Atoms, Elements and Compounds – 2023 IGCSE Chemistry 0620

1. Nov/2023/Paper_0620/11/No.3

The Group I element potassium forms an ionic bond with the Group VII element fluorine.

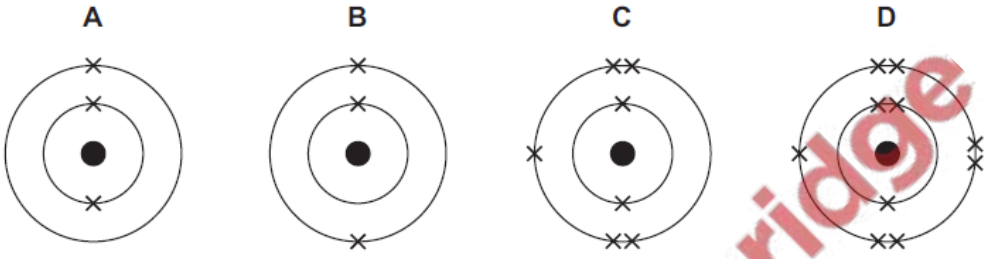
Which two ions are produced?

A K^+ and F^+ **B** K^+ and F^- **C** K^- and F^- **D** K^- and F^+

2. Nov/2023/Paper_0620/11/No.4

An isotope of lithium has the symbol $^{7}_{3}Li$.

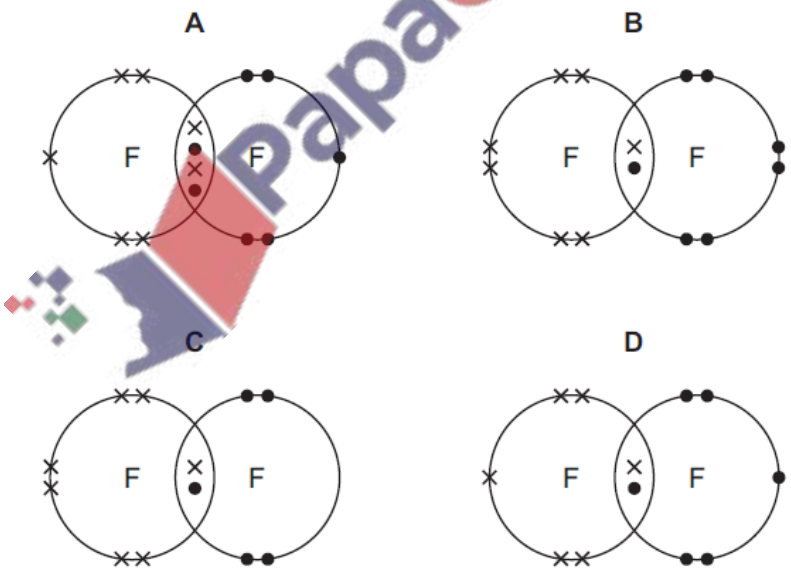
What is the arrangement of electrons in one atom of this isotope of lithium?



3. Nov/2023/Paper_0620/11/No.5

Fluorine, F_2, is in the same group of the Periodic Table as chlorine, Cl_2.

Which diagram represents the arrangement of the outer-shell electrons in a molecule of fluorine?



4. Nov/2023/Paper_0620/11/No.6

Which use of graphite depends on the layers of carbon atoms being able to slide over each other?

A cutting tools

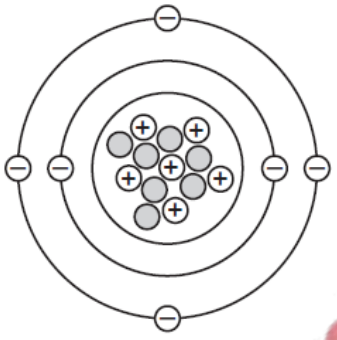
B electrodes

C jewellery

D lubricant

5. Nov/2023/Paper_0620/12/No.3

A representation of an atom is shown.



What is the nucleon number of this atom?

A 6 **B** 7 **C** 12 **D** 13

6. Nov/2023/Paper_0620/12/No.4

Which statement describes isotopes of the same element?

A They have different electron arrangements.

B They have different nuclear charges.

C They have nuclei with masses that are the same.

D They have the same number of protons.

7. Nov/2023/Paper_0620/12/No.5

Potassium reacts with iodine to form potassium iodide.

Which statement about potassium iodide is correct?

A Each potassium atom shares a pair of electrons with an iodine atom.

B In potassium iodide, the particles of potassium have more protons than electrons.

C Potassium iodide has a high melting point because it is a covalent compound.

D Potassium iodide has a low melting point because it is an ionic compound.

8. Nov/2023/Paper_0620/12/No.6

Which row describes the properties of a simple molecular substance?

	boiling point	electrical conductivity when solid
A	low	poor
B	high	poor
C	low	good
D	high	good

9. Nov/2023/Paper_0620/12/No.7

Different forms of an element G are used as lubricants and in cutting tools.

What is the structure of G?

A giant covalent

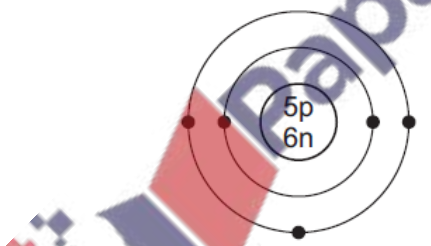
B ionic

C metallic

D simple covalent

10. Nov/2023/Paper_0620/13/No.3

The structure of an atom of element X is shown.



key

● = electron
n = neutron
p = proton

What is element X?

A boron

B carbon

C sodium

D sulfur

11. Nov/2023/Paper_0620/13/No.4

Sodium reacts with chlorine to form sodium chloride.

Which statements describe what happens to the sodium atoms in this reaction?

1 Sodium atoms form positive ions.

2 Sodium atoms form negative ions.

3 Sodium atoms gain electrons.

4 Sodium atoms lose electrons.

A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

12. Nov/2023/Paper_0620/13/No.5

Which statement about ammonia is correct?

A It conducts electricity when liquid.

B It contains three covalent bonds.

C It has a high boiling point.

D It has a giant covalent structure.

13. Nov/2023/Paper_0620/13/No.6

Which row describes the structure and a use of graphite?

	structure	use
A	giant covalent	lubricant
B	giant covalent	cutting tools
C	simple molecular	lubricant
D	simple molecular	cutting tools

14. Nov/2023/Paper_0620/21/No.3

The Group I element potassium forms an ionic bond with the Group VII element fluorine.

Which two ions are produced?

A K^+ and F^+ **B** K^+ and F^- **C** K^- and F^- **D** K^- and F^+

15. Nov/2023/Paper_0620/21/No.4

X and Y are atoms.

- X and Y have the same number of electron shells.
- X and Y have the same number of outer electrons.
- X and Y have different mass numbers.

Which statements about X and Y are correct?

1 X and Y are isotopes.

2 X and Y have the same total number of electrons.

3 X and Y have the same chemical properties.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

16. Nov/2023/Paper_0620/21/No.5

Lithium chloride is an ionic compound and silicon(IV) oxide is a covalent compound.

Which statement about **both** compounds is correct?

A They are not soluble in water.

B They conduct electricity when melted.

C They do not conduct electricity in solid form.

D They have low melting points.

17. Nov/2023/Paper_0620/21/No.9

Graphite has a giant covalent structure.

Which statements about graphite are correct?

1 Carbon atoms form four covalent bonds with neighbouring atoms.

2 There are delocalised electrons between layers of carbon atoms.

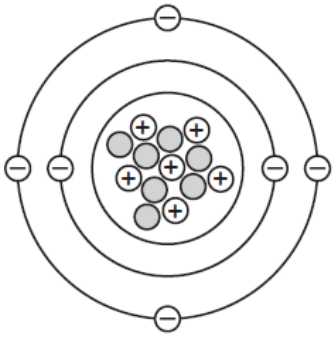
3 Graphite is a useful lubricant.

4 Graphite is a good conductor of electricity.

A 1 and 2 **B** 1, 3 and 4 **C** 2, 3 and 4 **D** 3 and 4 only

18. Nov/2023/Paper_0620/22/No.3

A representation of an atom is shown.



What is the nucleon number of this atom?

A 6 **B** 7 **C** 12 **D** 13

19. Nov/2023/Paper_0620/22/No.4

The percentage abundances of three isotopes in a sample of neon are shown.

isotope	percentage abundance / %
$^{20}_{10}Ne$	90.48
$^{21}_{10}Ne$	0.27
$^{22}_{10}Ne$	9.25

What is the relative atomic mass, A_r, of this sample of neon?

A 10.19 **B** 20.19 **C** 21.00 **D** 30.19

20. Nov/2023/Paper_0620/22/No.5

Potassium reacts with iodine to form potassium iodide.

Which statement about potassium iodide is correct?

A Each potassium atom shares a pair of electrons with an iodine atom.

B In potassium iodide, the particles of potassium have more protons than electrons.

C Potassium iodide has a high melting point because it is a covalent compound.

D Potassium iodide has a low melting point because it is an ionic compound.

21. Nov/2023/Paper_0620/23/No.4

Which statement explains why isotopes of an element have the same chemical reactions?

A They have different numbers of neutrons.

B They have ions with different numbers of electrons.

C They have the same number of outer shell electrons.

D They have the same number of protons.

22. Nov/2023/Paper_0620/23/No.5

Magnesium reacts with oxygen to form magnesium oxide.

What happens to magnesium atoms and oxygen atoms during this reaction?

A Magnesium and oxygen share two electrons.

B Magnesium gains two electrons and oxygen loses two electrons.

C Magnesium loses one electron and oxygen gains one electron.

D Magnesium loses two electrons and oxygen gains two electrons.

23. Nov/2023/Paper_0620/23/No.6

Which row about the properties of both diamond and silicon(IV) oxide is correct?

	conductor of electricity	type of molecule
A	yes	giant covalent
B	yes	simple covalent
C	no	giant covalent
D	no	simple covalent

24. Nov/2023/Paper_0620/31/No.8(a, b, c, e)

Lithium bromide is a compound with ionic bonding.

(a) State the meaning of the term ionic bond.

.....

..... [2]

(b) Complete Fig. 8.1 to show:

- the electronic configuration of a lithium ion
- the charge on the ion.

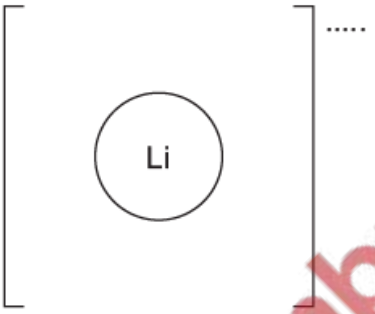


Fig. 8.1

[2]

(c) Deduce the number of protons and neutrons in the bromide ion shown.

$^{79}_{35}Br^-$

number of protons .....

number of neutrons .....

[2]

(e) Fig. 8.2 shows the structure of graphite.

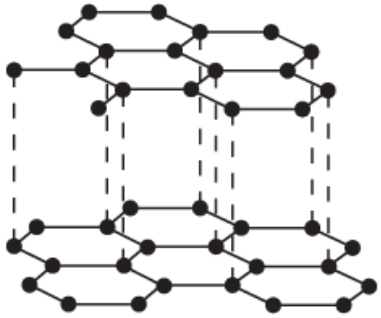


Fig. 8.2

(i) State the type of bonding in graphite.

..... [1]

(ii) Explain by referring to Fig. 8.2 why graphite is used as a lubricant.

..... [1]

(iii) Graphite and diamond are both forms of carbon.

State **one** use of diamond.

..... [1]

25. Nov/2023/Paper_0620/32/No.8(a _ c)

Zinc chloride is an ionic compound.

(a) Ionic compounds are good electrical conductors when molten or in aqueous solution.

Describe one **other** physical property of ionic compounds.

..... [1]

(b) Complete Fig. 8.1 to show:

- the electronic configuration of a chloride ion
- the charge on the ion.

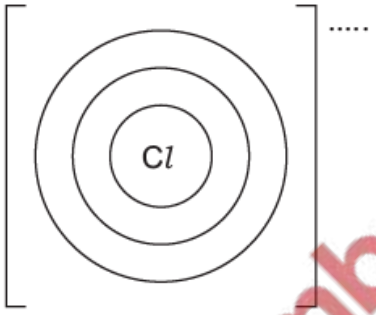


Fig. 8.1

[2]

(c) (i) Deduce the number of protons and neutrons in the zinc ion shown.

$^{67}_{30}Zn^{2+}$

number of protons .....

number of neutrons .....

[2]

(ii) Complete this sentence about positive ions.

Positive ions are known as ..... . [1]

26. Nov/2023/Paper_0620/33/No.3(c)

(c) Nitrogen dioxide is an acidic oxide.

Choose an oxide from the list which is also an acidic oxide.

Tick (✓) **one** box.

copper(II) oxide	☐
magnesium oxide	☐
phosphorus(V) oxide	☐
sodium oxide	☐

[1]

27. Nov/2023/Paper_0620/41/No.1(c)

A list of gases is shown.

ammonia
carbon dioxide
carbon monoxide
ethene
fluorine
oxygen
sulfur dioxide
xenon

Answer the following questions using only the gases from the list.
Each gas may be used once, more than once or not at all.

Give the name of the gas that:

(c) is inert

..... [1]

28. Nov/2023/Paper_0620/41/No.2(a, f)

Boron and aluminium are Group III elements.

(a) Boron has only two naturally occurring isotopes, ^{10}B and ^{11}B.

Complete Table 2.1 to show the numbers of protons, neutrons and electrons in an atom of ^{11}B.

Table 2.1

number of protons	number of neutrons	number of electrons

[2]

(f) Aluminium reacts with fluorine to form aluminium fluoride, AlF_3, an ionic compound.

(i) Write the symbol equation for this reaction.

..... [2]

(ii) Complete Fig. 2.2 to show the electronic configuration of one aluminium ion and one fluoride ion.
Show the charges on the ions.

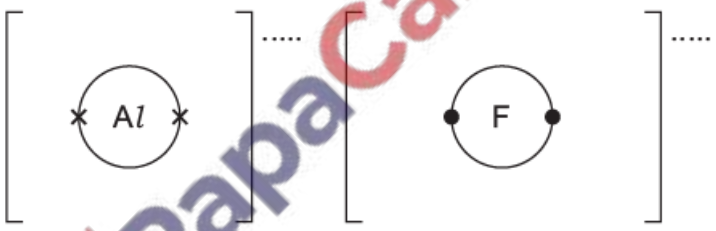


Fig. 2.2

[3]

29. Nov/2023/Paper_0620/42/No.2(a)

Cobalt and copper are transition elements.

(a) Copper has two naturally occurring isotopes, ^{63}Cu and ^{65}Cu. Cobalt has only one naturally occurring isotope, ^{59}Co.

(i) Complete Table 2.1 to show the number of protons, neutrons and electrons in the ^{59}Co atom and the $^{65}Cu^{2+}$ ion.

Table 2.1

	^{59}Co	$^{65}Cu^{2+}$
protons		
neutrons		
electrons		

[3]

(ii) Table 2.2 shows the relative abundance of the two naturally occurring isotopes of copper.

Table 2.2

isotope	^{63}Cu	^{65}Cu
relative abundance	70%	30%

Calculate the relative atomic mass of copper to **one** decimal place.

relative atomic mass = ... [2]

30. Nov/2023/Paper_0620/43/No.2

Table 2.1 gives information about particles **A**, **B**, **C**, **D**, **E** and **F**.

Table 2.1

particle	number of electrons	number of neutrons	number of protons
A	5	6	5
B	10	11	10
C	10	14	13
D	18	17	16
E	18	17	17
F	15	16	15

(a) Give the letters of **all** the particles which are:

(i) atoms

..... [1]

(ii) ions with a charge of 2–

..... [1]

(iii) cations.

..... [1]

(b) State the atomic number of **A**.

..... [1]

(c) Determine the number of nucleons in **D**.

..... [1]

(d) State the electronic configuration of **D**.

..... [1]

(e) State the group number of **F**.

..... [1]

(f) State the period number of **B**.

..... [1]

[Total: 8]