St. Joseph's College of Arts & Science (Autonomous)
Cuddalore – 607001

QUESTION BANK

CLASS: II - B.Sc., CHEMISTRY, SEMESTER-III

SUBJECT: ANALYTICAL CHEMISTRY-II

SUBJECT CODE: CH306S

UNIT-1

ONE MARK QUESTIONS

1. In the gravimetric estimation of Magnesium, Copper can be masked using
a. Citrate b. Tartarate c. Cyanide d. Triethanolamine

2. The instrument used in thermogravimetry (TG) is called a ----------

3. Distillation comprises ---------- and recondensation.

4. In DTA, temperature difference is plotted against _____

TWO & THREE MARK QUESTIONS

1. Write short note on Thermometric titration.

2. Write a note on recorder in TGA?

3. What are the factors that affecting DTA curves?

4. Write the principle of gravimetric analysis.

5. What are specific precipitants? Give an example.

6. Write the principle involved in TGA.

7. What is co-precipitation? Explain with example?

8. Draw the TGA curve for $CuSO_4.5H_2O$.

9. What are the factors that affecting DTA curve?

10. What are the advantages of precipitation from homogeneous medium?

11. The solubility of calcium sulphate ($CaSO_4$) is found to be 0.67 g/L. Calculate the value of Ksp for calcium sulphate.

12. What is thermogravimetry?

13. Write the important conditions for the precipitation.

14. What are the methods to decrease post precipitation.

15. Write the TGA curve of $CaC_2O_4 . H_2O$.

16. What is DTA.

17. Why little of excess of precipitant is to be added to precipitate SO_4^{-2}as $BaSO_4$.

18. Explain the DTA curve of $CaC_2O_4 . H_2O$.

19. A mixture of $CaCO_3$ and CaO is analysed using TGA technique. TG curve of the sample indicates that there is a mass change from 145.3 mg to 115.4 mg between 500–900 °C. Calculate the percentage of $CaCO_3$ in the sample.

20. Explain the instrumentation of DTA.

UNIT-2

ONE MARK QUESTIONS

1.A mixture of benzene and toluene is seperated by _____
a) Crystallization b) Sublimation c) Fractional distillation d) None of the above

2.Camphor can be purified by _____
a) Distillation b) Filltration c) Sedimentation d) Sublimation

3. Steam distillation is used in the manufacture of _____
a) Aniline and turpentine oil b) $C_6H_{12}O_6$ c) Acetophenone d) None of the above

4. Sublimable solids _____
a) Camphor b) Naphthalene c) Benzoic acid d) All the above three

5. Organic compounds which are decomposed when boiled at atmospheric pressure are purified by a) Steam distillation b) Vaccum distillation c) Fractional distillation d) Crystallization process

6. Aniline is purified by
a) Fractional crystallisation b) Steam distillation c) Vaccum distillation d) Electrophoresis

7. From the crushed peppermint plant, the peppermint oil can be separated by
a. Sublimation b. Vacuum distillation c. Steam distillation d. Fractional distillation

8. For the recrystallisation, the less commonly used solvent is
a. Water b. Ethanol c. Pyridine d. Acetone

9. Azeotropic mixture is a_____ boiling _____

TWO & THREE MARK QUESTIONS

1. Explain steam distillation process.

2. Mention the applications of steam distillation technique.

3. Write principle of distillation.

4. Write a note on sublimation under ordinary pressure.

5. What is sublimation?

6. Write the principle of crystallization?

7. Write a short note on the distillation under reduced pressure.

8. Write the differences between distillation and fractional distillation

9. How would you seperate a mixture of aniline and nitrobenzene?

10. What is distillation under reduced pressure?

11. Outline the principle and uses of fractional crystallization.

12. Mention any two conditions for good fractionation.

13. Write any two characteristics of an ideal solvent for recrystallization

14. Mention the important conditions of diffraction.

15. Why alcohol and water cannot be separated completely by distillation?

16. What is meant by electrophoresis?

17. Write the applications of Electrophoresis.

18. Explain electrodialysis.

19. Boiling chips should not be added to hot liquid. Why?

20. Mention any two conditions for good fractionation.

21. Explain the principle of Crystallisation with suitable example.

UNIT-III ONE MARK QUESTIONS

1. An electrode whose potential is changes from its reversible value is called----------(polarizable electrode)
2. Calomel electrode is an example for ----------(non polarizable electrode)
3. ---------- is an example for polarizable electrode.(DME)
4. What is concentration polarization?
5. Polarography can be used for the estimations of cations and anions in the presence of ---------- (interfering ions).
6. The determination of plant content can be done by ----------(polarography)
7. Dissolved oxygen can be determined by the application of ---------(polarography)
8. If the bulk concentration decreases, the limiting diffusion current obtained at a constant potential also decreases proportionately. This is the principle behind---------(amperometry)
9. The cell potential is an ---------- (intensive property)
10. In amperometry, the endpoint is found by----------(graph)

2 &3 MARK QUESTIONS

1. What is polarimetry?
2. Define Residual current?
3. What is a Convection?
4. What is a polarography?
5. Write the advantages and limitations of polarography.

6. Write the principle of Amperometric titration.
7. What is the basic principle of polarography?
8. What are the important uses of amperometry?
9. What is diffusion and Limiting current?
10. What are the uses of amperometry?
11. Give any two applications of amperometry.
12. Write Il kovic equation with terminologies.
13. Why ampertometric titration is better method than polarographic method for quantitative analysis?
14. Explain why an excess of supporting electrolyte is added to electroactive species in polarographic analysis?
15. Before starting the polarographic analysis the dissolved oxygen should be eliminated. Why?

7 marks

1. What are the advantages of DME?
2. Discuss on the instrumentation of polarimetry.
3. How polarography is used in qualitative analysis?
4. a. Discuss the principle and advantages of Amperometry. (4)
   b. Discuss the influence of temperature and agitation on diffusion current. (3)
5. a) What are the disadvantages of DME? **(4)**
   b) What is half wave potential? **(3)**
6. Define the following
   a) Diffusion current **(2)**
   b) Migration current **(2)**
   c) Discuss the construction and working of a DME. **(3)**
7. a) Why amperometry titration is a better method than polarographic method for quantitative analysis? **(3)**
   b) How Quantitative analysis is much more practicable with DME in comparison with solid electrodes **(2)**
   c) In which situation a rotating of electrode is preferable over DME. **(2)**
8. a) What is polarogram? **(2)**
   b) Write the advantages of DME. **(3)**
   c) Why amperometric titration is a better method than polarographic method for quantitative analysis? **(2)**
9. Give the advantages of amperometry.

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UNIT-IV
UV-VISIBLE SPECTROSCOPY

ONE MARK QUESTIONS

1. The region between 2000Å-4000Å is known as ----------.(near UV region)
2. -------are the electrons which are not involed in the bonding between atoms in molecules. (n electrons)
3. Xenon discharge lamps and mercury arcs are used as the radiation source in -------- (uv spectroscopy)
4. Give some examples for detectors in UV spectrometer.
5. The sample cells should be uniform and -------- in construction of uv spectroscopy.(inert)
6. Uv absorption spectrum is a plot between -------- and ----------.(degree of absorption, wavelength)
7. In UV absorption spectroscopy the bands due to ---------- are very intense.(impurities)
8. In UV spectroscopy ---------- is used to disperse the radiation according to the wavelength. (monochromators)
9. Give anyone advantage of double beam instrument.
10. In UV spectroscopy fast reactions can be studied using --------.(Stop flow method)
11. The unit of molar absorptivity is: 1. L mol–1 cm–1 2. L–1 mol cm–1 3. L mol cm–1 4. L mol cm

2 &3 MARK QUESTIONS

1. State Beer's law.
2. Draw the block diagram of UV spectrometer.
3. What is a chromophore?
4. State Lambert's law.
5. What is X-ray diffraction?
6. Explain the terms of Bragg's equation.
7. Write the requirements of a radiation source.
8. What is charge transfer transition?
9. Write a note on absorption band and intensity.
10. What is the concentration of a solution whose absorbance is 0.21 when placed in a tube of path length 10 cm (λ max = 245 nm and λ max = 31,500 M-1cm-1)

7 marks

1. a) What are the methods in X ray spectroscopy? **(3)**
   b) Explain Rotating Crystal method in X ray spectroscopy. **(4)**
2. Explain different types of electronic transitions?
3. Explain the instrumentation of spectrophotometer
4. a) Give the basic principle of Polarimeter? **(4)**
   b) Write Bragg's equation with terminologies. **(3)**
5. a) Write a short note on photocolorimeter. **(2)**
   b) What is x-ray diffraction? How it can be used to determine the internal structure of a NaCl crystal. **(2+3)**
6. a) What are chromophores? **(2)**
   b) What is Bragg's equation? **(2)**
   c) Write a short note on powder diffraction technique. **(3)**
7. . a. Explain the instrumentation of UV spectrophotometer. (4)
   b. Derive Bragg's equation. (3)
8. Explain powder technique and rotating crystal technique(7)
9. Explain the uses of UV spectroscopy.
10. Explain the estimation of glucose using polarimeter.

UNIT-5

1. When EBT is added to hard water buffered to a pH of about _____ a) 10 b) 2 c) 5 d) 3

2. 1 ppm = _____
a) 1 mg / litre b) 0.1 mg / litre c) 10 g / litre d) None of the above

3. Zeolite plant usually occupies _____ space than a lime soda plant softening same volume of water a) More b) Less c) Moderate d) Very high

4. In DTA an inert reference material is
a) Al b) Mg c) Zn d) None of the above

5. Temporary hardness of water can be removed by
a) Filtration b) Sedimentation c) Boiling d) Coagulation

6. For the sterilization of water we can use
a) O3 b. O2 c. CO d. N2
7.The unit of hardness is
a) Molarity b) Molality c) Normality d) ppm

8. Temporary hardness of water can be removed by
a. Filtration b. Sedimentation c. Boiling d. Coagulation

9. The most effective sterilization agent in domestic water treatment is
a. Chlorine b. Chloramine c. Bleaching powder d. Ozone

10._____ is a measure of oxidizable impurities present in the waste water.

11.Hardness of water is determined by _____

12. Molar solubility, is the number of moles of solute in --------- L of a standard solution.

13.the maximum desirable limit Bureau of Indian Standards (BIS) of lead in the drinking water is

A. 0.05 mg/l

B. 0.09 mg/l

C. 0.1 mg/l

D. 1.0 mg/l

14. Zeolite softening process removes

A. only temporary hardness of water

B. only permanent hardness of water

C. both temporary and permanent hardness of water

D. the dissolved gases in permanent hard water

15. Conventional tertiary treatment is

A. chemical coagulation and flocculation

B. filtration

C. sedimentation

D. none of these

16. The maximum desirable limit (BIS) of total hardness (as $CaCo_3$) in drinking water is

A. 600 ppm

B. 300 ppm

C. 500 ppm

D. 1000 ppm

17. The chemical oxygen demand (COD)measures the

A. amount of oxygen required for growth of microorganisms in water

B. amount of oxygen that would be removed from the water in order to oxidize pollution

C. amount of oxygen required to oxidize the calcium present in waste water

D. none of the above

18. Hardness of water does not

A. have any bad effect in boiler

B. make cooking of foods difficult

C. make it unfit for drinking

D. cause difficulty in the washing of clothes with soaps

19. Permanent hard water may be softened by passing it through

A. sodium silicate

B. sodium bicarbonate

C. sodium hexametaphosphate

D. sodium phosphate

20. Zeolite used in zeolite softening process for the treatment of hard water gets exhausted after certain time of usage but can be regenerated by flushing it with

A. 10% calcium chloride solution

B. 10% magnesium sulfate solution

C. 10% magnesium chloride solution

D. 10% sodium chloride solution

21. Temporary hardness of water is caused by the presence of

A. chlorides of calcium and magnesium

B. sulfates of calcium and magnesium

C. bicarbonates of calcium and magnesium

D. carbonates of sodium and potassium

22. Secondary treatment uses _____ to consume wastes.

A. micro-organisms

B. chemicals

C. filtration

D. none of these

23. Application of quaternary ammonium compounds as sanitizing agents tends to

A. favor gram positive bacteria

B. decrease gram positive bacteria

C. increase the percentage of gram(-)ve rods on utensils

D. none of the above

24. Permanent hardness of water is caused by the presence of

A. bicarbonates of calcium and magnesium

B. carbonates of sodium and potassium

C. chlorides and sulfates of calcium and magnesium

D. phosphates of sodium and potassium

25. According to BIS the maximum permissible limit of dissolved solids in drinking water is

A. 1000 mg/l

B. 500 mg/l

C. 2000 mg/l

D. 1500 mg/l

26. Acid used mostly for removal of milk stone is

A. phosphoric acid

B. nitric acid

C. gluconic acid

D. tartaric acid

27. Which of the following chemical is sometime added in the process of coagulation and flocculation?

A. Aluminum sulphate

B. Aluminum oxide

C. Calcium chloride

D. None of these

28. Which of the following physical method is used as germicidal in modern time for the treatment of drinking water?

A. Chlorination

B. Treating with potassium permagnate

C. UV radiation

D. Treating with bleaching powder

29. Sanitizer used specifically for vitreous enamel are

A. strong alkalis

B. strong acids

C. weak alkali with sodium silicate

D. none of these

30. The common methods used for disinfection in waste water treatment plants are

A. chlorination

B. UV light

C. both (a) and (b)

D. Phenolic solvent

31. Inhibitors are used along with sanitizer to

A. improve their action

B. to prevent corrosion

C. both (a) and (b)

D. none of these

32. Sanitizers used for rubber made equipments are

A. strong acids

B. strong alkalis

C. combination of both

D. none of these

33. Which of the following substances are commonly used in a filter?

A. Charcoal

B. Sand

C. Both (a) and (b)

D. Aluminum chloride

34. Biological oxidation processes usually referred as biological treatment, are the most common form of

A. primary treatment

B. secondary treatment

C. tertiary treatment

D. all of these

35. The maximum permissible limit (BIS) of turbidity in drinking water is

A. 5 NTU

B. 10 NTU

C. 15 NTU

D. 20 NTU

36. Sedimentation is a physical process used in wastewater treatment to

A. remove particles that are less dense than water

B. remove particles that are more dense than water

C. remove the pertinacious material from the water

D. none of the above

37. The ultimate source of water is

A. rivers and lakes

B. dew and forest

C. rain and snow

D. underground and surface

38. Permanent hardness of water may be removed by the addition of

A. lime

B. soda ash

C. potassium permagnate

D. sodium bicarbonate

39. Both temporary and permanent hardness of water can be removed on boiling water with

A. calcium hydroxide

B. sodium carbonate

C. calcium oxide

D. calcium carbonate

40. Lagoons may be characterized as

A. Anaerobic

B. Facultative

C. Aerated

D. all of these

41. Temporary hardness of water may be removed by adding

A. calcium hydroxide

B. calcium carbonate

C. calcium chloride

D. sodium bicarbonate

42. The maximum desirable limit (BIS of mercury in the drinking water is

A. 0.05 mg/l

B. 0.9 mg/l

C. 0.1 mg/l

D. 0.001 mg/l

43.From the following sanitizers which one comes under category of surface active agents?

A. Tetra phosphate

B. Teepol

C. Meta phosphate

D. None of these

44. The purest form of naturally occurring water is

A. rain water

B. river water

C. pond water

D. well water

45. Calgon is used for removal of

A. sodium carbonate

B. permanent hardness of water

C. potassium carbonate

D. none of these

46. The water being used in dairy industry should contain not more than

A. 5 proteolytic and/or lipolytic organisms per ml

B. 10 proteolytic and/or lipolytic organisms per ml

C. 15 proteolytic and/or lipolytic organisms per ml

D. 20 proteolytic and/or lipolytic organisms/ml

47. The activated sludge process consists of returning a portion of the clarifier

A. effluent water entering the reactor

B. influent water coming out of the reactor

C. influent water entering the reactor

D. effluent water coming out of the reactor

48. The activated sludge process is sometime referred as

A. fluid bed biological oxidation system

B. fixed bed biological oxidation system

C. turning bed biological oxidation system

D. none of the above

49. BOD stands for

A. biochemical oxygen demand

B. british oxygen demand

C. british oxygen depletion

D. biological oxygen depletion

50. When temporary hard water is boiled, one of the substances formed is

A. calcium bicarbonate

B. calcium sulfate

C. hydrogen chloride

D. carbon dioxide

51. Zeolite softening process removes both temporary and permanent hardness of water. In this process the calcium and magnesium present in water are precipitated as

A. insoluble carbonates

B. insoluble zeolites

C. insoluble chlorides

D. insoluble sulfates

52. The methods used for biological treatment are

A. lagoon

B. activated sludge process

C. oxidation ditches

D. all of these

53. Both temporary and permanent hardness of water can be removed by

A. boiling

B. distillation

C. filtration

D. decantation

54. Coliform bacteria in water is an indication of the presence of

A. radioactive wastes

B. excess fertilizer

C. decaying animals and plants

D. human feces

55. When EBT is added to hard water buffered to a pH of about _____
a) 10 b) 2 c) 5 d) 3

56. 1 ppm = _____
a) 1 mg / litre b) 0.1 mg / litre c) 10 g / litre d) None of the above

57. Zeolite plant usually occupies _____ space than a lime soda plant softening same volume of water a) More b) Less c) Moderate d) Very high 46.The
58. unit of hardness is
a) Molarity b) Molality c) Normality d) ppm

59. Temporary hardness of water can be removed by
a. Filtration b. Sedimentation c. Boiling d. Coagulation

60._____ is a measure of oxidizable impurities present in the waste water.

61. Hardness of water is determined by _____

62. Molar solubility, is the number of moles of solute in --------- L of a standard solution

63. Distillation comprises ---------- and recondensation.

64. The dissolved oxygen is determined by _____ method

TWO & THREE MARK QUESTIONS

1. Name the indicator used in EDTA method.

2. What is reverse osmosis?

3. Write a short note on filtration.

4. What is COD?

5. What are the important chemicals used in coagulation process?

6. Write short note on zeolite process?

7. What is lime-soda process?

8. What is chemical oxygen demand?

9. Calculate the permanent hardness of a sample of water containing $MgSO_4$ = 2.6 ppm and $CaSO_4$ = 7.6 ppm

10. A sample of water on water analysis has been found to contain the following: $Ca(HCO_3)_2$ = 10.5 ppm $Mg(HCO_3)_2$ =12.5 ppm $CaSO_4$ = 7.5 ppm $CaCl_2$ = 8.2 ppm $MgSO_4$ = 2.6 ppm. Calculate the temporary and permanent hardness.

11. Explain the reverse osmosis technique.

12. Define BOD.

13. How many grams of $FeSO_4$ dissolved per litre does give 200 ppm of hardness?

14. Calculate the temporary hardness of a sample of water containing $Mg(HCO_3)$ = 7.5 mg/l and $Ca(HCO_3)_2$ = 16 mg/l 32. What are the advantages of precipitation from homogeneous medium?

15. Explain the different methods of treatment of domestic water.

16. A mixture of $CaCO_3$ and CaO is analysed using TGA technique. TG curve of the sample indicates that there is a mass change from 145.3 mg to 115.4 mg between 500–900 °C. Calculate the percentage of $CaCO_3$ in the sample.

17. How many grams of $FeSO_4$ dissolved per litre gives 200 ppm of hardness?

18. Calculate the temporary hardness of a sample of water containing $Mg(HCO_3)$ = 7.5 mg/l and $Ca(HCO_3)_2$ = 16 mg/l

19. Write briefly about the chemical coagulation

20. What is degree of hardness of water?

21. Explain any one type of water treatment.

22. How will you estimate the permanent hardness of water? Write the procedure.

23. Calculate the permanent hardness of a sample of water containing $MgSO_4$ = 2.6 ppm and $CaSO_4$ = 7.6 ppm

24. A 2.00g sample of limestone was dissolved in hydrochloric acid and all the calcium present in the sample was converted to $Ca^{2+}(aq)$. Excess ammonium oxalate solution, $(NH_4)_2C_2O_4(aq)$, was added to the solution to precipitate the calcium ions as calcium oxalate, $CaC_2O_4(s)$. The precipitate was filtered, dried and weighed to a constant mass of 2.43g. i) Wite the balanced chemical equation for the precipitation reaction

Match the following

1.Zeolite process	- Manufacture of aniline
2.Oxime	- Polarography
3.Steamdistillation	- Rontgen
4.DME	- Aluminium estimation
5.X-ray	- Zero hardness
6.Thermometric titration	- Micro electrode
7.Distillation	- – * transition
8.DME	- EBT indicator
9. Alkenes	- Purification technique
10. EDTA	- Dewar flask
11. Sequestering	- concentration

12. Erlenmeyer flask - salty

18. Wave height - masking
19. Miller - Drying
20. Brackish -crystal

21. Benzoin-α-oxime - Distribution law

22. Separation - ppm

23. Half-wave potential - Amino group

24. Auxochrome - Diffusion current

25. Hardness - Cupron

26. Sequestering - Concentration

27. Erlenmeyer flask - Salty

28. Wave height - Masking

29. Miller - Drying

30. Brackish - Crystal

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