Metals – 2021 IGCSE 0620

1. June/2021/Paper_11/No.25

Some properties of metal J are listed.

- J does not react with cold water.
- J reacts with dilute hydrochloric acid.
- No reaction occurs when the oxide of J is heated with carbon.

What is J?

A copper

B iron

C magnesium

D sodium

2. June/2021/Paper_11&12/No.26

Iron from a blast furnace is treated with oxygen and with calcium oxide to make steel.

Which substances in the iron are removed?

	oxygen removes	calcium oxide removes
A	carbon	acidic oxides
B	carbon	basic oxides
C	iron	acidic oxides
D	iron	basic oxides

3. June/2021/Paper_11/No.27

Which row describes a use of the metal and explains why it is used?

	metal	use	reason
A	aluminium	food containers	good conductor of electricity
B	aluminium	aircraft wings	high density
C	copper	cooking utensils	good conductor of heat
D	copper	electricity cables	good electrical insulator

4. June/2021/Paper_12/No.27

Cobalt, manganese and chromium are all metals.

- Cobalt(II) oxide reacts with carbon to form cobalt metal.
- Manganese(II) oxide does not react with carbon.
- Chromium(II) oxide does not react with carbon.
- Chromium does not react with water.
- Manganese reacts with water.

What is the order of reactivity of these metals?

	least reactive →		most reactive
A	cobalt	chromium	manganese
B	cobalt	manganese	chromium
C	chromium	manganese	cobalt
D	manganese	chromium	cobalt

5. June/2021/Paper_12/No.28

Iron is extracted from hematite. Aluminium is extracted from bauxite.

Which statements about the extraction processes are correct?

1 Both involve reduction.

2 Both take place at high temperature.

3 Both involve electrolysis.

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

6. June/2021/Paper_12/No.29

Which property of aluminium makes it useful for food containers?

A It conducts heat.

B It has low density.

C It is strong.

D It resists corrosion.

7. June/2021/Paper_13/No.25

Which statement about the reactivity of metals is correct?

A Iron is more reactive than magnesium.

B Copper reacts with dilute hydrochloric acid.

C Potassium reacts with cold water.

D Calcium oxide is reduced more easily than iron oxide.

8. June/2021/Paper_13/No.26

Iron from a blast furnace is treated with oxygen and with calcium oxide to make steel.

Which substances in the iron are removed?

	oxygen removes	calcium oxide removes
A	carbon	acidic oxides
B	carbon	basic oxides
C	iron	acidic oxides
D	iron	basic oxides

9. June/2021/Paper_13/No.30

Which reaction does **not** occur during the extraction of iron from hematite in a blast furnace?

A $C + O_2 \rightarrow CO_2$

B $CaO + SiO_2 \rightarrow CaSiO_3$

C $CO_2 + C \rightarrow 2CO$

D $4Fe + 3O_2 \rightarrow 2Fe_2O_3$

10. June/2021/Paper_13/No.32

Metal X is a good conductor of electricity and is used for electrical wiring.

Metal Y is used to make an alloy which is resistant to corrosion and is used to make cutlery.

Metal Z is light and strong and is used in the manufacture of aircraft.

What are X, Y and Z?

	X	Y	Z
A	aluminium	iron	copper
B	copper	iron	aluminium
C	aluminium	copper	iron
D	copper	aluminium	iron

11. June/2021/Paper_21/No.25

Some properties of metal J are listed.

- J does not react with cold water.
- J reacts with dilute hydrochloric acid.
- No reaction occurs when the oxide of J is heated with carbon.

What is J?

A copper

B iron

C magnesium

D sodium

12. June/2021/Paper_21,22&23/No.26,25

Some metal nitrates and carbonates decompose when heated strongly.

Metal Q has a nitrate that decomposes to give a salt and a colourless gas only.

The carbonate of metal Q does not decompose when heated with a Bunsen burner.

What is metal Q?

A calcium

B copper

C sodium

D zinc

13. June/2021/Paper_21/No.27

Which substances are used in the extraction of aluminium?

A bauxite and cryolite

B bauxite and hematite

C cryolite and zinc blende

D hematite and zinc blende

14. June/2021/Paper_21/No.28

Different types of steel alloys are manufactured by changing the percentage of carbon in the alloy.

The properties of four steel alloys are shown.

alloy mixture	percentage of carbon in the alloy	strength of the alloy	hardness of the alloy
1	0.00 to 0.20	high	low
2	0.21 to 0.30	high	medium
3	0.31 to 0.40	medium	high
4	0.41 to 1.50	low	high

What are the properties of the steel alloy containing 0.23% of carbon?

	strength	hardness
A	high	low
B	low	high
C	high	medium
D	medium	high

15. June/2021/Paper_22/No.25

A piece of aluminium is dropped into dilute hydrochloric acid.

No immediate reaction is observed.

Which statement explains this observation?

A Aluminium does not neutralise acids.

B Aluminium is a non-metal so does not react with acids.

C Aluminium is below hydrogen in the reactivity series.

D Aluminium is covered in an unreactive oxide layer.

16. June/2021/Paper_22/No.27

Aluminium is extracted from its ore by electrolysis.

Which equation represents the reaction that occurs at the anode during the electrolysis?

A $Al^{3+} + 3e^- \rightarrow Al$

B $Al^{3+} \rightarrow Al + 3e^-$

C $2O^{2-} \rightarrow O_2 + 4e^-$

D $2O^{2-} + 2e^- \rightarrow O_2$

17. June/2021/Paper_23/No.21

Which property is shown by transition elements?

A low density

B low melting point

C variable oxidation state

D white compounds

18. June/2021/Paper_23/No.26

Which compounds are released by the extraction of zinc from zinc blende and by respiration?

	extraction of zinc	respiration
A	CO_2 and SO_2	CO_2 only
B	CO_2 and SO_2	CO_2 and H_2O
C	CO_2 only	CO_2 only
D	CO_2 only	CO_2 and H_2O

19. June/2021/Paper_23/No.29

Which reaction does **not** occur during the extraction of iron from hematite in a blast furnace?

A $C + O_2 \rightarrow CO_2$

B $CaO + SiO_2 \rightarrow CaSiO_3$

C $CO_2 + C \rightarrow 2CO$

D $4Fe + 3O_2 \rightarrow 2Fe_2O_3$

20. June/2021/Paper_23/No.31

Metal X is a good conductor of electricity and is used for electrical wiring.

Metal Y is used to make an alloy which is resistant to corrosion and is used to make cutlery.

Metal Z is light and strong and is used in the manufacture of aircraft.

What are X, Y and Z?

	X	Y	Z
A	aluminium	iron	copper
B	copper	iron	aluminium
C	aluminium	copper	iron
D	copper	aluminium	iron

21. March/2021/Paper_12&22/No.24

The metal beryllium does not react with cold water.

It reacts with hydrochloric acid but cannot be extracted from its ore by using carbon.

Where is beryllium placed in the reactivity series?

magnesium

A

zinc

B

iron

C

copper

D

22. March/2021/Paper_12/No.25

Pure iron is a soft metal.

When mixed with small amounts of tungsten it produces a hard alloy called tungsten steel.

Which statements are correct?

1 Pure iron is a transition element.

2 The particles in pure iron are arranged in ordered layers.

3 Tungsten steel is a compound.

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

23. March/2021/Paper_12/No.26

Which row describes magnesium?

	electrical conductivity	reacts with dilute acid
A	low	no
B	low	yes
C	high	no
D	high	yes

24. March/2021/Paper_12/No.27

Four equations are shown.

1 $C + O_2 \rightarrow CO_2$

2 $CaCO_3 \rightarrow CaO + CO_2$

3 $SiO_2 + 2CO \rightarrow Si + 2CO_2$

4 $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

Which equations represent reactions that take place during the extraction of iron from hematite?

A 1, 2 and 3 **B** 1, 2 and 4 **C** 2, 3 and 4 **D** 3 and 4 only

25. March/2021/Paper_12/No.28

Copper is used to make saucepans.

Which properties of copper make it suitable for this use?

1 Copper has a relatively high melting point.

2 Copper has a low density.

3 Copper is a good conductor of electricity.

4 Copper is a good conductor of heat.

A 1 and 2 **B** 1 and 4 **C** 2 and 4 **D** 3 and 4

26. March/2021/Paper_22/No.25

Why is cryolite used in the extraction of aluminium from bauxite?

A as a catalyst for the process

B as a solvent for aluminium oxide

C it stops the carbon anodes burning away

D it reduces aluminium ions in aluminium oxide

27. March/2021/Paper_22/No.26

Which statements about the uses of metals are correct?

1 Iron is used to make aircraft because iron has a low density.

2 Copper is used to make electric cables because copper is a good conductor of electricity.

3 Aluminium is used to make brass because aluminium is strong and hard.

4 Iron is mixed with additives to make an alloy used in chemical plant.

A 1 and 2 **B** 3 and 4 **C** 1 and 3 **D** 2 and 4

28. March/2021/Paper_22/No.27

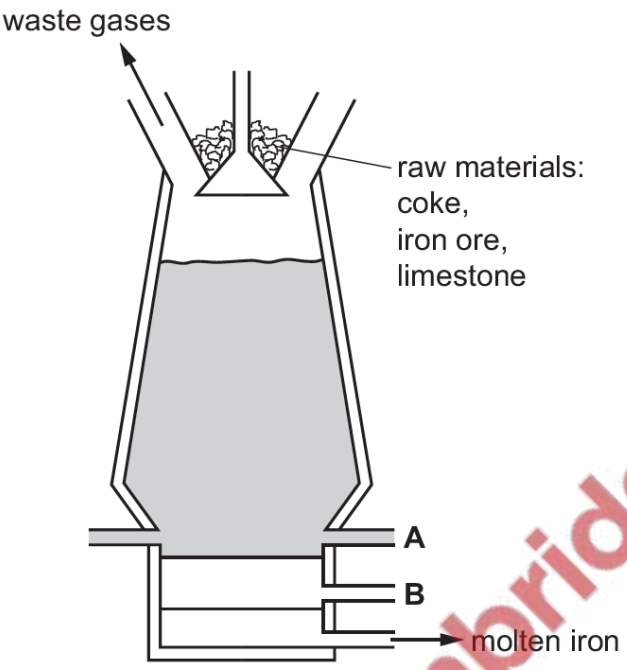
Which row describes the reactions of magnesium hydroxide and magnesium oxide?

	effect of heat on hydroxide	effect of heating oxide with carbon
A	forms magnesium oxide	magnesium and carbon dioxide formed
B	forms magnesium oxide	no reaction
C	no reaction	magnesium and carbon dioxide formed
D	no reaction	no reaction

29. June/2021/Paper_41/No.6

This question is about iron.

(a) Iron is extracted from its main ore in a blast furnace.



(i) Name the main ore of iron used in the blast furnace.

..... [1]

(ii) Name the substance that enters the blast furnace at **A**.

..... [1]

(iii) Name the substance that leaves the blast furnace at **B**.

..... [1]

(iv) Give two reasons for using coke in the blast furnace.

1 .....

2 .....

[2]

(b) Another ore of iron is iron pyrites, FeS_2. Iron pyrites contains the positive ion, Fe^{2+}.

Deduce the formula of the negative ion in FeS_2.

..... [1]

(c) Iron is a transition element.

A list of properties of iron is shown.

- Iron is a good conductor of electricity.
- Iron forms soluble salts.
- Iron forms coloured compounds.
- Iron has variable oxidation states.
- Iron acts as a catalyst.
- Iron forms a basic oxide.

(i) Give **two** properties from the list in which iron differs from Group I elements.

1 .....

2 .....

[2]

(ii) Give **two** properties from the list in which iron is similar to Group I elements.

1 .....

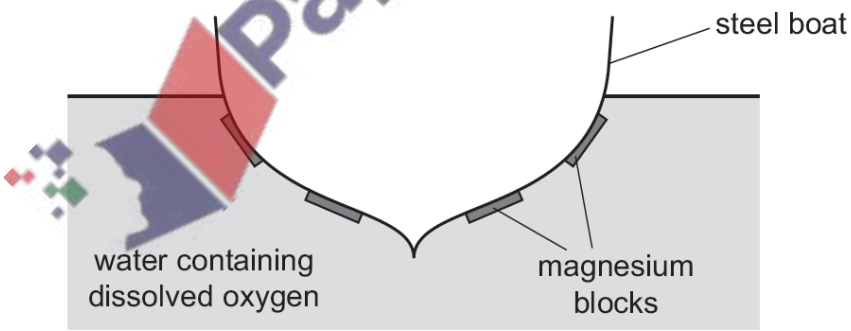
2 .....

[2]

(d) Steel consists mainly of iron.

Iron forms rust when it reacts with water and oxygen.

Magnesium blocks can be attached to the bottom of steel boats. The magnesium does not completely cover the steel.



(i) Explain how the magnesium blocks prevent iron from rusting.

.....

.....

.....

..... [2]

(ii) Explain why replacing the magnesium blocks with copper blocks will **not** prevent the bottom of the boat from rusting.

.....

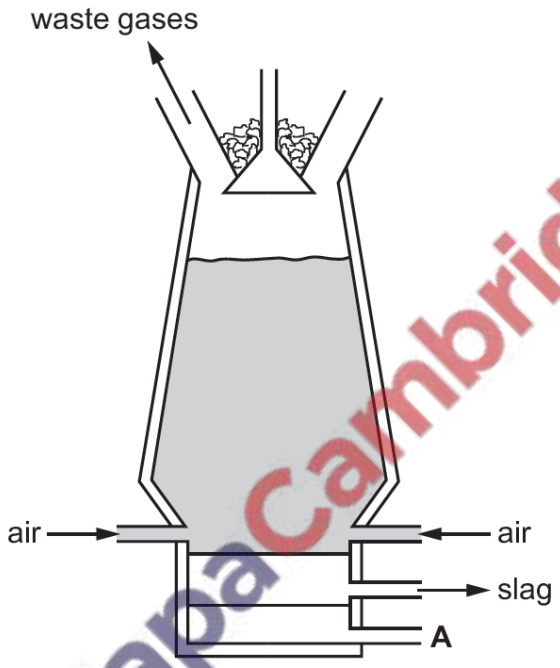
..... [1]

[Total: 13]

30. June/2021/Paper_43/No.6

This question is about metals.

(a) Iron is extracted from its main ore in a blast furnace.



(i) Coke and iron ore are added at the top of the blast furnace.

Name one **other** substance that is added at the top of the blast furnace.

..... [1]

(ii) Name the substance that leaves the blast furnace at **A**.

..... [1]

(iii) Iron ore is mainly iron(III) oxide, Fe_2O_3.

Name a substance that reduces iron(III) oxide to iron in the blast furnace.

..... [1]

(iv) Temperatures inside a blast furnace can reach 2000 °C.

Name **two** substances that react together, in the blast furnace, to produce this high temperature.

..... [1]

(v) Name **two** waste gases that leave the blast furnace.

1 .....

2 .....

[2]

(b) Zinc is extracted from zinc blende.

(i) Name the main zinc compound that is present in zinc blende.

..... [1]

(ii) When zinc is extracted, it is formed as a gas.

The gaseous zinc is then converted into molten zinc.

State the name of this physical change.

..... [1]

(c) Name the alloy that contains zinc and copper only.

..... [1]

(d) Copper has the following properties.

- It has a high melting point.
- It has a high density.
- It is a good conductor of electricity.
- It has variable oxidation states.
- It forms a basic oxide.
- It forms soluble salts.

(i) Give **two** properties from the list in which copper differs from Group I elements.

1 .....

2 .....

[2]

(ii) Give **two** properties from the list in which copper is similar to Group I elements.

1 .....

2 .....

[2]

[Total: 13]

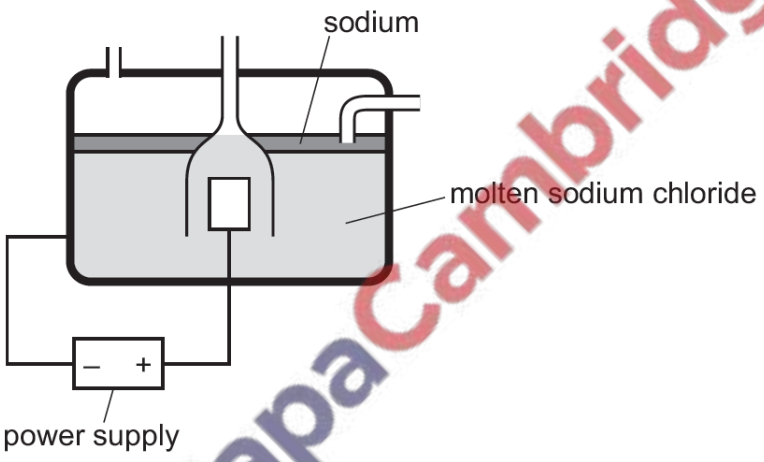
31. March/2021/Paper_32/No.7

Sodium is manufactured by electrolysis.

(a) Explain why sodium is manufactured by electrolysis and **not** by reduction with carbon.

..... [1]

(b) The diagram shows the equipment for the production of sodium.



(i) The anode is inert.

Suggest a suitable substance that can be used for the anode.

..... [1]

(ii) Label the anode **on the diagram**. [1]

(iii) Describe, by reference to the diagram, how you know that sodium is less dense than molten sodium chloride.

..... [1]

(c) When concentrated aqueous sodium chloride is electrolysed, gases are produced at each electrode.

State the names of the products and give the observations at each electrode.

product at the negative electrode .....

observations at the negative electrode .....

.....

product at the positive electrode .....

observations at the positive electrode .....

.....

[4]

(d) Give **two** ways in which the physical properties of sodium are different from the physical properties of transition elements.

1 .....

2 .....

[2]

(e) The symbol equation for the production of sodium hydride is shown.

$$2Na + H_2 \rightarrow 2NaH$$

(i) Write a word equation for this reaction.

..... [1]

(ii) Suggest why the hydrogen must be dry.

..... [1]

(iii) Sodium hydride reduces iron(III) oxide to iron.

$$Fe_2O_3 + 3NaH \rightarrow 2Fe + 3NaOH$$

Explain how this equation shows that iron(III) oxide is reduced.

..... [1]

(f) State the colour observed in the flame test for sodium.

..... [1]

[Total: 14]