

Reactions of metals and metal compounds/patterns of reactivity

9E & 9F

31 min

31 marks

Q1-L3, Q2-L4, Q3-L6, Q4-L6, Q5-L7

1. (a) The table below shows the melting points of four metals.

metal	melting point, in °C
gold	1064
mercury	-37
sodium	98
iron	1540

- (i) Which metal in the table has the highest melting point?

.....

1 mark

- (ii) Which metal in the table has the lowest melting point?

.....

1 mark

- (b) Gold can be a **gas** or a **liquid** or a **solid**.

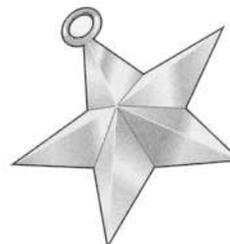
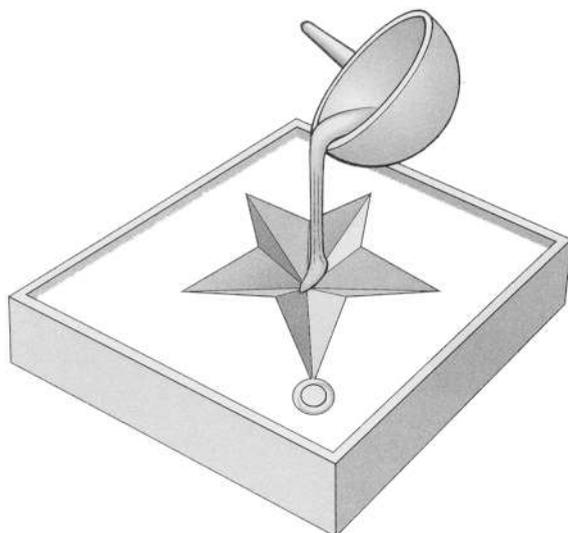
Choose from these words to fill the gaps below.

When gold is heated from room temperature to 1070°C, the gold

changes from a to a

1 mark

- (c) 5 g of gold is melted and **all** of it is poured into a mould to make a pendant as shown below.



gold pendant

melted gold is poured into a mould

What is the mass of the gold pendant?

..... g

1 mark

- (d) The table below shows how the four metals react with oxygen when heated in air.

metal	reaction when heated in air
gold	no change
mercury	slowly forms a red powder
sodium	bursts into flames straight away
iron	very slowly turns black

- (i) Which is the **most** reactive metal in the table?

.....

1 mark

- (ii) Which is the **least** reactive metal in the table?

.....

1 mark

Maximum 6 marks

2. (a) The table below shows the percentage of carbon in four different materials.

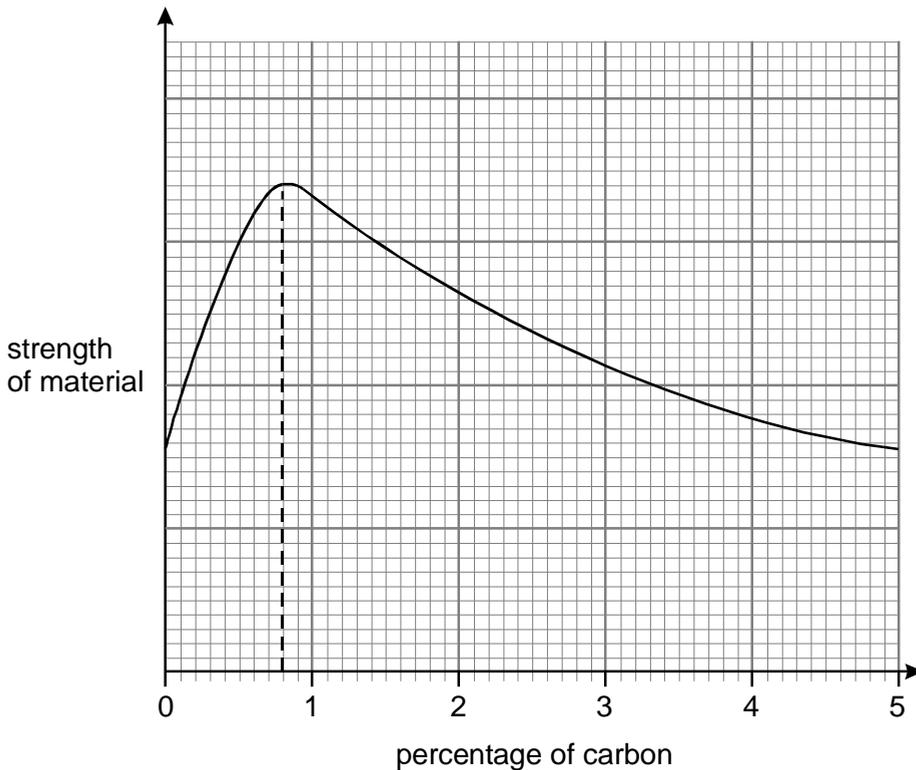
name of material	percentage of carbon in the material
cast iron	4.5
high carbon steel	0.8
mild steel	0.3
wrought iron	0.1

Which material has the highest percentage of carbon?

.....

1 mark

- (b) The graph below shows how the percentage of carbon affects the **strength** of the materials.



- (i) Use the graph to find the percentage of carbon in the material with the greatest strength.

..... %

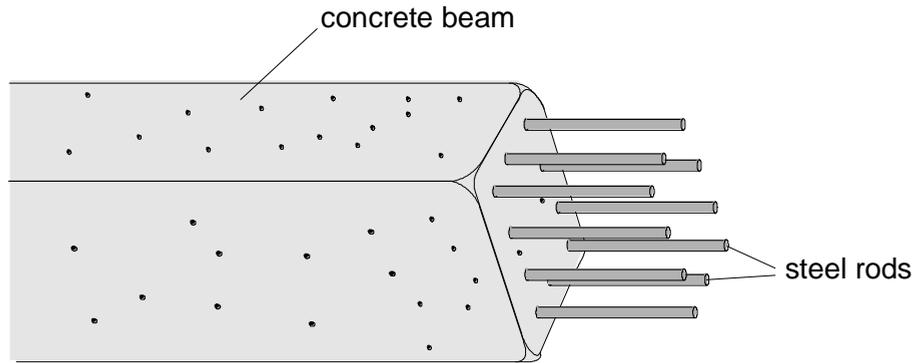
1 mark

- (ii) Use your answer to part (i) to name the strongest material in the table.

.....

1 mark

(c) Steel rods can be put into concrete beams before the concrete sets.



(i) What could these concrete beams be used for?

.....
.....

1 mark

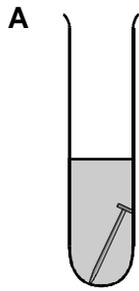
(ii) Steel contains iron. Give the name of **one** other substance which must be present for the iron to go rusty.

.....

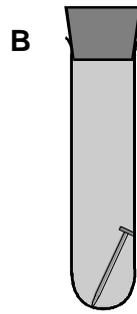
1 mark

Maximum 5 marks

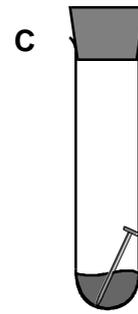
3. Jessica was investigating the rusting of iron. She set up five experiments as shown below, and left the test-tubes for three days.



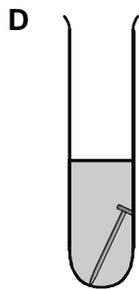
iron nail in distilled water



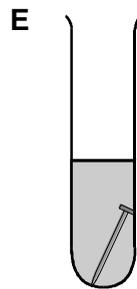
iron nail in tap water which has been boiled to remove dissolved gases



iron nail and a chemical to absorb water vapour



iron nail in sea water



iron nail in vinegar

Jessica wrote the following results in her book.

Test-tube	observation
A	nail slightly rusty
B	nail still shiny
C	nail still shiny
D	nail very rusty
E	nail slightly rusty, bubbles of gas seen

(a) Explain why the nails had **not** rusted in test-tubes B and C.

in test-tube B

.....

in test-tube C

.....

2 marks

(b) In test-tube E the iron nail reacted with the vinegar.

(i) Is vinegar **acidic**, **alkaline** or **neutral**?

.....

1 mark

(ii) When the iron reacted with the vinegar, bubbles of gas were formed.
What gas was formed?

.....

1 mark

(c) Before putting the iron nail in test-tube D, Jessica weighed the nail.
After three days she dried and weighed the nail **and** the rust which had formed.

(i) How did the total mass of the nail and rust compare to the mass of the nail
at the beginning?

.....

1 mark

(ii) Give the reason for your answer.

.....

.....

1 mark

(d) Jessica concluded that the presence of salt in the water made the nail rust more
quickly.

Explain why she drew that conclusion from her experiments.

.....

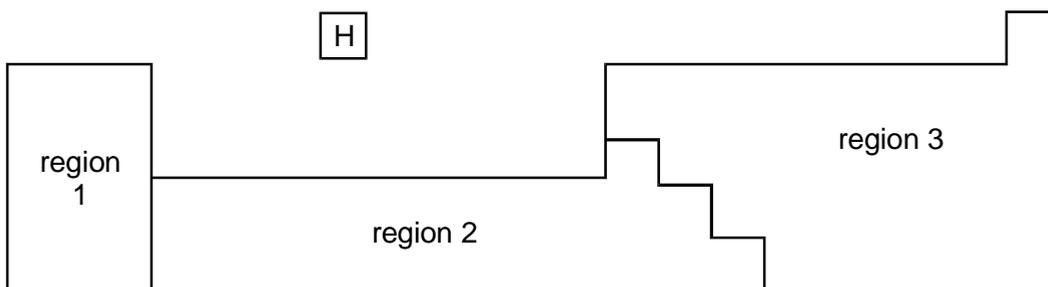
.....

.....

1 mark

Maximum 7 marks

4. The diagram shows an outline of part of the Periodic Table of Elements.



(a) What is the name of the element with the symbol H?

.....

1 mark

(b) In which regions of the Periodic Table are the following types of element found?

(i) non-metals (such as oxygen and chlorine);

region

1 mark

(ii) very reactive metals (such as sodium and potassium);

region

1 mark

(iii) less reactive metals (such as copper and zinc).

Region

1 mark

(c) Why is copper sulphate **not** found in the Periodic Table?

.....

1 mark

(d) An iron nail is placed into some blue copper sulphate solution.
 A reaction takes place between the iron and the copper sulphate.

(i) Complete the word equation for the reaction.

iron + copper sulphate → +

1 mark

(ii) Describe **one** change you would see on the surface of the nail.

.....
.....

1 mark

Maximum 7 marks

5. Railway lines can be joined together by pouring molten iron into the gap between them.

(a) The molten iron is produced by the reaction between powdered aluminium and iron oxide.

Complete the word equation for the reaction.

aluminium + iron oxide → iron +

1 mark

(b) Iron can be produced from a mixture of aluminium and iron oxide but **not** from a mixture of copper and iron oxide.

Write the names of the **three** metals, in the order of their reactivity.

most reactive

.....

.....

1 mark

(c) The list shows the names and symbols of five metals in order of their reactivity.

name	symbol
sodium	Na
calcium	Ca
magnesium	Mg
zinc	Zn
silver	Ag

(i) What, if anything, would be the result of heating zinc powder with calcium oxide?

.....

1 mark

(ii) Write down the **name** of a metal in the list that will **not** react with a solution of magnesium sulphate.

.....

1 mark

(d) The powdered metal with the symbol Zn burns in air.

Write the **word equation** for the reaction.

.....

2 marks

Maximum 6 marks