

1(a). A student sets up three test tubes to investigate the rusting of iron as shown in **Fig. 17.1**.

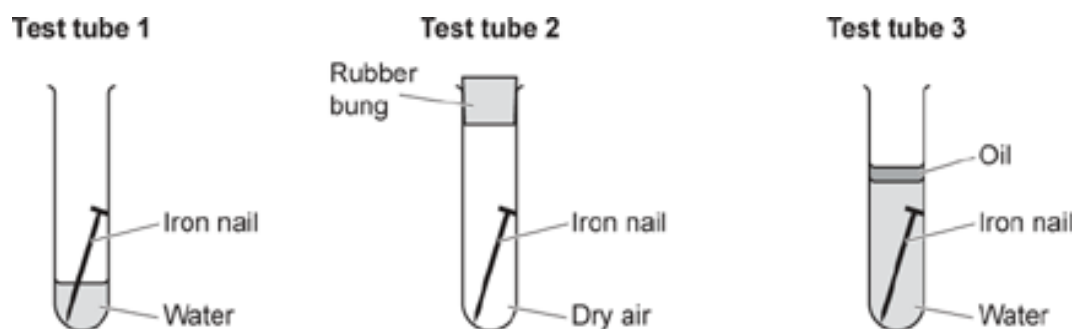


Fig. 17.1

The student measures the mass of each nail at the start and the end of the experiment.

Only the mass of the nail in test tube 1 increases.

Explain why the iron nail in test tube 1 is the only nail that rusts.

[2]

(b). The student sets up another test tube as shown in **Fig. 17.2**.

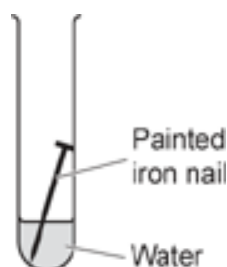


Fig. 17.2

The mass of this iron nail was unchanged after a week.

Explain why.

[2]

(c). **Table 17.1** shows some properties of three different materials.

Table 17.1

	Ceramic	Metal	Polymer
Melting point ($^{\circ}\text{C}$)	2200	1083	204
Strength (MPa)	416	69	27
Relative thermal conductivity	18	388	0.21

i. The diagram shows a pan of boiling water.



Which material would you choose to make the base of a pan?

Explain your choice using the information in **Table 17.1**.

Material

Explanation

.....

..... **[3]**

ii. Estimate how many times higher the melting point of the ceramic is compared to the polymer.

You will need to round the melting points to 1 significant figure.

Answer = **[1]**

(d). **Table 17.2** shows some information about recycling containers made from different materials.

Table 17.2

	Time powering a TV from the energy saved by recycling (hours)	CO ₂ saved by recycling each year (kg)
Aluminium cans	4	294
Glass bottles	3	9
Plastic bottles	6	23

A student thinks that recycling aluminium cans is the most beneficial to the environment.

Explain why they are correct.

Use information from **Table 17.2**.

[2]

2. Which polymer would be best for making a washing up bowl?

Polymer	Maximum useable temperature (° C)	Strength
A	38	high
B	85	low
C	110	high
D	160	low

Your answer ☐

[1]

Cat food is sold in plastic packets or metal cans.




	Plastic packet	Metal can
Raw Materials	Crude oil	Aluminium ore
Manufacture	Fractional distillation Cracking Polymerisation	Aluminium ore is mined Aluminium is extracted by electrolysis
Using the product	Usually single use	Usually single use but easily repurposed or upcycled
Disposal of the product	Harder to recycle Not biodegradable so takes up space in landfill 90% energy saved by recycling	Easier to recycle Not biodegradable so takes up space in landfill 95% energy saved by recycling

[illegible]

[illegible]

4. Iron is a transition metal.

Sodium	Most reactive
Calcium	
Magnesium	
Carbon	
Zinc	
Iron	
Copper	Least reactive



How is iron extracted from iron oxide? Explain your answer. Use the information in the list.

What is this process called?

- A** Galvanising
B Insulating
C Oxidation
D Reduction

[1]

6. Which conditions are needed for the rusting of iron to happen?

- A Air and no water
- B Air and oil
- C Air and salt
- D Air and water

Your answer ☐

[1]

7. Brass is an alloy used to make musical instruments.

What are the main metals in brass?

- A Aluminium and copper
- B Copper and tin
- C Copper and zinc
- D Lead and tin

Your answer ☐

[1]

END OF QUESTION PAPER