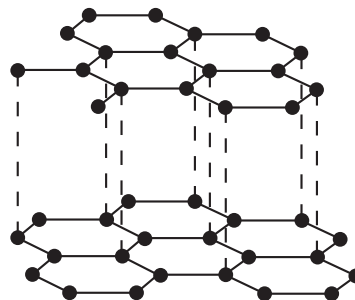


diamond



graphite

(a) Explain how the structure of diamond relates to its use in cutting hard materials.

.....

.....

..... [2]

(b) Explain how the structure of graphite relates to its use as a lubricant.

.....

.....

..... [2]

[Total: 4]

4 Radioactive isotopes can be used as a source of energy.

Give **one** use of radioactive isotopes in medicine.

..... [1]

[Total: 1]

5 Radioactive isotopes can be used as a source of energy.

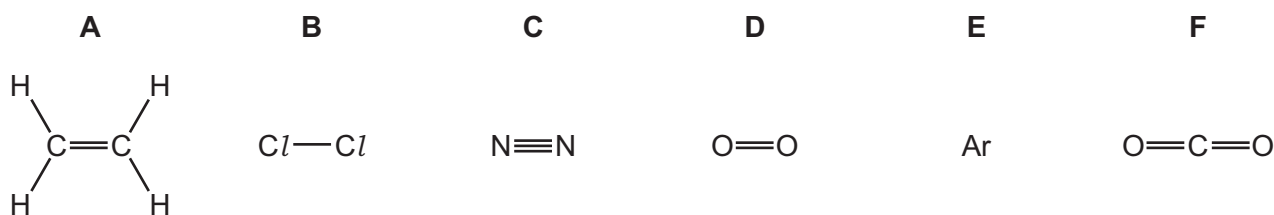
An isotope of radium, Ra, has 226 nucleons in its nucleus.

How many neutrons does this isotope contain?
Use your Periodic Table.

..... [1]

[Total: 1]

6 The structures of six gases are shown below.



Gas **F** is a compound.

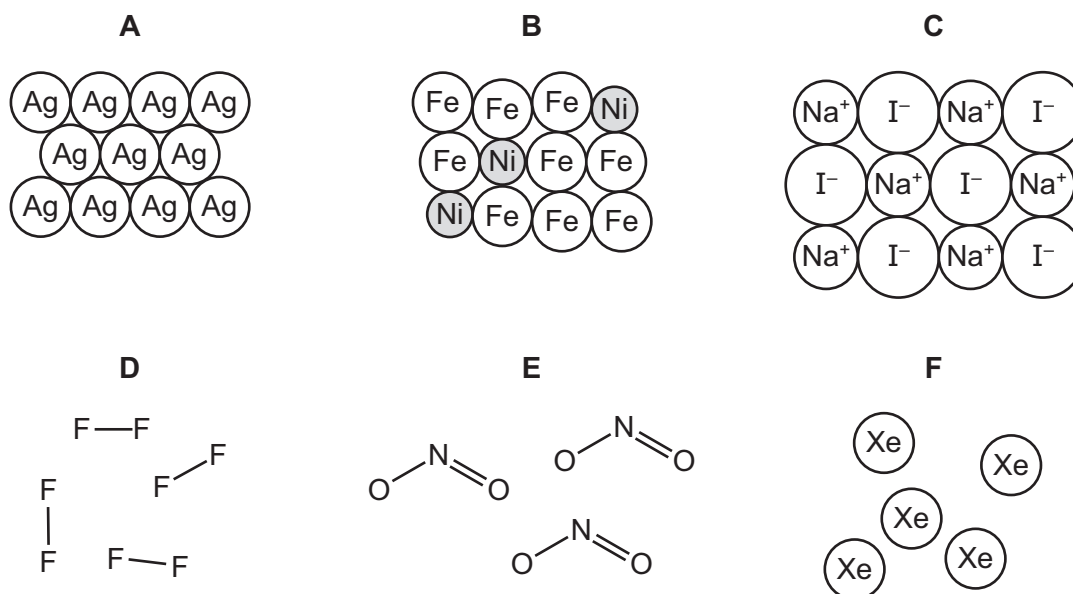
Define the term *compound*.

.....

..... [1]

[Total: 1]

7 The structures of six substances are shown below.



(a) Substance **A** is an element.

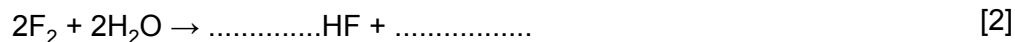
What is meant by the term *element* ?

.....

..... [1]

(b) Substance **D** oxidises water to oxygen.

Complete the symbol equation for this reaction.



[2]

[Total: 3]

8 Two different atoms of sodium are ${}_{11}^{23}\text{Na}$ and ${}_{11}^{24}\text{Na}$.

Explain why these two atoms are isotopes.

.....

..... [2]

[Total: 2]

9 ${}_{21}^{45}\text{Sc}$ represents an atom of scandium.

How many nucleons and how many charged particles are there in one atom of scandium?

number of nucleons

number of charged particles

[2]

[Total: 2]

10 ${}_{11}^{24}\text{Na}$ is radioactive. It changes into an atom of a different element which has one more proton.

Identify this element.

..... [1]

[Total: 1]

11 How many protons, neutrons and electrons are there in one copper(II) ion ${}_{29}^{64}\text{Cu}^{2+}$?

number of protons

number of neutrons

number of electrons

[2]

[Total: 2]

12 State **two** uses of radioactive isotopes.

.....
.....

[2]

[Total: 2]

13 Carbon and silicon are elements in Group IV. They both form oxides of the type XO_2 .

Explain why the physical properties of carbon dioxide are different from those of diamond and silicon(IV) oxide.

.....
.....

[1]

[Total: 1]

14 Carbon and silicon are elements in Group IV. They both form oxides of the type XO_2 .

Silicon(IV) oxide, SiO_2 , has a macromolecular structure.

Describe the structure of silicon(IV) oxide.

.....
.....
.....
.....
.....

[3]

[Total: 3]

15 Carbon and silicon are elements in Group IV. They both form oxides of the type XO_2 .

Silicon(IV) oxide, SiO_2 , has a macromolecular structure.

State **three** properties which silicon(IV) oxide and diamond have in common.

.....
.....
.....

[3]

[Total: 3]

- 16 Bromine has two naturally-occurring isotopes.

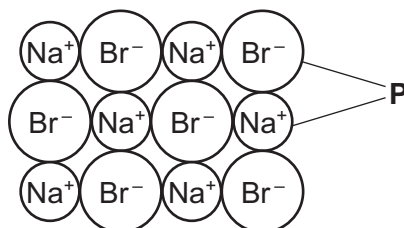
What is the meaning of the term *isotope*?

.....

[1]

[Total: 1]

- 17 The figure below shows the arrangement of the particles in sodium bromide at room temperature.



- (a) Give the name of the type of particles, **P**, present in sodium bromide.

..... [1]

- (b) What is the state of sodium bromide at room temperature?
 Use the information in the figure to explain your answer.

.....

[2]

[Total: 3]

- 18 The table below shows the number of electrons, protons and neutrons in some isotopes of helium, argon and neon.

Complete the table.

element	number of electrons	number of protons	number of neutrons
${}^3_2\text{He}$	2	2
${}^{38}_{18}\text{Ar}$	18	20
.....	10	10	11

[3]

[Total: 3]

19 The table shows some properties of the Group 0 elements helium, neon, argon and krypton.

element	electron arrangement	density of the liquefied gas in g/cm ³	melting point /°C	boiling point /°C
helium	2	0.15	-272	-269
neon		1.20	-248	-245
argon	2,8,8	1.40	-189	-186
krypton	2,8,18,8	2.15	-157	-152

Deduce the electron arrangement of neon.

..... [1]

[Total: 1]

20 (a) Draw a diagram to show the electron arrangement in a molecule of hydrogen.

[1]

(b) What type of bonding is present in a hydrogen molecule?

..... [1]

[Total: 2]

21 Complete the following sentence about compounds using words from the list below.

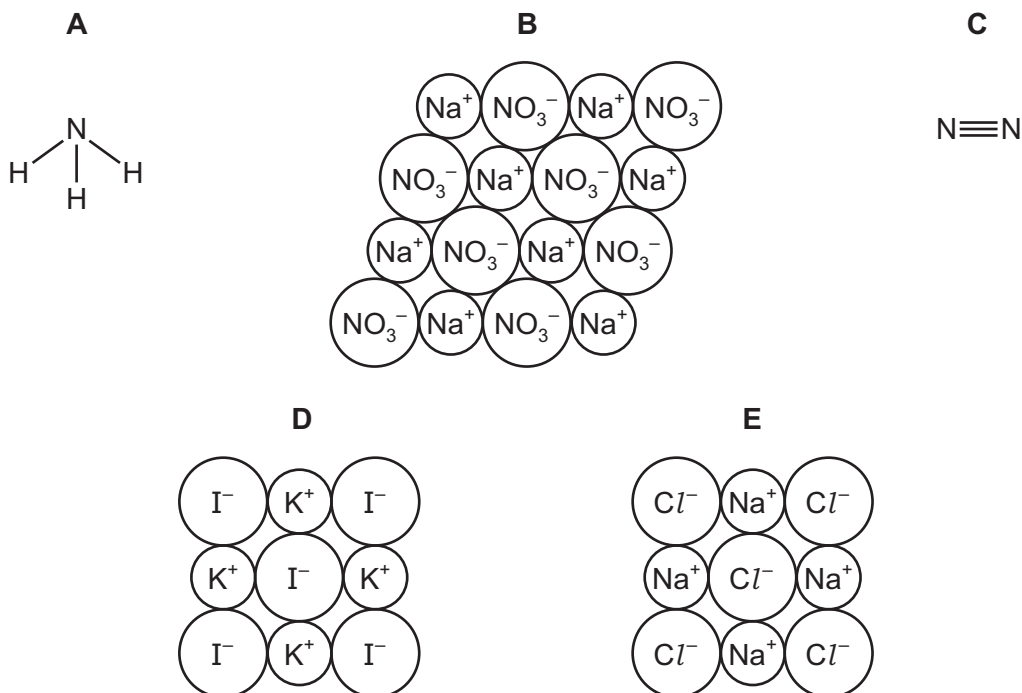
atoms **combined** **mixtures**
molecules **separated** **unreactive**

A compound is a substance containing two or more different which are chemically

[2]

[Total: 2]

22 The structures of five substances are shown below.



Complete the following sentences about compounds **A** and **E** using words from the list below.

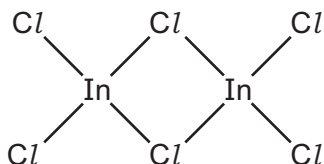
atoms gas giant ions liquid molecular polymer solid

Compound **A** is a at room temperature. It does not conduct electricity because it has a simple structure. Compound **E** does not conduct electricity when it is because its cannot move.

[4]

[Total: 4]

23 Chlorine reacts with indium, In, to form a chloride with the formula shown below.



How many protons does indium have in its nucleus?
Use the Periodic Table to help you.

..... [1]

[Total: 1]

- 24** A radioactive isotope of carbon called carbon-14 can be used to date old pieces of cloth.

What is meant by the term *isotope*?

.....
.....

[1]

[Total: 1]

- 25** Many flowers produce volatile oils. These oils are responsible for the sweet scent (perfume) of many flowers.

What does the term *volatile* mean?

..... [1]

[Total: 1]

- 26** A radioactive isotope of carbon called carbon-14 can be used to date old pieces of cloth.

Carbon-14 contains 8 neutrons and 6 protons.

The symbol for carbon-14 can be written ${}^{14}_6\text{C}$.

Write the symbol for carbon-12 in a similar way.

[1]

[Total: 1]

27 The table below shows the properties of some non-metallic elements, **A**, **B**, **C** and **D**.

element	state at room temperature	colour	melting point /°C	electrical conductivity
A	solid	black	3317	good
B	solid	grey	1410	poor
C	gas	green	-101	does not conduct
D	solid	yellow	119	does not conduct

Which element is carbon in the form of graphite?

Give a reason for your answer.

.....

[2]

[Total: 2]

28 The table below shows the properties of some non-metallic elements, **A**, **B**, **C** and **D**.

element	state at room temperature	colour	melting point /°C	electrical conductivity
A	solid	black	3317	good
B	solid	grey	1410	poor
C	gas	green	-101	does not conduct
D	solid	yellow	119	does not conduct

Which element is chlorine?

.....

[1]

[Total: 1]

29 The table below shows the properties of some non-metallic elements, **A**, **B**, **C** and **D**.

element	state at room temperature	colour	melting point /°C	electrical conductivity
A	solid	black	3317	good
B	solid	grey	1410	poor
C	gas	green	-101	does not conduct
D	solid	yellow	119	does not conduct

Which **two** elements are giant covalent structures?
Give a reason for your answer.

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

[Total: 2]

30 Iron from the Blast Furnace is impure. It contains about 5% of impurities, mainly carbon, sulfur, silicon and phosphorus, which have to be removed when this iron is converted into steel.

Mild steel is the most common form of steel. Mild steel contains a maximum of 0.3% of carbon.

High carbon steel contains 2% of carbon. It is less malleable and much harder than mild steel.

(a) Give a use of mild steel.

..... [1]

(b) Suggest a use of high carbon steel.

..... [1]

(c) Explain why metals are malleable.

.....
.....
.....
..... [3]

(d) Suggest an explanation why high carbon steel is less malleable and harder than mild steel.

.....

[2]

[Total: 7]

31 An isotope of calcium is written as shown.



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]

32 The question is about sulfur and compounds of sulfur.

An isotope of sulfur is written as shown.



(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]

33 Draw the electronic structure of a sulfur atom.

[2]

[Total: 2]

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

..... [1]

[Total: 1]

35 An isotope of sodium is written as shown.



(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]

36 $^{12}_6\text{C}$, $^{13}_6\text{C}$ and $^{14}_6\text{C}$ are isotopes of carbon.

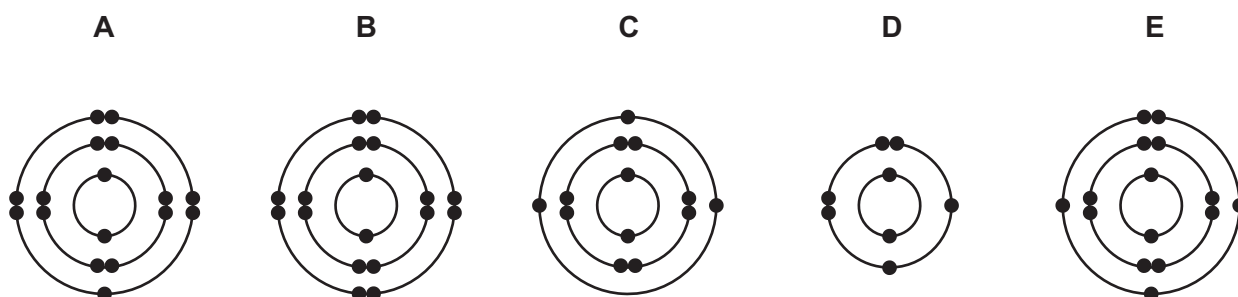
Complete the table.

	number of protons	number of neutrons
$^{12}_6\text{C}$		
$^{13}_6\text{C}$		
$^{14}_6\text{C}$		

.....
 [2]

[Total: 2]

37 The electronic structures of five atoms, A, B, C, D and E, are shown.



State which structure, A, B, C, D or E, represents an atom with only **two** shells of electrons.

..... [1]

[Total: 1]

38 Answer the following question using only the substances in the list.

- ammonia
- bauxite
- carbon dioxide
- carbon monoxide
- hematite
- oxygen
- sodium chloride
- sulfur dioxide

State which substance is an element.

..... [1]

[Total: 1]

39 Give **one** medical use of radioactive isotopes.

..... [1]

[Total: 1]

40 Give **one** industrial use of radioactive isotopes.

..... [1]

[Total: 1]