**COMET BAY COLLEGE**

**Physics - Unit 1 – Task 6**

**Heating and Cooling Test**

**Name: Total Marks /55**

**Question 1:**

People who have not studied Physics often use the word *heat* when they actually mean *temperature* or even *internal energy (thermal energy)* of the object*.* Explain the difference between the three words underlined. **(3 marks)**

**Question 2:**

Explain why supermarket bucket freezers still manage to keep the contents frozen despite often having no lids. Also explain what the advantage of having a lid would be? **(3 marks)**

**Question 3:**

A large 2.50 × 103 W kettle uses 1.65 × 106 J to completely boil away the contents of a kettle. Calculate the time (in minutes) that it would take for this to occur. **(3 marks)**

**Question 4:**

What is the specific heat of an alloy if it requires 5.10 × 104 J of energy to heat 2.20 kg of the alloy from 15.0 0C to 92.5 0C? **(2 marks)**

**Question 5:**

A laboratory technician was trying to find the latent heat of fusion of an alloy she had created. She found that she needed to add 4.9× 105 J of energy to 0.95 kg of the alloy to fully melt it without changing the temperature. Find the latent heat of fusion of the alloy. **(2 marks)**

**Question 6:**

Explain how a calorimeter works, by considering all the compartments that make up the calorimeter, comparing the specific heat of each and what their purposes are. **(2 marks)**

**Question 7:**

A small espresso coffee machine contains 0.500 kg of water at 20.00 C. How much energy is required to heat the water to 100.00 C and boil all of the water away? **(3 marks)**

**Question 8:**

An ice-block tray holding 0.250 kg of water at 18.0 0C is placed in the freezing compartment of a refrigerator. If it takes 1.50 hours for all the water to form into ice-blocks (at 0.00 0C), find the power that the refrigerator is using to extract heat from the water?

**(4 marks)**

**Question 9:**

Alan wants to add the exact amount of ice (made of pure water) to his 250.0 mL drink (the drink has a specific heat 3.99 × 103 J kg-1 K-1) to cool it from 36.0 0C to 7.00 0C. The ice comes from the freezer where it is kept at a temperature of -6.00 0C. Assuming the cup used is fully insulated, how much ice must he add?  **(5 marks)**

**Question 10:**

A 2.3 kW kettle holds 1.8 litres of water, initially at 16.0 0C. How long will it be before a quarter the water has boiled away, assuming that there are no heat losses? **(5 marks)**

**Question 11:**

MetALwerx wants to decrease energy usage during its smelting of low grade bauxite to extract aluminium. They usually achieve this by raising the temperature of the bauxite ore to 2600o C at standard atmospheric pressure. This turns the aluminium to a gaseous state, allowing it to be separated from the hydroxide molecules. Using mathematical expressions, find the temperature required to achieve gaseous state if the pressure was decreased to two thirds standard atmospheric pressure. Since the pressure decrease is so small there is no volume change. **(3 marks)**

**Question 12:**

The two disk brakes of a 600 kg motorbike each have a mass of 1 kg. The motorbike brakes to a stop from 30 m s-1. If 50% of the bike’s Kinetic energy is transferred to the disk brakes and transformed into heat, calculate their change in temperature.

Specific heat capacity of the disk brakes: c = 500 J kg-1 K-1? **(4 marks)**

**Question 13:**

A 0.680 kg solid sample of an unknown substance is heated slowly while inside an insulated container. The graph below illustrates the heating curve of this substance.



**E**

**D**

**C**

1. State the temperature at which

(i) the substance boils. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **(1 mark)**

(ii) the substance melts. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **(1 mark)**

1. What state or states is/are present between
2. B and C? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **(1 mark)**
3. C and D? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **(1 mark)**
4. Explain on a molecular level why the temperature doesn’t change between A and B although heat is still being added to the substance. **(3 marks)**
5. Explain why section AB is shorter than section CD. **(2 marks)**
6. Calculate the latent heat of vaporisation of this substance, and give the correct units.

**(3 marks)**

1. Calculate the specific heat capacity of this substance in the liquid phase. **(4 marks)**