Metals – 2022J O Level 5070

1. June/2022/Paper_11/No.11

Two statements about the structure and properties of metals are given.

statement 1 Metals are malleable and have high melting points.

statement 2 Metals have mobile electrons in their structure.

What is correct?

A Both statements are correct and statement 2 explains statement 1.

B Both statements are correct but statement 2 does not explain statement 1.

C Statement 1 is correct but statement 2 is incorrect.

D Statement 2 is correct but statement 1 is incorrect.

2. June/2022/Paper_11/No.26

Some types of chemical reaction are listed.

1 acid-base

2 combustion

3 redox

Which types of reaction occur in a blast furnace during the extraction of iron?

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

3. June/2022/Paper_11/No.32

The carbonates of metals W, X and Y are heated and the results are shown.

	colour of metal carbonate	gas given off which turns limewater cloudy	colour after heating
W	white	yes	yellow when hot, white when cold
X	green	yes	black
Y	white	no	no change

These experimental results can be used to write statements about W, X and Y.

1 The carbonates of W and X gave off carbon dioxide on heating.

2 Metals X and Y are less reactive than metal W.

3 X could be copper.

Which statements are correct?

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

4. June/2022/Paper_12/No.11

The table describes two properties associated with metals.

Which row shows a correct reason for the stated property?

	property	reason
A	malleable	the layers of metal anions can slide over each other
B	malleable	the layers of metal cations can slide over each other
C	conduct electricity	metallic structures contain mobile anions
D	conduct electricity	metallic structures contain mobile cations

5. June/2022/Paper_21/No.7

Aluminium is an element in Group III of the Periodic Table.

(a) Aluminium is used to make containers for food because it does not react with water.

State and explain, in terms of its properties, one other large-scale use of aluminium.

large-scale use .....

explanation .....

.....

[1]

(b) Explain why aluminium does not react with cold water.

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..... [2]

(c) Describe, with the aid of a labelled diagram, the metallic bonding in solid aluminium.

.....

.....

.....

[2]

(d) Aluminium is manufactured by the electrolysis of aluminium oxide dissolved in molten cryolite.

Write the ionic equations for the reactions at the cathode and at the anode.

cathode .....

anode .....

[2]

(e) A sample of 2.34 g of aluminium is reacted with 50.0 cm^3 of 2.00 mol / dm^3 sulfuric acid.

$$2Al(s) + 3H_2SO_4(aq) \rightarrow Al_2(SO_4)_3(aq) + 3H_2(g)$$

Show by calculation that the aluminium is in excess in this reaction.

[3]

[Total: 10]

6. June/2022/Paper_22/No.6

A sample of an alloy containing aluminium and copper is added to hot dilute sulfuric acid.

Only the aluminium reacts with the dilute sulfuric acid. The products of the reaction are hydrogen and aqueous aluminium sulfate.

(a) Construct the ionic equation, with state symbols, for the reaction of aluminium with dilute sulfuric acid.

..... [2]

(b) Describe a chemical test for aluminium ions.

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..... [2]

(c) The aqueous aluminium sulfate formed is crystallised to make hydrated aluminium sulfate, $Al_2(SO_4)_3 \cdot xH_2O$.

The relative formula mass of hydrated aluminium sulfate is 666.

Calculate the value of x in the formula $Al_2(SO_4)_3 \cdot xH_2O$.

x = ... [2]

(d) State what is meant by the term *alloy*.

.....

..... [1]

[Total: 7]

7. June/2022/Paper_22/No.9

Zinc is a metal.

(a) Coating iron with zinc prevents iron from rusting.

Explain how a coating of zinc prevents iron from rusting when the coating is scratched.

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..... [2]

(b) Zinc has metallic bonding.

(i) Describe, with the aid of a labelled diagram, the metallic bonding in solid zinc.

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.....

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[2]

(ii) Explain why zinc is a good conductor of electricity.

.....

..... [1]

(c) One of the stages in the extraction of zinc involves electrolysis.

At the cathode, zinc ions, Zn^{2+}, are changed into zinc atoms.

At the anode, hydroxide ions, OH^-, are changed into oxygen molecules and water molecules.

Write the ionic equations for the reactions at the cathode and at the anode.

cathode .....

anode .....

[2]

(d) A sample of 2.34 g of zinc is reacted with 50.0 cm^3 of 2.00 mol / dm^3 hydrochloric acid.

$$Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$$

Show by calculation that the hydrochloric acid is in excess in this reaction.

[3]

[Total: 10]