

# NATURAL SCIENCES

## GRADE 7

### **INSTRUCTIONS:**

- \* PAGE 1 – Keywords
- \* PAGE 2 – Explaining physical properties of materials (read) and answer activity 1 on the worksheet.
- \* HANDWRITTEN WORK – Work given on the board to draw. Explaining using diagrams – Compressive and tensile strength AND Boiling and melting.
- \* PAGE 3 – Read and understand
- \* PAGE 4 – Complete activity by drawing a simple circuit board using symbols.
- \* PAGE 5 – Read the paragraph and answer Questions 1 (a) and 2 (a)(b)(c)

Date : 10 June 2020

Topic: **Properties of Materials**

*Keywords*

1. Compressive Strength – Strength of an object that stops it from being crushed, or changing shape when it is pushed or squeezed.
2. Tensile Strength – Strength of an object that stops it from breaking when it is pulled apart.
3. Flexibility – Ability to bend easy.
4. Melt – When a substance changes from a solid to a liquid.
5. Melting Point – Temperature at which a substance melts as it changes from a solid to liquid. The melting point of ice is 0 degree.
6. Boil – When a liquid starts to bubble and changes into gas.
7. Boil Point – Temperature at which a liquid turns into gas. It does this at around 100 degrees.
8. Electrical conductors – material that do not allow electrical to move through.
9. Electrical conductivity – ability of a material to allow electricity to move through it.
10. Heat conductivity - ability of a material to allow heat to flow through it.
11. Thermal conductivity – materials that prevent heat from flowing through them or that reduce the rate at which heat flows through them.
  
12. Variables – factors that can change, are observable and measurable.
13. Independent variables – variables that is not affected by other variables, for example, time.
14. Dependent variable – variable that changes according to the independent variable, for example, the size of a growing plant will depend on how much time has passed.
15. Fair test – test in which the condition are the same for all the different objects or cases you are going to test
16. Factor – one of the different conditions in your test for example, time, strength, colour are all factors that could affect the results.

# Physical properties of materials

## Properties of materials determine their suitability for a particular use

A material is suitable for a particular use if it has the properties that are needed in the finished product. The objects in Figure 4 are all made from materials that are suitable for its use. For example, we would not use sponge to build a tall building and we would not sleep on a concrete mattress. We might carry our shopping home in a bag made of thin, strong plastic or a recyclable cloth bag, but not one made of metal sheets.

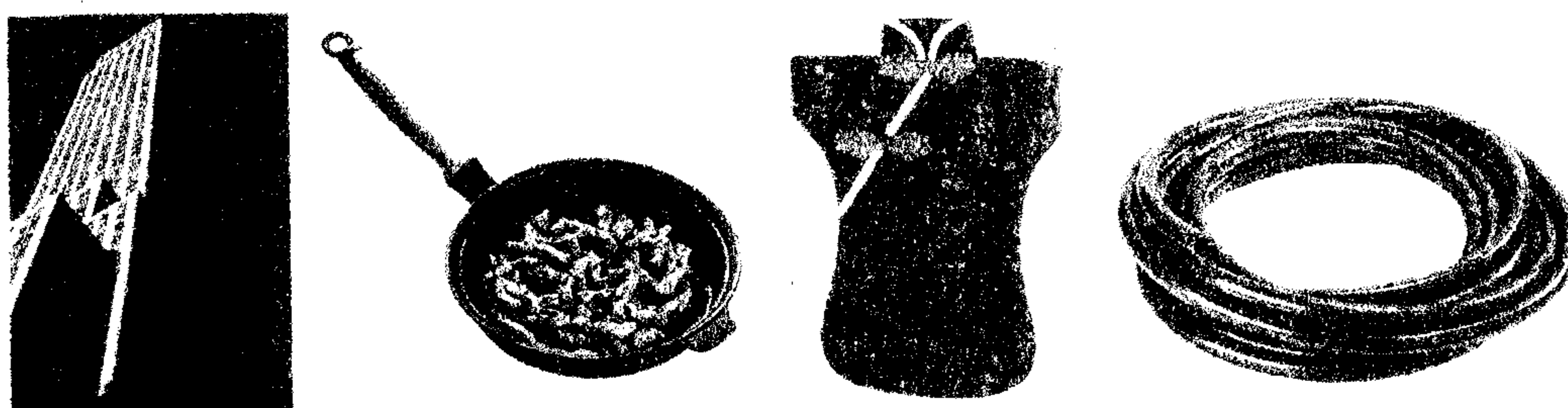


Figure 4 The objects in these photos are made of different materials that are suitable for the objects' use.

### Strength

Materials can be strong in different ways. Concrete is very strong. Concrete does not easily change shape and it is difficult to crush. We say concrete has **compressive strength**. Materials such as concrete, rock and bricks have high compressive strength.

Steel is strong in another way. It can resist being stretched. Steel can withstand tension. We say that steel has **tensile strength**.

### Flexibility

**Flexibility** is a measure of how easy it is to bend a material. Flexible materials can bend without breaking. For example, rubber is a flexible material. It is easier to water the garden with a rubber hose than with a steel one. We use flexible materials in objects such as car tyres, plastic rulers, fabrics for clothes and household furnishings.

### Boiling points and melting points

Water is a substance that is familiar to us. We know that water can be in solid, liquid and gas states. When ice **melts**, it changes from solid to liquid, and it does this at around  $0^{\circ}\text{C}$ . We call this the **melting point** of ice. If you heat water, eventually it will **boil**. It does this at around  $100^{\circ}\text{C}$ . We call this the **boiling point** of water. Notice that we say 'around'  $0^{\circ}\text{C}$  or  $100^{\circ}\text{C}$ . This is because conditions are not identical at all times. Pressure and impurities, such as chemicals in the water, make a difference to melting and boiling points. For example water boils at about  $96^{\circ}\text{C}$  in Johannesburg because of the lower air pressure there.

### Activity - strength

1. What is the difference between compressive and tensile strength?

# PROPERTIES OF MATERIALS (PAGE 2)

## a) COMPRESSIVE STRENGTH

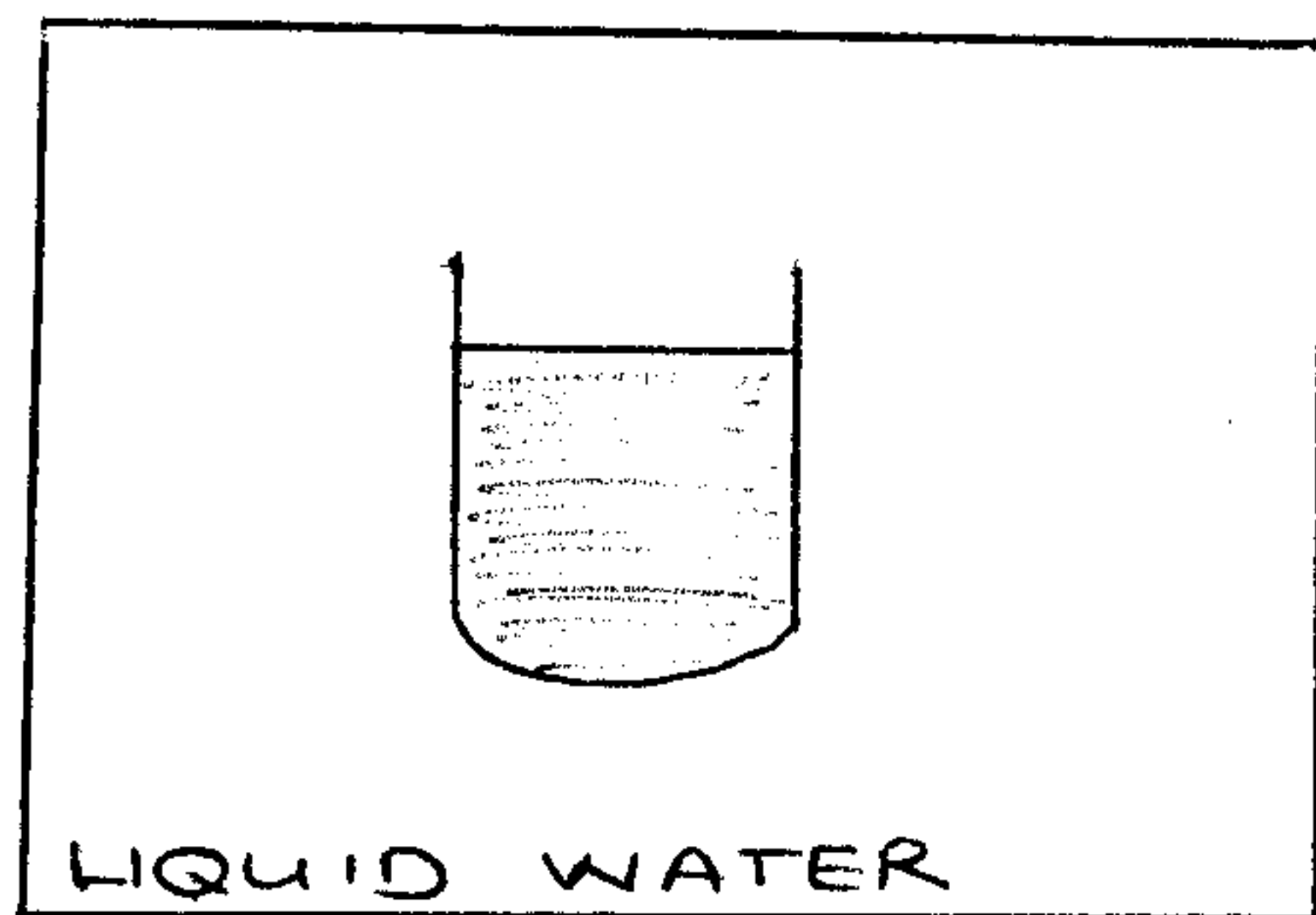
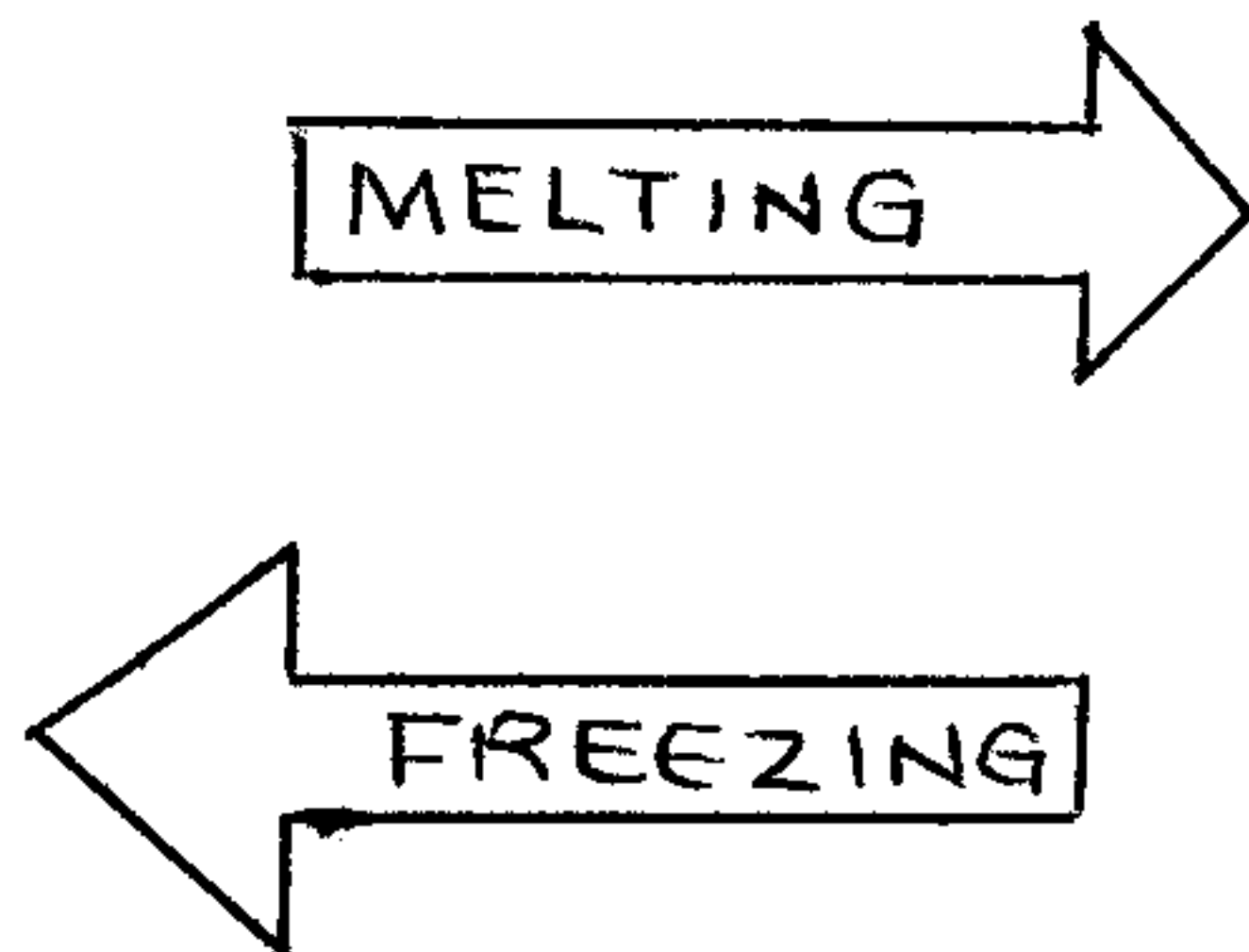
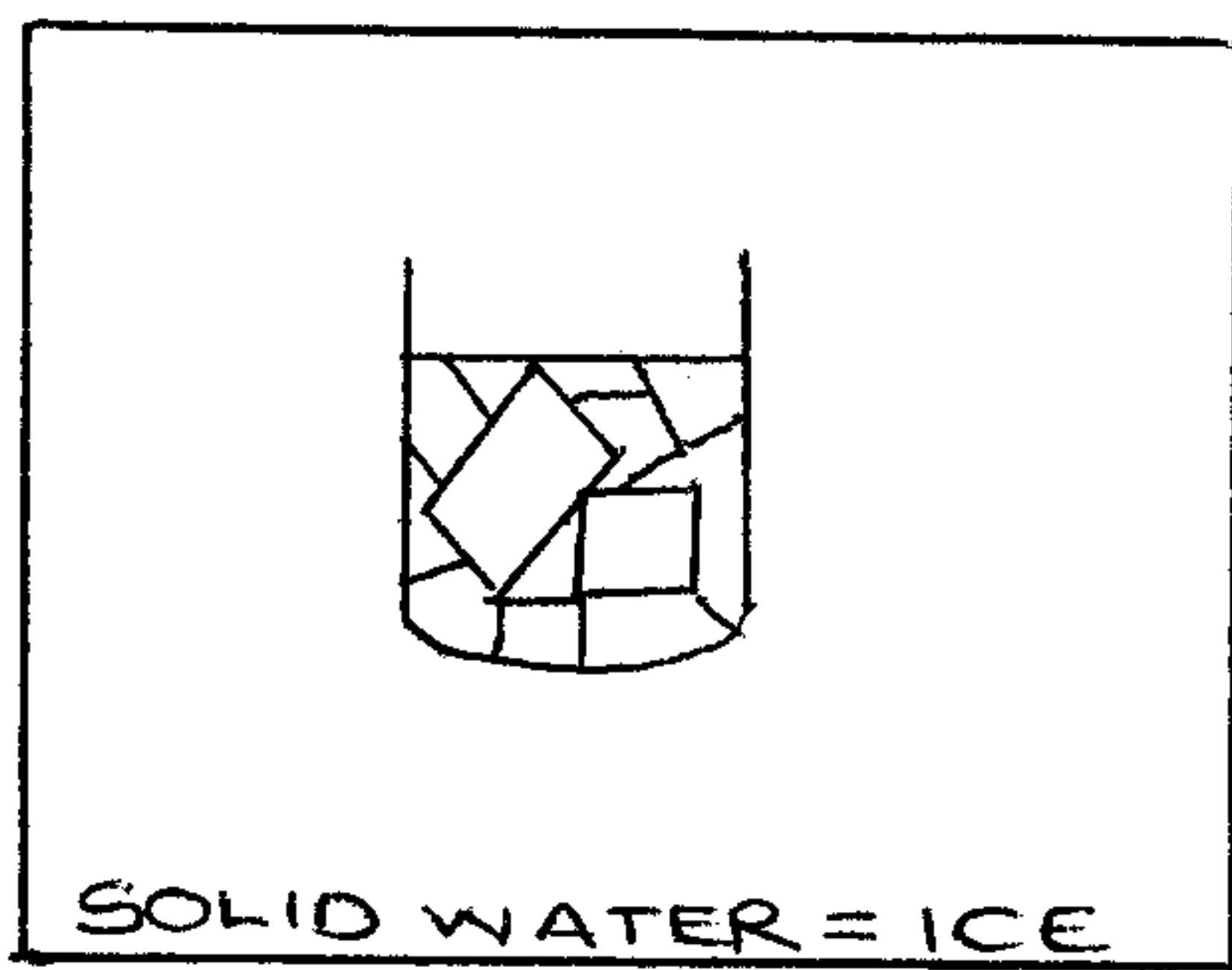


## b) TENSILE STRENGTH

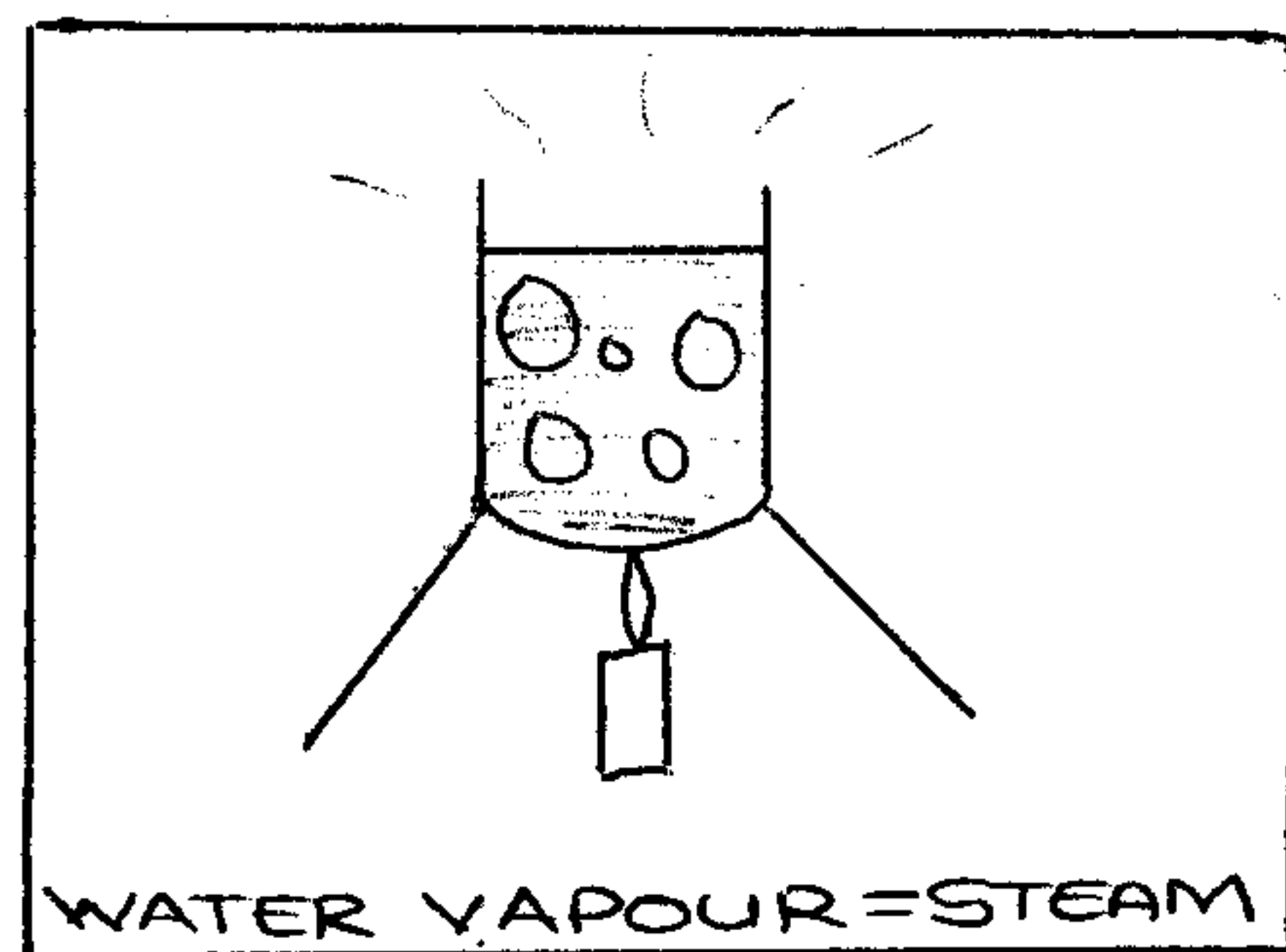
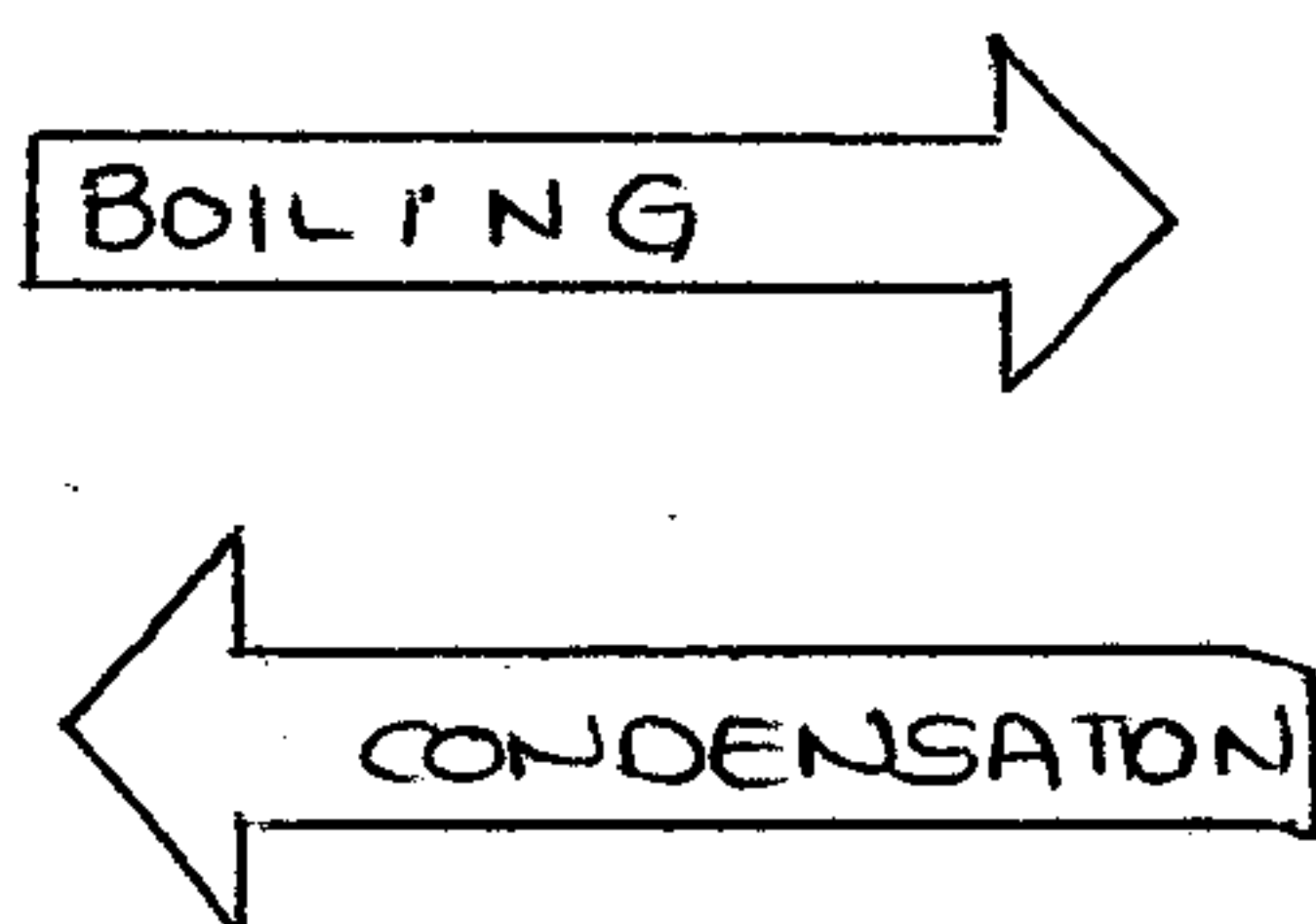
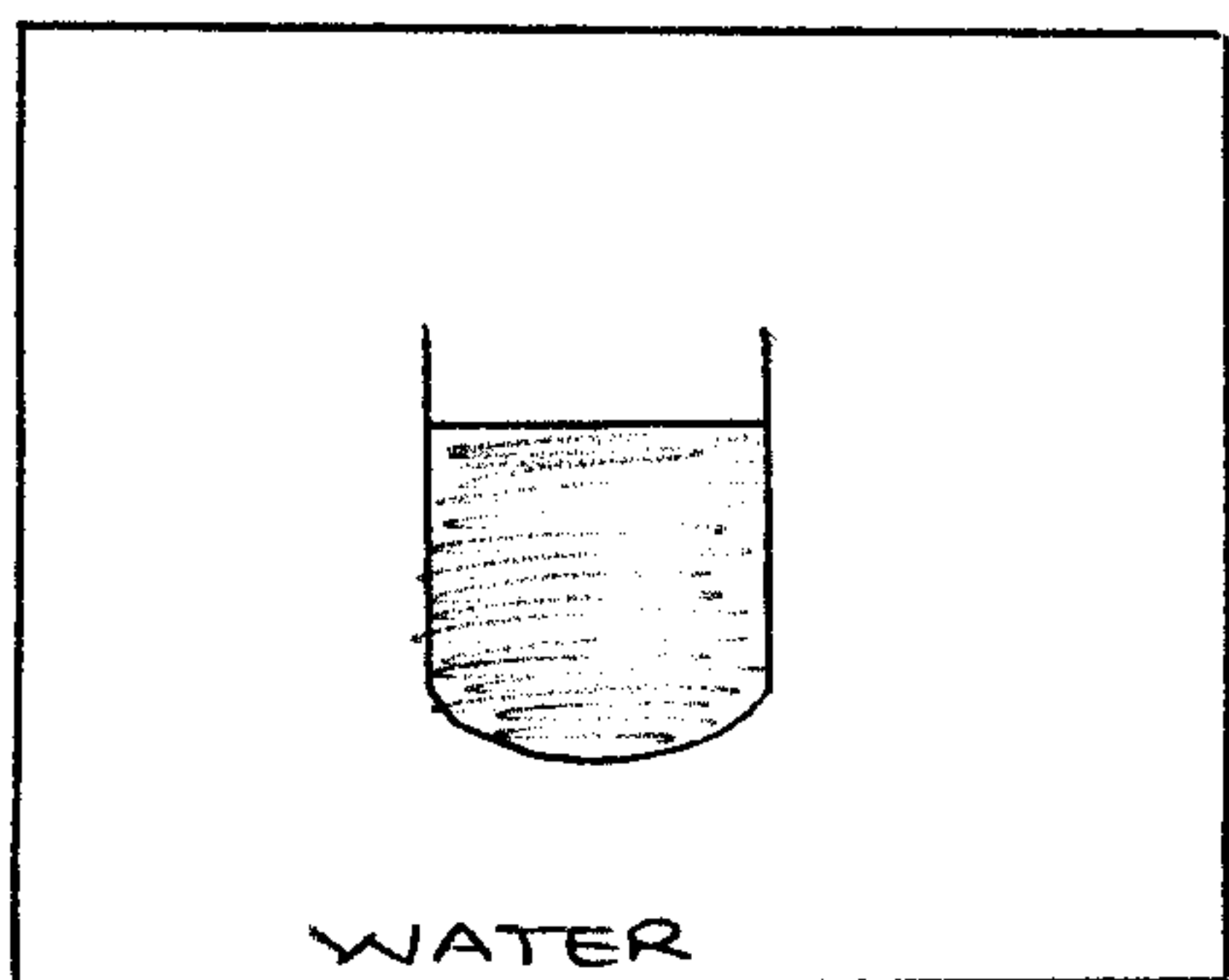


# BOILING AND MELTING (PAGE 2)

## a) MELTING AND FREEZING

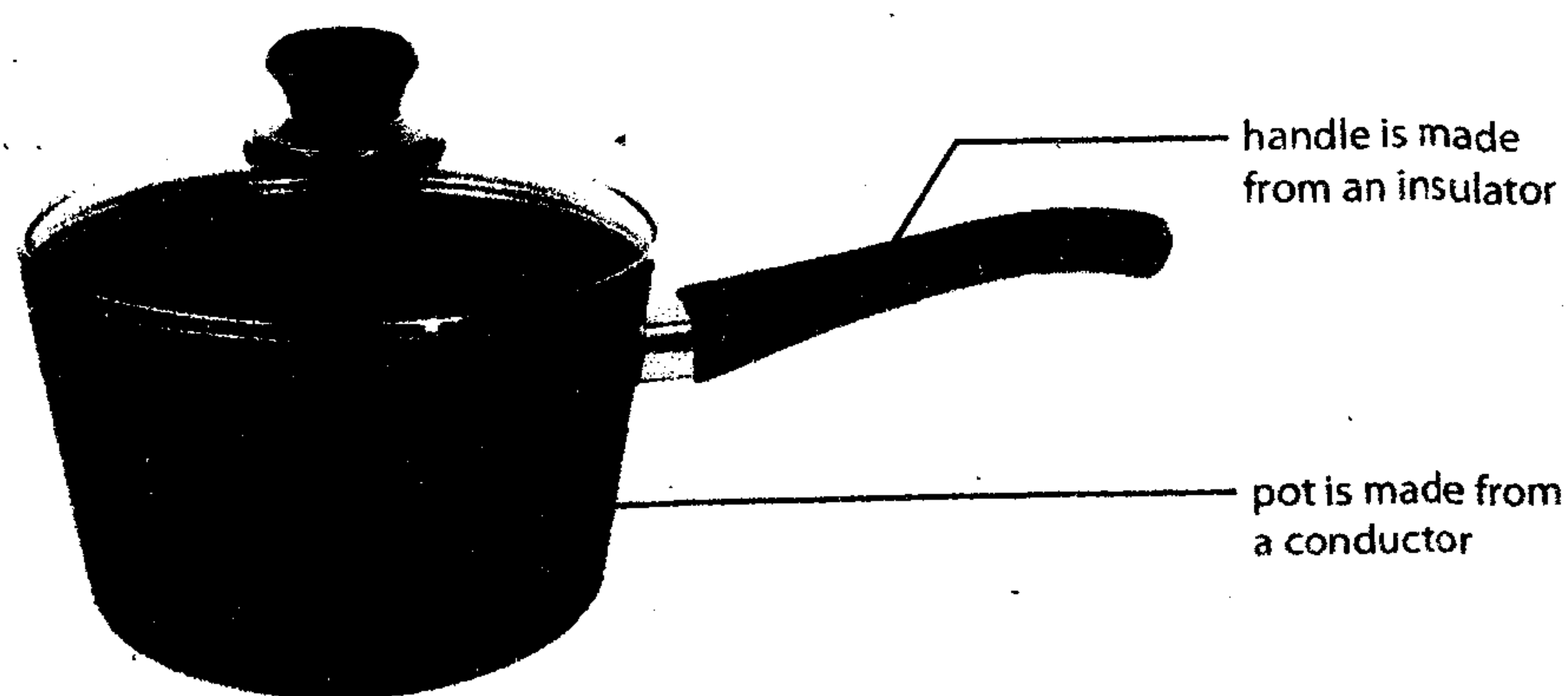


## b) BOILING AND CONDENSATION



## Heat conductivity

In previous grades, you learnt that certain materials allow heat to pass easily through them. **Heat conductivity** is the ability of a material to conduct heat. We sometimes call this **thermal conductivity**. Cooking pots can be made from different materials. The pot itself is made of a metal such as copper or aluminium, but the handle is usually made of wood or hard plastic. Metals are good thermal conductors, so the heat can pass through the pot to the food. The handle of a pot should not conduct heat so that you do not burn your hand when you remove the pot from the heat source. Plastic and wood are often used to make handles because they are **thermal insulators**.



**Figure 12** The metal allows heat to enter the pot, and the handle insulates our hands from the heat.

### Electrical conductivity

Some materials allow electricity to move through them easily, while others do not. Materials that allow electricity to move through them easily are called **electrical conductors**. Materials that do not allow electricity to move through them easily are called **electrical insulators**.

### Using the property of conductivity

We use the property of **electrical conductivity** of materials like copper and aluminium to make electrical wiring. However, electricity can be very dangerous and so we have to protect ourselves from it. To do this, we use good insulators like ceramic and plastic (see Figures 9 and 10). Always switch the socket off when you push in or remove a plug. Never use a plug that does not have a cover. The plug cover is there so that you cannot touch the live wires inside.

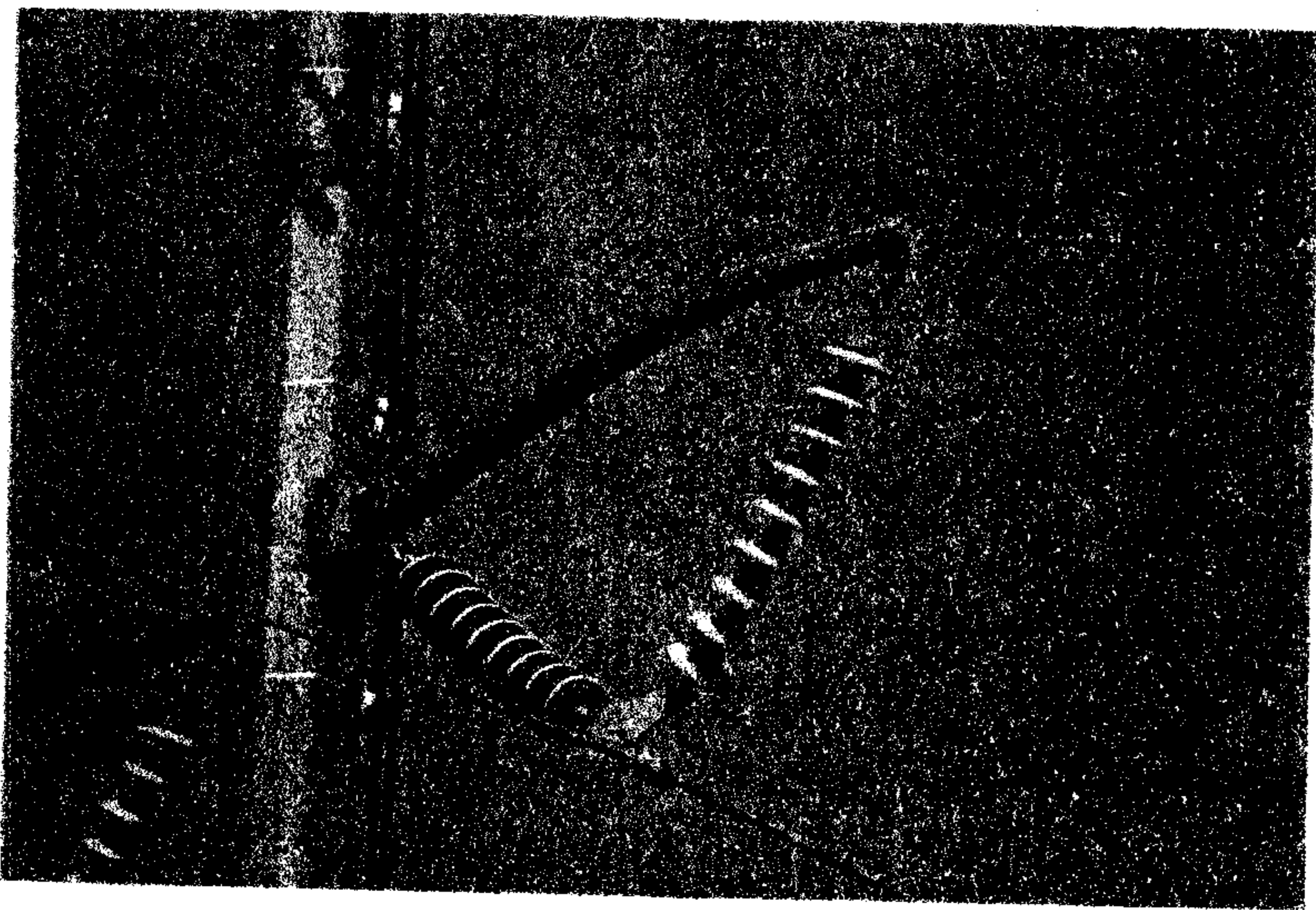


Figure 9 These cables are attached to the pylon by ceramic insulators.

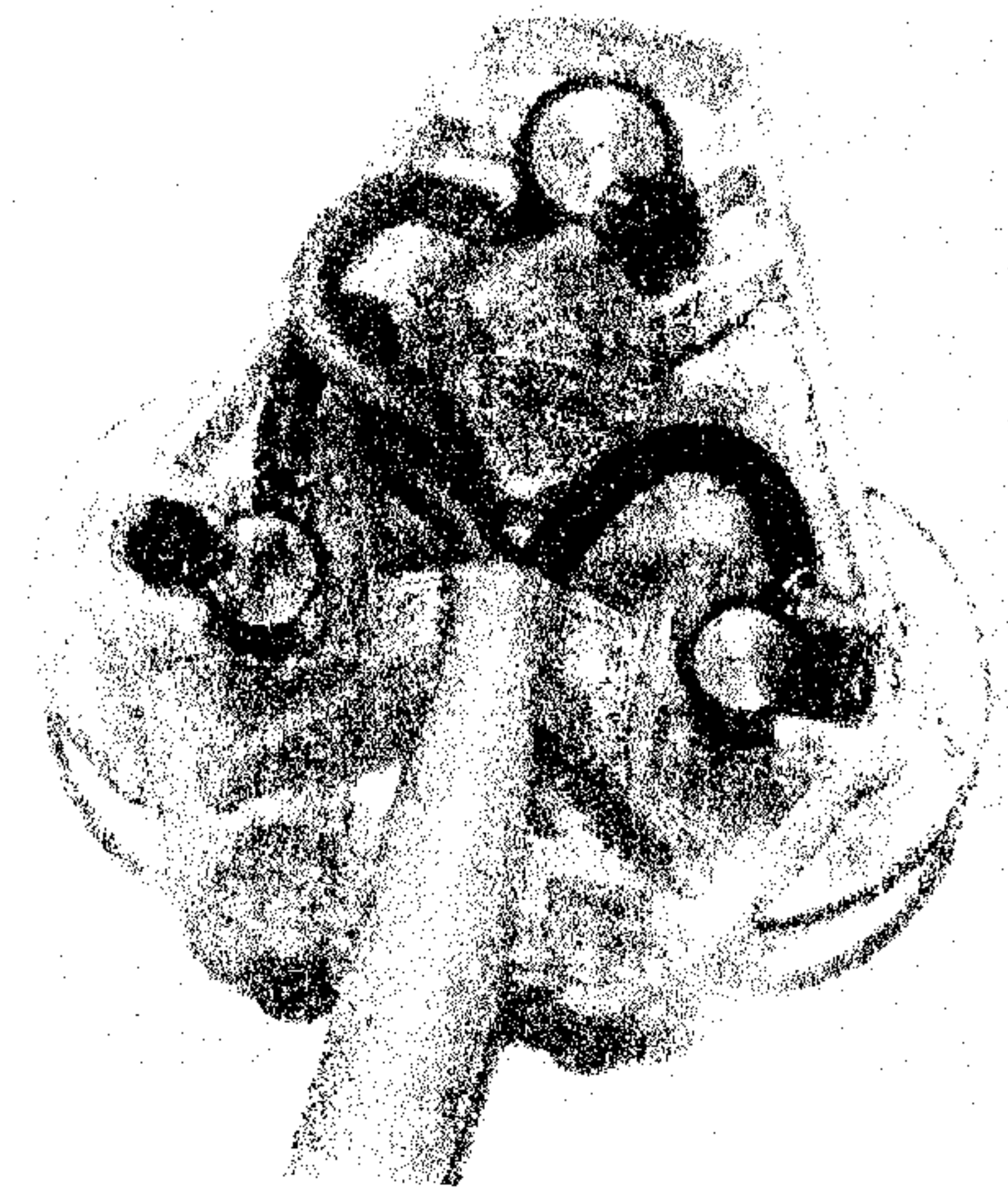
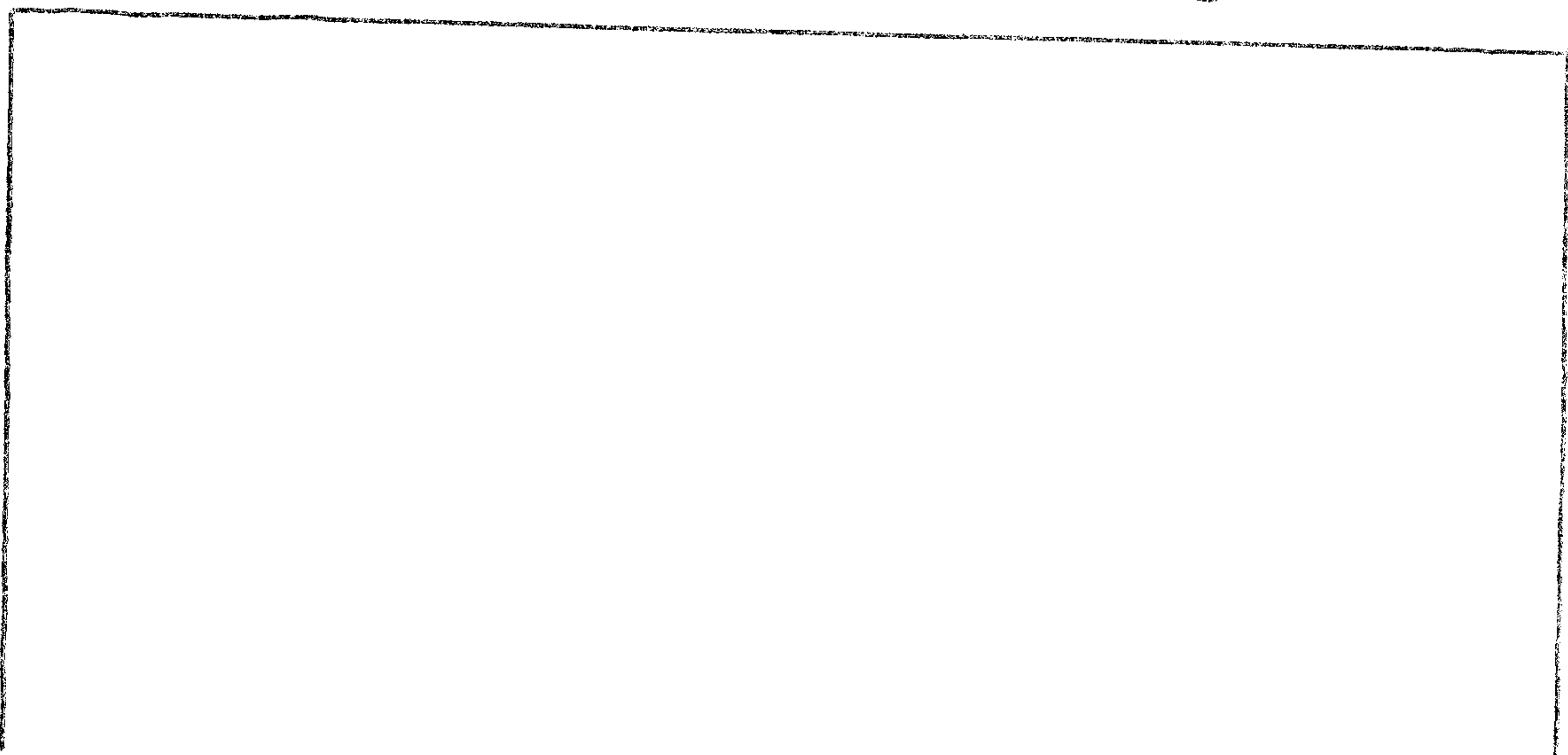


Figure 10 The copper wire is covered in plastic to insulate it and the plug cover protects us.

### Activity: Electrical Conductivity

Draw a circuit board - Insert all labelling



**Activity 4** Read about the boiling and melting points of different materials

Read the passage below and answer the questions that follow.

Many substances melt and boil. The melting point of iron is about  $1535^{\circ}\text{C}$ . Lead melts at a much lower temperature:  $327^{\circ}\text{C}$ . This is why we use lead in electrical fuses. The lead in a fuse melts if an electrical fault makes the wires too hot. Silver and gold also have fairly low melting points. Gold melts at  $1064^{\circ}\text{C}$  and silver melts at  $962^{\circ}\text{C}$ . This makes them very suitable to use in jewellery. Copper's melting point is  $1085^{\circ}\text{C}$ .

Some substances boil at surprisingly low temperatures. For example, ethanol, which is a type of alcohol, has a boiling point of about  $78^{\circ}\text{C}$ .

Salt melts at about  $800^{\circ}\text{C}$ . We can use molten salt to transfer heat. In a concentrated solar power station, the Sun's heat is focussed using many mirrors to melt salt. The molten salt is then piped to boilers to produce steam that turns generators that produce electricity. Molten salt can also be stored and used at night to keep generating electricity.

Paraffin is a mixture of different petroleum-based products. This means that it can have different boiling points, from approximately  $150^{\circ}\text{C}$  up to  $300^{\circ}\text{C}$ .

- Name all the substances described in the passage.
  - For each substance that has a use described in the passage, explain how its melting and/or boiling point makes it suitable for that use.
- Explain how the melting and boiling points of the following substances make them useful to us:
  - water
  - candle wax
  - steel pot
- ~~Do some research and find out which metal has the highest boiling point.~~