EXERCISE 20

MATTER AND MATERIALS

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1 What are the following alloys composed of?

1.1 Bronze **Copper and tin**

1.2 Stainless steel **Iron, chrome and nickel**

1.3 Alnico **Aluminium, nickel and cobalt**

2 Complete the following table:

Substance	Metal/non-metal	Thermal conductor yes/no	Electrical conductor yes/no	Magnetic Yes/no
Aluminium	2.1 **Metal**	2.2 **Yes**	2.3 **Yes**	2.4 **No**
Carbon rod	2.5 **Non-metal**	2.6 **Not very well**	2.7 **Yes**	2.8 **No**

Substance	Metal/non-metal	Thermal conductor yes/no	Electrical conductor yes/no	Magnetic Yes/no
Iron	2.9 **Metal**	2.10 **Yes**	2.11 **Yes**	2.12 **Yes**
Nickel	2.13 **Metal**	2.14 **Yes**	2.15 **Yes**	2.16 **Yes**
Copper	2.17 **Metal**	2.18 **Yes**	2.19 **Yes**	2.20 **No**
Sulfur	2.21 **Non-metal**	2.22 **No**	2.23 **No**	2.24 **No**

3. Into which two groups are ferromagnetic substances divided?

Soft ferromagnetic substance

Hard ferromagnetic substance

4 What are the following types of substances used for?

4.1 Good thermal conductors

Cooking utensils, e.g. pots, pans, and stove plates

4.2 Insulators

To insulate electric wires, and for handles of pots and pans.

4.3 Ferromagnetic material

To make magnets.

4.4 Metalloids

As conductors in computers and other electronic material, to make diodes.

5 Use a fridge magnet to test whether the following items found in and around your house are magnetic or non-magnetic:

Material	Magnetic/non-magnetic	Material	Magnetic/non-magnetic
Mirror	5.1 **Non-magnetic**	Bodywork of a car	5.4 **Magnetic**
Fridge door	5.2 **Magnetic**	Door handle	5.5 **Non-magnetic**
Security gate	5.3 **Magnetic**	Window pane	5.6 **Magnetic**

6 Complete the following table:

Substance	Metal/metalloid/non-metal	Properties
Copper	6.1 **Metal**	6.2 **Shiny, metallic appearance** **Malleable and ductile** **Conducts heat and electricity well.**
Lead	6.3 **Metal**	6.4 **Shiny, metallic appearance** **Malleable and ductile** **Conducts heat and electricity well.**
Aluminium	6.5 **Metal**	6.6 **Shiny, metallic appearance** **Malleable and ductile** **Conducts heat and electricity well.**

Substance	Metal/metalloid/non-metal	Properties
Zinc	6.7 **Metal**	6.8 **Shiny, metallic appearance** **Malleable and ductile** **Conducts heat and electricity well.**
Iron	6.9 **Metal**	6.10 **Shiny, metallic appearance** **Malleable and ductile** **Conducts heat and electricity well.**
Sulfur	6.11 **Non-metal**	6.12 **Dull appearance** **Brittle and breaks.** **Does not conduct heat or electricity.**

Substance	Metal/metalloid/non-metal	Properties
Carbon rod	6.13 **Non-metal**	6.16 **Dull appearance** **Brittle** **Does not conduct heat or electricity.**
Iodine crystals	6.15 **Non-metal**	6.18 **Dull appearance** **Brittle and breaks** **Does not conduct heat well.**
Graphite	6.17 **Non-metal**	6.20 **Shiny surface** **Brittle** **Conducts electricity, but poorly**

Substance	Metal/metalloid/non-metal	Properties
Silicon	6.19 **Metalloid**	6.20 **Shiny surface** **Brittle** **Conducts electricity, but poorly**

7. Explain why metals are good conductors of electricity.

Metals have metallic bonding. The valence electrons of the atoms are free to move and are called delocalised electrons. The positive cores of the atoms are packed in a crystal lattice.

8. Explain how metallic bonding leads to metals being good thermal conductors.

Metal bonds contain:

- **densely packed positive cores of atoms: heat is conducted because they are close together;**
- **valence electrons that move freely also transfer the energy/heat.**