| AEPHY2024  **Narrogin SHS Year 11 ATAR PHYSICS Name: SOLUTIONS** |
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| Task No: | 2 |
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| Task Type: | Test |
| Content: | Heating processes |
| Task Description: | Complete the attached questions in the spaces provided.  Marks will be awarded for presentation and working.  **Test conditions (50 minutes).**  *Formulae and data booklet provided.*  *Non-programmable calculator permitted.* |
| Total Marks: | 35 |
| Weighting: | 6% |
| Materials required | pens, pencils (including coloured), sharpener, correction fluid, eraser, ruler, highlighters, scientific calculator |
| Due Date: |  |

1. Explain the difference between temperature and heat.

(4 marks)

**1. Temperature (2 marks)**

* **Definition**: Temperature is a measure of the average kinetic energy of the particles in a substance. It indicates how hot or cold something is.
* **Example**: Imagine a cup of hot coffee at 80°C and a swimming pool at 25°C. The coffee is much hotter than the pool, so the particles in the coffee are moving faster on average than those in the pool. Despite the swimming pool containing more water, the temperature only reflects the average kinetic energy, not the total energy.

**2. Heat (2 marks)**

* **Definition**: Heat is a form of energy that is transferred between substances or systems due to a temperature difference. It always flows from the hotter object to the cooler one.
* **Example**: If you place an ice cube in a cup of hot coffee, heat will flow from the hot coffee (higher temperature) to the ice cube (lower temperature). The coffee will cool down, and the ice will melt as it absorbs the heat energy. The total energy transferred is dependent on the mass of the ice cube, the specific heat capacity of water, and the temperature difference.

(Other examples can be used – upto teacher’s discretion)

1. Draw a cooling curve for water. You will need to assume some values. (4 marks)

**Values and Phase Changes (2 Marks):**

1. **Segment AB**: Liquid water cools from 100°C to 0°C (1 mark).
2. **Segment BC**: Water freezes at 0°C, temperature remains constant (1 mark).
3. **Segment CD**: Solid ice cools from 0°C to -10°C (1 mark).
4. **Overall Curve with Values and Phase Changes Labeled** (1 mark).

**Graphing Skills (2 marks)**

1. Ruler and Pencil (1 mark)
2. Title (1 mark)
3. Explain why metals are better conductors of heat than non-metal solids. (3 marks)
4. **Free Electrons in Metals**: Metals have delocalized electrons that transfer heat quickly (1 mark).
5. **Atomic Structure and Bonding**: Metals have a closely packed lattice that facilitates efficient heat transfer (1 mark).
6. **Lack of Free Electrons in Non-Metals**: Non-metals rely on less efficient lattice vibrations for heat transfer (1 mark).
7. Explain what causes sea breezes. A suitable diagram may be needed to help with your explanation. (6 marks)

**(6 Marks)**

1. **Definition and Cause**: Sea breezes are cool winds from the sea towards the land, caused by differential heating (1 mark).
2. **Differential Heating**: Land heats up more quickly than water (1 mark).
3. **Rising Warm Air and Low Pressure**: Warm air over land rises, creating low pressure (1 mark).
4. **Cooler Air from Sea**: Cooler air from the sea moves in to replace the rising warm air (1 mark).
5. **Continuous Cycle**: The process continues as long as the temperature difference exists (1 mark).
6. **Diagram**: Illustrates the process of sea breeze formation (1 mark).

**Diagram has to include**

* **Step 1**: During the day, the land heats up faster than the sea.
* **Step 2**: The warm air above the land rises, creating a low-pressure area.
* **Step 3**: Cooler, denser air from the sea moves in to replace the rising warm air.
* **Step 4**: This movement of air from the sea to the land creates a sea breeze.

1. How much energy is absorbed when 350g of water is heated from 25oC to 45oC?

(3 marks)

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1. A 2.54kg sample of water at 30oC is heated with 350J of energy. Calculate the final temperature of the water. (3 marks)

A maths with numbers and symbols

Description automatically generated with medium confidence

1. A microwave oven can warm 60g of water from 5oC to 40oC in 50 seconds. Calculate the theoretical power rating of the microwave.

(3 marks)

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1. 2 kg block of ice at -20oC is heated until it melts and then the water it produces continues to be heated until it reached 20oC. Determine the total amount of energy required. (4 marks)

Heating the Ice from -20°C to 0°C

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Melting the Ice at 0°C

A close up of numbers

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Heating the Water from 0°C to 20°C

A screenshot of a calculator

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1. A 30kg block of iron (cFe = 900 JKg-1K-1) had an initial temperature of 80oC. It was slowly lowered in to a drum of water. The water had a mass of 60kg and an initial temperature of 15oC. Calculate the final temperature of the combined iron/water mixture. Assume no loss of heat to the surrounding environment. (5 marks)

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A math equations and formulas

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End of test