

Name:

Date:

C10 - Test 5
USING RESOURCES
Advanced

GCSE

CHEMISTRY

AQA - Triple Science

Mark

Grade

Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown

Information

- The marks for the questions are shown in brackets

1.

(a) PEX is a material that is used as an alternative to copper for hot water pipes. PEX is made from poly(ethene).

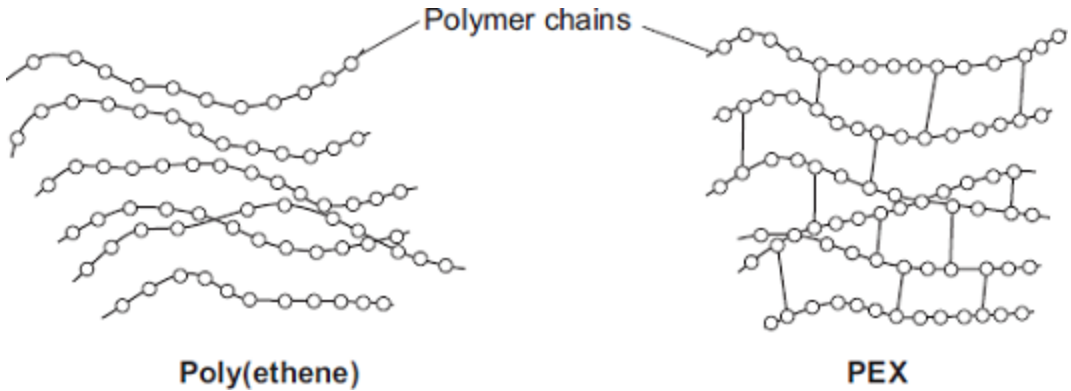
(i) Describe how ethene forms poly(ethene).

(2)

(ii) PEX is a shape memory polymer. What property does a shape memory polymer have?

(1)

(iii) The simplified structures of poly(ethene) and PEX are shown.



Poly(ethene) is a thermoplastic that softens easily when heated. Suggest and explain how the structure of PEX changes this property.

(3)

- (b) Copper is a suitable material to use for hot water pipes.
PEX is now used as an alternative material for hot water pipes.

Copper is extracted from its ore by a series of processes.

- 1 The low-grade copper ore is powdered and concentrated.
- 2 The concentrated powdered copper ore is blown into a furnace with air to produce impure, molten copper. (This furnace is heated to 1100 °C using a hydrocarbon fuel.)
- 3 Oxygen is blown into the impure, molten copper to remove any sulfur. The molten copper is cast into rectangular slabs.
- 4 The final purification of copper is done by electrolysis.

PEX is made from crude oil by a series of processes:

- fractional distillation of crude oil
- cracking of naphtha fraction
- polymerisation of ethene
- conversion of poly(ethene) into PEX.

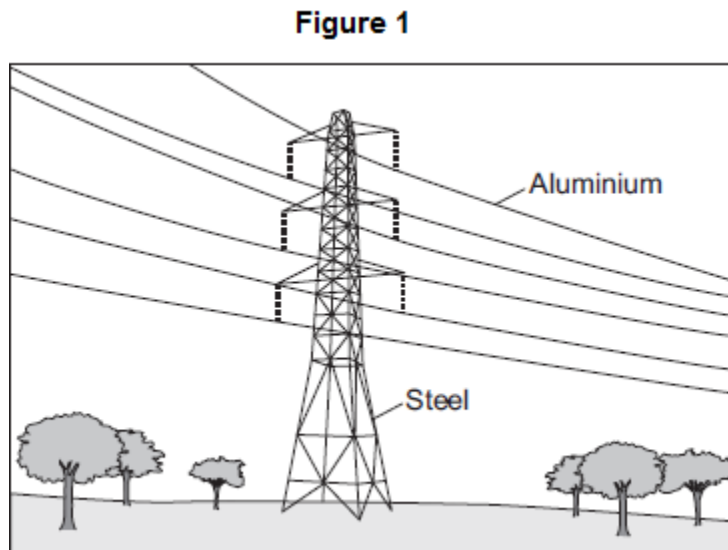
Use the information above and your knowledge and understanding to suggest possible environmental advantages of using PEX instead of copper for hot water pipes.

(4)
(Total 10 marks)

2.

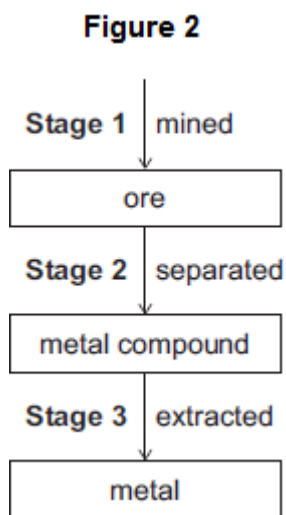
This question is about metals.

Figure 1 shows the metals used to make pylons and the wires of overhead cables.



(a) An ore contains a metal compound.

A metal is extracted from its ore in three main stages, as shown in **Figure 2**.



Explain why **Stage 2** needs to be done.

(2)

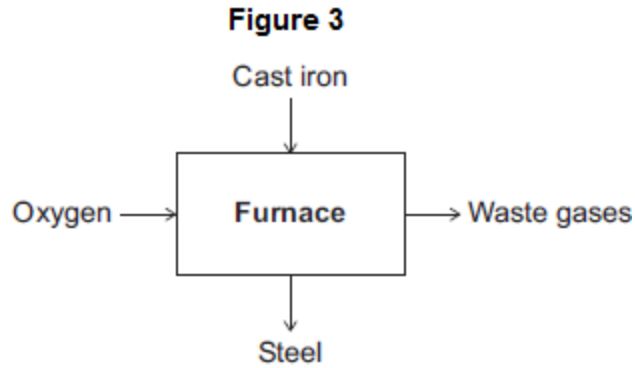
(b) Cast iron from a blast furnace contains 96% iron and 4% carbon.

(i) Cast iron is not suitable for the manufacture of pylons.

Give **one** reason why.

(1)

(ii) Most cast iron is converted into steel, as shown in **Figure 3**.



Describe how cast iron is converted into steel.

Use **Figure 3** to help you to answer this question.

(2)

(c) Aluminium and copper are good conductors of electricity.

(i) State **one** property that makes aluminium more suitable than copper for overhead cables.

(1)

(ii) How can you tell that copper is a transition metal and aluminium is **not** a transition metal from the position of each metal in the periodic table?

(2)

(iii) Copper can be extracted from solutions of copper salts by adding iron.

Explain why.

(2)

(Total 10 marks)

3.

This question is about the properties and uses of materials.

Use your knowledge of structure and bonding to answer the questions.

(a) Explain how copper conducts electricity.

(2)

(b) Explain why diamond is hard.

(2)

(c) Explain why thermosetting polymers are better than thermosoftening polymers for saucepan handles.

(2)

(Total 6 marks)

4.

Supermarkets in the UK have been advised by the Government to stop giving plastic bags to customers. The Government states that this is because plastic bags use up resources that are not renewable and that the manufacture of plastic bags produces carbon dioxide. Most of these plastic bags are made from poly(ethene). The table shows methods to deal with large numbers of used plastic bags.

Method	Description of what happens to the plastic bag
Reused	used again by the customer
Recycled	collected, transported, washed and melted to make new plastic items
Burned	collected, transported and burnt to release heat energy
Dumped	mixed with other household waste, collected, transported and disposed of at a landfill site

Use the information and your knowledge and understanding to briefly give **one advantage and one disadvantage** for each of these methods.

Reused _____

Recycled _____

Burned _____

Dumped _____

(4)
(Total 4 marks)

5. Oil rigs are used to drill for crude oil.



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(a) Drill heads are made from steel. Steel is an alloy.

Explain why alloys are harder than pure metals.

(3)

(b) Drill heads also contain diamonds.

Describe, as fully as you can, the structure and bonding in diamond.

(4)

(c) Polymers are produced from crude oil.

Describe the structure and bonding in a thermosoftening polymer and explain why thermosoftening polymers melt when heated.

(4)

(Total 11 marks)