Part I: Choose the correct answer from the given alternatives and circle your answer

1. Which one of the following is an acidic buffer?

A. CH_3COOH plus $NaCH_3COO$ C. A and B

B. NH_3 plus NH_4Cl D. All

2. What type of solution is made during hydrolysis of weak acids and weak bases?

A. Acidic B. Basic C. Neutral D. All

3. According to Lewis acid-base concept, which one of the following is not true?

A. The atom that has low electron density acts as a Lewis acid

B. Molecules that contain a polar double bond act as Lewis base.

C. Ammonia is a stronger Lewis base than water

D. All

4. Which one of the following weak acids is relatively high strength in acidity?

A. HOCl with Ka = 3.5×10^{-8} C. HCN with Ka = 3.5×10^{-10}

B. HNO_2 with Ka = 3.5×10^{-4} D. NH_4^+ with Ka = 5.70×10^{-10}

5. According to any conjugate acid-base pair, which one of the following is not true?

A. The conjugate base has one fewer H and one more minus charge than the acid.

B. The conjugate acid has one more H and one fewer minus charge than the base.

C. A and B are answer D. None of the answer

6. How is the solubility of $Pb(NO_3)_2$ affected if we add $Pb(IO_3)_2$ to a solution of 0.10 M $Pb(NO_3)_2$?

A. Increases B. Decreases C. Remains constant D. None

7. Which one of the following is true about quantitative analysis?

A. The analysis is based on the identification of individual elements in the sample

B. The analysis is carried out to determine the amounts of constituents in the sample

C. The analysis is carried out to determine the quantities of components in the sample

D. B & C are correct E. None

8. Which one of the following is the importance of analytical techniques?

A. Analysis of blood or urine

B. Determination of major and minor components of food

C. Comparison of DNA codes D. All E. None

9. According to any conjugate acid-base pair, which one of the following is **not** true?

A. The conjugate base has one fewer H and one more minus charge than the acid.

B. The conjugate acid has one more H and one fewer minus charge than the base.

C. The conjugate acid has one fewer H and one more minus charge than the base.

D. A and B are answer E. None of the answer

10. How is the solubility of $Cd(NO_3)_2$ affected if we add $Cd(IO_3)_2$ to a solution of 0.10 M $Cd(NO_3)_2$?

A. Increases B. Decreases C. Remains constant D. All E. None

11. What features can you observe from strong acid-strong base titration curve?

A) At the beginning of the titration the pH is low

B) After equivalent point suddenly, the pH rises steeply by addition of base

C) At the equivalent point is pH > 7

D) All except C E) None

12. Which one of the following is the strongest acid?

A) Perchloric acid, $HClO_4$ C) Hydrofluoric acid, HF

B) Phosphoric acid, H_3PO_4 D) A & B E. None

13. The type of titration that works based on the use of silver nitrate is known as _____ titration.

A. Argentometric

B. Complexometric

C. Amperometric

D. Conductometric

E. None of these

14. Both classical and instrumental methods can be used to determine the concentration of a specific element or species in a compound. Which of the following pairs is the WRONG combination of the type of analysis with its characteristic?

A. Spectrophotometric analysis – density

B. Volumetric analysis – volume

C. Gravimetric analysis – mass

D. Potentiometric analysis - voltage

15. What is a neutral solution?

A. A solution that contains a greater concentration of [OH^-]

B. A solution that measures greater than 7 on the pH scale

C. A solution that contains equal concentrations of [H_3O^+] and [OH^-]

D. A solution that contains a greater concentration of [H_3O^+]

16. EDTA has _____ binding sites and it is used as titrant for _____ type of titration.

A. Six and redox

B. Five and complexation

C. Four and precipitation

D. Seven and acid-base

E. None of these

17. The unit molarity (mole per liter) is used to express the concentration of a certain species of chemical element in a concentrated solution. Meanwhile, other more appropriate units are more commonly used to describe the concentration of more diluted solutions. One of these units, which is very close to the milligram per liter measurement, is?

A. Part per thousand (ppt)

B. Part per million (ppm)

C. Part per billion (ppb)

D. Part per trillion (pptr)

18. In the precipitation titration the adsorption, potassium chromate, and iron ions indicators are used for _____, _____, and _____

A. Fajan's, Mohr's, and Volhard's method

B. Mohr's, Fajan's, and Volhard's method

C. Volhard's, Fajan's, and Mohr's method

D. Volhard's, Mohr's, and Fajan's

E. None of these

19. What do you need to know about a stock solution in order to calculate a dilution?

A. Its volume

B. Its ppm

C. Its mass

D. Its molarity

20. A 50.0-mL sample of 0.50 *M* HCl is titrated with 0.50 *M* NaOH. What is the pH of the solution after 28.0 mL of NaOH has been added to the acid?

A. 0.85 B. 0.75 C. 0.66 D. 0.49 E. None of these

21. In chemical equilibrium, a principle states that if a stress (for example, a change in concentration, pressure, temperature or volume of the vessel) is applied to a system in equilibrium, the equilibrium will shift in such a way to lessen the effect of the stress. This principle is called?

A. Hess Principle
B. Aufbau Principle
C. Le Chatelier's Principle
D. Robert Principle

22. The _____ is present in the largest amount in a solution and is referred to as the substance that does the dissolving.

A. Solvent
B. Product
C. Ion
D. Solute

23. Consider the following balanced redox reaction

$$Mn^{2+}(aq) + S_2O_8^{2-}(aq) + 2H_2O(l) \rightarrow MnO_2(s) + 4H^{+}(aq) + 2SO_4^{2-}(aq)$$

Which of the following statements is true?

A. $Mn^{2+}(aq)$ is the oxidizing agent and is reduced.
B. $Mn^{2+}(aq)$ is the oxidizing agent and is oxidized.
C. $Mn^{2+}(aq)$ is the reducing agent and is oxidized.
D. $Mn^{2+}(aq)$ is the reducing agent and is reduced.
E. None of these.

24. Many statistical tests are performed for the data obtained in analytical chemistry. One of the tests decides whether a given datum (either the value is too big or too small compared to the other data) can be rejected or not. This test is?

A. A test

B. F test

C. Q test

D. T test

25. A lab technician has 2 mol of X in an Erlenmeyer flask and pours in 1 liter of water in order to make a 2 M solution. Why is the solution not exactly 2 M?

A. They should have used a beaker.

B. They did not account for the volume of the 2 moles of X so the solution is not 2 M.

C. They did not put in an extra splash of water to account for the 2 moles of X.

D. They did not heat the solution to make it dissolve better.

26. How many significant figures are in 54,050?

A. 3 B. 2 C. 5 D. 1 E. 4

27. In complexometric titration, the most common used chelating agent is EDTA (Ethylenediamine tetraacetic acid). EDTA's molecules will combine with metals to form chelate. EDTA is classified as a?

A. Bidentate ligand

B. Hexadentate ligand

C. Tetradentate ligand

D. Monodentate ligand

28. What is the standard SI unit of mass?

A. Weight

B. Kilogram

C. Quart

C. Pound

D. Newton

29. You are conducting a political survey in a neighborhood and decide that after randomly selecting a start point, you will sample every 15th house on the street. What type of sampling will you be using for this survey?

A. Systematic B. Non-random C. Simple random

D. Cluster E. Interval

30. All of the following methods are used for the analysis of precipitate, EXCEPT?

A. Volhard's method

B. Haber's method

C. Fajan's method

D. Mohr's method

31. What is the concentration of hydronium and hydroxide ions in pure water?

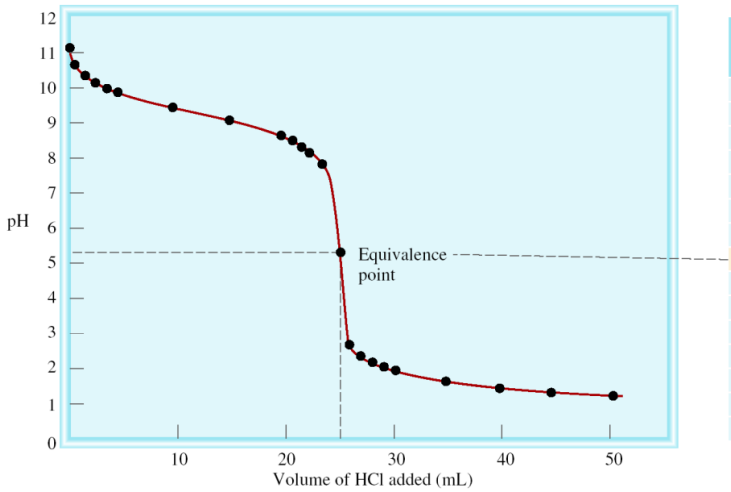
A. 1.0 x 10^{-14} M each

B. 1.0 x 10^{-7} and 1.0 x 10^{-14} M, respectively

C. 1.0 x 10^{-14} and 1.0 x 10^{-7} M, respectively

D. 1.0 x 10^{-7} M each

32. The following titration curve is the kind of curve expected for the titration of a _____ with a _____.



Volume HCl added (mL)	pH
0.0	11.13
5.0	9.86
10.0	9.44
15.0	9.08
20.0	8.66
22.0	8.39
24.0	7.88
25.0	5.28
26.0	2.70
28.0	2.22
30.0	2.00
35.0	1.70
40.0	1.52
45.0	1.40
50.0	1.30

A. Strong base, strong acid

B. Weak base, strong acid

C. Strong base, weak acid

D. Weak base, weak acid

E. None of these

33. Auto-ionization of water occurs when _____

A. Two water molecules form equal amounts of ions.

B. Two water molecules form both hydronium and hydroxide ions by transferring an electron.

C. A water molecule interacts with an acid molecule.

D. Two water molecules form both hydronium and hydroxide ions by transferring a proton.

34. In redox titration, what chemical substance is added to the iodometry and iodimetry analysis?

A. Glucose

B. Argentum

C. Phenolphthalein

D. Starch

Part II: Give the proper answer for the following

35. The solubility of, silver iodide, AgI, increases in the presence of NH_3. Why? Explain.

36. Calculate the pH of a buffer solution that is 0.50 M CH_3COOH and 0.50 M CH_3COONa and what is the pH after adding 0.020 mol of solid NaOH to 1.0 L of this buffer solution? Ka of $CH_3COOH = 1\ .8 \times 1\ 0^{-5}$

37. What is the difference between systematic and random errors?

38. Three students weighed the same object of mass 22.30 g on two different balances and made 5 trials each. The second and the third student used the same balance. The result was

1st	2nd	3rd	
10.08 g	21.97 g	22.55 g	10.09 10.10 10.12
10.11 g	21.98 g	22.39 g	
10.09 g	21.97 g	21.80 g	
10.10 g	22.00 g	21.85 g	
10.12 g	21.97 g	21.75 g	

_____i. Which students are most precise?

A) The 1st B) the 2nd C) the 3rd D) 1st and 2nd E) 2nd and 3rd

_____ii. Which students are most accurate?

A) The 1st B) the 2nd C) the 3rd D) 1st and 2nd E) 2nd and 3rd

39. If one has to prepare copper II sulphate solution in water for the experiment the salt must be ground to powder. Why?

40. Differentiate between galvanic cell & electrolytic cell in redox titration.

41. The solubility of, silver iodide, AgI, increases in the presence of NH_3. Why? Explain.

42. Explain the difference between systematic error and random error in measurements.

43. List the three limitations of the Arrhenius theory of acids and bases.

44. Mohr's method is used for end point detection in determination of Cl^- by using Ag^+ as titrant in precipitation titration method; in this method the medium should be **neutral**. Why? Explain .

45. The difference between end point and equivalent point

46. List at least two properties of precipitating reagents and one property of precipitates in gravimetric methods of analysis.

47. Calculate the molality, molarity, and mole fraction of NH_3 in an 8.00 mass % aqueous solution (d = 0.9651g/mL).

48. Titration of 0.325 g of $Na_2C_2O_4$ (134.00 g $mmol^{-1}$) requires 38.64 mL of $KMnO_4$ solution to reach the end point (4 point)

a) Write a balanced overall equation for the reaction occurring during the titration.

b) Calculate the molarity of the $KMnO_4$ solution

49. An ore containing magnetite, Fe_3O_4, was analyzed by dissolving a 1.1324 g sample in Fe^{2+} and Fe^{3+}. After adding HNO_3 to oxidize any Fe^{2+} to Fe^{3+}, the resulting solution was diluted with water and the Fe^{3+} precipitated as $Fe(OH)_3$ by adding NH_3. After filtering and rinsing, the residue was ignited, giving 0.5394 g of pure Fe_2O_3 (159.69 g/mol). Calculate:

a) The %w/w Fe (55. 847 g mol^{-1}) in the sample

b) The %w/w Fe_3O_4 (231.54 g/mol) in the sample

50. How many grams of solid barium sulfate form when 25.0 mL of 0.160 M barium chloride reacts with 68.0 mL of 0.055M sodium sulfate? Aqueous sodium chloride is the other product.

51. An aqueous solution contains 24% (w/w) of NH_3 and has a density of 0.910 g/mL. Calculate

a) The molality

b) The molarity, and

c) The mole fraction of NH_3

52. A solution contains 30.0 g of $CHCl_3$ dissolved in 70.0 g of CCl_4. The vapor pressure of $CHCl_3$ and CCl_4 water at 27°C are 124 torr and 214 torr respectively. Assuming ideal gas behavior, calculate the partial pressure of each component and the total pressure above the solution.