**Chemistry, Test 3**

**1) Fill in the missing quantities in the table below (be sure to format numbers the same as shown).**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Substance** | **Name** | **Atomic (or molecular) weight (g/mol)** | **Mass of sample (g)** | **Count (particles)** | **Moles** |
| H | Hydrogen | 1 | 1.000 |  | 1.000 |
| C | Carbon | 12 | 6.000 | 3.011x10^23 |  |
| Mg | Magnesium | 24.3 | 24.300 |  | 1.000 |
| CO2 | Carbon Dioxide | 44 | 88.000 | 1.204x10^24 |  |
| CH4 | Methane | 16 |  | 1.506x10^24 | 2.500 |
| CuSO4 | Copper Sulfate | 160 | 798.043 |  | 5.000 |
| H2O |  | 18 |  | 2.047x10^24 | 3.400 |
| H2SO4 | Sulfuric Acid |  | 98.000 | 6.022x10^23 |  |
| HCl | Hydrochloric Acid | 36 | 60.12 | 1.006x10^24 |  |
| N2 | Nitrogen | 28 |  |  | 3.375 |
| NaCl |  | 58 | 43.832 |  |  |
| O2 | Oxygen | 32 |  |  | 3.500 |
| C6H12O6 | Glucose |  | 720.624 | 2.409x10^24 |  |
| KNO3 | Potassium nitrate |  | 505.516 | 3.011x10^24 |  |

**2) Use the given properties of water below to calculate amount of energy required to cause the following changes:**

|  |  |
| --- | --- |
| **Increase the temperature of 75g ice by 12 °C** |  |
| **Decrease the temperature of 75g of (liquid) water by by 12 °C** |  |
| **Vaporize 270g of 90 °C water** |  |

**Water Properties:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Heat of Fusion | 334 J/g |  |  |  |  |
| Heat of Vaporization | 2260 J/g |  |  |  |  |
| Specific Heat |  |  |  |  |  |
| gas | 2.01 J/g °C |  |  |  |  |
| liquid | 4.18 J/g °C |  |  |  |  |
| solid | 2.09 J/g °C |  |  |  |  |

**3) Calculate the molarities of the following solutions:**

|  |  |
| --- | --- |
| **175g NaCl dissolved in 500ml of H2O** |  |
| **Pure water** |  |
| **25ml of a solution of 70% Isopropyl Alcohol (C3H3OH)** |  |
| (assume 13.8g of alcohol in 25ml of solution) |  |

**4) State whether the following conditions would be expected to increase or decrease reaction rate**

|  |  |
| --- | --- |
| **Grinding the reactants into a powder** |  |
| **Halving the concentration on one reactant** |  |
| **Adding a catalyst** |  |
| **Heating the reactants** |  |
| **Doubling the volume of solvent** |  |

**5) Determine the enthalpies of reaction for the following reactions. For each, state whether it is an exothermic or endothermic reation.**

|  |  |
| --- | --- |
| **Substance** | **Standard Enthalpy of Formation (kJ/mol)** |
| CH4 (g) | -74.81 |
| CO2(g) | -393.5 |
| H2O (g) | -241.82 |
| NH3 | -46.1 |
| HCl | -92.3 |
| NH4Cl | -314.4 |
| CaCO3 (calcite) | -1206.9 |
| CO2 (g) | -393.51 |
| CaO(s) | -635.5 |

|  |  |  |
| --- | --- | --- |
| **Reaction** | **Enthalpy** | **Endothermic or exothermic?** |
| **CH4(g) + O2(g) --> CO2(g) + 2H2O(g)** |  |  |
| **NH3(g) +HCl(g) --> NH4Cl** |  |  |
| **CaCO3(s) --> CaO +CO2** |  |  |

**6) Given that the enthalpy for the combustion of isopropyl alcohol is -2006 kJ/mol, how many moles would be needed to bring 1 liter of 10 °C water to a boil (100 °C)?**

|  |  |
| --- | --- |
| Your answer: |  |