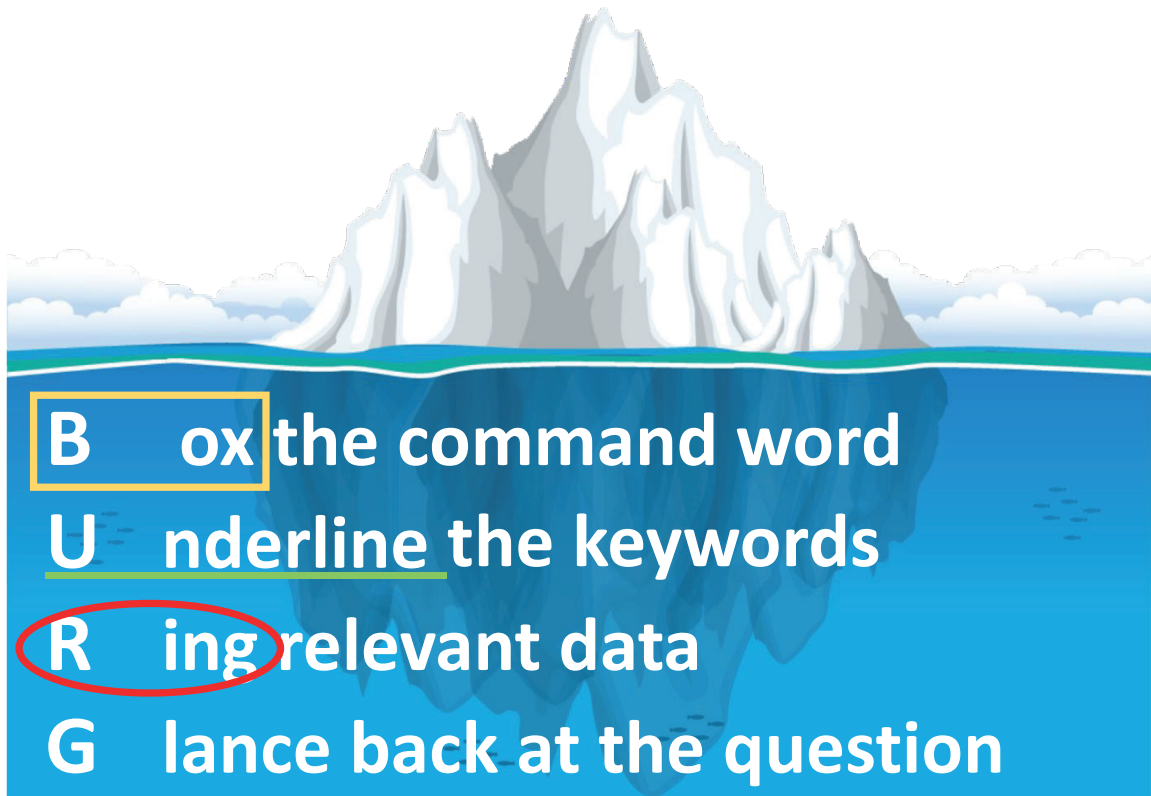
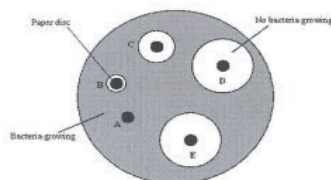


Science



Q5. An investigator placed paper discs containing different concentrations of an antibiotic onto a culture of bacteria in a petri dish.

After an incubation period of two days, the dish looked like this.



(c) When students carry out this experiment, they need to take several safety precautions.

The precautions include:

- 1 • passing inoculating loops through a flame
- 2 • sealing the lid of the petri dish with tape
- 3 • incubating at a maximum temperature of 25 °C

Explain why each of these precautions is necessary.

Why?
State
the
reasons.

- ① reason for flaming loop...
- ② reason for sealing the lid...
- ③ reason for maximum incubation temperature of 25°C.

(4)

Science

Making a 5 point flash card from a textbook page

Learning objectives

After this topic you will be able to:

- describe the properties of a substance in its three states
- use ideas about particles to explain the properties of a substance in its three states.

Do you like ice in cold drinks? An ice cube is made up of water particles. Ice is water in the solid state. Now imagine a steaming kettle. Steam is also made up of water particles. It is water in the gas state.

Water can exist in three states, as a **solid**, a **liquid**, or a **gas**. These are the **states of matter**. The particles of water in its three states are identical. But the properties of ice, liquid water, and steam are different. These pages explain why.

A Name the three states of matter.

How does state affect properties?

Most substances can exist in three states. The state of a substance depends on temperature. At room temperature, gold is solid. But if you make it hot enough, gold exists as a liquid or gas.

The table compares the properties of a substance in its three states.

State	Can you compress (squash) the substance in this state?	Does the substance flow?	Shape
solid	no	no	fixed, unless you apply a force
liquid	no	yes	takes the shape of the bottom of its container
gas	yes	yes	takes the shape of the whole container

B Identify three differences between a substance in the solid and liquid states.

How do particles explain properties?

The particles of a substance do not change. All water particles are the same, in all three states. But the arrangement and movement of particles are different in each state.

The solid state

When a substance is in the solid state, its particles touch their neighbours. This explains why you cannot compress a solid. In the solid state, a substance's particles are arranged in a pattern.

In the solid state, particles do not move around. They vibrate on the spot. This explains why solids cannot flow.

The particles of a substance in the solid state.

The liquid state

When a substance is in the liquid state, its particles touch their neighbours. This is why you cannot compress a liquid. The particles move from place to place, sliding over each other. This explains why liquids flow and why they have no fixed shape.

The particles of a substance in the liquid state.

C State why you cannot compress a liquid.

The gas state

In the gas state, particles spread out. So it is easy to compress a gas. The particles move throughout the whole container. This explains why gases flow.

The particles of a substance in the gas state.

Express particle?

In 2016 a Chinese train became the world's fastest passenger train. It reached a speed of 486 km/h (302 mph). In the air, oxygen particles travel at about 500 m/s. Calculate which is faster – the train or the particles.

Key Words

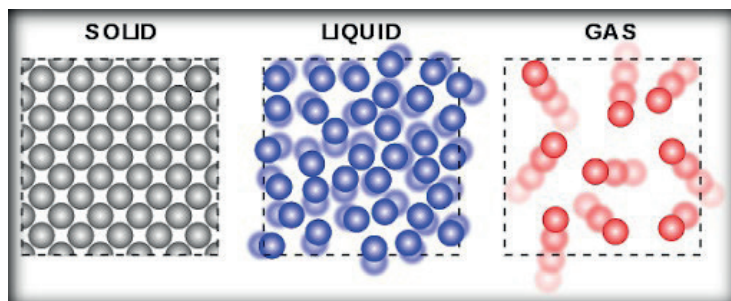
solid, liquid, gas, states of matter

Summary Questions

- Each sentence in the paragraph below has one or more mistakes. Write corrected versions of the sentences.
There are two states of matter. You can compress a substance in the solid state because the particles touch each other. In the liquid and gas states, a substance flows because the particles cannot move from place to place. You cannot compress a gas because the particles are spread out. (4 marks)
- Compare the properties of a substance in the liquid and gas states. (3 marks)
- Use the particle model to explain in detail why the properties of water are different in its three states. (6 marks)

States of matter


- The three states of matter are **SOLID, LIQUID AND GAS**
- The state the substance is in depends on the temperature, for example gold will turn into a liquid or gas if it gets hot enough
- In a solid the particles are in a regular pattern, touching each other and can only vibrate
- In a liquid the particles touch each other but can move around each other
- In a gas the particles are spread out and move randomly in all directions



Science

FLASH CARD TEMPLATE

Science

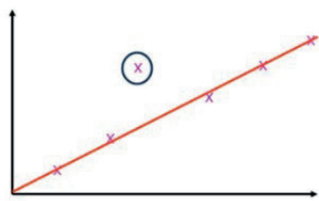
<u>Mixtures</u> Keywords: <i>Element, Atom</i> <i>Compound</i> Diagram:  Extra facts: <i>Mixtures can be separated</i>	<u>Solutions</u>	<u>Filtration</u>	<u>Evaporation</u>
<u>Chromatography</u>	<u>Distillation</u>	<u>Diffusion</u>	<u>Ceramics, polymers & composites</u>

Science

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SCIENCE KEY TERMS YOU NEED TO KNOW

anomalies



These are values in a set of results which are judged not to be part of the variation caused by random uncertainty. They do not fit on or near the line of best fit.

random error

	1	2	3	average
	21	22	39	

These cause readings to be spread about the true value, due to results varying in an unpredictable way from one measurement to the next.

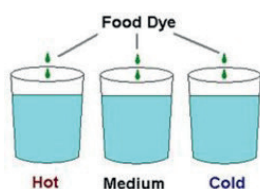
Random errors are present when any measurement is made, and cannot be corrected. The effect of random errors can be reduced by making more measurements and calculating a new mean.

Repeatable

Time (mins)	Temperature ($^{\circ}\text{C}$)			
	1	2	3	average
1	22	24	21	22.3
2	34	32	33	33.0

A measurement is repeatable if the original experimenter repeats the investigation using same method and equipment and obtains the same results.

Validity



Suitability of the investigative procedure to answer the question being asked. For example, an investigation to find out if the rate of a chemical reaction depended upon the concentration of one of the reactants would not be a valid procedure if the temperature of the reactants was not controlled.

Science

SCIENCE KEY TERMS YOU NEED TO KNOW

<p>Valid conclusion</p>	<p>A conclusion supported by valid data, obtained from an appropriate experimental design and based on sound reasoning.</p>
<p>categoric variables</p>	<p>Categoric variables have values that are labels. E.g. names of plants or types of material.</p>
<p>continuous variables</p>	<p>Continuous variables can have values (called a quantity) that can be given a magnitude either by counting (as in the case of the number of shrimp) or by measurement (e.g. light intensity, flow rate etc).</p>
<p>control variables</p>	<p>A control variable is one which may, in addition to the independent variable, affect the outcome of the investigation and therefore has to be kept constant or at least monitored.</p>
<p>dependent variables</p>	<p>The dependent variable is the variable of which the value is measured for each and every change in the independent variable.</p>
<p>independent variables</p>	<p>The independent variable is the variable for which values are changed or selected by the investigator.</p>