1. Which statement is true about limiting reactants?
   1. It is the reactant present in the smallest quantity.
   2. It is the reactant that produces the most product.
   3. **It is the reactant the produces the least product.**
   4. a and c
   5. a and b

Use the balanced chemical equation for the reaction of aluminum metal and oxygen gas to determine the limiting reactant for each reactant mixture.

4 Al(s) + 3 O2(g) 🡪 2 Al2O3(s)

1. 1 mol Al, 1 mol O2
   1. **Al**
   2. O2
   3. Al2O3
2. 16 mol Al, 13 mol O2
   1. **Al**
   2. O2
   3. Al2O3
3. Iron(III) oxide reacts with carbon monoxide to form solid iron and carbon dioxide:

Fe2O3(s) + 3 CO(g) 🡪 2 Fe(s) + 3 CO2(g)

What is the theoretical yield of Fe(s) when 22.55 g of iron(III) oxide reacts with 14.80 g of carbon monoxide?

* 1. 19.68 g
  2. **15.77 g**
  3. 0.3523 g
  4. 0.2824 g
  5. 7.886 g

1. A reaction has a theoretical yield of 12.5 grams and an actual yield of 15.6 grams. What is true about this reaction?
   1. The yields are listed correctly, and the percent yield is 80.1%
   2. The yields are listed correctly, and the percent yield is 125%
   3. The chemical equation is needed to determine if the yields are correct.
   4. **The yields are switched; a reaction can’t have over a 100% yield.**
2. A reaction with a 44.6% yield produced 6.25 grams of product. What is the theoretical yield for the reaction?
   1. 6.25 grams
   2. 2.79 grams
   3. **14.0 grams**
   4. 11.3 grams
   5. The theoretical yield can’t be found with the given information.
3. Solid magnesium and oxygen gas react to form magnesium oxide:

2 Mg(s) + O2(g) 🡪 2 MgO(s)

A 10.1 g sample of magnesium reacted with 10.5 g of oxygen gas. The actual yield for this reaction was 11.9 grams. What is the percent yield?

* 1. **71.0%**
  2. 45.0%
  3. 141%
  4. 223%
  5. 3.49%

1. Methane is the main component of marsh gas. Heating methane with sulfur produces carbon disulfide and hydrogen sulfide:

CH4(g) + 4 S(g) 🡪 CS2(g) + 2 H2S(g)

The percent yield for this reaction is 92.3%. How many grams of sulfur are needed to produce 55.2 grams of carbon disulfide in excess methane?

1. 93.0 g
2. 5.81 g
3. 85.8 g
4. **101 g**
5. 6.30 g
6. The generic reaction 2 A + 3 B 🡪 C + 3 D has an enthalpy of -156 kJ. What is the enthalpy change when 0.587 moles of A react with excess B?
   1. **-45.8 kJ**
   2. -156 kJ
   3. -312 kJ
   4. -78.0 kJ
   5. -91.6 kJ
7. How many grams of carbon dioxide (MM = 44.01 g/mol) are formed from the combustion of methane (CH4) if 126 kJ of energy were released?

CH4(g) + 2 O2(g) 🡪 CO2(g) + 2 H2O(l) ΔH = -802.3 kJ

* 1. 44.01 g
  2. 6.36 g
  3. **6.91 g**
  4. 0.157 g
  5. 280. g

The dancing gummy bear demonstration involves dropping a gummy bear, which is mostly sucrose, into molten potassium chlorate. The reactions gives off lots of heat (seen as fire!) and produces potassium chloride, water, and carbon dioxide:

8 KClO3(l) + C12H22O11(s) 🡪 8 KCl(s) + 12 CO2(g) + 11 H2O(l) ΔHrxn = -5,466 kJ

Use this information to answer questions 11 and 12.

1. What is the energy change of combusting a standard-sized gummy bear, which has a mass of 3.50 grams? Assume the entire mass of the gummy bear is sucrose (MM = 342.30 g/mol).
   1. -1.91 x 104 kJ
   2. -447 kJ
   3. -671 kJ
   4. **-55.6 kJ**
   5. -615 kJ
2. A scientist created a car that runs on standard-sized gummy bears, and you get to test-drive it from Athens to the World of Coca-Cola! How many standard sized gummy bears are needed to make the trip if it takes 257,000 kJ of energy?
   1. **4.60 x 103 gummy bears**
   2. 4.70 x 101 gummy bears
   3. 2.51 x 107 gummy bears
   4. 1.43 x 107 gummy bears
3. The gummy bear car produces 564 moles of CO2 on the trip. The same car in a gasoline version gets 35 miles per gallon. The trip is 70.2 miles. How many moles of carbon dioxide are produced by the gasoline version of the car? The combustion of gasoline is approximated by the combustion of octane (C8H18):

2 C8H18(l) + 25 O2(g) 🡪 16 CO2(g) + 18 H2O(g)

1 gallon = 128 oz.

1 oz = 30 mL

doctane = 0.703 g/mL

MMoctane = 114.232 g/mol

1. 57.5 moles
2. **379 moles**
3. 0.169 moles
4. 47.4 moles
5. 758 moles