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.

.....

.....

.....

ionic half-equation .....

[4]

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

.....

..... [1]

MARKING SCHEME:

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

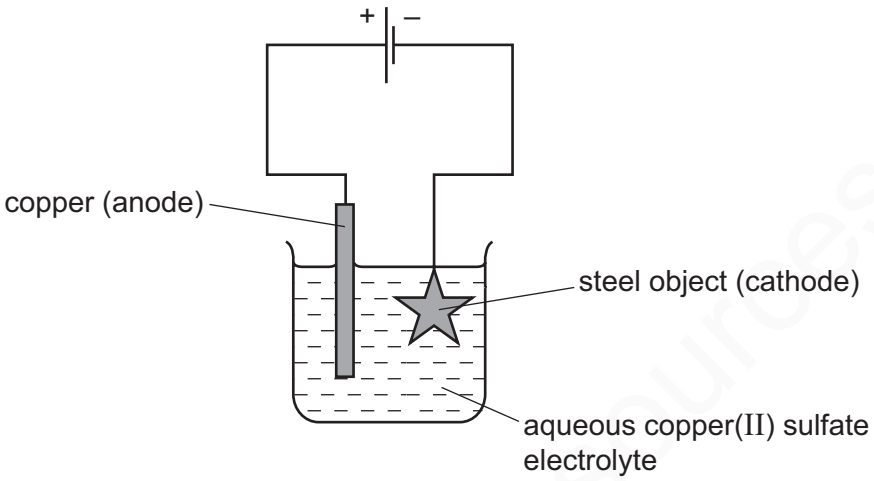
2 Electroplating steel objects with silver involves a three-step process.

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

$$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$$

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**.

.....

.....

..... [2]

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

.....

.....

.....

..... [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.

.....

.....

..... [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)		**2**
	formation of Cu^{2+}/copper ions at the anode happens at the same rate as;	1
	removal of Cu^{2+}/copper ions at the cathode ora;	1
(b)		**2**
	replace (anode of) copper with nickel;	1
	replace electrolyte with nickel(II) sulfate/$NiSO_4$;	1
(c)		**3**
	(good) catalysts;	1
	variable oxidation numbers;	1
	form coloured compounds/coloured ions;	1