Paper 3

Questions are applicable for both core and extended candidates

1 Samarium is a metal.

(a) Deduce the number of electrons and neutrons in the samarium atom shown.

$^{154}_{62}Sm$

number of electrons .....

number of neutrons .....

[2]

(b) Samarium has properties that are similar to the properties of transition elements.

Choose **one** statement about samarium that is correct.

Tick (✓) **one** box.

Compounds of samarium are colourless.	☐
Samarium has a low melting point.	☐
Samarium and its compounds do **not** act as catalysts.	☐
Samarium has a high density.	☐

[1]

2 This question is about metals and compounds of metals.

(a) Table 4.1 shows some properties of five metals, **A**, **B**, **C**, **D** and **E**.

Table 4.1

metal	density in g/cm^3	melting point in °C	colour of metal chloride
A	5.90	30	white
B	5.96	1890	green
C	11.34	328	white
D	8.90	1455	yellow
E	1.53	39	white

State which **two** of these metals, **A**, **B**, **C**, **D** and **E**, are transition elements.

Give two reasons for your answer using only the information in Table 4.1.

metals ..... and .....

reason 1 .....

reason 2 .....

[3]

3 This question is about metals.

(a) Iron is a transition element. Potassium is an element in Group I of the Periodic Table.

State **two** differences in the physical properties of iron compared to potassium.

1 .....

2 .....

[2]

4 A list of substances is shown.

ammonium nitrate
carbon monoxide
copper(II) chloride
ethane
ethene
litmus
methane
methyl orange
sodium chloride
sodium sulfate
sulfur dioxide
thymolphthalein

Answer the following questions using only the substances from the list.
Each substance may be used once, more than once or not at all.

Give the name of the substance that:

(f) is a compound of a transition element.

..... [1]

5 (d) Cobalt is a transition element. Lithium is a Group I element.

Describe **two** ways in which the properties of cobalt differ from those of lithium.

1 .....

2 .....
[2]

6 This question is about metals.

(a) Nickel is a transition element. Sodium is an element in Group I of the Periodic Table.
Nickel has a higher melting and boiling point than sodium.

Give two **other** ways in which the physical properties of nickel differ from the physical properties of sodium.

1 .....

2 .....
[2]

Paper 4

Questions are applicable for both core and extended candidates unless indicated in the question

7 Copper is element 29 in the Periodic Table.

(c) Copper is a transition element.

Some physical and chemical properties of transition elements are shown.

physical properties:
- high density
- high strength

chemical properties:
- form coloured compounds
- have ions with variable oxidation numbers

(i) State one **other** physical property of transition elements.

..... [1]

(ii) State one **other** chemical property of transition elements.

..... [1]

8 Copper is a transition element. It has variable oxidation states.

(a) State **two** other chemical properties of transition elements which make them different from Group I elements.

1 .....

2 .....
[2]

9 Ethanoic acid is manufactured by the reaction of methanol with carbon monoxide.

An equilibrium mixture is produced.

$$CH_3OH(g) + CO(g) \rightleftharpoons CH_3COOH(g)$$

(a) State **two** characteristics of an equilibrium.

1 .....

2 .....
[2]

(d) Suggest which of the following metals is a suitable catalyst for the reaction. Give a reason for your answer.

aluminium **calcium** **cobalt** **magnesium** **potassium**

suitable catalyst .....

reason .....
[2]

10 The Periodic Table can be used to classify elements.

(b) Group I elements have lower melting points than transition elements.

Describe one **other** difference in the **physical** properties of Group I elements and transition elements.

..... [1]