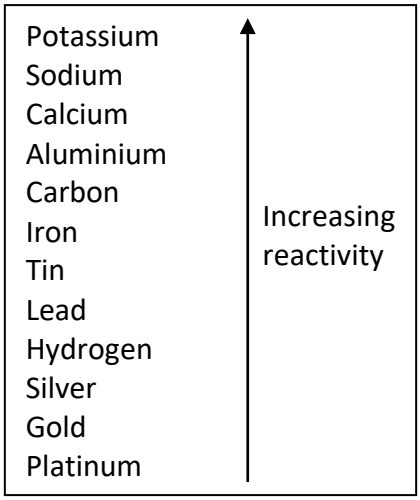
Name:
Class:

Science Mastery

C4.2 Mastery Quiz: Extraction of Metals

Section A

1. Part of the reactivity series is shown in the box.



Choose the only correct statement about reactivity. [1]

Tick (✓) **one** box.

A. Potassium is the least reactive ☐

B. Platinum is the least reactive ☐

C. Tin is less reactive than lead ☐

2. Electrolysis is a process where _____can be broken down into simpler substances using electricity.

Choose the correct term to complete the blank. [1]

Tick (✓) **one** box.

A. covalent substances ☐

B. ionic substances ☐

C. elements ☐

3. An example of an oxidation reaction is when a metal…

Tick (✓) **one** box.

A. loses oxygen. ☐

B. reacts with oxygen. ☐

C. reacts with an oxide. ☐

4. An electrolyte is... [1]

Tick (✓) **one** box.

A. a liquid able to conduct electricity. ☐

B. a mixture used to extract a metal from its ore. ☐

C. a molten compound, such as molten sodium chloride. ☐

5. Choose one way that metals can be recycled. [1]

Tick (✓) **one** box.

A. Extracting metals using electrolysis ☐

B. Melting and recasting ☐

C. Separating iron using magnets ☐

6. Choose which reaction is an example of the extraction of a metal using reduction with carbon. [1]

Tick (✓) **one** box.

A. Magnesium oxide + carbon ⟶ magnesium oxide + carbon ☐

B. Sodium hydroxide + carbon dioxide ⟶ sodium carbonate + water ☐

C. Copper oxide + carbon ⟶ copper + carbon dioxide ☐

7. A good inert electrode… [1]

Tick (✓) **one** box.

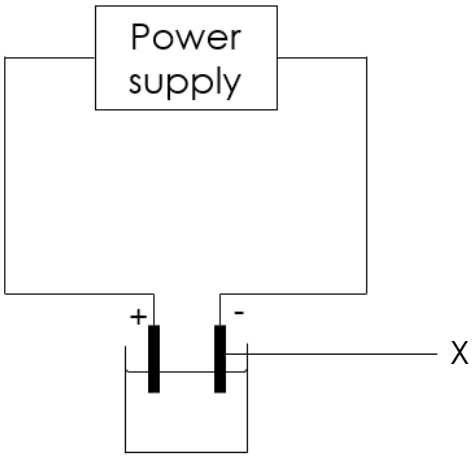
A. conducts electricity and reacts with ions. ☐

B. conducts electricity and is unreactive. ☐

C. doesn't conduct electricity and reacts with ions. ☐

D. doesn't conduct electricity and is unreactive. ☐

8. The diagram below shows the equipment used for electrolysis.



Choose the label for X. [1]

Tick (✓) **one** box.

A. Electrode ☐

B. Circuit ☐

C. Electricity ☐

9. Using the reactivity series, choose what could be used to extract iron from iron oxide. [1]

Tick (✓) **one** box.

A. Carbon ☐

B. Oxygen ☐

C. Lead ☐

Potassium Sodium Calcium Aluminium Carbon Iron Tin Lead Hydrogen Silver Gold Platinum	↑ Increasing reactivity

10. Electrolysis can be used to extract aluminium from a molten mixture of aluminum oxide and cryolite.

Choose one disadvantage of this extraction method. [1]

Tick (✓) **one** box.

A. Large amounts of energy are required ☐

B. The negative electrode needs to be continually replaced ☐

C. Cryolite makes it more difficult to melt aluminium oxide ☐

11. Choose what would happen if a mixture of molten pure iron and molten pure aluminium was electrolysed. [1]

Tick (✓) **one** box.

A. Both iron and aluminium would move to the negative electrode because metals form positive charges ☐

B. Nothing would happen because there must be ions present for electrolysis to take place ☐

C. Iron and aluminium would be separated because metals conduct electricity ☐

12. Choose which of the following is a chemical reaction.

Tick (✓) **one** box.

A. Reduction of calcium oxide ☐

B. Electrolysis of calcium oxide ☐

C. Both A and B ☐

D. Neither A or B ☐

13. The table below shows whether a chemical reaction was observed between different metals and ionic solutions. A tick (✓) means there was a reaction and a

cross (X) means there was no reaction.

	Zinc	Magnesium	Copper
Magnesium sulfate	X	X	X
Copper sulfate	✓	✓	X
Zinc sulfate	X	✓	X

Using the information in the table, choose the correct order of reactivity.

Start from the **least** reactive. [1]

Tick (✓) **one** box.

A. Zinc, magnesium, copper ☐

B. Magnesium, zinc, copper ☐

C. Copper, zinc, magnesium ☐

14. Molten copper chloride can be electrolysed.

Choose the product formed at the negative electrode. [1]

Tick (✓) **one** box.

A. Cu ☐

B. Cu^{2+} ☐

C. Cl ☐

D. Cl^{-} ☐

15. A scientist wanted to extract sodium metal from sodium chloride solution using

electrolysis.

Choose the best explanation for why sodium metal could not be extracted. [1]

Tick (✓) **one** box.

A. Hydrogen is produced instead of sodium because sodium is more reactive than hydrogen ☐

B. Only chlorine would be produced because chlorine is more reactive than sodium ☐

C. Solid metals cannot be produced from electrolysis. ☐

Questions 16 – 20 are suitable for higher tier only

16. The reactions of acids and metals… [1]

Tick (✓) **one** box.

A. are redox reactions. ☐

B. happen in electrolysis. ☐

C. are very reactive. ☐

17. Choose the correct ionic equation for the reaction between magnesium and hydrochloric acid. [1]

Tick (✓) **one** box.

A. $Mg + 2\,HCl \longrightarrow 2MgCl_2 + H_2$ ☐

B. $Mg(s) + 2H^+(aq) \longrightarrow Mg^{2+}(aq) + H_2(g)$ ☐

C. $Mg \longrightarrow Mg^{2+} + 2e^-$ ☐

18. Below shows two half equations.

$Ca \longrightarrow Ca^{2+} + 2e^-$
$2H^+ + 2e^- \longrightarrow H_2$

Choose which reaction these half equations represent. [1]

Tick (✓) **one** box.

A. Calcium reacts with sulfuric acid ☐

B. Calcium reacts with hydrochloric acid ☐

C. It could be either A or B ☐

19. Choose why the equation below is **not** an ionic equation. [1]

$Zn(s) + 2Cl^-(aq) + 2H^+(aq) \longrightarrow Zn^{2+}(aq) + 2Cl^-(aq) + H_2(g)$

Tick (✓) **one** box.

A. Ions that appear on both sides of the equations should not be included ☐

B. State symbols are not needed ☐

C. It doesn't need to be balanced because it is the charge on the ions that is important ☐

20. Choose the method which is used to obtain copper metal from copper solutions. [1]

Tick (✓) **one** box.

A. Displacement using scrap iron ☐

B. Quarrying and mining ☐

C. Reacting the solution with silver ☐

CHEMISTRY ONLY

21. Choose what is required for iron to rust. [1]

Tick (✓) **one** box.

A. Air ☐

B. Water ☐

C. Both air and water ☐

22. Aluminium is more reactive than iron.

Choose why aluminium would be used as a coating for iron to prevent rusting. [1]

Tick (✓) **one** box.

A. For sacrificial protection ☐

B. For electroplating ☐

C. Both A and B ☐

Section B

1. State the charge on the ion formed from a group 2 metal. [1]

2. Describe what it means when a compound is 'reduced'. [1]

3. Explain why gold is found as pure metal in the Earth. [2]

4. Molten magnesium chloride was electrolysed.

   Explain how magnesium is produced by electrolysis. [4]

Questions 5-6 are suitable for higher tier only

5. Ores that contain a high percentage of copper are rare, so low-grade ores are used for copper extraction.

Describe two methods used to extract copper from low-grade copper ore. [6]

6. Zinc reacts with hydrochloric acid.

Write the two half equations for the reaction between zinc and hydrochloric acid. [2]

CHEMISTRY ONLY

7. Explain how metals can be corroded. [1]