

Name: CALVIN
Date:
Hour:

AP Chem Ch.4 Review

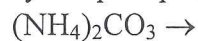
1) In which of the following does nitrogen have the lowest oxidation state?

- A) HNO_3 5+
- B) NO_2 4+
- C) N_2O +
- D) NH_4Cl 3-
- E) NaNO_2 3+

2) In which of the following does nitrogen have the highest oxidation state?

- A) HNO_3 5+
- B) NO_2 4+
- C) N_2O +
- D) NH_4Cl 3-
- E) NaNO_2 3+

3) Identify the precipitate(s) formed (if any) in the following reaction in aqueous solution, $\text{Fe}(\text{NO}_3)_2 +$

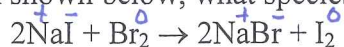


- A) $\text{Fe}_2(\text{CO}_3)_3$
- B) $\text{FeCO}_3(\text{s})$
- C) $(\text{NH}_4)_2\text{CO}_3(\text{s})$
- D) $\text{NH}_4\text{NO}_3(\text{s})$
- E) No precipitate will be observed

4) Select the spectator ions for the following reaction in aqueous solution, $\text{AgNO}_3 + \text{LiI} \rightarrow \text{AgI} + \text{LiNO}_3$

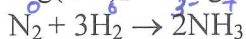
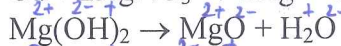
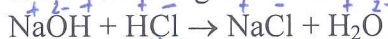
- A) $\text{Li}^+(\text{aq}), \text{NO}_3^-(\text{aq})$
- B) $\text{Ag}^+(\text{aq}), \text{NO}_3^-(\text{aq})$
- C) $\text{Li}^+(\text{aq}), \text{I}^-(\text{aq})$
- D) $\text{Ag}^+(\text{aq}), \text{I}^-(\text{aq}), \text{Li}^+(\text{aq}), \text{NO}_3^-(\text{aq})$
- E) $\text{Ag}^+(\text{aq}), \text{I}^-(\text{aq})$

5) In the reaction shown below, what species is oxidized?



- A) Na^+
- B) I^-
- C) Br_2
- D) Br^-
- E) I_2

6) How many of the following are oxidation-reduction reactions?



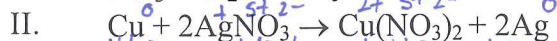
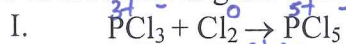
- A) 0
- B) 1
- C) 2
- D) 3
- E) 4

7) In the following reaction, which species is oxidized?



- A) sodium
- B) iodine
- C) sulfur
- D) hydrogen
- E) oxygen

8) Which of the following are oxidation-reduction reactions?



- A) III
- B) IV
- C) I and II
- D) I, II, and III
- E) I, II, III, and IV

9) The oxidation state of iodine in IO_3^- is:

- A) 0
- B) +3
- C) -3
- D) +5
- E) -5

10) In which of the following does nitrogen have an oxidation state of +4?

- A) HNO_3 +5
- B) NO_2 +4
- C) N_2O +
- D) NH_4Cl -3
- E) NaNO_2 +5

11) A student weighs out 0.512 g of KHP (molar mass = 204.22 g/mol) and titrates to the equivalence point with 36.78 mL of a stock NaOH solution. What is the concentration of the stock NaOH solution? KHP is an acid with one acidic proton.

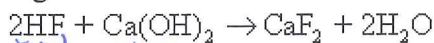
- A) 0.00251 M
- B) 0.092 M
- C) 0.0139 M
- D) 0.0682 M
- E) none of these

$$\frac{0.512 \text{ g KHP}}{204.22 \text{ g KHP/mol}} = 0.00251 \text{ mol}$$

$$\frac{0.00251 \text{ mol}}{0.03678 \text{ L}} = 0.0682 \text{ M NaOH}$$

12) With what volume of 5.00 M HF will 4.72 g of calcium hydroxide react completely, according to the following reaction?

- A) 12.7 mL
- B) 127 mL
- C) 637 mL
- D) 25.5 mL
- E) 39.2 mL



$$\frac{4.72 \text{ g Ca}(\text{OH})_2}{74.10 \text{ g Ca}(\text{OH})_2/\text{mol}} \times \frac{1 \text{ mol Ca}(\text{OH})_2}{1 \text{ mol Ca}(\text{OH})_2} \times \frac{2 \text{ mol HF}}{1 \text{ mol Ca}(\text{OH})_2} = 0.127 \text{ mol HF}$$

$$M = \frac{n}{L} \Rightarrow L = \frac{n}{M} = \frac{0.127 \text{ mol}}{5.00 \text{ mol/L}} = 0.0254 \text{ L} \rightarrow 25.4 \text{ mL}$$

13) You have separate solutions of HCl and H_2SO_4 with the same concentrations in terms of molarity.

You wish to neutralize a solution of NaOH. Which acid solution would require more volume (in mL) to neutralize the base?

- A) The HCl solution.
- B) The H_2SO_4 solution.
- C) You need to know the acid concentrations to answer this question.
- D) You need to know the volume and concentration of the NaOH solution to answer this question.
- E) C and D

hint: HCl makes 2 mol of ions; H_2SO_4 makes 3 moles of ions

14) You have exposed electrodes of a light bulb in a solution of H_2SO_4 such that the light bulb is on. You add a dilute solution and the bulb grows dim. Which of the following could be in the solution?

- A) $\text{Ba}(\text{OH})_2$
- B) NaNO_3
- C) K_2SO_4
- D) $\text{Cu}(\text{NO}_3)_2$
- E) none of these

hint: precipitate

15) A 230.0-mL sample of a 0.275 M solution is left on a hot plate overnight; the following morning the solution is 1.29 M. What volume of solvent has evaporated from the 0.275 M solution?

- A) 49.0 mL
- B) 63.3 mL
- C) 181.0 mL
- D) 230. mL
- E) 279.0 mL

$$M = \frac{n}{L}$$

$$M = \frac{n}{L} \quad L = \frac{n}{M} = \frac{0.0633 \text{ mol}}{1.29 \frac{\text{mol}}{\text{L}}}$$

$$n = M \cdot L = (0.275 \frac{\text{mol}}{\text{L}})(0.2300 \text{ L}) = 0.0633 \text{ mol}$$

$$L = 0.0491 \text{ L}$$

$$230 - 49.1 = 181 \text{ mL}$$

16) Which of the following do you need to know to be able to calculate the molarity of a salt solution?

- I. the mass of salt added
- II. the molar mass of the salt
- III. the volume of water added
- IV. the total volume of the solution
- A) I, III
- B) I, II, III
- C) II, III
- D) I, II, IV
- E) You need all of the information.

17) What volume of 18 M sulfuric acid must be used to prepare 2.30 L of 0.145 M H_2SO_4 ?

- A) 19 mL
- B) 0.33 mL
- C) 1.1×10^3 mL
- D) 2.9 mL
- E) 6.0 mL

$$M_1 V_1 = M_2 V_2$$

$$V_2 = \frac{M_1 V_1}{M_2} = \frac{(0.145 \text{ M})(2.30 \text{ L})}{(18 \text{ M})} = 0.019 \text{ L} \rightarrow 19 \text{ mL}$$

Go VIKINGS!!