

Directions:

1) Draw and generally explain how a still works and what it does.

2) $\text{H}_3\text{C}(\text{CH}_2)_{16}\text{CO}_2\text{K}$ is the formula for potassium stearate (“lye” soap). Predict what the chemical products between potassium stearate and the following ions would be.

A) Fe^{2+}

B) Fe^{3+}

C) Cu^{2+}

D) Mg^{2+}

E) Mn^{2+}

F) Ca^{2+}

3) Briefly explain how cation exchange resins work.

4) Briefly explain how anion exchange resins work.

5) Explain how detergents make water "wet".

6) Name the following hydrates chemically:

A) $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$

B) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

C) $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$

D) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

E) $\text{H}_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$

F) $\text{Na}_2\text{SO}_4 \cdot 7\text{H}_2\text{O}$

- 7) Define hygroscopic, effloresce and deliquescent.
- 8) Explain the surface tension exhibited by H_2O .
- 9) Explain why ice is less dense than liquid water.
- 10) Define basic and acidic anhydrides. Give three examples of each – do NOT use the examples in the notes.
- 11) Why is $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ blue and CuSO_4 white?

12) What is the triple point of water in definition terms and in actual numbers?

13) Illustrate and explain the water cycle in your own words and sketches.

14) List and give examples of the four types of surface water impurities.

15) Define eutrophication in your own words.

16) Sketch and explain a generic public water purification scheme.

17) Draw a diagram of how you'd go about deionizing water for laboratory use. Explain the diagram. How would you know if your system is failing? Or if it's time to re-charge it?

18) Knowing that the electronic configuration of oxygen is $1s^2 2s^2 2p^4$, show the strange sp^3 hybridization oxygen undergoes when it forms water. Explain the hybridization.

19) Write out and explain the chemical reaction for the auto-ionization of water.

20) Write the chemical structures (formulas) for the following acids:

A) Hypobromous acid

C) Hypochlorous acid

B) Hypoiodous acid

D) Hypoflourous acid

21) Write the chemical structures (formulas) for the following acids:

C) Perbromic acid

C) Perchloric acid

D) Periodic acid

D) Perflouric acid

22) Write the chemical structures (formulas) for the following acids:

E) Bromic acid

C) Chloric acid

F) Iodic acid

D) Fluoric acid

23) Write the chemical structures (formulas) for the following acids:

G) Bromous acid

C) Chlorous acid

H) Iodous acid

D) Fluorous acid

24) What's the molar concentration, in general, broad, terms of the hydronium ion in acidic, neutral and basic solutions? What about the hydroxide concentration in each solution?

25) The "p" in $p\text{CO}_2$ means what? The "p" in pH means what?

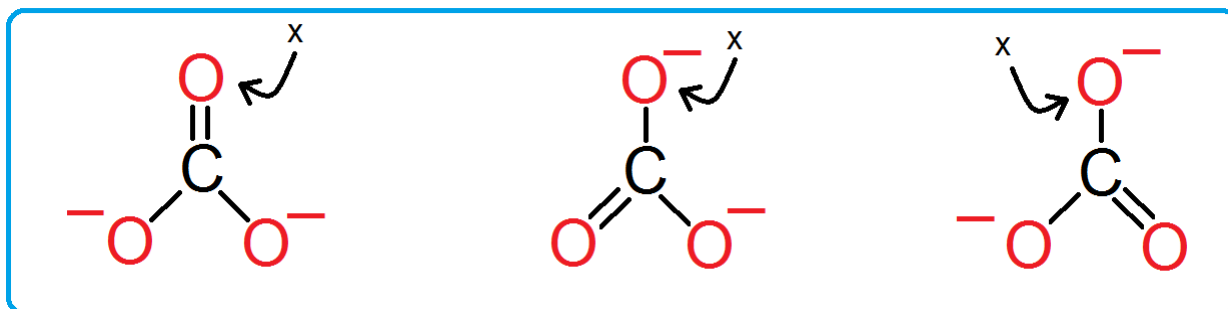
26) In an acidic solution, the hydronium ion concentration goes _____ and the pH goes _____.

27) In an alkaline solution, the hydronium ion concentration goes _____ and the pH goes _____.

28) In a neutral solution, the hydronium ion concentration _____ the hydroxide concentration and the pH is _____.

Here's something that will let you comingle Lewis Structures (lab) with Thermochemistry (reading) in your spare time: <http://science.uvu.edu/ochem/index.php/alphabetical/q-r/resonance-theory/>

29) According to resonance theory, each bond in the carbonate ion (CO_3^{2-}) is consistent with the observation that the three bonds in the carbonate ion have the same bond length. Given that the $\text{C}=\text{O}$ bond energy is 745 kJ/bond and that the $\text{C}-\text{O}$ bond energy is 358 kJ/bond, determine the bond energy for the O labeled "X" in the diagram, below.



30) The pH of a solution is 4.25. What is the pOH of the solution? What is the hydroxide ion concentration in this solution?