

Directions. There is only one best answer for multiple-choice questions. All calculations must show work with units for full credit. *Good Luck.* ☺

1. Answer a-c using this balanced reaction: $2 \text{Al}(s) + 6 \text{HCl}(aq) \rightarrow 2 \text{AlCl}_3(aq) + 3 \text{H}_2(g)$

a. How many moles of hydrogen are produced when 4.25 moles of hydrochloric acid react?

b. How many grams of hydrochloric acid are needed to react with 9.35 grams of aluminum?

c. How many liters of hydrogen gas at STP are produced from reacting 12.5 grams of aluminum?

2. Balance and classify these reactions as (C) combination, (D) decomposition, (CB) combustion, (SR) single replacement, (DR) double replacement, and (N) acid base neutralization.

type:_____ $\text{Na}_2\text{CO}_3(aq) + \text{MgCl}_2(aq) \rightarrow \text{MgCO}_3(s) + \text{NaCl}(aq)$

type:_____ $\text{P}_4\text{O}_{10}(l) \rightarrow \text{P}(s) + \text{O}_2(g)$

type:_____ $\text{Ca}(s) + \text{AlCl}_3(aq) \rightarrow \text{CaCl}_2(aq) + \text{Al}(s)$

3. Write the products, states, and then balance these reactions. Write NR if no reaction.

a. $\text{C}_5\text{H}_8(l) + \text{O}_2(g) \rightarrow$ _____

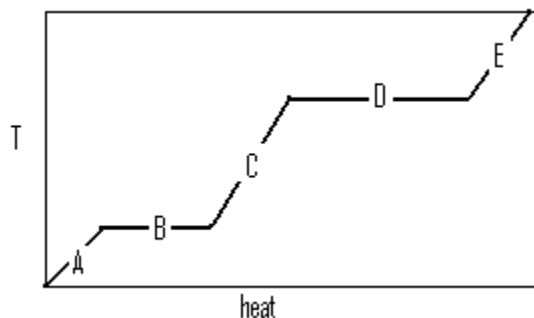
b. $\text{Cu}(s) + \text{MnBr}_2(aq) \rightarrow$ _____

c. $\text{HI}(aq) + \text{Sr}(\text{OH})_2(aq) \rightarrow$ _____

d. $\text{Al}(s) + \text{Ni}(\text{NO}_3)_2(aq) \rightarrow$ _____

4. Consider this reaction: $2 \text{AgCl}(\text{aq}) + \text{Cd}(\text{s}) \rightarrow \text{CdCl}_2(\text{aq}) + 2 \text{Ag}(\text{s})$
- What is reduced? _____
 - What is oxidized? _____
5. What holds the sulfur atom to the hydrogen atom in one molecule of hydrogen sulfide gas, H_2S , the gas partly responsible for the rotten egg smell and flatulence?
- Ionic bonds
 - polar covalent bonds
 - H bridge force
 - dipole-dipole forces
 - nonpolar covalent bonds
6. What holds HF molecules with other HF molecules?
- London forces
 - polar covalent bonds
 - H bridge force
 - dipole-dipole forces
 - nonpolar covalent bonds
7. What holds Br_2 molecules with other Br_2 molecules in liquid bromine?
- London forces
 - polar covalent bonds
 - H bridge force
 - dipole-dipole forces
 - nonpolar covalent bonds
8. Answer the following based on the comparison of liquid butane, C_4H_{10} , and liquid butanol, $\text{C}_4\text{H}_9\text{OH}$?
- Which has the higher IMF? _____
 - Which has the higher Vapor Pressure? _____
 - Which has the lower boiling point? _____
 - Which has the higher surface tension? _____
 - Which has the lower viscosity? _____
9. What is the highest IMF you expect to see in samples of millions of molecules of:
- HBr _____
 - H_2O _____
 - Cl_2 _____

10. Answer the following according to this heating curve graph below.



- At which point is melting or freezing occurring? _____
 - At which point is there liquid only? _____
 - At which point is there solid only? _____
 - At which point is boiling or condensation occurring? _____
11. A solution is defined as a _____ dissolved in a _____.

12. Which of the following is most likely to dissolve in benzene, $C_6H_6(l)$?
- a. NaCl b. N_2 c. NH_3 d. HF e. Na_2SO_4
13. Popular as a salad dressing, vinegar and oil don't mix so we call them:
- a. soluble b. insoluble c. miscible d. immiscible e. undissolved
14. What is the mass % if 87.45 grams of KOH is dissolved in 238 grams of water?

15. Calculate the molarity if 1.525 grams of $NaC_2H_3O_2$, is dissolved in 755 mL of water.

16. How many moles are in 6.15×10^{24} atoms of calcium?

17. How many grams are in 0.8735 moles of $AgNO_3$?

18. How many liters are in 55.3 grams of CO_2 gas at STP?

Bonus: How many atoms of sodium are in 22.99 grams? (No calculations needed) _____