

Chem Lab C - Chem Lab: Division C - December 19 SO Practice - 12-19-2020

1. (1.00 pts)

Water exposed to the atmosphere can form multiple ionic species by dissolving atmospheric carbon dioxide. Which of the following ions are NOT formed by dissolution of carbon dioxide in water?

- A) HC_2O_4^-
- B) CO_3^{2-}
- C) HCO_3^-
- D) None of the above

2. (1.00 pts) Match the order of names below to the order of ions: bromide, hypobromite, bromite, bromate, perbromate. Br^- , BrO^- , BrO_2^- , BrO_3^- , BrO_4^-

- A) BrO^- , BrO_2^- , BrO_3^- , BrO_4^- , Br^-
- B) Br^- , BrO^- , BrO_2^- , BrO_3^- , BrO_4^-
- C) BrO_4^- , BrO_3^- , BrO_2^- , BrO^- , Br^-
- D) None of the above

3. (1.00 pts) "Weak acid" refers to an acid that does not cause harm when in contact with skin because it is "weak".

- True False

4. (1.00 pts) What quality of water makes it a good solvent for ionic compounds?

- A) Three atoms
- B) Heat capacity
- C) Polarity
- D) All of the above

5. (1.00 pts) Polar solvents dissolve nonpolar solutes.

- True False

6. (1.00 pts) When mixing acid and water, which is the safest procedure?

- A) Pour water into acid
- B) Pour acid into water
- C) Either procedure is equally safe

7. (1.00 pts) A solute is added to a pure solvent. What happens to the freezing point of the solvent?

- A) The freezing point decreases
- B) The freezing point increases

- C) The result depends on the nature of the solute
- D) The freezing point does not change

8. (1.00 pts) A "strong acid" refers to:

- A) Any acid that is dangerous to touch
- B) An acid that can corrode metal
- C) An acid that dissociates completely to produce protons in aqueous solution
- D) An acid that dissociates partially to produce protons in aqueous solution

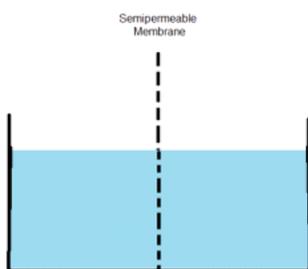
9. (1.00 pts) Which of the following characteristics would be the most useful for an indicator being used in a titration?

- A) The indicator changes color when the titrant is added.
- B) The indicator changes color when titrant is no longer being added.
- C) The indicator changes color at a pH range corresponding to the equivalence point.
- D) The indicator changes color at a pH range corresponding to the titrant.

10. (1.00 pts) Your lab supervisor asks you to make a 7 M solution of NaCl in H₂O. What do you put in the beaker?

- A) 14 moles of NaCl in 0.5 L of water
- B) 7 moles of NaCl in 0.5 L of water
- C) 3.5 moles of NaCl in 1 L of water
- D) 3.5 moles of NaCl in 0.5 L of water

11. (1.00 pts)



The above picture shows a pure solvent in a container, separated into two sections by a semipermeable membrane that allows the passage of solvent molecules but not solute molecules. Solute molecules are added to the left side of the semipermeable membrane. What happens?

- A) Solute molecules pass through the membrane until the concentration is equal on both sides
- B) Solute molecules evaporate until the solvent is pure
- C) Solvent molecules pass through the membrane towards the side with solute molecules
- D) Solvent molecules pass through the membrane towards the side without solute molecules

12. (1.00 pts) In an acid-base titration, what is the difference between the end point and the equivalence point?

- A)
The equivalence point is when enough titrant has been added to completely neutralize the analyte, and the end point is when enough titrant has been added to cause a color change in the indicator
- B)
The equivalence point is when enough titrant has been added to cause a color change in the indicator, and the end point is when enough titrant has been added to completely neutralize the analyte
- C)
The equivalence point is when enough titrant has been added to cause a color change in the indicator, and the end point is when enough data has been collected to complete the experiment
- D) The equivalence point and the end point refer to the same point

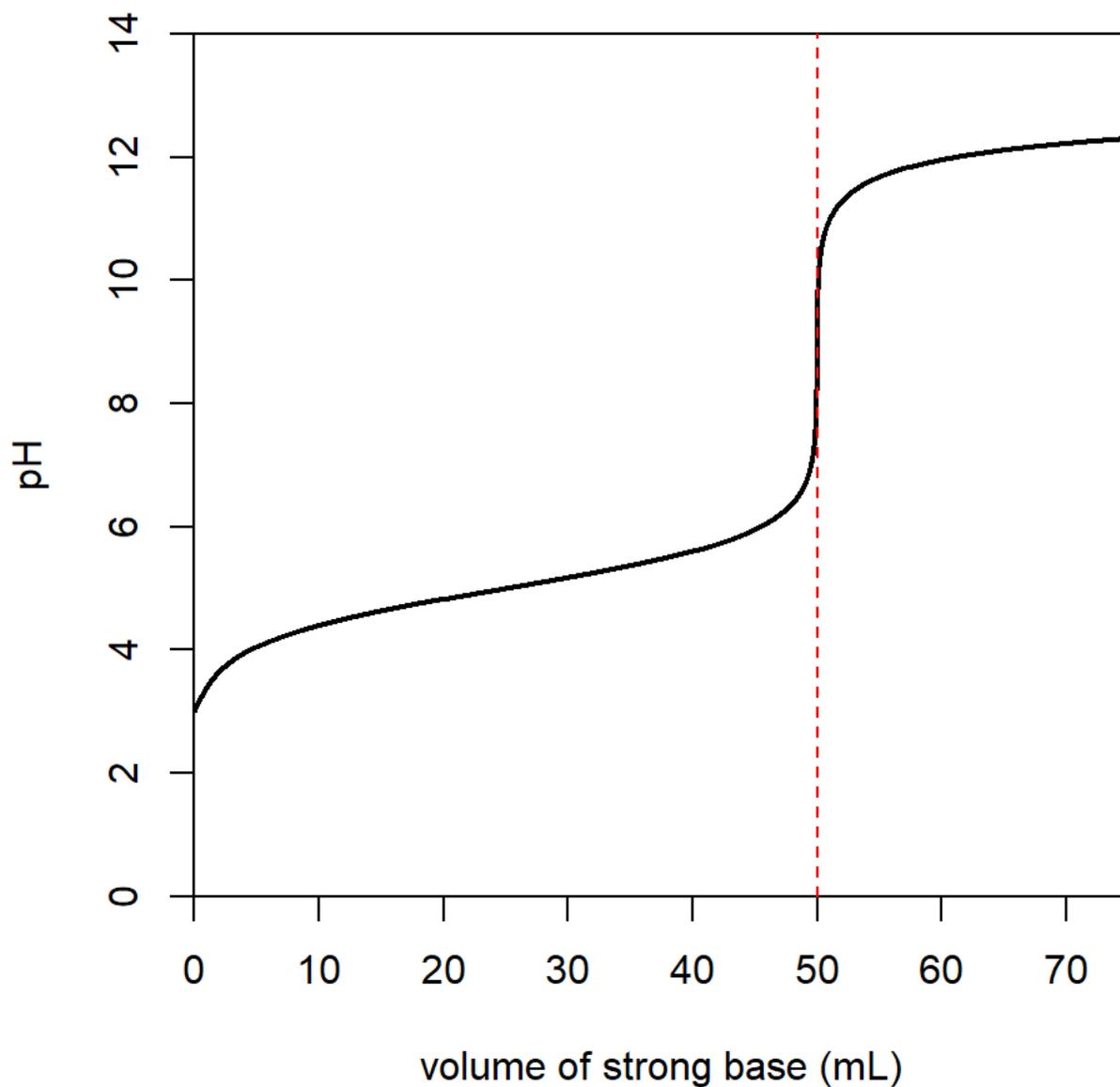
13. (1.00 pts) What relationship does pH have with the concentration of protons in solution?

- A) pH is equal to the concentration of protons in solution
- B) pH is equal to the negative logarithm (base 10) of the concentration of protons in solution
- C) pH is equal to the natural logarithm of the concentration of protons in solution
- D) pH is not indicative of the concentration of protons in solution

14. (1.00 pts) When a blood transfusion is not possible, sometimes saline water is used to increase blood volume. Why can't pure water be used?

- A) Pure water increases the concentration of blood cells to a toxic amount in the body.
- B) Blood cells contain a high concentration of solutes. If pure water were used, water would leave the cell and cause the cells to shrivel.
- C) Blood cells contain a high concentration of solutes. If pure water were used, water would enter the cell and cause the cells to burst.
- D) Blood cells contain a high concentration of solutes. If pure water were used, solute molecules would be drawn out of the cell, tearing the cell wall.

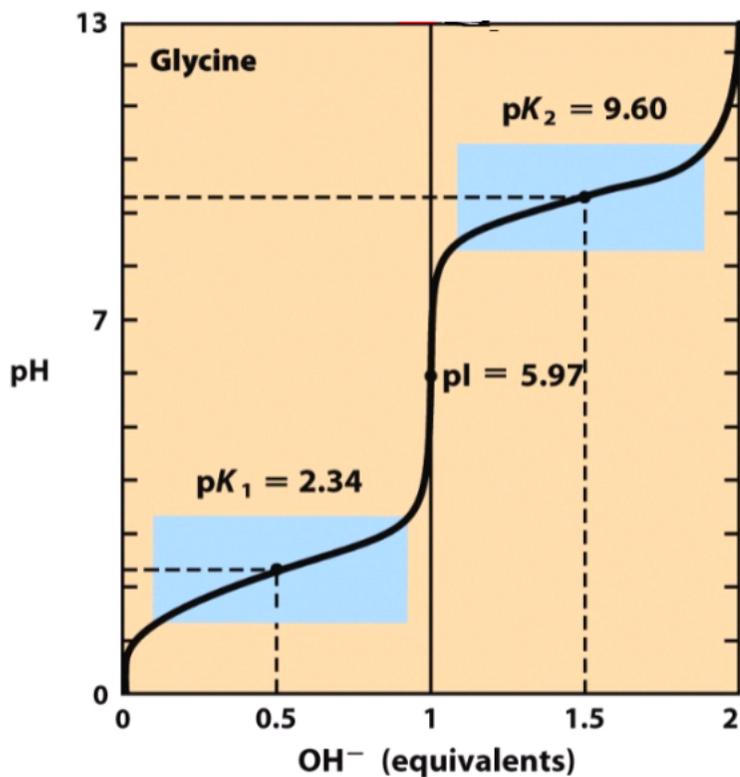
15. (1.00 pts)



What is the point indicated by the dotted line above, and why is it significant?

- A) The dotted line indicates the equivalence point, the point at which enough strong base has been added to completely neutralize the analyte.
- B) The dotted line indicates the equivalence point, the point at which enough strong base has been added to reach equilibrium.
- C) The dotted line indicates the end point, the point at which the pH has changed enough to complete the titration.
- D) The dotted line indicates the end point, the point at which the pH has changed enough to change the color of the indicator being used.

16. (1.00 pts)



The above curve shows a titration curve of the amino acid glycine. Why is more than one pK value indicated?

- A) More glycine was added to the solution, requiring a second titration.
- B) Glycine has multiple sites that can be deprotonated by reacting with a base, and the order occurs randomly.
- C) Glycine has multiple sites that can be deprotonated by reacting with a base, and the order depends on the pK_a of that site.
- D) Glycine has multiple sites that can be deprotonated by reacting with a base, and the order depends on the orientation of the molecule in solution.

17. (1.00 pts) A Bronsted-Lowry acid forms its conjugate base when it donates a proton in solution.

- True
- False

18. (1.00 pts) What factors can affect the K_a of an acid?

- A) The stability of the conjugate base
- B) The stability of the acid molecule in solution
- C) The temperature of the solution
- D) All of the above

19. (1.00 pts) The K_a of free amino acids can differ significantly from the K_a of amino acids in the body. What might an enzyme in the body do in order to achieve this?

- A) Change the temperature of the cell
- B) Stabilize the conjugate base of the amino acid
- C) None of the above
- D) All of the above

20. (1.00 pts)

You are given 10 mL HCl of unknown concentration. In order to determine the concentration, you perform a titration using 1 M NaOH. It takes 15 mL NaOH to reach the end point. What is the concentration of the HCl you were given?

- A) 1.5 M HCl
- B) 15 M HCl
- C) 7 M HCl
- D) 0.7 M HCl

21. (1.00 pts) Why might a direct titration of an acid solution in water using $\text{Mg}(\text{OH})_2$ be difficult?

- A) Magnesium is a metal, therefore it does not dissolve in water
- B) Magnesium hydroxide can dissociate into one magnesium ion and two hydroxide ions per molecule in solution, which significantly alters the stoichiometry
- C) Magnesium hydroxide has very low solubility in water, and the precipitate may complicate the titration
- D) Magnesium hydroxide is an acid

22. (1.00 pts) What are colligative properties?

- A) Colligative properties are the properties of solutions depending on the concentration of solutes and the nature of the solute
- B) Colligative properties are the properties of solutions depending on the concentration of solutes only
- C) Colligative properties are the properties of pure liquids at different temperatures
- D) Colligative properties are the properties of solutions at different temperatures

23. (1.00 pts) What assumptions are made of an ideal solution?

- A) An ideal solution has a 1:1 ratio of solutes to solvent by volume
- B) An ideal solution has a 1:1 ratio of solutes to solvent by weight
- C) An ideal solution has all intermolecular forces equal
- D) An ideal solution has no intermolecular forces

24. (1.00 pts) Why are colligative properties often studied for dilute solutions?

- A) At high concentrations, the nature of the solute molecule affects the colligative properties
- B) At high concentrations, the temperature of the solution increases, affecting intermolecular forces
- C) At high concentrations, the colligative properties are no longer exhibited
- D) At high concentrations, colligative properties are too small to be observed

25. (1.00 pts) Why do rising CO_2 levels lead to ocean acidification?

- A) Carbon dioxide causes evaporation of ocean water, leaving the acidic species and increasing the acidity of the water
- B) Carbon dioxide forms gas bubbles in the ocean, increasing the concentration of acidic species
- C) Carbon dioxide dissolves in the ocean to form acidic species in solution
- D) Carbon dioxide kills fish, causing ocean acidification

26. (1.00 pts) Which indicator changes color in the pH range of 6-7?

- A) Phenolphthalein

- B) Bromothymol blue
- C) Methyl red
- D) Potassium dichromate

27. (1.00 pts) Adding one mole of which compound to pure water will increase the pH the most?

- A) Hydrochloric acid
- B) Ascorbic acid
- C) Sodium hydroxide
- D) Calcium hydroxide

28. (1.00 pts) If the K_a of compound A is twice as large as the K_a of compound B, which of the following is true?

- A) Compound A is twice as acidic as compound B
- B) Compound B is twice as acidic as compound A
- C) Compound A reacts twice as quickly as compound B with water
- D) None of the above

29. (1.00 pts) Which of the following increases the rate of a chemical reaction?

- A) Decreasing the temperature
- B) Adding dye
- C) Decreasing the concentration of solutes used in the reaction
- D) Adding catalyst to the reaction

30. (1.00 pts) What is the difference between molarity and molality?

- A) Molarity measures the concentration of the solute while molality measures the concentration of the solvent
- B) Molarity measures the concentration of the solvent while molality measures the concentration of the solute.
- C) Molarity measures the moles per liter of a solution while molality measures the moles per kg of a solution.
- D) Molarity measures the moles per kg of a solution while molality measures the moles per liter of a solution.

31. (1.00 pts) You are given an unknown acid of unknown concentration. What should you do to identify it?

- A) You should use a titration because using a base of known concentration and volume will determine the pH, and therefore the concentration of acid.
- B) You should use a titration because a strong base reacts with a strong acid, and a weak base reacts with a weak acid, so using either will tell you if the acid is strong or weak.
- C)
You should not use a titration because it is unknown how many protons per molecule are donated from the acid since its identity is unknown, which affects the equivalence point
- D) You should not use a titration because a pH meter will be able to identify the acid more easily

32. (1.00 pts) Which of these are properties of sulfuric acid?

- A) Diprotic acid
- B) High kinetic energy
- C) Colorless and odorless
- D) A, B
- E) A, C

- F) B, C

33. (1.00 pts) All alcohols can be dissolved in water.

- True False

34. (1.00 pts)

You forget to pay attention during pre-lab lecture and mindlessly make a solution as instructed. Since you didn't pay attention, you don't know what you just mixed together. However, you do realize that the solution is warming the beaker as you mix it. Aside from the safety hazard of doing this, what do you then know about the solution you prepared?

- A) The solvation is endothermic, meaning that heat is released through solvation because the solution is lower in energy than the reactants.
 B) The solvation is endothermic, meaning that heat is absorbed through solvation because the solution is higher in energy than the reactants.
 C) The solvation is exothermic, meaning that heat is released through solvation because the solution is lower in energy than the reactants.
 D) The solvation is exothermic, meaning that heat is absorbed through solvation because the solution is higher in energy than the reactants.

35. (1.00 pts) What type of acid/base definition does HSAB theory subscribe to?

- A) Bronsted-Lowry
 B) Arrhenius
 C) Lewis

36. (1.00 pts) What is the essential basis of HSAB theory?

- A) Polarizability
 B) Quantum theory
 C) Kinetic energy
 D) None of the above

37. (1.00 pts) Which of the following are typically insoluble in water?

- A) Sulfides
 B) Bisulfates
 C) Sulfates
 D) Compounds containing alkali metal ions

38. (1.00 pts) An ideal solution obeys Raoult's law.

- True False

39. (1.00 pts) What causes deviations from Raoult's law?

- A) Formation of a precipitate instead of a solution
 B) Intermolecular forces between solute particles and solvent molecules interfere with intermolecular forces between solvent molecules
 C) Intermolecular forces between solvent molecules occur at higher temperatures than between solvent and solute molecules

D) None of the above

40. (1.00 pts) Which of the following mixtures is a colloid?

- A) Oil paint
- B) Salad dressing
- C) Milk
- D) Air

41. (1.00 pts) A colloid is a solution

True False

42. (1.00 pts) A foam is a type of emulsion.

True False

43. (1.00 pts) All emulsions require chemical emulsifiers.

True False

44. (1.00 pts) Water is:

- A) Amphibious
- B) Amphomorphich
- C) Amphoteric
- D) Anthropogenic