

26 Which row identifies a transition element?

	melting point	density at r.t.p.
A	high	high
B	high	low
C	low	high
D	low	low

23 Some properties of elements are listed.

- 1 They have good electrical conductivity.
- 2 They have high melting points.
- 3 They are malleable.
- 4 They have ions with variable oxidation numbers.

Which properties are correct for **both** iron and lithium?

- A** 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

24 Which element is a transition element?

	melting point in °C	density at r.t.p. in g/cm ³	colour of oxide at r.t.p.
A	98	1.0	white
B	328	11.3	yellow
C	651	1.7	white
D	1907	7.2	green

5 Manganese is the element with atomic number 25 in the Periodic Table.
Calcium is the element with atomic number 20 in the Periodic Table.

- (a) Complete Table 5.1 to show the number of protons, neutrons and electrons in the ⁵⁵Mn atom and the ⁴²Ca²⁺ ion.

Table 5.1

	⁵⁵ Mn	⁴² Ca ²⁺
protons		
neutrons		
electrons		

[3]

- (b) Manganese forms several oxides. The formulae of some of these oxides are shown.

MnO**Mn₂O₃****Mn₃O₄****MnO₂****Mn₂O₇**

- (i) Suggest why manganese is expected to form coloured oxides.

..... [1]

- (ii) State which other property of manganese is shown by the formation of several oxides.

..... [1]

- (iii) State the formula of manganese(II) oxide.

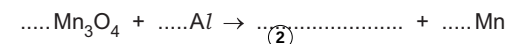
..... [1]

- (c) Mn₃O₄ is found in an ore of manganese. Manganese metal can be extracted from Mn₃O₄ using aluminium as the reducing agent.

- (i) Define the term reducing agent.

.....
 [2]

- (ii) Complete the symbol equation by inserting the formula of the missing product and balancing the equation.



[2]

(d) MnO_2 reacts with dilute hydrochloric acid as shown in the equation.



(i) Calculate the volume of chlorine gas formed, in cm^3 , at r.t.p. when excess MnO_2 reacts with 50.0 cm^3 of $0.200\text{ mol/dm}^3\text{ HCl}$.

Use the following steps.

- Calculate the number of moles of HCl used.

..... mol

- Determine the number of moles of Cl_2 formed.

..... mol

- Calculate the volume of Cl_2 formed.

..... cm^3
[3]

(ii) Describe a test for chlorine gas.

test

observations

[1]

(iii) Explain, in terms of collision theory, why decreasing the temperature decreases the rate of this reaction.

.....

 [3]