T13Q2: Level 1 (L.G. 6)

The calcium sulfate used in gypsum is a hydrate (meaning that water is absorbed into the sulfate). The formula for gypsum is: $CaSO_4 \bullet 2H_2O$. How much would one mole of gypsum weight? In other words, what is its molar mass?

A. 172 g
B. 156 g
C. 147 g
D. 141 g
E. 136 g

1A																		8A
1 **H** 1.008	2A											3A	4A	5A	6A	7A		2 **He** 4.003
3 **Li** 6.941	4 **Be** 9.012											5 **B** 10.81	6 **C** 12.01	7 **N** 14.01	8 **O** 16.00	9 **F** 19.00		10 **Ne** 20.18
11 **Na** 23.00	12 **Mg** 24.31											13 **Al** 26.98	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.06	17 **Cl** 35.45		18 **Ar** 39.95
19 **K** 39.10	20 **Ca** 40.08	21 **Sc** 44.96	22 **Ti** 47.90	23 **V** 50.94	24 **Cr** 52.00	25 **Mn** 54.94	26 **Fe** 55.85	27 **Co** 58.93	28 **Ni** 58.70	29 **Cu** 63.55	30 **Zn** 65.38	31 **Ga** 69.72	32 **Ge** 72.59	33 **As** 74.92	34 **Se** 78.96	35 **Br** 79.90		36 **Kr** 83.80
37 **Rb**	38 **Sr**	39 **Y**	40 **Zr**	41 **Nb**	42 **Mo**	43 **Tc**	44 **Ru**	45 **Rh**	46 **Pd**	47 **Ag**	48 **Cd**	49 **In**	50 **Sn**	51 **Sb**	52 **Te**	53 **I**		54 **Xe**

T13Q6: Level 2 (L.G. 5)

How many fluorine molecules are there in a 38.00 g sample of fluorine gas?

| 9 |
| F |
| 19.000 |

A. 2.289×10^{25} molecules

B. 6.023×10^{23} molecules

C. 1.205×10^{24} molecules
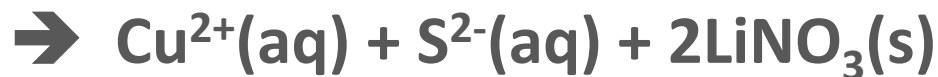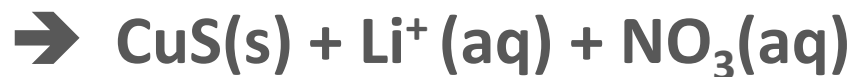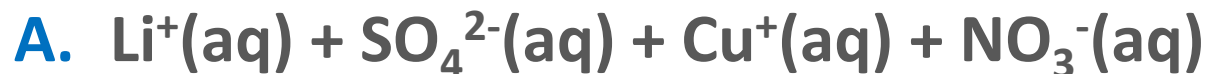
D. 2.553×10^{24} molecules

T18Q2: Level 2 (L.G. 9)

Give the **net ionic equation** for the reaction that occurs when aqueous solutions of barium nitrate and ammonium phosphate are mixed:

A. $3Ba(NO_3)_2(aq) + 2(NH_4)_3PO_4(aq) \rightarrow Ba_3(PO_4)_2(s) + 6NH_4NO_3(aq)$

B. $3Ba(NO_3)_2(aq) + 2(NH_4)_3PO_4(aq) \rightarrow Ba_3(PO_4)_2(aq) + 6NH_4NO_3(s)$

C. $2NO_3^-(aq) + 6NH_4^+(aq) \rightarrow 6NH_4NO_3(s)$

D. $3Ba^{2+}(aq) + 2PO_4^-(aq) \rightarrow Ba_3(PO_4)_2(s)$

E. $2NO_3^-(aq) + 6NH_4^+(aq) + 2PO_4^-(aq) \rightarrow Ba_3(PO_4)_2(s) + 6NH_4^+(aq) + NO_3^-(aq)$

T18Q1: Level 2 (L.G. 9)

Give the **complete ionic equation** for the reaction that occurs when aqueous solutions of lithium sulfide and copper (II) nitrate are mixed:

A. $Li^+(aq) + SO_4^{2-}(aq) + Cu^+(aq) + NO_3^-(aq)$
   $\rightarrow CuS(s) + Li^+(aq) + NO_3(aq)$

B. $Li^+(aq) + S^-(aq) + Cu^+(aq) + NO_3^-(aq)$
   $\rightarrow CuS(s) + LiNO_3(aq)$

C. $2Li^+(aq) + S^{2-}(aq) + Cu^{2+}(aq) + 2NO_3^-(aq)$
   $\rightarrow Cu^{2+}(aq) + S^{2-}(aq) + 2LiNO_3(s)$

D. $2Li^+(aq) + S^{2-}(aq) + Cu^{2+}(aq) + 2NO_3^-(aq)$
   $\rightarrow CuS(s) + 2Li^+(aq) + 2NO_3^-(aq)$

How many moles of sodium atoms are there in 6.3 grams of sodium carbonate?

6	8	11
C	O	Na
12.01	16.00	23.00

A. 0.06 moles

B. 0.12 moles

C. 7.2×10^{22} moles

D. 3.6×10^{22} moles

When an unknown hydrate of Na_2CO_3 is heated until all the water is removed, it looses 54.3% of its mass. What was the formula of the hydrate before it was heated?

A. Na_2CO_3
B. $Na_2CO_3 \cdot 1H_2O$
C. $Na_2CO_3 \cdot 5H_2O$
D. $Na_2CO_3 \cdot 7H_2O$

The percent water in the hydrate $CuSO_4 \cdot 6H_2O$ is:

1	8	16	29
H	O	S	Cu
1.008	16.00	32.06	63.55

A. 40.4%

B. 6.73%

C. 9.60%

D. 57.6%

T18Q5: Level 3 (L.G. 10)

What mass, in g, of AgCl is formed from the reaction of 75.0 mL of a 0.078 M $AgC_2H_3O_2$ solution with 55.0 mL of 0.109 M $MgCl_2$ solution?

A. 0.860 g
B. 1.72 g
C. 2.56 g
D. 3.20 g

T16Q13: Level 2 (L.G. 11)

Which of the following statements is **not** characteristic of a hydrogen bond?

A. The other atom involved in the hydrogen bond (not the hydrogen atom) must be a very electronegative atom that is attached to another hydrogen atom.

B. The other atom involved in the hydrogen bond (not the hydrogen atom) always possesses at least one lone pair of electrons.

C. The hydrogen atom involved must be covalently bonded to a very electronegative atom.

D. Hydrogen bonds are typically weaker than ionic or covalent bonds.

T14Q1: Level 4 (L.G. 8)

An aqueous solution containing 7.60 g of lead(II) nitrate is added to an aqueous solution containing 7.39 g of potassium chloride. If the percent yield is 84.0%, how many grams of excess reagent remain after the reaction is complete?

A. 5.66 g
B. 4.50 g
C. 3.33 g
D. 0.0604 g

What is the molar mass of the compound, $Cu_3(PO_4)_2$?

- A. 110.5 g/mol
- B. 237.6 g/mol
- C. 316.6 g/mol
- D. 349.6 g/mol
- E. 380.6 g/mol

1A																	8A
1 H 1.008	2A											3A	4A	5A	6A	7A	2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 23.00	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.70	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe

T14Q9: Level 3 (L.G. 8)

When 2.5 moles of calcium carbonate is added to 4.8 moles of hydrochloric acid, calcium chloride, carbon dioxide, and water are produced: $CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$
Which calculation represents the number of *grams* of calcium chloride that are produced if the reaction proceeds with a 65% yield?

A. 2.5 moles $CaCl_2$ * 110.98 grams/mol * 0.65
B. 2.4 moles $CaCl_2$ * 110.98 grams/mol * 0.65
C. 2.5 moles $CaCl_2$ * 110.98 grams/mol / 0.65
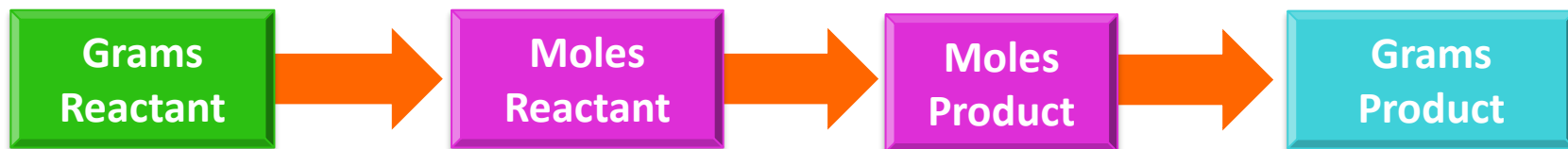D. 2.4 moles $CaCl_2$ * 110.98 grams/mol / 0.65

Calculate the maximum amount of aluminum oxide (Al_2O_3) that could be produced if 2.5 g of Al react with 2.5 g of oxygen .

A. 4.7 g

B. 5.3 g

C. 7.4 g

D. 9.4 g

<u>**Before doing any math:**</u>
We need to write a balanced equation for the reaction

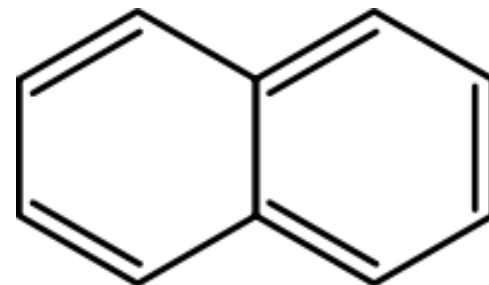| Grams Reactant | → | Moles Reactant | → | Moles Product | → | Grams Product |

T17Q4: Level 3 (L.G. 11)

Determine the molecular weight of a gas that has a density of 5.75 g/L at STP.

A.   3.90 g/mol
B.   129 g/mol
C.   141 g/mol
D.   578 g/mol

T16Q4: Level 3 (L.G. 12)

Napthalene ($C_{10}H_8$) is an organic molecule that has only LDF. How is it possible then that napthalene is a solid at room temperature, but water is a liquid?

A. **Molecules with stronger IMF always have have higher boiling points.**

B. **Water molecules can form H-bonds so water must have stronger IMF than those of napthalene.**

C. **Napthalene is a large planar molecule and so its LDF's are stronger than the H-bond in water.**

D. **Molecules with stronger IMF are more likely to be solids at room temperature.**

T17Q1: Level 2 (L.G. 9)

Calculate the volume of helium in a 2-mole helium balloon that floats up into the atmosphere and is left inflated to a total pressure of 1.5 atm at a temperature of -73 deg C.

A.   37.9 L
B.   22.1 L
C.   7.98 L
D.   0.045 L

Pure samples of which of the following compounds will exhibit hydrogen bonding?

I. CH_3OH II. CH_3NO_3 III. CH_3CN

A. I only
B. I and II only
C. II and III only
D. I, II and III

Consider the chemical reaction that occurs when sodium metal reacts with oxygen gas: **4Na(s) + O$_2$(g) ➔ 2Na$_2$O(s)**
How many grams of sodium oxide are produced when 5.00 g of sodium and 5.00 g of oxygen react and a 84% yield of sodium oxide is obtained.

A. **5.64 grams**
B. **6.73 grams**
C. **8.33 grams**
D. **9.92 grams**

| Grams L.R | ➔ | Moles L.R | ➔ | Moles Product | ➔ | Grams Product | ➔ | % Yield Calculation |

A 1.9 mol sample of gas in a rigid flask at 21°C and 697 mm Hg is opened to the atmosphere and more gas is added to the flask. The pressure after the addition of gas is 795 mm Hg and the temperature is 26°C. How many moles of gas have been added to the container?

A. 0.23

B. 1.63

C. 1.75

D. 2.13

E. 2.9

An unknown compound has the formula $C_xH_yO_z$. When 0.200 g of the compound is burned in oxygen you isolate 0.293 g of CO_2 and 0.120 g of H_2O. If the experimentally determined molar mass of the compound is 60.07 g/mol, what is its molecular formula?

A. CH_2O

B. $C_2H_4O_2$

C. $C_2H_2O_2$

D. C_2H_2O