



Answer all the questions then check your answers

1. Where on the periodic table would you find the transition metals? Mark or colour in all the transition metals in the periodic table outline below.

| | | | | | | | | | | | | | | | | | |
|----|----|----|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|
| H | | | | | | | | | | | | | | | | | He |
| Li | Be | | | | | | | | | | | B | C | N | O | F | Ne |
| Na | Mg | | | | | | | | | | | Al | Si | P | s | Cl | Ar |
| K | Ca | Sc | Ti | V | Cr | Mn | Fe | Co | Ni | Cu | Zn | Ga | Ge | As | Se | Br | Kr |
| Rb | Sr | | | | | | | | | | | | | | Te | I | Xe |
| Cs | Ba | | | | | | | | | | | | | | Po | As | Rn |

2. Make a short list to show the common properties you expect of metals.

3. When metals from groups I, II and III from the periodic table react they lose either 1, 2 or 3 electrons, how are transition metals different?

b. Can you give an example of where the variable valencies exhibited by transition metals are put to use?

c. Metals like sodium from group I, calcium from group II and aluminium from group III in the periodic table react with non-metals to form colourless (white) compounds. How are transition metals different? Give some examples.

d. What use is made of these coloured transition metal compounds?

e. The table below contains some information on the melting points and densities of transition metals and metals from groups I, II and III. How do they compare? What differences are there between transition metals and non-transition metals?

| Metal | Melting point/ $^{\circ}\text{C}$ | Density/ gcm^{-3} |
|-----------|-----------------------------------|----------------------------|
| lithium | 180 | 0.53 |
| sodium | 98 | 0.97 |
| nickel | 1453 | 8.9 |
| mercury | -38 | 13.53 |
| copper | 1085 | 8.96 |
| iron | 1538 | 7.87 |
| aluminium | 660 | 2.7 |

4. Give examples of the use of transition metals as catalysts in an industrial process.

Transition metals

Answers

1. Where on the periodic table would you find the transition metals? Mark or colour in all the transition metals in the periodic table outline below. *Shown in red on table*

| | | | | | | | | | | | | | | | | | |
|----|----|----|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|
| H | | | | | | | | | | | | | | | | He | |
| Li | Be | | | | | | | | | | | B | C | N | O | F | Ne |
| Na | Mg | | | | | | | | | | | Al | Si | P | S | Cl | Ar |
| K | Ca | Sc | Ti | V | Cr | Mn | Fe | Co | Ni | Cu | Zn | Ga | Ge | As | Se | Br | Kr |
| Rb | Sr | | | | | | | | | | | | | | Te | I | Xe |
| Cs | Ba | | | | | | | | | | | | | | Po | At | Rn |

2. Make a short list to show the common properties you expect of metals.

- Strong in tension
- Good conductors of heat and electricity
- High melting points
- Dense
- Shiny
- Malleable
- ductile

3. When metals from groups I, II and III from the periodic table react they lose either 1, 2 or 3 electrons, how are transition metals different? *They can have variable valencies, meaning they can lose multiple number of electrons depending on what they react with and on the reaction conditions.*

b. Can you give an example of where the variable valencies exhibited by transition metals are put to use? *As catalysts, variable valencies are essential for many catalysts to work properly.*

c. Metals like sodium from group I, calcium from group II and aluminium from group III in the periodic table react with non-metals to form colourless (white) compounds. How are transition metals different? Give some examples. *They form coloured compounds, see examples on webpage.*

d. What use is made of these coloured transition metal compounds? *Used to colour ceramics and pottery.*

e. The table below contains some information on the melting points and densities of transition metals and metals from groups I, II and III. How do they compare? What differences are there between transition metals and non-transition metals?

| Metal | Melting point/ $^{\circ}\text{C}$ | Density/ gcm^{-3} |
|-----------|-----------------------------------|----------------------------|
| lithium | 180 | 0.53 |
| sodium | 98 | 0.97 |
| nickel | 1453 | 8.9 |
| mercury | -38 | 13.53 |
| copper | 1085 | 8.96 |
| iron | 1538 | 7.87 |
| aluminium | 660 | 2.7 |

Transition metals are dense with high melting points. This is not the case with metals in groups I, II and III from the left side of the periodic table.

4. Give examples of the use of transition metals as catalysts in an industrial process.

Iron- Haber process, Nickel - used to harden margarine

platinum/Rhodium used in Ostwald process.