

Reactivity Series

Q1. (2018)

- 9 (a) A student placed a piece of metal **P** in a test tube containing excess dilute sulfuric acid. The student repeated this with three other metals, **Q**, **R** and **S**. All the pieces of all four metals were the same size.

A)

- (i) The student recorded the observations until each metal had reacted with the acid for two minutes. The observations are shown in Figure 9.

metal	observations
P	bubbles produced very slowly some metal remained
Q	bubbles produced quickly no metal remained
R	bubbles produced slowly no metal remained
S	bubbles produced very quickly no metal remained

Figure 9

Use this information to put the four metals in order of reactivity from the least reactive to the most reactive.

(2)

least reactive

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 most reactive

B)

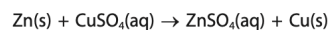
- (ii) Complete the diagram below to show how the student could add to the apparatus to measure the volume of gas produced in the two minutes.

(2)



Q2. (2019)

- 8 Pieces of zinc react with copper sulfate solution. Zinc sulfate solution is colourless.



- (a) Describe what you would **see** when an excess of zinc is added to copper sulfate solution and the mixture left until the reaction is complete.

(2)

Q3. (2019) – 9c

*(c) Some properties of four solids, **A**, **B**, **C** and **D**, are shown in Figure 6.

The solids, in no particular order, are copper carbonate, copper oxide, magnesium metal and sodium hydroxide.

	A	B	C	D
colour of solid	black	silver	white	green
observation when solid is added to water	black solid remains	a few bubbles appear on surface of solid	solid dissolves and forms colourless solution	green solid remains
pH of mixture of solid added to water	7	8	13	7
observation when solid is added to dilute sulfuric acid	on warming, solid disappears to form blue solution	effervescence solid disappears to form colourless solution	solid disappears to form colourless solution	effervescence solid disappears to form blue solution

Figure 6

Identify the solids **A**, **B**, **C** and **D**, explaining how the information in Figure 6 supports the identification of each solid.

(6)

Q4. (2020) – 8b

A)

(b) Calcium and potassium react with water in similar ways.

(i) One similarity in the reactions is that hydrogen gas is produced.

State **one** other similarity in the products of the reactions of calcium and potassium with water.

(1)

B)

(ii) Potassium is higher in the reactivity series than calcium and reacts more vigorously with water than calcium reacts with water.

State why potassium is higher in the reactivity series and reacts more vigorously with water than calcium.

(1)

Q5. (2021)

- 7 (a) The order of reactivity of copper, magnesium and zinc can be determined by the displacement reactions between these metals and solutions of their salts.

You are provided with

- samples of the three metals
- solutions of copper sulfate, magnesium sulfate and zinc sulfate.

Describe the experiments that can be done to determine the order of reactivity of these metals by displacement reactions.

(3)

Q6. (2022)

- 9 (a) A student carried out an investigation to determine the order of reactivity of four metals, **W**, **X**, **Y** and **Z**.
A piece of metal **W** was added to a test tube containing excess dilute hydrochloric acid.
This was repeated with the other three metals, **X**, **Y** and **Z**.
In each case, the size of each piece of metal was the same.
The student recorded observations on each reaction for three minutes.

The observations obtained are shown in Figure 8.

metal	observations with dilute hydrochloric acid
W	Bubbles formed quickly with some metal remaining after three minutes.
X	A few bubbles were seen to form. The metal looked unchanged after three minutes.
Y	Bubbles formed quickly. After three minutes all the metal had reacted.
Z	Bubbles formed very quickly with no metal remaining after three minutes.

Figure 8

A)

- (i) Use the information in Figure 8 to place the metals in order of reactivity from the least reactive to the most reactive.

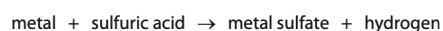
(2)

least reactive $\longrightarrow$ most reactive

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B)

- (ii) The experiment was repeated using an excess of dilute sulfuric acid in place of the dilute hydrochloric acid.



When metal **Y** reacts with dilute sulfuric acid, bubbles form quickly at first and then the reaction stops.
Most of the solid metal remains.

Explain why the reaction between metal **Y** and excess dilute sulfuric acid stopped even though there was solid metal **Y** left.

(2)

Q7. (2023) – 3a, 3b (i)

- 3 Figure 5 shows part of the reactivity series of metals.

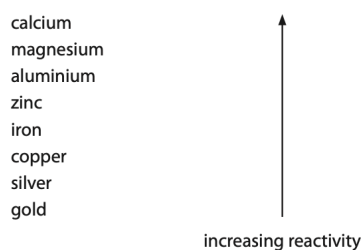


Figure 5

A)

- (a) Which metal reacts when added to cold water?

(1)

- ☐ **A** calcium
☐ **B** copper
☐ **C** gold
☐ **D** silver

B)

- (b) A student investigates the reactivity of four different metals.

The student adds an equal-sized piece of each metal to separate test tubes containing dilute hydrochloric acid.

The student's observations for zinc and copper are recorded in Figure 6.

metal	observations
magnesium	
zinc	bubbles produced at a steady rate test tube feels slightly warm
iron	
copper	no reaction

Figure 6

- (i) Use the information in Figure 5 and in Figure 6 to predict the observations for the reactions of magnesium and of iron with dilute hydrochloric acid.

(2)

magnesium

iron

Q8. (2024)

- 9 (a) An investigation was carried out on the reactivity of four metals, **D**, **E**, **F** and **G**.

Equal sized pieces of these metals were placed in excess dilute hydrochloric acid and left for three minutes.

Figure 9 shows the observations of the reactions for metals **D**, **E** and **F**.

metal	observations with dilute hydrochloric acid
D	Bubbles formed quickly. After three minutes all the metal had reacted.
E	Bubbles formed very quickly. No metal remaining after three minutes.
F	A few bubbles were seen to form. The metal looked unchanged after three minutes.
G	

Figure 9

The order of reactivity for these metals is shown in Figure 10.

E	D	G	F
most reactive			least reactive

Figure 10

- (i) Use the information in Figure 9 and Figure 10 to suggest the observations that would be made for metal **G**.

(2)