

Honors Chemistry(Chps. 6, 7, 13/14, 18, 22)

Semester 2 Final Review Problems

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Name _____ Date _____ Period _____

- How many grams of potassium hydroxide are required to make 600.mL of a solution with a pOH of 4.50?
- Calculate the hydronium ion concentration and pOH of a solution in which 200mL of .020M sodium hydroxide is mixed with 300mL of .015M hydrochloric acid.
- Write Lewis dot structures and predict a) the hybridization on the central atom, b) electronic geometry and c) molecular geometry for the following molecules. Which, if any, exhibit resonance? Which, if any, are polar?
a. PCl_3 b. BrF_5 c. CO_3^{2-} d. SF_4 e. NH_3
- Balance the following reaction which takes place in acidic solution.
$$\text{Cr}_2\text{O}_7^{2-}(\text{aq}) + \text{I}^-(\text{aq}) \rightarrow \text{Cr}^{3+}(\text{aq}) + \text{I}_2(\text{aq})$$
- How many milliliters of .1M potassium hydroxide would be required to titrate 50.0mL of a nitric acid solution with a pH of 5.5 to the equivalence point?
- Write the full and condensed spectroscopic notation for gallium, Ga.
- Calculate the equilibrium concentration of hydronium and the pOH of a .02M acetylsalicylic acid (monoprotic) solution. $K_a = 3.0 \times 10^{-4}$.
- Calculate the wavelength (in nm) of electromagnetic radiation that has a frequency of 7.692×10^{14} Hz. Approximately what region of the electromagnetic spectrum does it fall in?
- Draw a diagram for a voltaic cell that is composed of calcium and cadmium electrodes and uses nitrate solutions of those metals. Use potassium nitrate as the salt bridge. Identify: anode, cathode, direction of electron flow, direction of ion flow for the salt bridge, and the signs (+/-) of the electrodes. Determine the cell voltage for this configuration. Also draw an abbreviated cell diagram (Hint: You will need your reduction potential chart.)
- Determine the oxidation state of nitrogen in the following compounds.
a. HNO_3 b. N_2O c. NO_2 d. NH_4^+
- Give a valid set of quantum numbers for the outermost electron of potassium.
- Calculate the hydroxide concentration for a solution with a pH of 3.5.
- Use the Rydberg equation to calculate the energy and frequency of a photon making a transition from the $n=3$ to $n=1$ energy level. $R_H = 2.18 \times 10^{-18} \text{J}$
- Calculate the DeBroglie wavelength of an electron (mass = $9.11 \times 10^{-31} \text{kg}$) traveling at 80% of the speed of light.

15. If 50.0mL of water is added to the solution made in question 1, what is the new pH of the solution?

16. A compound used as an anti-knock additive in gasoline is 71.65% Cl, 24.27% C and 4.07% H. The molar mass is known to be 98.96g. Determine the empirical and molecular formula for this compound.

17. If an atom releases a photon of wavelength 300nm during a transition from a higher to lower energy orbital, what is the energy difference between the two energy levels?

18. Write the structural formula for the compound 3-ethylheptane.

19. Name the following compound:

$$\begin{array}{cccccccc} \text{C} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{C} \\ & & & & & & | & & & & & & | & & \\ & & & & & & \text{C} & - & \text{C} & - & \text{C} & & & & \text{C} \end{array}$$

20. How many valence electrons does germanium (Ge) have? In what energy level(s) and orbital(s) are they?

21. With regard to the original solution made in question 1, how many mL of solution are required to completely neutralize 30.0mL of .02M HBr?

22. Using a table of standard reduction potentials, list the following metals in order of increasing activity:

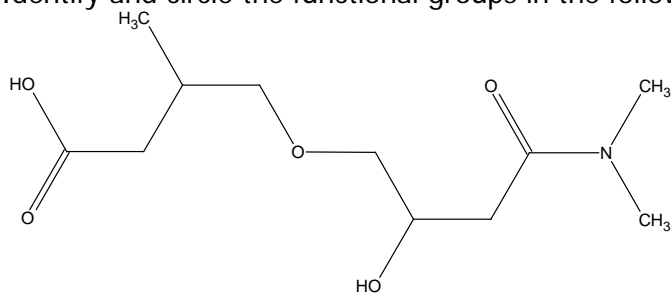
Mg, Au, Pt, Ag, Zn

23. Write the balanced equation for the redox reaction between aluminum metal and chlorine gas. Which element is the oxidizing agent? Which element would have a greater electronegativity?

24. Based on your results from question 9, which metal would be considered to be more active? Which one would have a greater first ionization energy? If you placed some magnesium ribbon into a solution of silver nitrate would a reaction occur? If yes, write a balanced equation for this reaction.

25. Determine the total number of sigma and pi bonds in carbon monoxide.

26. Identify and circle the functional groups in the following organic molecule.



27. Write and name all the structural isomers for C₅H₁₂.

28. A metal object is to be gold-plated by an electrolytic procedure using aqueous AuCl₃ electrolyte. Calculate the number of moles of gold deposited in 3.0min by a constant current of 10.0A.

29. Explain what will happen if a strip of copper is placed in a solution of hydrochloric acid. If a reaction occurs, write a balanced equation for the reaction.

30. Draw the structure and name the compound CH₃C(CH₃)CHC(CH₂CH₃)₂CH(CH₃)CH₂CH₃. Disregard cis/trans isomerism.