# Corrosion

## Total Mark – 17

## Question: 1

**16** This question is about the corrosion of metals.

**(a)** A student investigates the rusting of iron.

**Fig. 16.1** shows the experiments she sets up.

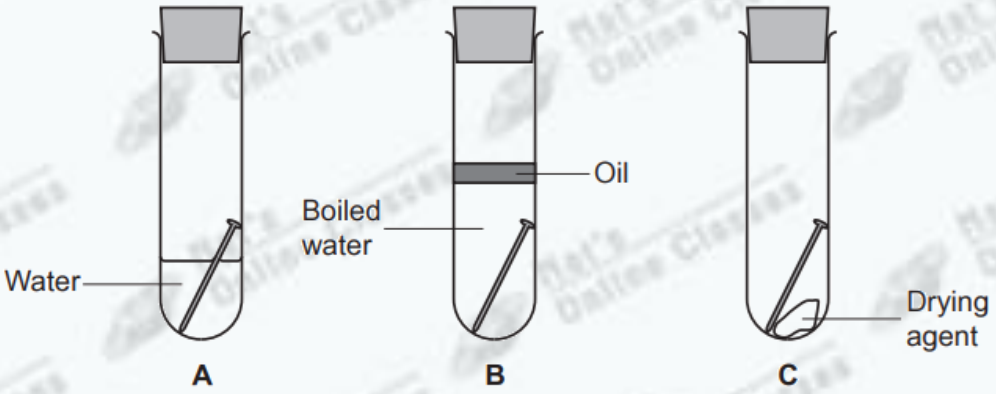


**Fig. 16.1**

Write about what the student would observe in each tube after one week.

Explain the observations.

Tube **A** .....

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Tube **B** .....

.....

Tube **C** .....

.....

**[3]**

**(b)** Another student buys a new bicycle. The bicycle chain is made of iron.

The student decides to oil the chain to prevent it from rusting, as shown in **Fig. 16.2**.

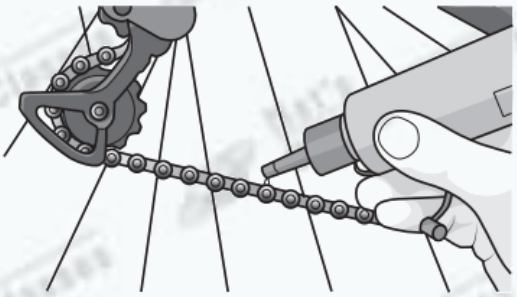

**Fig. 16.2**

Explain why oiling the chain will prevent the iron from rusting.

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..... **[2]**

**(c)** A galvanised iron bucket is made of iron coated with a layer of zinc.

After years of use, the zinc coating has become scratched.

The iron below the zinc has been exposed but the iron has not rusted.

Explain why the iron has not rusted.

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..... **[2]**

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 16 | (a) | | Tube **A**<br>(nail) will rust because water AND air/oxygen are present ✓<br><br>Tube **B**<br>no rust/change as there is no air/oxygen present ✓<br><br>Tube **C**<br>no rust/change as there is no water present ✓ | 3 | 2.2 | **Observation AND explanation needed for each mark**<br><br>**ALLOW** For Tube **A** idea of suitable colour change e.g. red/orange.<br><br>**Allow** 'nothing happens'<br><br>**ALLOW** 'because it's dry' as the reason<br>**ALLOW** One mark for getting all three observations as a standalone mark |
| | (b) | | (Oil) prevents water (reaching the iron) ✓<br><br>(Oil) prevents air / oxygen (reaching the iron) ✓ | 2 | 1.1 | **IGNORE** other detail which doesn't contradict the answer<br>'lubricates the chain so it doesn't absorb water' |
| | (c) | | (Iron has not rusted because) zinc is more reactive (than iron) / ora ✓<br><br>(so) zinc corrodes instead of iron / zinc acts as a sacrificial metal ✓ | 2 | 1.1 | **Marks are for explanation** |

# Question: 2

**23** This question is about metals and alloys.

**(a)** The table gives information about some alloys.

| Alloy | Main metal or metals | Use |
|---|---|---|
| Brass | ..... | Musical instruments and coins |
| Bronze | ..... | Statues |
| Duralumin | ..... | Aircraft parts |
| Solder | Lead and tin | Joining metals |
| Steel | Iron | Bridges, cars |

Complete the table.

Choose your answers from the list.

**Aluminium and copper**

**Aluminium and iron**

**Copper and tin**

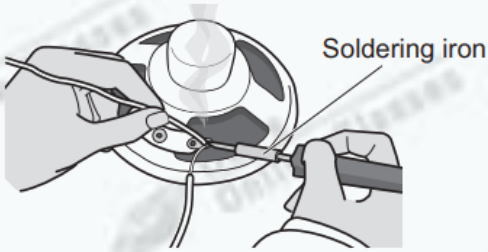
**Copper and zinc**

**Copper and lead**

**Lead and zinc**

**[3]**

**(b)** Solder can be used to join metals together. A hot soldering iron is used to melt the solder.



The table gives some information about solder, copper and tin.

| Metal | Melting point (°C) | Density ($g/cm^3$) | Relative hardness |
|---|---|---|---|
| Copper | 1085 | 8.96 | Soft |
| Tin | 232 | 7.31 | Soft |
| Solder | 130 | 10.3 | Quite hard |

Solder is better than copper or tin for joining metals together.

Suggest why. Use the information in the table.

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..... **[2]**

**(c)** Steel is an alloy containing iron.

Complete the **word equation** for the corrosion of iron.

Iron + ..... + ..... → .....

**[2]**

**(d) (i)** Iron can be plated with a layer of **zinc** to prevent it corroding.

This is called **galvanising**.

Explain how galvanising prevents iron from corroding.

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..... **[2]**

**(ii)** Iron can also be plated with a layer of **tin** to prevent it corroding.

Describe a **disadvantage** of tin plating for preventing corrosion.

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..... **[1]**

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|---|---|---|---|---|---|---|
| **23** | **(a)** | | Brass – **copper and zinc** ✓<br><br>Bronze – **copper and tin** ✓<br><br>Duralumin – **aluminium and copper** ✓ | **3** | 3 x 1.1 | |
| | **(b)** | | Solder has a lower melting point (than copper or lead) ✓<br>Solder is quite hard (whereas copper & tin are soft) ✓ | **2** | 2 x 2.1 | **IGNORE references to density** |
| | **(c)** | | iron + oxygen + water → hydrated iron(III) oxide<br><br>Reactants ✓<br>Product ✓ | **2** | 2 x 1.1 | **ALLOW 'air' instead of oxygen**<br>**ALLOW** hydrated iron oxide<br>**ALLOW** Iron hydroxide<br>**DO NOT ALLOW** iron(III) oxide / iron oxide |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| | (d) | (i) | **ANY TWO FROM:**<br>zinc (acts as a barrier) to prevent water / oxygen / air reaching / reacting (with the iron) ✓<br><br>zinc reacts instead of iron / zinc reacts first / zinc is more reactive / ora ✓<br><br>detail - zinc acts as a sacrificial metal / loses electrons more easily (than iron) / ora ✓ | **2** | 2 x 1.1 | **IGNORE** 'Protects the iron' This is insufficient, too close to stem, there must be some indication of what the barrier is against<br><br>**IGNORE** zinc rusting |
| | | **(ii)** | Idea that tin won't prevent rusting when scratched ✓ | **1** | 1.1 | Must be a disadvantage of Sn, not an advantage of Zn<br>**IGNORE** tin scratches (more) easily |