

ELECTROPLATING

1 Metal objects can be electroplated with silver.

(i) Describe how a metal spoon can be electroplated with silver.

Include:

- what to use as the positive electrode and as the negative electrode
- what to use as the electrolyte
- an ionic half-equation to show the formation of silver.

You may include a diagram in your answer.

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.....

ionic half-equation [4]

(ii) Give **one** reason why metal spoons are electroplated with silver.

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..... [1]

MARKING SCHEME:

(i)	M1 spoon as cathode M2 (pure)silver as anode M3 aqueous silver nitrate as electrolyte M4 $\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag}$	4
(ii)	any one from: ∞ Improves appearance ∞ prevent / resist corrosion / oxidation ∞ antibacterial	max 1

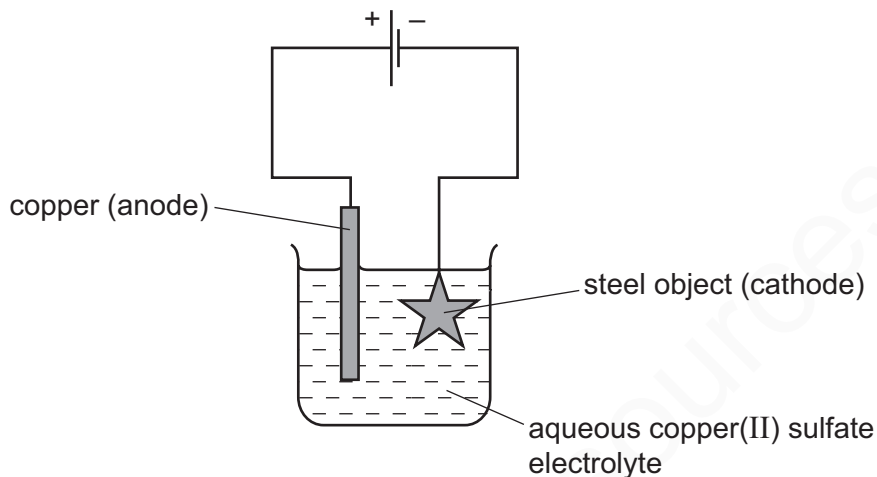
2 Electroplating steel objects with silver involves a three-step process.

step 1 A coating of copper is applied to the object.

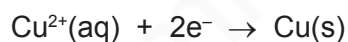
step 2 A coating of nickel is applied to the object.

step 3 The coating of silver is applied to the object.

(a) A diagram of the apparatus used for **step 1** is shown.



(i) The chemical process taking place on the surface of the object is



Explain whether this process is oxidation or reduction.

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

(ii) Explain why the concentration of copper ions in the electrolyte remains constant throughout **step 1**.

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..... [2]

(b) Give **two** changes which would be needed in order to coat nickel onto the object in **step 2**.

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..... [2]

(c) Copper, nickel and silver are transition elements.
Typical physical properties of transition elements are a high density and a high melting point.

Give **three** different properties of transition metals which are not typical of other metals.

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..... [3]

[Total: 8]

MARKING SCHEME:

(a)(i)	reduction and (the Cu^{2+} ion/copper ions) is gaining electrons/is decreasing in oxidation number;	1
(a)(ii)	formation of Cu^{2+} /copper ions at the anode happens at the same rate as; removal of Cu^{2+} /copper ions at the cathode ora;	2 1 1
(b)	replace (anode of) copper with nickel; replace electrolyte with nickel(II) sulfate/ NiSO_4 ;	2 1 1
(c)	(good) catalysts; variable oxidation numbers; form coloured compounds /coloured ions;	3 1 1 1