

Past-paper walk-through

Reactivity series ■ 9.4

eXercise

Questions in this set

- 0620/21 N25 Q26 ■ 1 mark
- 0620/21 N25 Q27 ■ 1 mark
- 0620/22 N25 Q26 ■ 1 mark
- 0620/23 N25 Q28 ■ 1 mark
- 0620/21 J25 Q26 ■ 1 mark
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Question 26

0620/21 N25 ■ Q26 ■ 1 mark

26 What is the correct order of reactivity of the following metals, from least reactive to most reactive?

- A** calcium → magnesium → zinc → copper
- B** copper → zinc → magnesium → calcium
- C** copper → zinc → calcium → magnesium
- D** zinc → copper → magnesium → calcium

Solution 26

Answer: **B**

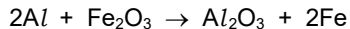
Why

- Order the metals by how readily they lose electrons.
- Copper is below hydrogen and barely reacts; calcium reacts vigorously with cold water.
- So from least to most reactive: copper, zinc, magnesium, calcium.

Question 27

0620/21 N25 ■ Q27 ■ 1 mark

27 The equation for the reaction between aluminium and iron(III) oxide is shown.



Which statement about this reaction is correct?

- A** The aluminium acts as an oxidising agent.
- B** It shows that iron is more reactive than aluminium.
- C** The oxidation number of the aluminium decreases during the reaction.
- D** It shows that aluminium has a greater tendency to form ions than iron.

Solution 27

Answer: **D**

Why

- Aluminium removes the oxygen from the iron oxide, so aluminium is *oxidised*.
- A species that is oxidised is the reducing agent, not the oxidising agent.
- The reaction also shows aluminium is more reactive than iron, since it takes the oxygen.

Question 26

0620/22 N25 ■ Q26 ■ 1 mark

26 Four different metals are separately added to water.

The oxide of each metal is separately heated with carbon.

The results are shown.

metal	metal with water	metal oxide with carbon
Q	no reaction	brown solid forms
R	rapid fizzing	no reaction
S	a few bubbles	no reaction
T	a few bubbles	grey solid forms

Question 26



What is the order of reactivity of the four metals, least reactive first?

A $Q \rightarrow T \rightarrow S \rightarrow R$

B $Q \rightarrow S \rightarrow T \rightarrow R$

C $R \rightarrow S \rightarrow T \rightarrow Q$

D $R \rightarrow T \rightarrow S \rightarrow Q$

Solution 26

Answer: **A**

Why

- A metal that reacts with cold water is very reactive – Group I or Group II.
- A metal oxide that carbon can reduce belongs to a metal *less* reactive than carbon.
- Those two behaviours are mutually exclusive, and that is what orders the four metals.

Question 28

0620/23 N25 ■ Q28 ■ 1 mark

28 Some information about four metals P, Q, R and S is listed.

Metal P does **not** react with dilute hydrochloric acid.

Metal Q is more reactive than magnesium.

Metal R reacts rapidly with cold water to produce hydrogen.

Metal S reacts with dilute hydrochloric acid to produce hydrogen.

Which row identifies P, Q, R and S?

	P	Q	R	S
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Question 28

A	gold	aluminium	sodium	copper
B	copper	potassium	calcium	magnesium
C	silver	calcium	iron	zinc
D	magnesium	sodium	potassium	iron

Solution 28

Answer: **B**

Why

- P does not react with dilute acid, so it lies below hydrogen – the least reactive.
- R reacts rapidly with *cold water*, so it is the most reactive of the four.
- Q is more reactive than magnesium but does not attack cold water, so it sits between them.

Question 26

0620/21 J25 ■ Q26 ■ 1 mark

26 Three statements about solid Z are listed.

- It reacts with dilute hydrochloric acid to produce hydrogen.
- It reacts very slowly with cold water and quickly with steam.
- It is a good thermal conductor.

What is solid Z?

A gold

B magnesium

Question 26

C potassium

D silver

Solution 26

Answer: **B**

Why

- It gives hydrogen with dilute acid and conducts heat, so it is a metal.
- Reacting only slowly with cold water but quickly with steam puts it in the middle of the reactivity series.
- That fits magnesium or zinc – not sodium (violent with cold water) or copper (no reaction with acid).

Question 27

0620/21 J25 ■ Q27 ■ 1 mark

27 Four metals J, K, L and M are added separately to aqueous solutions of their ions.

The results are shown.

metal	aqueous ions			
	J^{2+}	K^{2+}	L^{2+}	M^{2+}
J	x	✓	✓	✓
K	x	x	x	✓
L	x	✓	x	✓
M	x	x	x	x

key

✓ = reaction

x = no reaction

Question 27

Which statement about the metals is correct?

- A** J has a greater tendency to form positive ions than K.
- B** L has a greater tendency to form positive ions than J.
- C** K has a greater tendency to form positive ions than L.
- D** M has a greater tendency to form positive ions than K.

Solution 27

Answer: **A**

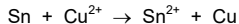
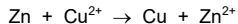
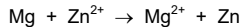
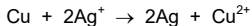
Why

- A metal displaces the ions of any metal *less* reactive than itself.
- So count how many solutions each metal reacts with: the most reactive reacts with the most.
- Order them from the metal that reacts with everything down to the one that reacts with nothing.

Question 26

0620/22 J25 ■ Q26 ■ 1 mark

26 The ionic equations for some reactions between metals and aqueous metal ions are shown.



Which further information can be used to place copper, magnesium, silver, tin and zinc in order of their reactivity?

- A** Zinc reacts with Sn^{2+} ions.
- B** Copper does **not** react with Sn^{2+} ions.
- C** Magnesium reacts with Cu^{2+} ions.

Question 26

D Magnesium reacts with Ag^+ ions.

Solution 26

Answer: **A**

Why

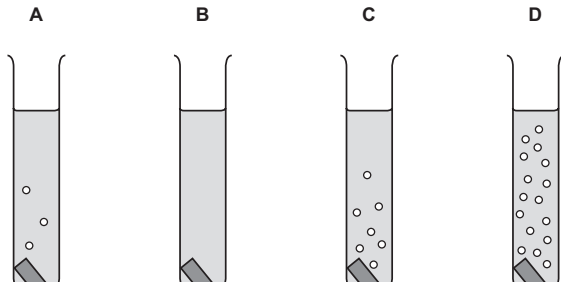
- Each equation shows the metal on the left displacing the metal in the ion, so it is the more reactive of the two.
- Chaining them gives $\text{Mg} > \text{Zn} > \text{Sn} > \text{Cu} > \text{Ag}$.
- To place a metal not yet in that chain you need one more experiment linking it to one already there.

Question 25

0620/23 J25 ■ Q25 ■ 1 mark

- 25** Four test-tubes contain dilute hydrochloric acid. Each test-tube has one piece of a different metal added to it. The metals are copper, iron, magnesium and zinc.

Which test-tube contains iron and dilute hydrochloric acid?



Question 25



Solution 25

Answer: **A**

Why

- Rank the four metals by reactivity: magnesium > zinc > iron > copper.
- Copper gives no reaction at all, magnesium fizzes vigorously.
- Iron reacts steadily but slowly, giving a pale green solution – neither the fastest nor the inert one.

Question 29

0620/22 M25 ■ Q29 ■ 1 mark

29 Separate pieces of aluminium foil and copper foil are heated in air.

The copper foil reacts to give a black solid.

The aluminium foil does **not** react.

Which statement explains these observations?

- A** Aluminium has an unreactive layer, but copper does **not**.
- B** Aluminium is below copper in the reactivity series.

- C** Copper reacts with moisture in the air, but aluminium does **not**.
- D** Copper reacts with nitrogen in the air, but aluminium does **not**.

Solution 29

Answer: **A**

Why

- Aluminium is actually more reactive than copper, so the observation looks backwards.
- But aluminium carries a tough, unreactive oxide layer that seals its surface.
- That layer keeps air away from the metal beneath, so no further reaction is seen.