**Chemistry 534**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**All Questions 4 Marks Each**

1

Name the following compounds:

A) N2S5 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

B) Mg3N2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

C) Cu2CO3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

D) NH4OH \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2

Indicate the formulae for the following:

A) sodium phosphate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

B) aluminum acetate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

C) nickel (III) sulfate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

D) OF2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3

Indicate how the following compounds split up in water:

A) Fe 2S3 → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

B) Ca(ClO4)2 → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4

During a hot stone massage, smooth pieces of black volcanic rock that absorb and retain heat well are used to relax and prepare muscles for deep tissue treatments. The stones, stored at a room temperature of 21.0°C, must be sanitized and brought to the ideal temperature of 63.0°C by pouring boiling water at 100.0°C over them. Each treatment requires 3.0 kg of stones. The specific heat capacity of the stones is 0.84 J/g°C.



What volume of boiling water must be prepared?

**(Assume complete heat transfer between the water and the stones.)**

**Answer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

5

Four processes are shown below.

1. Sunlight + 6 CO2(g) + 6 H2O(l) → C6H12O6(aq) + 6 O2(g)

2. NaOH(s) → Na+(aq) + OH−(aq)

3. CH4(g) + 2 O2(g) → CO2(g) + 2 H2O(g)

4. H2O(l) → H2O(g)

Which of these processes are endothermic?

|  |  |  |  |
| --- | --- | --- | --- |
| A) | 1 and 3 | C) | 1 and 4 |
| B) | 2 and 3 | D) | 2 and 4 |

6

You have set up a lemonade stand on your street. After a few hours, a customer complained that his lemonade was too warm. You took the temperature of the remaining 250.0 mL and agreed that lemonade at 24.0°C was indeed unpleasant to drink. Instead of throwing the lemonade out, you simply added 2.0 L of fresh lemonade from the fridge at 4.0 °C.

What was the final temperature of the lemonade?

(Assume the density and specific heat capacity of lemonade are the same as water.)

**Answer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

7

Everyday phenomena take place all around us.

Which of the following may be identified as exothermic processes?

1. Dew forming on blades of grass

2. Melting snow and ice on a driveway by adding salt

3. Drying a wet T-shirt on a clothesline

4. Freezing meat to preserve it

5. Burning propane gas in a stove

|  |  |  |  |
| --- | --- | --- | --- |
| A) | 2 and 3 | C) | 1, 2 and 3 |
| B) | 4 and 5 | D) | 1, 4 and 5 |

8

The enthalpy diagram below shows the energy involved in the formation of CO2(g).

C(s) + O2(g) → CO2(g)



Once the reaction above has been initiated, which of the following statements is true?

|  |  |
| --- | --- |
| A) | The formation of CO2(g) constitutes an endothermic reaction. |
| B) | The formation of CO2(g) does not result in energy from the system being transferred into the surroundings. |
| C) | The formation of CO2(g) results in energy from the system being transferred into the surroundings. |
| D) | In the formation of CO2(g) the enthalpy of the products will be greater than the enthalpy of the reactants. |

9

Ethanol, the active ingredient in wine or beer, can be used as a fuel in the following manner:

**C2H5OH(l) + 3 O2(g) → 2 CO2(g) + 3 H2O(g) + 1428 kJ**

If 6.00 g of oxygen gas reacted, how much heat energy was available?

**Answer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

10

0.12 L of water vapour are cooled from 120.0 0C to 37.0 0C.

How much heat energy was involved?

**Answer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

11

In order to determine how much heat is released during the combustion of candle wax, C25H52, a burning candle is used to heat some water in a metal can that serves as a calorimeter.

The following data is obtained:

|  |  |
| --- | --- |
| Volume of water heated | 355.0 mL |
| Initial mass of candle | 136.0 g |
| Final mass of candle | 112.0 g |
| Initial temperature of the water | 15.4°C |
| Final temperature of the water | 23.0°C |

Calculate the molar heat of combustion of the candle wax.

**Answer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

12

Compare and contrast the Bucket of 50 oC water vs the Cup of T at 100 oC. **Use point form.**

|  |
| --- |
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|  |
|  |
|  |

**4 lines means 4 lines!! STOP now**!