Pearson Edexcel

Additional Assessment Materials
Summer 2021

Pearson Edexcel GCSE in Chemistry (1CH0)
Foundation

Resource Set Topic H – Test 1: Separate Chemistry 1 (F tier only)

Questions

(Public release version)

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Additional Assessment Materials, Summer 2021

General guidance to Additional Assessment Materials for use in 2021

Context

- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an **optional** part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

Purpose

- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

7 *(a) Pure metals are often converted into more useful alloys.
For example, aluminium is converted into an alloy used in aircraft, iron is converted into an alloy used in cutlery and gold alloys are used in jewellery.
These processes of alloying change the structures of the metals.

Some properties of pure aluminium, iron and gold are shown in Figure 12.

	density in g cm^{-3}	malleability	relative strength
aluminium	2.70	easy to bend	low
iron	7.75	easy to bend	low
gold	19.3	easy to bend	low

Figure 12

Explain how alloying changes these pure metals to make the alloys more suitable for the given uses.

(6)

Alloys have greater strength as the atoms of different sizes disrupts the regular lattice, so the layers do not slide when force is applied. Alloys are still malleable, so they can be shaped according to their uses. Alloys of aluminium also have a low density, so they are light and suitable for making aircrafts. The alloy of iron, stainless steel, can be used to make cutlery as it is resistant to rusting.

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(b) Iron objects can corrode when exposed to the atmosphere.

(i) Corrosion involves the oxidation of iron.

State what is meant by **oxidation**.

(1)

Oxidation is the loss of electrons, gain of oxygen or loss of hydrogen.

(ii) Painting iron objects prevents corrosion.

Explain why painting iron objects prevents corrosion.

(2)

Corrosion requires both oxygen & water. Painting provides a physical barrier between the iron object and air and water.

(iii) Corrosion of iron objects can be prevented by painting them or by electroplating them.

State one **other** way of preventing the corrosion of iron objects.

(1)

sacrificial protection

Q7ci_ii

(c) The apparatus shown in Figure 13 was used to electroplate a spoon with nickel.

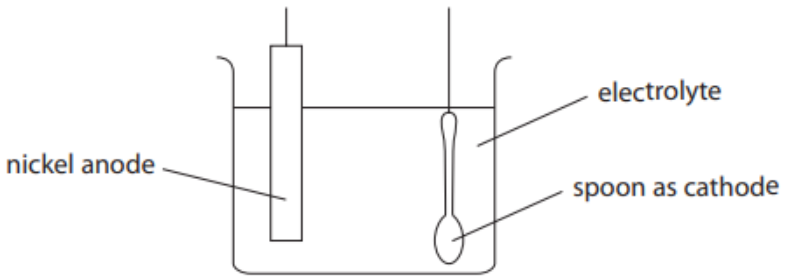

Figure 13

(i) State to what the anode and cathode have to be connected in order to carry out the electroplating.

(1)

power supply

(ii) Predict the name of a substance that could be dissolved in water to form the electrolyte for this electroplating.

(1)

nickel sulfate

2 Alloys are mixtures of two or more metals.

(a) Alloy steels are formed when other metals are mixed with iron.

Cutlery is made of stainless steel.

Give **two** reasons why cutlery is made of stainless steel rather than iron.

(2)

1 stainless steel is stronger

2 stainless steel is resistant to rusting

(b) Brass is an alloy of copper.
Figure 3 shows the brass pins of an electric plug.

(Source: © Adamlee01/Shutterstock)

Figure 3

Brass is harder than copper.

Give a reason why using a harder substance for the pins is an advantage.

(1)

So that the pins will not bend when the plug is put into socket.

(c) Magnalium is an alloy of magnesium and aluminium.
It is often used for aircraft parts.

(i) Figure 4 shows information about pure aluminium and magnalium.

substance	density in g cm^{-3}	relative strength	resistance to corrosion
aluminium	2.7	low	high
magnalium	2.0	high	very high

Figure 4

Explain, using the information in Figure 4, why magnalium, rather than pure aluminium, is used for aircraft parts.

(3)

Magnalium has a lower density, so they are more light-weighted. They are also stronger so the aircraft parts will not easily deform. They have a higher resistance to corrosion so aircraft parts can last longer without rusting.

(ii) 63.0 g of magnalium contains 3.15 g of magnesium.

Calculate the percentage by mass of magnesium in the magnalium.

(2)

$\frac{3.15}{63.0} \times 100 = 5\%$

percentage of magnesium in the magnalium = 5 %

3 (a) Transition metals and group 1 metals have many properties in common because they are all metals.

However some properties of transition metals are different from properties of group 1 metals.

Which is a property of transition metals but not of group 1 metals?

(1)

- ☒ **A** good conductor of electricity
- ☒ **B** high melting point
- ☒ **C** malleable
- ☒ **D** shiny when cut or polished

(b) Copper is a transition metal.

Magnesium reacts with copper sulfate solution to form copper and a solution of magnesium sulfate.
Magnesium sulfate solution is colourless.

Describe **two** changes you would **see** during this reaction.

(2)

1 solution changes from blue to colourless

2 precipitate formed

(c) Rusting is the corrosion of iron.

(i) Water is one of two substances needed for iron to rust.

Give the name of the **other** substance needed for iron to rust.

(1)

oxygen

(ii) The rate of rusting can be increased by using sea water.

Describe a simple experiment to compare how much an iron nail rusts in sea water when compared to water.

(3)

In one test tube, place an iron nail is water. In another test tube, place the nail in seawater. Seal both test tubes with stoppers, so that no other factors such as oxygen concentration affects speed of rusting, and observe any changes over time. The nail in seawater will rust faster.

(iii) Rusting can be prevented by galvanising iron which involves coating the iron with a layer of zinc.

A small iron bucket was galvanised. The surface area of the bucket was 0.68 m^2.

Calculate the mass of zinc required to coat the surface of the bucket with a layer of zinc of 200 g m^{-2}.

(1)

$0.68 \times 200 = 136g$

mass of zinc = 136 g

(c) Hydrogen can also be used in a hydrogen-oxygen fuel cell.

Give the name of the product formed in this fuel cell.

(1)

water

5 Transition metals have many uses.

(a) The pie chart in Figure 6 shows the uses of one transition metal.

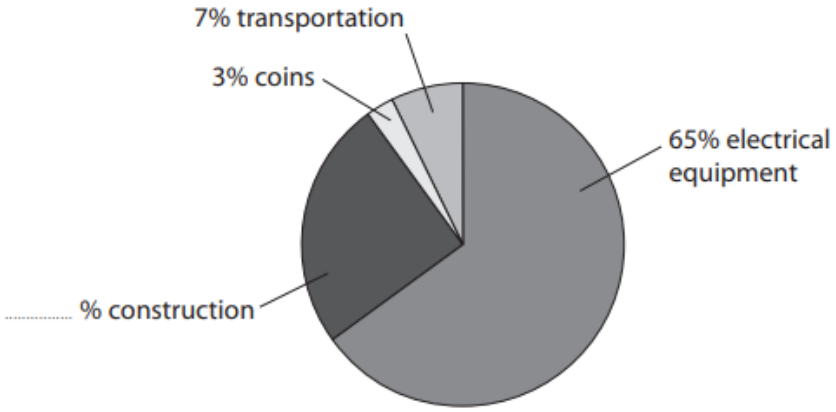

Figure 6

Calculate the percentage of this transition metal used in construction.

(1)

100 - 65 - 7 - 3 = 25

percentage of this transition metal used in construction = 25 %

(b) Figure 7 shows five statements about iron.

Put ticks (✓) in the boxes in Figure 7 to show which statements are true and which statements are false.
The first one has been done for you.

(3)

	true	**false**
iron is a poor conductor of heat		✓
iron can act as a catalyst	✓	
iron forms compounds that are coloured	✓	
iron has a low density		✓
iron has a very high melting point	✓	

Figure 7

(c) Most iron produced is converted into alloys of iron.

(i) State why alloys have more uses than pure metals.

(1)

Alloys are stronger and some are resistant to rusting.

(ii) An alloy of iron contains 0.40 % of molybdenum.

Calculate the mass of molybdenum contained in a 30 g sample of this alloy of iron.

(2)

0.40% x 30 = 0.12g

mass of molybdenum = 0.12 g

(d) Many transition metals are used to make the reactants in chemical cells.

Figure 8 shows a graph of the voltage produced by a chemical cell as it is used in a torch for many hours.

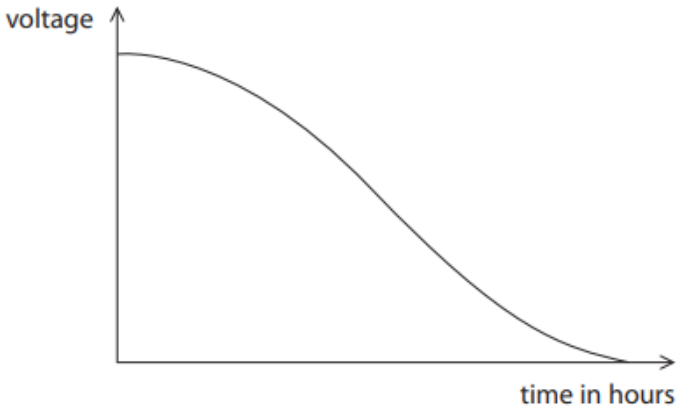

Figure 8

Suggest an explanation for the shape of the graph.

(2)

Initially, there are plenty of reactants for reaction to take place, so voltage is high. As reactants are used, less reactants are available so voltage decreases. When reactants are all used up, no voltage is produced.

7 (a) Iron rusts when it is left in certain conditions.

(i) Figure 9 shows the apparatus used to investigate the rusting of some iron nails.

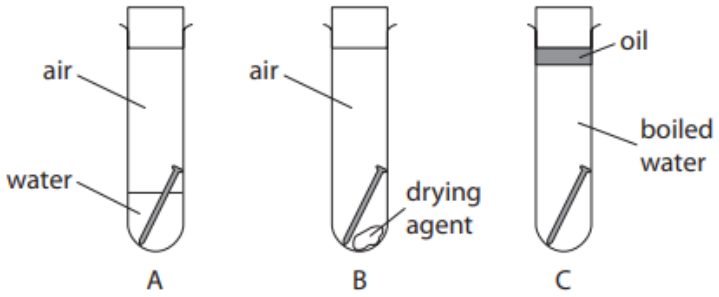

Figure 9

Explain why the iron nail in tube A would rust but the iron nails in tubes B and C would not rust.

(3)

Iron nails will only rust when both oxygen and water are present. In B, there is no water and in C, there is no air in the boiled water so the nails do not rust.

(ii) Magnesium is more reactive than iron.
Figure 10 shows an iron nail with a strip of magnesium wrapped around it, placed in some water.
The tube was left for a few days.

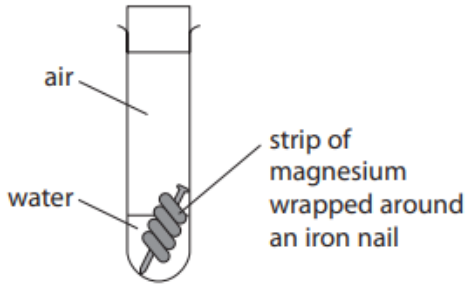

Figure 10

State what would happen to this iron nail.

(1)

The parts covered by magnesium did not rust, as it is protected by sacrificial protection from magnesium

(iii) When iron rusts, a brown solid forms on the surface of the iron.

What happens to the iron as the rust forms?

(1)

☒ **A** the iron is hydrated

☒ **B** the iron is neutralised

☒ **C** the iron is oxidised

☒ **D** the iron is reduced

(b) Give **one** reason why metals are electroplated.

(1)

To prevent corrosion

*(c) The pure metals aluminium, copper and gold and the alloys brass and magnalium are used to make many useful articles.

The way in which these metals and alloys are used is related to their properties, such as their density, electrical conductivity, resistance to corrosion and strength.

State some uses of aluminium, copper, gold, brass and magnalium and explain how each use is related to their properties.

(6)

Aluminium is used for storing food. It is covered with a layer of aluminium oxide so it does not rust. It is light and malleable, so it can be easily shaped to wrap up the food.

Copper is used to make wires as it is a good electrical conductor. Copper is also ductile so it can be drawn into wires.

Gold is malleable and resists corrosion, so it can be shaped into jewelleries and stay shiny.

Brass is a good conductor of electricity and strong, so it can be used to make pins in electrical plugs.

Magnalium has low density and is strong and resistant to corrosion. It is used to make aircraft parts.

(iii) Suggest a reason why the actual yield was greater than the theoretical yield.

(1)

There are impurities in the products or they have reacted with oxygen.

TOTAL FOR PAPER IS 49 MARKS