

How to write long answers for particle model of matter questions.

Question: Describe an experiment to calculate the density of a cube of copper and a bunch of keys

When writing a long answer, you need to tell a story and include scientific content. It is not enough just to put down several bullet points. The best way to start, is to **define** any key terms in the question. In this question, the key term is **density**.

Density is calculated by dividing the mass by the volume of an object.

The next step is to describe how to measure the mass and the volume of each object. We will start by measuring the volume. We have a regular object (cube of copper) and an irregular object (bunch of keys) so we will need to describe two methods.

The volume of a regular object can be calculated by measuring the length, height and width of the cube. The volume is calculated using the following equation: $\text{volume} = \text{length} \times \text{height} \times \text{width}$

The next step is to measure the volume of a bunch of keys.

To determine the volume of a set of keys, fill a measuring cylinder with a known volume of water. Immerse the keys in the water and measure the volume of water again. The volume of the keys can be calculated using the following equation: $\text{volume of keys} = \text{volume of water} + \text{keys} - \text{volume of water}$.

You could also write a method using a Eureka can:

To determine the volume of a set of keys, fill a Eureka can with water. Immerse the keys into the water and collect the displace from the Eureka can in a measuring cylinder. The volume of the keys is equal to the volume of water collected.

Now we say how we will measure the mass.

The mass of both objects can be obtained using a balance.

We finish off by stating how we will calculate the density.

Calculate the density of each object by using the equation: $\text{density} = \text{mass} / \text{volume}$

The whole answer looks like this...

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or

To determine the volume of a set of keys, fill a Eureka can with water. Immerse the keys into the water and collect the displace from the Eureka can in a measuring cylinder. The volume of the keys is equal to the volume of water collected.

The mass of both objects can be obtained using a balance.

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Variations of the question.

The density of gold is 19.320 g/cm^3 . Describe an experiment to investigate if a small statue is made of pure gold.

Question: Describe the changes in internal energy that occur when a solid changes into a liquid.

When writing a long answer, you need to tell a story and include scientific content. It is not enough just to put down several bullet points. The best way to start, is to **define** any key terms in the question.

In this question, the key term is **internal energy**.

Internal energy is the total kinetic energy and potential energy of all the particles (atoms and molecules) that make up a system.

To help the structure of the essay we will define the kinetic energy of molecules and the potential energy of molecules. As we then describe the changes of state we will be able to refer to these. Note that you should refer to the kinetic or potential energy of the system and not the individual molecules.

The kinetic energy of molecules depends on how fast they are moving. Changing the speed of molecules will change the kinetic energy of the system.

The potential energy of molecules changes depending on the bonds between molecules. Bonds breaking or forming will change the potential energy of the system.

Now we need to describe what happens as the object starts to change state. Focus your answer only on facts relating to the internal energy changes. Clearly state what happens the kinetic energy and potential energy at each stage.

As the solid is heated the particles start to vibrate faster. This increases the kinetic energy of the system. During this stage, the potential energy remains constant. When the solid reaches the melting point the energy from heating is used to break the attraction between the particles. The potential energy of the system increases. During melting the kinetic energy remains constant.

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Variations of the question.

Explain how changing temperature affects the kinetic energy of molecules when a gas condenses into a liquid
Describe the kinetic energy of a solid, a liquid and a gas.