Past-paper walk-through

Alloys and their properties ▪ 9.3

eXercise

Questions in this set

- 0620/22 J25 Q25 ▪ 1 mark
- 0620/23 J25 Q26 ▪ 1 mark
- 0620/42 J25 Q4 ▪ 9 marks
- 0620/22 M25 Q28 ▪ 1 mark

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- // separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = "or words to that effect" – the wording need not match.

Question 25

0620/22 J25 ▪ Q25 ▪ 1 mark

25 Brass is an alloy of copper.

Which statement about brass or copper is correct?

A Brass does **not** conduct electricity because it is a compound.

B Copper conducts electricity because its atoms are free to move.

C Brass is harder than copper because its layers of atoms **cannot** easily slide over each other.

D Copper is stronger than brass because it is a pure metal.

Solution 25

Answer: **C**

Why

- Brass is a mixture of metals, not a compound, so it still conducts electricity.
- In any metal it is the delocalised *electrons* that move, not the atoms.
- Brass is harder than copper because its different-sized atoms stop the layers sliding.

Question 26

0620/23 J25 ▪ Q26 ▪ 1 mark

26 Brass is a mixture of copper and zinc.

Which statement describes and explains the relative strength of brass compared to copper?

A Brass is stronger than copper because the layers of atoms in brass **cannot** easily slide over each other.

B Brass is stronger than copper because the intermolecular forces are greater in brass than in copper.

C Brass is weaker than copper because the layers of atoms slide more easily over each other in brass than in copper.

D Brass is weaker than copper because the intermolecular forces are weaker in brass than in copper.

Solution 26

Answer: **A**

Why

- A pure metal has identical atoms in regular layers that can slide over one another.
- Brass contains zinc atoms of a different size, which disrupt those layers.
- The layers can no longer slide, so brass is stronger and harder than pure copper.

Question 4

0620/42 J25 ▪ Q4 ▪ 9 marks

4 Chromium is the element with atomic number 24 in the Periodic Table.

(a) The main ore of chromium is chromite. Chromite contains $FeCr_2O_4$.

$FeCr_2O_4$ reacts with carbon.

(i) Complete the equation for this reaction.

Question 4

(ii) Suggest **one** disadvantage of extracting chromium by reacting chromite with carbon.

Question 4

(b) Chromium can be mixed with nickel and other elements to form stainless steel.

Name the type of substance formed when a metal is mixed with other elements.

Question 4

(c) $(NH_4)_2Cr_2O_7$ is a compound containing chromium.

The negative ion in $(NH_4)_2Cr_2O_7$ is $Cr_2O_7^{2-}$.

(i) State the sum of the oxidation numbers in the $Cr_2O_7^{2-}$ ion.

Question 4

(ii) The oxidation number of each O in $Cr_2O_7^{2-}$ ions is –2.

Determine the oxidation number of each Cr in $Cr_2O_7^{2-}$ ions. Show your working.

Question 4

(iii) When $(NH_4)_2Cr_2O_7$ is heated the following reaction occurs.

$$(NH_4)_2Cr_2O_7 \rightarrow Cr_2O_3 + 4H_2O + N_2$$

Calculate the volume of nitrogen gas produced at r.t.p., in cm^3, when 1.26 g of $(NH_4)_2Cr_2O_7$ is heated using the following steps.

The M_r of $(NH_4)_2Cr_2O_7$ is 252.

- Calculate the number of moles of $(NH_4)_2Cr_2O_7$ used.

Question 4

- Determine the number of moles of N_2 formed.

Question 4

- Calculate the volume of N_2 formed at r.t.p. in cm^3.

Question 4

[3]

[Total: 9]

Solution 4

(a)(i)

Mark scheme

- 4CO
- 1

(a)(ii)

Mark scheme

- chromium will need to be separated from iron
- 1

Solution 4

(b)

Mark scheme

- alloy
- 1

Solution 4

(c)(i)

Mark scheme

- –2
- 1

Solution 4

(c)(ii)

Mark scheme

- M1 use of -14 or 7×-2 M2
- $+6$
- 2

Solution 4

(c)(iii)

Mark scheme

- M1 mol (NH4)2Cr2O7 = 1.26 / 252 = 0.005(00) M2
- mol of N2 = 0.005(00) M3
- vol of N2 = 0.005 × 24000 = 120 (cm3)
- 3
- 0620/42
- May/June 2025

Question 28

0620/22 M25 ▪ Q28 ▪ 1 mark

28 Which statement about alloys is correct?

A Alloys are harder than pure metals because they contain strong intermolecular forces.

B Brass is an alloy containing mainly copper and tin.

C The different-sized atoms in an alloy mean that the layers **cannot** easily slide over each other.

D There are no alloys containing carbon because carbon is a non-metal.

Solution 28

Answer: **C**

Why

- A pure metal has identical atoms in regular layers that slide over each other easily.
- An alloy mixes in atoms of a different size, distorting those layers.
- The layers can no longer slide, so the alloy is harder; brass is copper with *zinc*, not tin.