buffer?
31. What is a rotor?
32. Name the buffers present in RBC?
33. Define Svedberg unit?
34. What is sedimentation rate?
35. Write the principles of isopycnic density gradient centrifugation
36. What is a rotor?
37. Name the buffers present in RBC?
38. Define solution
39. List the formed elements of blood

40. What is Rf value?
45. Define activity co-efficient
46. What is the use of calomel electrode?
45. How the speed of centrifuge is measured?
46. Define sedimentation coefficient
47. Define isotonic solution
48. Explain buffering capacity
49. List out any two factors that influence sedimentation rate.
50. List few common acid base indicators.
55. What are the components of pH meter?
61. Define RCF
62. What is the range of operation high speed centrifuges?
63. State Lambert-Beer's law
64. Comment on monochromators

IV) ANSWER THE FOLLOWING (5 MARKS)

1. Give an account on Tiselius moving boundary electrophoresis
2. Mention few applications of buffers.
3. Explain the technique of isopycnic centrifugation
4. Write a short note on buffers in body fluids
5. Write a short note on glass electrode.
6. Give a short account on reverse phase chromatography

7. Write a short note on density gradient centrifugation
8. Outline the different buffer systems operating in cells and tissues
9. List out the features of an ideal buffer for use in biological experiments
10. Explain the separation of organelles using differential centrifugation
11. Calculate the pH of 0.01M NaOH.
12. Define Normality , Molarity and molality
13. Write a note on the various types of centrifuges
14. What are rotors? How are they classified?
15. What is wall effect or Trajectory in centrifuges?
16. Bring out the differences between rate Zonal and isopycnic centrifugation.
17. Derive Henderson – Hasselbach equation?
18. Write a note on differential centrifugation.
19. Outline the different buffer system operating in cells and tissues.
20. List out the features of an ideal buffer for use in biological experiments.
21. .Explain the separation of organelles using differential centrifugation.
22. .Explain the different types of rotors?
23. Write a short note on density gradient centrifugation.

24. Write a note on the various types of centrifuges
25. What do you mean by strength of an acid?
26. Describe in brief the detection methodology involved in GLC
27. Give a brief account on electromagnetic radiation.
28. Explain the principles behind fluorescence.

V) ANSWER THE FOLLOWING (10 MARKS)

1. Explain the mechanism of action of buffers in body fluids.
2. Give a detailed account on the instrumentation of analytical ultracentrifuge.
3. Write an essay on the structure and function of Clark oxygen electrode.
4. Explain the buffers in the body?
5. How will you separate sub cellular organelles by differential centrifugation?
6. Describe in detail the principle and applications of ultracentrifuge
7. Define Henderson-Hasselbalch equation. Bring out its importance.
8. Describe the operation procedure and applications of glass electrode.
9. Describe the principle and applications of glass electrode.
10. Explain the principle and application oxygen electrode.
11. How will you separate sub cellular organelles by differential centrifugation?

12. Describe in detail the process of differential centrifugation.
13. Give a detail account on the instrumentation of spectrophotometer.
14. Explain the principle behind the fluorescence.
15. Give a detailed account on the instrumentation of spectrophotometer.
16. Write an essay on spectrofluorimetry.
17. Explain UV-Spectrophotometry.