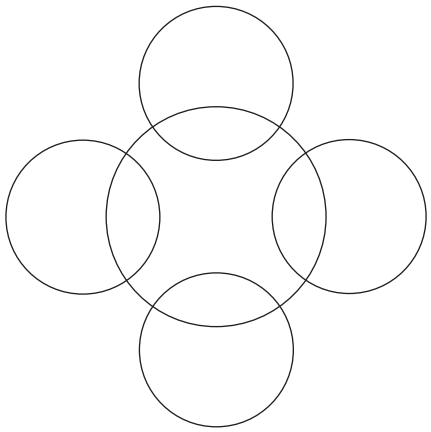
1 Draw a dot-and-cross diagram to show the electron arrangement in a molecule of methane, CH_4. Show outer shell electrons only.



[2]

[Total: 2]

2 State **one** industrial use of radioactive isotopes.

..... [1]

[Total: 1]

3 State the name of the particle which is lost from a lithium atom when it forms a lithium ion.

..... [1]

[Total: 1]

4 This question is about solids, liquids and gases.

(a) The list gives the names of nine substances which are solids at room temperature.

a ceramic

aluminium

anhydrous cobalt(II) chloride

anhydrous copper(II) sulfate

calcium oxide

graphite

iodine

iron

sodium

Answer the following questions about these substances.
Each substance may be used once, more than once or not at all.

State which substance:

(a) turns pink when water is added to it

..... [1]

(b) is a non-mental which is used as a lubricant

..... [1]

(c) is used to neutralise acidic industrial waste

..... [1]

(d) is extracted from bauxite

..... [1]

(e) is used as an electrical insulator.

..... [1]

[Total: 5]

5 An isotope of sodium is written as shown.

$^{23}_{11}Na$

(a) Deduce the number of protons, electrons and neutrons in this isotope of sodium.

number of protons .....

number of electrons .....

number of neutrons ..... [3]

(b) State **one** medical use of radioactive isotopes.

..... [1]

[Total: 4]

6 State the name of the particle which is lost when a sodium atom forms a sodium ion.

..... [1]

[Total: 1]

7 The question is about sulfur and compounds of sulfur.

An isotope of sulfur is written as shown.

$^{33}_{16}S$

(a) Deduce the number of protons, electrons and neutrons in this isotope of sulfur.

number of protons .....

number of electrons .....

number of neutrons ..... [3]

[Total: 3]

8 Draw the electronic structure of a calcium atom.

[2]

[Total: 2]

9 An isotope of calcium is written as shown.

$^{44}_{20}Ca$

Deduce the number of protons, electrons and neutrons in this isotope of calcium.

number of protons .....

number of electrons .....

number of neutrons ..... [3]

[Total: 3]

10 Draw the electronic structure of a sulfur atom.

[2]

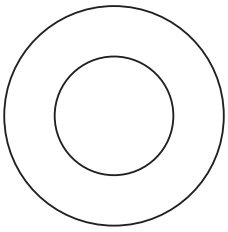
[Total: 2]

11 Draw a dot-and-cross diagram to show the electron arrangement in a molecule of hydrogen.

[1]

[Total: 1]

12 Complete the diagram to show the electron arrangement in an oxygen atom.



[1]

[Total: 1]

13 Sulfur exists as a number of different isotopes.

What is meant by the term *isotopes*?

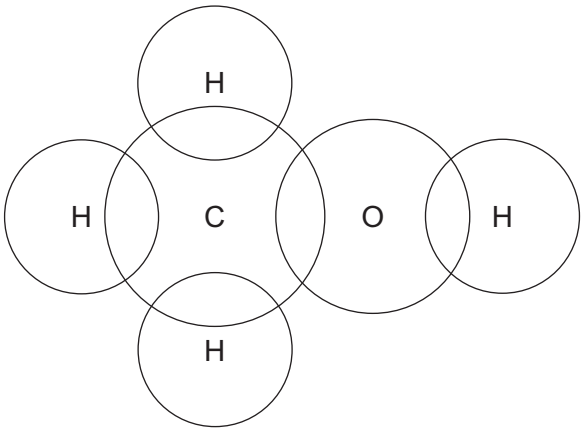
.....

.....

..... [2]

[Total: 2]

14 Draw a dot-and-cross diagram to show the electron arrangement in a molecule of methanol. Show outer shell electrons only.



[2]

[Total: 2]

15 Atoms are made of smaller particles called electrons, neutrons and protons.

Complete the table.

particle	relative charge	relative mass
electron		$\frac{1}{1840}$
neutron		
proton	+1	

[2]

[Total: 2]

16 The table gives the boiling points of ethanal and ethanol.

substance	boiling point / °C
ethanal	20
ethanol	78

In terms of attractive forces between particles, suggest why ethanal has a lower boiling point than ethanol.

.....

..... [1]

[Total: 1]

17 A sulfide ion has the symbol shown.

$$^{34}_{16}S^{2-}$$

(a) How many neutrons are contained in this sulfide ion?

..... [1]

(b) How is a sulfide ion, S^{2-}, formed from a sulfur atom?

..... [1]

(c) Which element forms an ion with a 2+ charge that has the same number of electrons as a S^{2-} ion?

..... [1]

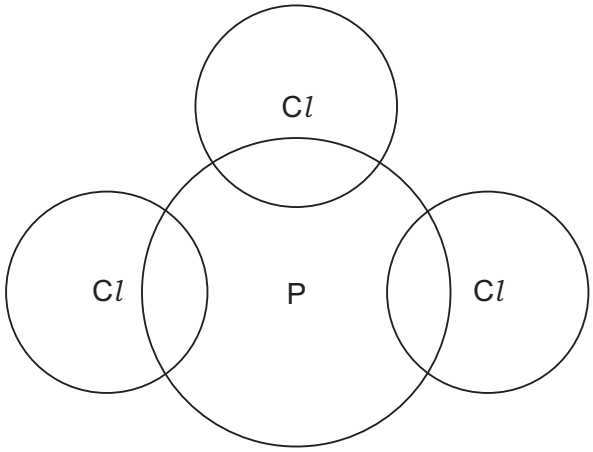
[Total: 3]

18 Phosphorus reacts with chlorine gas to produce phosphorus(III) chloride, PCl_3.

(a) Write a chemical equation for the reaction between phosphorus and chlorine to produce phosphorus(III) chloride, PCl_3.

..... [2]

(b) Complete the dot-and-cross diagram to show the electron arrangement in a molecule of phosphorus(III) chloride, PCl_3. Show outer shell electrons only.



[2]

[Total: 4]

19 Many substances conduct electricity.

Identify all the particles responsible for the passage of electricity in:

graphite .....

magnesium ribbon .....

molten copper(II) bromide..... [4]

[Total: 4]

20 The Periodic Table is very useful to chemists.

Refer only to elements with atomic numbers 1 to 36 in the Periodic Table provided when answering this question.

Use information from the Periodic Table provided to identify one element which:

(a) has atoms with exactly 9 protons ..... [1]

(b) has atoms with 0 neutrons ..... [1]

(c) has atoms with exactly 23 electrons ..... [1]

(d) has atoms with an electronic structure of 2,8,6 ..... [1]

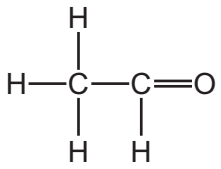
(e) forms ions with a charge of 3– containing 18 electrons ..... [1]

(f) forms ions with a charge of 2+ containing 10 electrons ..... [1]

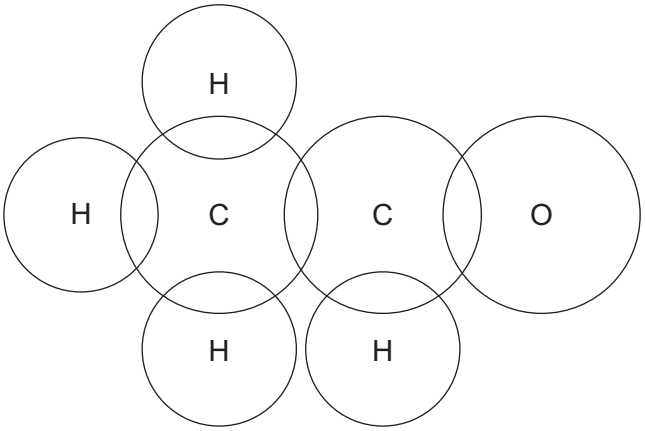
(g) has a relative atomic mass that shows it has at least **two** isotopes. ..... [1]

[Total: 7]

21 The structure of ethanal is shown.



Complete the dot-and-cross diagram to show the electron arrangement in a molecule of ethanal. Show outer shell electrons only.



[3]

[Total: 3]

22 Ethene, C_2H_4, is a compound.

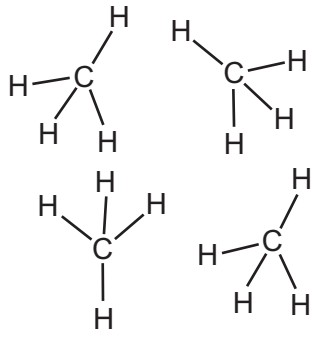
What is meant by the term *compound*?

.....

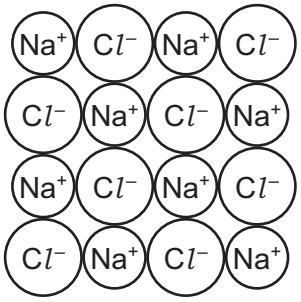
..... [1]

[Total: 1]

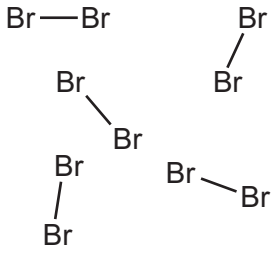
23 The diagram shows part of the structures of five substances, **A**, **B**, **C**, **D** and **E**.



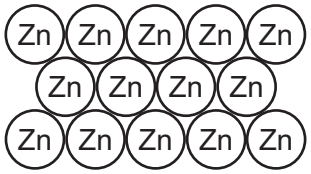
A



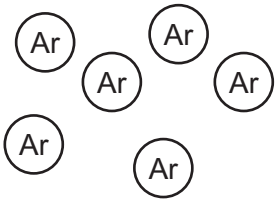
B



C



D



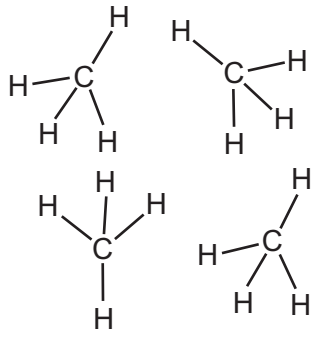
E

Which **one** of these structures, **A**, **B**, **C**, **D** or **E**, is monatomic?

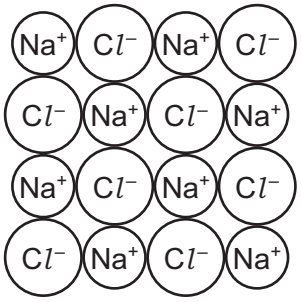
..... [1]

[Total: 1]

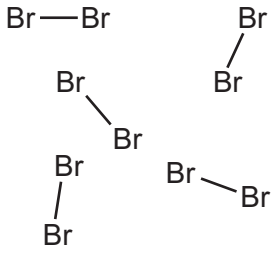
24 The diagram shows part of the structures of five substances, **A**, **B**, **C**, **D** and **E**.



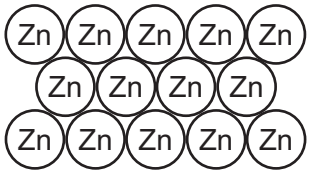
A



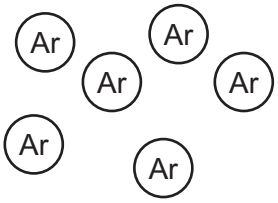
B



C



D



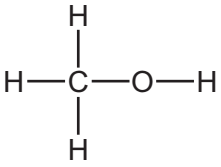
E

Which **two** of these structures, **A**, **B**, **C**, **D** or **E**, are compounds?

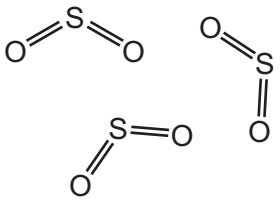
..... and ..... [2]

[Total: 2]

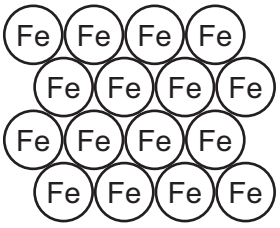
25 The diagrams show part of the structures of five substances, **A**, **B**, **C**, **D** and **E**.



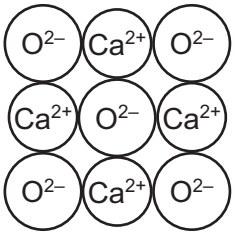
A



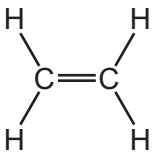
B



C



D



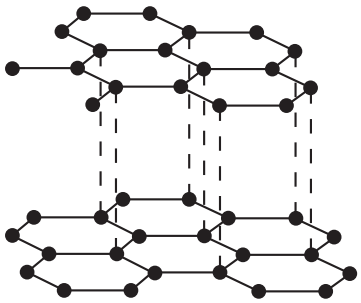
E

State which **one** of these structures, **A**, **B**, **C**, **D** or **E** conducts electricity when solid.

..... [1]

[Total: 1]

26 Part of the structure of graphite is shown.



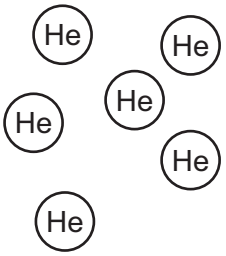
Use the information from the diagram to explain why graphite is used as a lubricant.

.....

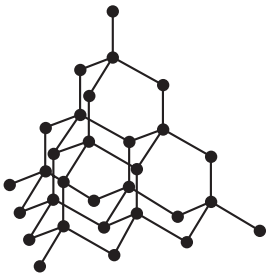
..... [1]

[Total: 1]

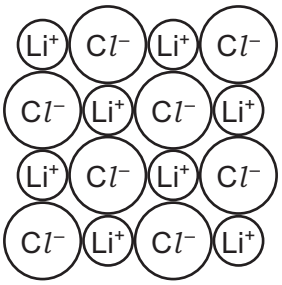
27 The diagrams show part of the structures of five substances, **A**, **B**, **C**, **D** and **E**.



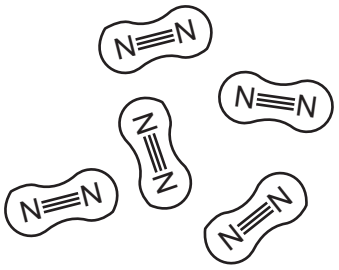
A



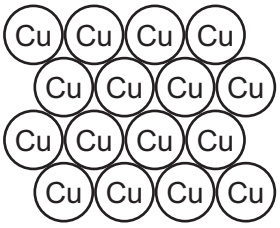
B



C



D



E

(a) Answer the following questions about these structures.
Each structure may be used once, more than once or not at all.

(i) Which **two** of these structures, **A**, **B**, **C**, **D** or **E**, are covalently bonded?

..... and ..... [2]

(ii) Which **one** of these structures, **A**, **B**, **C**, **D** or **E**, is a diatomic molecule?

..... [1]

(iii) Which **one** of these structures, **A**, **B**, **C**, **D** or **E**, is a compound?

..... [1]

(iv) Which **one** of these structures, **A**, **B**, **C**, **D** or **E**, is very soluble in water?

..... [1]

(v) Which **one** of these structures, **A**, **B**, **C**, **D** or **E**, is used in cutting tools?

..... [1]

(vi) Which **one** of these structures, **A**, **B**, **C**, **D** or **E**, is used in electrical wiring?

..... [1]

(b) Substance **B** is an element.

What is meant by the term *element* ?

.....

..... [1]

[Total: 8]

28 Aqueous potassium iodide reacts with aqueous copper(II) sulfate to produce iodine.

(a) Balance the chemical equation for this reaction.

$$KI + CuSO_4 \rightarrow CuI + I_2 + K_2SO_4$$ [2]

(b) Deduce the charge on the copper ion in CuI.

..... [1]

(c) In terms of electron transfer, explain why copper is reduced in this reaction.

..... [1]

(d) Identify the reducing agent.

..... [1]

[Total: 5]

29 Complete the table to identify the atoms and ions which have the following numbers of protons, neutrons and electrons.

	number of protons	number of neutrons	number of electrons
$^{23}_{11}Na^{+}$	11	12	10
	4	5	4
	17	20	18

[4]

[Total: 4]