**Quiz 5**

# Directions: Answer each of the following questions. Be sure to use complete sentences where appropriate. For full credit be sure to show all of your work. Where appropriate answers should be boxed for clarity, written to the correct number of significant figures, and, include the proper units.

1. A person’s blood alcohol (C2H5OH) level can be determined by titrating a sample of blood plasma with a potassium dichromate solution. The balanced equation is (10 points)

16 H+ (aq) + 2 Cr2O72- (aq) + C2H5OH (aq) → 4 Cr3+ (aq) + 2 CO2 (g) + 11 H2O (l)

* 1. What is the oxidation state of C in C2H5OH (aq)? \_\_\_\_-2\_\_\_\_\_
  2. What is the oxidation state of C in CO2 (g)? \_\_\_+4\_\_\_\_\_
  3. What is the element that is oxidized? \_\_\_C\_\_\_\_
  4. What is the element that is reduced? \_\_\_Cr\_\_\_\_
  5. What is the oxidizing agent? \_\_\_\_K2Cr2O7
  6. What is the reducing agent? \_\_\_\_C2H5OH
  7. How many electrons are transferred in the reaction as it is balanced? \_\_\_\_12\_\_\_\_

Red: (Cr2O72- (aq) + 14 H+ (aq) + 6 e- → 2 Cr3+ (aq) + 7 H2O (l)) × 2

+ Ox: C2H5OH (aq) + 3 H2O (l) → 2 CO2 (g) + 12 H+ (aq) + 12 e-

2 Cr2O72- (aq) + 28 H+ (aq) + 12 e- + C2H5OH (aq) + 3 H2O (l) → 2 CO2 (g) + 12 H+ (aq) + 12 e- + 4 Cr3+ (aq) + 14 H2O (l)

1. Cr2O72- (aq) + 16 H+ (aq) + C2H5OH (aq) → 2 CO2 (g) + 12 H+ (aq) + 4 Cr3+ (aq) + 11 H2O (l)
   1. If 25.41 mL of 0.05961 M Cr2O72- is required to titrate 28.00 g of plasma, what is the mass percent of alcohol in the blood?
2. 25.64 g of calcium carbide powder, CaC2, is reacted with 4.525 g of water to produce acetylene gas, C2H2, and calcium hydroxide precipitate (10 points).
   1. Write the balanced conventional equation for the reaction and use an ICE table to determine the limiting reagent.

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| --- | --- | --- | --- | --- |
|  | CaC2 (s) + | 2 H2O (l) → | Ca(OH)2 (s) + | C2H2 (g) |
| I | 0.4000 mol | 0.2512 mol | 0 mol | 0 mol |
| C | -x | -2x | +x | +x |
| E | 0.4000 mol –x =  0.4000 mol – 0.1256 mol =  0.2744 mol | 0.2512 mol -2x =  0 mol | x = 0.1256 mol | x = 0.1256 mol |

There are 0.6279 mol H2O available for the reaction, but 2 mol H2O are needed. Therefore, water is the limiting reagent.

* 1. What volume of acetylene gas can be produced if the reaction takes place at 22.5 °C and 0.9983 atm?