

Name these compounds		molar mass of compound	% composition by mass of the metal in this compound
1. $\text{MgSO}_4$	Magnesium sulfate	120 g/mole	20% Mg
2. $\text{Ba}(\text{OH})_2$	Barium hydroxide	171 g/mole	80% Ba
3. $\text{CaCl}_2$	Calcium chloride	110 g/mole	36% Ca
4. $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$	Iron (II) sulfate heptahydrate	278 g/mole	20% Fe

5. Put these statements in a CHRONOLOGICAL order (oldest first): **C, E, D, A, F, B**

- Rutherford shoots alpha particles at gold, discovers the positive nucleus and he puts the negative electrons in orbits.
- Electrons exist in energy levels called orbitals. These are zones of their most likely to be found.
- Democritus thinks about some things and invents the concept of the atom
- Thomson uses the cathode ray tube to discover the electron as a separate particle of the atom. Since he likes his wife's plum pudding, he imagines the atoms as food, putting his electrons into the positive "mush" or "pudding" of the atom.
- Dalton finds himself bored with farming so he invents modern chemistry in his barn. His Atomic Theory stands today with some exceptions. His "model" of the atom was similar a very tiny, hard sphere. These little balls had different masses, but otherwise were the same as each other.
- Neils Bohr does the math to save his boss's idea of the atom. He puts the electrons into distinct orbits, where they can fly around with out losing energy and when they jump to higher energy levels they are excited, when they return to the ground state, they release spectra.

species		mass	Number of moles present	
6	NaCl	214 grams	$\frac{214 \text{ g NaCl}}{1}$	$\times \frac{1 \text{ mole NaCl}}{58 \text{ g NaCl}} = 3.69 \text{ moles NaCl}$
7	Cu	624 grams	$\frac{624 \text{ g Cu}}{1}$	$\times \frac{1 \text{ mole Cu}}{64 \text{ g Cu}} = 9.75 \text{ moles Cu}$
8	Al <sub>2</sub> O <sub>3</sub>	501 grams	$\frac{501 \text{ g Al}_2\text{O}_3}{1}$	$\times \frac{1 \text{ mole Al}_2\text{O}_3}{102 \text{ g Al}_2\text{O}_3} = 4.91 \text{ moles Al}_2\text{O}_3$

9. Convert 0.658 Liters into milliliters with a math calculation.

$$\frac{0.658 \text{ L}}{1} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 658 \text{ mL}$$

10. What is the normal boiling point of ethanol?

Look at Table H, find the ethanol curve, follow it to the dotted line (standard temp) = ~80°C

11. The mass of a sample of cobalt is 464 grams. What is the volume? Use density formula, solve for V, volume.

$$\frac{8.86 \text{ g/cm}^3}{1} = \frac{464 \text{ g}}{V} \quad 8.86 (V) = 464 \quad V = 52.4 \text{ cm}^3$$

12. What phase is phosphorous at 299K? Look at Table S, phosphorous has a MP of 317 K, and BP of 554 K.

The temp of 299 K is below the melting point, so at this temp, phosphorus is still solid.

13. Skip this one

14. Which of these is aqueous?

Strontium sulfate, calcium carbonate, ammonium sulfide, sodium hydroxide

Look at Table F. Most sulfates are AQ but with strontium. Most carbonates are not soluble, this one included.

All ammonium compounds are AQ this is the correct answer.

Hydroxides are not usually AQ but sodium is in group 1, so this compound is a correct answer too.

15. Write the formula for both aluminum dichromate and calcium hydrogen carbonate.  
 $\text{Al}^{+3}$  cation,  $\text{Cr}_2\text{O}_7^{-2}$  anion, criss cross shows you need 2 aluminums and three dichromate ions.  
This is  $\text{Al}_2(\text{Cr}_2\text{O}_7)_3$ .
- Calcium hydrogen carbonate is  $\text{Ca}^{+2}$  cation with  $\text{HCO}_3^{-1}$  anion.  
You need only one calcium with 2 hydrogen carbonate anions, criss cross to  $\text{Ca}(\text{HCO}_3)_2$ .
16. Write the names of these two compounds:  $\text{PCl}_5$  and  $\text{SCl}_2$  these are phosphorous pentachloride and sulfur dichloride. Both are molecular compounds, no metals, so we use prefix names.
17. How many kilojoules of energy are absorbed when 6.0 moles of  $\text{C}_2\text{H}_2$  form?  
Look at table I for thermos chem questions. When one mole of this stuff forms 227.4 kJ are absorbed, so with 6 moles, it's  $6 \times 227.4 \text{ kJ} = 1363 \text{ kJ}$  (SF annoy everyone!)
18. Write a balanced equation showing zinc metal going into hydrochloric acid.  
$$\text{Zn}_{(\text{S})} + 2\text{HCl}_{(\text{AQ})} \rightarrow \text{ZnCl}_{2(\text{AQ})} + \text{H}_{2(\text{G})}$$
19. Name the type of reaction that happens in question #18 just above. **Single Replacement**
20. Comparing ethanol and propanone, which has a higher vapor pressure at  $50^\circ\text{C}$  and which has stronger intermolecular attractions? **At ANY temperature, the propanone has a higher vapor pressure because it has weaker intermolecular attractions, it evaporates easier and it boils at a lower temperature than ethanol.**
21. When aluminum oxide forms, is that an exo or endothermic reaction? **Table I clearly shows that with this synthesis reaction, it's very exothermic.  $\Delta H = -3351 \text{ kJ}$  It's important to note here, that this is not for the synthesis of ONE MOLE, the balanced equation shows that 2 moles of  $\text{Al}_2\text{O}_3$  form in the John Dalton simple whole number ratio balanced equation. Still pretty hot.**