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| Name:          |
| Science Class: |
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# Y9 Science

## Term 3 Homework Booklet

### Physics

|                                 | Hand in Date | Parents Signature |
|---------------------------------|--------------|-------------------|
| <b>Particle Model of Matter</b> |              |                   |
| Homework 1                      |              |                   |
| Homework 2                      |              |                   |
| Homework 3                      |              |                   |
| Homework 4                      |              |                   |
| Homework 5                      |              |                   |
| Homework 6                      |              |                   |

## **Homework 1- Density – understanding**

<https://www.my-gcsescience.com/aqa/physics/density/>

1. Which Greek letter is used to represent density?
2. What is the SI unit for density?
3. Write the equation linking density to mass and volume
4. How many  $\text{cm}^3$  are there in  $1\text{m}^3$ ?
5. Explain why density varies between different substances.
6. Write a method for finding the density of a cube of wood

7. Describe how you would find the density of a liquid.

8. What is the displacement method and why would you use it?

9. Name the apparatus you use to measure mass

10. Write the equations to find the volume of:

a. A cuboid

b. A cylinder

c. A sphere

## **Homework 2 - Density calculations**

1. In each of the following questions find the **density**. State the units of your answer

a. Mass 45g, volume  $5\text{cm}^3$

b. Mass 18.9g, volume  $9\text{cm}^3$

c. Volume  $7\text{cm}^3$ , mass 56g

d. Mass 4340kg, volume  $7\text{m}^3$

e. Volume  $0.4\text{m}^3$ , mass 688kg

f. Volume  $12.8\text{cm}^3$ , mass  $8601.6\text{cm}^3$

2. In each of the following questions find the **mass**. State the units of your answer.

a. Density  $5\text{g}/\text{cm}^3$ . volume  $4\text{cm}^3$

b. Density  $190\text{kg}/\text{m}^3$ , volume  $3\text{m}^3$

c. Volume  $19\text{cm}^3$ , density  $8\text{g}/\text{cm}^3$

d. Volume  $4\text{m}^3$ , density  $5450\text{kg}/\text{m}^3$

e. Volume  $3\text{cm}^3$ , density  $1.4\text{g}/\text{cm}^3$

f. Density  $960\text{kg}/\text{m}^3$ , Volume  $0.25\text{m}^3$

3. In each of the following questions find the **volume**. State the units of your answer.

a. Density  $1.4\text{g/cm}^3$ . mass  $5.6\text{g}$

b. Density  $800\text{kg/m}^3$ , mass  $4800\text{kg}$

c. Mass  $4.2\text{g}$ , density  $0.7\text{g/cm}^3$

d. Mass  $420\text{kg}$ , density  $140\text{kg/m}^3$

e. Mass  $16.32\text{g}$ , density  $2.4\text{g/cm}^3$

f. Density  $6904\text{kg/m}^3$ , Mass  $28306.4\text{kg}$

4. Lead has a density of  $11.5\text{g/cm}^3$ . A rectangular block of lead measures  $7\text{cm} \times 5\text{cm} \times 2\text{cm}$ .

a) Find the volume of the block of lead.

b) Find the mass of the block of lead

5. A plywood plank measures  $1\text{cm} \times 8\text{cm} \times 90\text{cm}$  and weighs  $396\text{g}$ .

a. Find the volume of the plywood plank.

b. Find the density of the plywood.

6. The petrol in a petrol can weighs 2000g. The density of petrol is  $0.8\text{g/cm}^3$ . What is the volume of the petrol in the can in;

- a.  $\text{cm}^3$
- b. litres      ( $1000\text{cm}^3=1\text{ litre}$ )

7. A marble slab is 1 metre long and has a rectangular cross section of area  $15\text{cm}^2$ .

- a. What is the volume of the marble slab?
- b. The density of marble is  $2.7\text{g/cm}^3$ , what is the mass of the marble slab?

8. Olympics medals have a diameter of 60mm and a thickness of 3mm.

Gold has a density of  $19\text{g/cm}^3$  Work out

- a. the volume of a gold medal
- b. the mass of a gold medal.

### **Homework 3 – Solids, liquids and gases -understanding**

<https://www.my-gcsescience.com/aqa/physics/solids-liquids-and-gases/>

1. What are the 3 states of matter?

2. Complete the table

| State  | Diagram | Example | Particles |
|--------|---------|---------|-----------|
| Solid  |         |         |           |
| Liquid |         |         |           |
| Gas    |         |         |           |

3. Why is it difficult to change the shape of a solid?

4. Why are liquids difficult to compress?

5. Why can gases expand to fill any volume?

6. Above what temperature do all particle systems store energy?

7. What is the internal energy of a system?

8. What happens when the internal energy of a system changes?

9. What is difference between boiling and evaporation?

10. Why is a change of state a physical change?



### **Homework 3 Specific heat capacity – understanding**

<https://www.my-gcsescience.com/aqa/physics/specific-heat-capacity-and-specific-latent-heat/>

1. State the two effects of increasing the heat energy of a system?
2. Why does the mass affect the increase in temperature of a substance?
3. Define specific heat capacity.
4. List the three factors that affect how much the temperature of a substance increases.
5. What is the unit for specific heat capacity?
6. What does the Greek letter delta ( $\Delta$ ) represent?
7. Write the equation for specific heat capacity
8. When is  $\Delta\theta$  a negative number?
9. Explain why the temperature of liquid water does not rise above 100°C.
10. What is the difference between specific latent heat of fusion and specific latent heat of vaporisation?

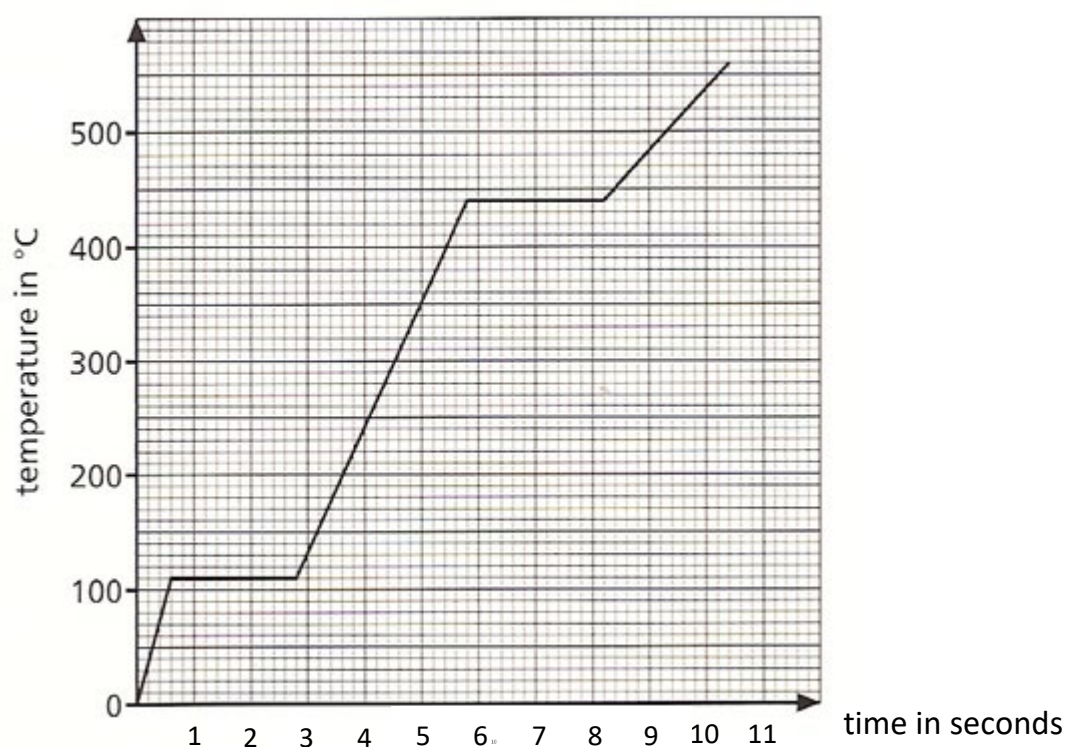
#### Homework 4 Specific heat capacity and latent heat capacity

1. (a) The melting point and boiling point of lead are 327 and 1774 degrees Celsius and -219 and -183 for Oxygen.

(i) At - 200 °C will the oxygen be a solid, liquid, or gas? .....

(ii) At 450 °C will the lead be a solid, liquid, or gas? .....

(b) The graph shown alongside shows how the temperature of a pure substance



changes as it is heated.

(i) At what temperature does the substance melt? .....

(ii) Label the section of the graph with a letter X where the substance is a liquid only and with a letter Y where it exists as both a liquid and solid at the same time.

(iii) If the heater provides 100J of heat energy every second use the graph to calculate the energy required to melt this substance

.....

(iv) If 1.5 kg of the substance was used, use your answer to part (ii) to calculate the specific latent heat of fusion for this substance.

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2. Fill the blanks in the following sentences:

(a) A solid must be given ..... heat of ..... before it can be melted into a liquid.

(b) A liquid must be given ..... heat of ..... before it can be boiled into a gas.

(c) The energy needed to melt a solid is used to break the ..... between the molecules so that they can move ..... freely.

(d) The specific latent heat of fusion is the amount of energy (measured in ..... ) needed to melt ..... kg of a solid into a ..... without changing its .....

3. Explain why a scald from steam at 100 degrees C is very much worse than a scald from water at 100 degrees C.

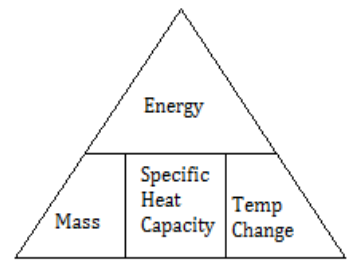
4. An electric kettle produces 2000 J of energy each second. It is filled with water, weighed and switched on. After coming to the boil, it is left on for a further 120 seconds and is then switched off. It is found to be 90 g lighter. Calculate the specific latent heat of vaporisation from this data.

**Remember: Energy = mass x specific latent heat**

Hint: Try rearranging the formula.

Work out how much total energy is used in 120seconds

## Homework 5 - Specific heat capacity calculations



1. How much **energy** is needed to raise the temperature of 2 kg of copper from 0°C to 10°C. The specific heat capacity of copper is 380J/kg°C.
2. A hot water bottle is filled with 0.8kg of water at 80°C. During the night it cools to 30°C. The specific heat capacity of water is 4200J/kg°C. How much **energy** has it given out?
3. How much **energy** is needed to heat 2kg of cooking oil with a specific heat capacity of 2000J/kg°C from 20°C to 120°C?
4. Andy has a bath and uses 1500g of water heated from 10°C to 40°C and with a specific heat capacity of 4200J/kg°C. How much **energy** does he use?
5. An electric kettle supplies 20,000J of energy to heat 0.5kg of water. What is the **temperature change**? The specific heat capacity of water is 4200J/kg°C.

6. A piece of lead with a specific heat capacity of  $126\text{J/kg}^{\circ}\text{C}$  is given  $5000\text{J}$  of energy to heat it from  $20^{\circ}\text{C}$  to  $250^{\circ}\text{C}$ . What was the **mass** of the piece of lead?
  
7. A  $2\text{ kg}$  metal cylinder is supplied with  $1600\text{J}$  of energy to heat it from  $5^{\circ}\text{C}$  to  $13^{\circ}\text{C}$ . What is the **specific heat capacity** of the metal?
  
8.  $201,600\text{J}$  is supplied to  $600\text{g}$  of water with a specific heat capacity of  $4200\text{J/kg}^{\circ}\text{C}$ . What is the **change in temperature**?
  
9. **CHALLENGE!** Becky has a shower and uses  $20,000\text{g}$  of water with a specific heat capacity of  $4200\text{J/kg}^{\circ}\text{C}$ . When the water is supplied with  $336,000\text{J}$  of energy, it heats up to  $50^{\circ}\text{C}$ . What was the **starting temperature** of the water?
  
10. Explain why houses built of stone take a long time to warm up. But once they are warm, they stay warm for a very long time.

## **Homework 6 -Particle model and Pressure understanding**

<https://www.my-gcsescience.com/aga/physics/particle-model-and-pressure-double-award/>

1. How are the particles in a gas arranged compared to a liquid or a solid?
2. Describe how the particles in a gas move.
3. State Newton's third law.
4. Explain why particles in a gas exert a force on the walls of a container.
5. Why does heating a gas increase the speed of the particles?
6. Describe temperature in terms of kinetic energy.
7. Define pressure.
8. What happens when a fixed volume of gas is cooled?
9. Explain why the pressure of a solid does not increase when it is heated.
10. What happens to the pressure of a gas when it is compressed? Why?