Q1.

This question is about elements, compounds and mixtures.

(a)   Substance **A** contains only one type of

atom. Substance **A** does **not** conduct

electricity. Which type of substance is **A**?

Tick (✓) **one** box.

Compound ☐

Metallic element ☐

Mixture ☐

Non-metallic element ☐

(1)

(b)   Substance **B** contains two types of atoms.

The atoms are chemically combined together in fixed

proportions. Which type of substance is **B**?

Tick (✓) **one** box.

Compound ☐

Metallic element ☐

Mixture ☐

Non-metallic element ☐

(1)

(c)   What is the name of the elements in Group 0 of the periodic table? Tick (✓) **one** box.

Alkali metals ☐

Halogens ☐

Noble gases ☐

Transition metals ☐

(1)

(d)   Which statement about the elements in Group 0 is correct? Tick (✓) **one** box.

All elements in the group are very reactive. ☐

All elements in the group form negative ions. ☐

The boiling points increase down the group. ☐

The relative atomic masses (A_r) decrease down the group. ☐

(1)

(e)   Neon is in Group 0.

What type of particles are in a sample of neon?
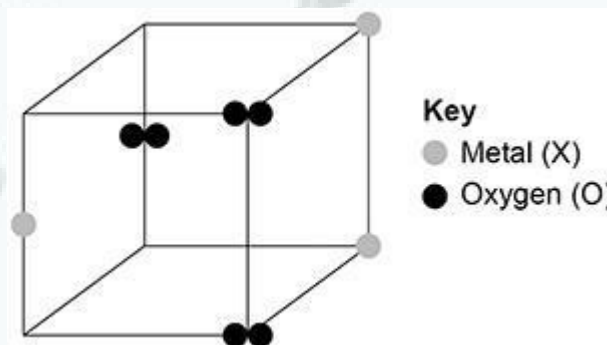
Tick (✓) **one** box.

Atoms ☐

Ions ☐

Molecules ☐

(1)

(f)   **Figure 1** represents part of the structure of an oxide of a metal.
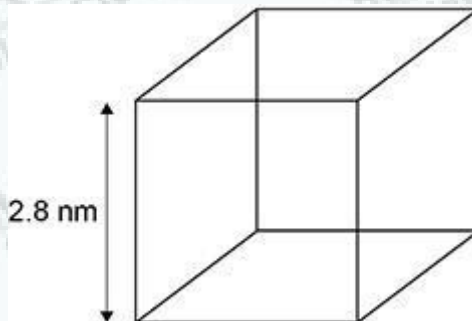
Figure 1

Key
○ Metal (X)
● Oxygen (O)

Determine the empirical formula of this oxide.

Empirical formula = XO____

(1)

A nanoparticle of a metallic element is a cube.

Figure 2 shows a diagram of the nanoparticle.

Figure 2

2.8 nm

(g)   The surface area of a cube is given by the equation:

surface area = (length of side)$_2$ × 6

Calculate the surface area of the cube in **Figure 2**.

Give your answer to 2 significant figures.

_____

_____

Surface area (2 significant figures) = _____ nm$_2$

(3)

(h)   Fine and coarse particles of the metallic element are also cubes.

The length of a fine particle cube is 10 times smaller than the length of a coarse particle cube.

How does the surface area to volume ratio of the fine particle cube compare with that of the coarse particle cube?

Tick (✓) **one** box.

Both surface area to volume ratios are the same.

The surface area to volume ratio of the fine particle is 10 times greater.

The surface area to volume ratio of the fine particle is 10 times smaller.

(1)
(Total 10 marks)

Q2.

This question is about atomic structure and the periodic table.

Gallium (Ga) is an element that has two isotopes.

(a)   Give the meaning of 'isotopes'.

You should answer in terms of subatomic particles.

_____

_____

_____

_____

(2)

(b)   The table below shows the mass numbers and percentage abundances of the isotopes of gallium.

Mass number	Percentage abundance (%)
69	60
71	40

Calculate the relative atomic mass (A_r) of gallium.
Give your answer to 1 decimal place.

_____

_____

_____

_____

Relative atomic mass (1 decimal place) = _____

(2)

Gallium (Ga) is in Group 3 of the modern periodic table.

(c)   Give the numbers of electrons and neutrons in an atom of the

isotope Number of electrons _____

Number of neutrons _____

(2)

(d)   What is the most likely formula of a gallium
ion? Tick (✓) **one** box.

Ga_+

Ga_-

Ga_{3+}

Ga_{3-}

(1)

(e)　Gallium was discovered six years after Mendeleev published his periodic table.

Give **two** reasons why the discovery of gallium helped Mendeleev's periodic table to become accepted.

1 _____

_____

2 _____

(2)