OCT-Holiday Pack (G1 Chemistry 2024) **Name:.....ID.....**

1

Which of the following contains the same number of electrons as an atom of neon?

A Cl^-

B Li

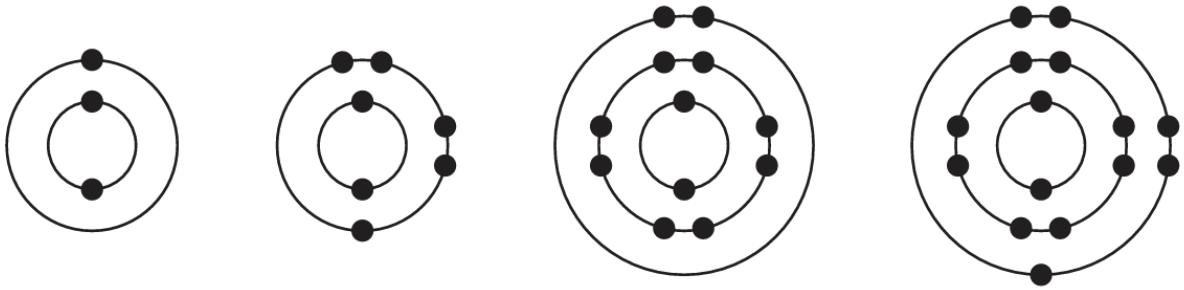
C Li^+

D O^{2-}

2

The diagrams show the arrangements of the electrons of four elements.

element 1 element 2 element 3 element 4



Which two elements are metals?

A 1 and 2

B 1 and 3

C 2 and 4

D 3 and 4

3

The formulae of the ions of four elements are shown below.

O^{2-} F^- Li^+ Mg^{2+}

Which statement about these ions is correct?

They all have

A the same number of electrons in their outer shells.

B the same electronic structure as a noble gas.

C the same number of protons in their nuclei.

D more electrons than protons.

4

An element X has two isotopes, ^{238}X and ^{235}X.

How does ^{238}X differ from ^{235}X?

A It has 3 more protons and 3 more electrons.

B It has 3 more protons, but no more electrons.

C It has 3 more neutrons and 3 more electrons.

D It has 3 more neutrons, but no more electrons.

5

What is the structure of the ion $^{90}_{38}Sr^{2+}$?

	protons	neutrons	electrons
A	38	52	36
B	38	52	38
C	38	90	36
D	52	38	36

6

The atoms $^{64}_{29}Cu$ and $^{65}_{30}Zn$ have the same

A nucleon number.

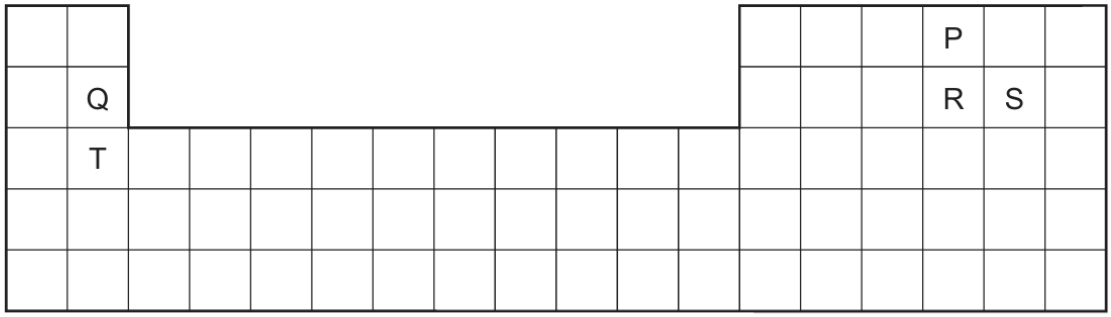
B number of electrons.

C number of neutrons.

D proton number.

7

The diagram shows part of the Periodic Table.



Which pair of letters represents elements that are in the same period?

A P and R **B** P and S **C** Q and T **D** R and S

8

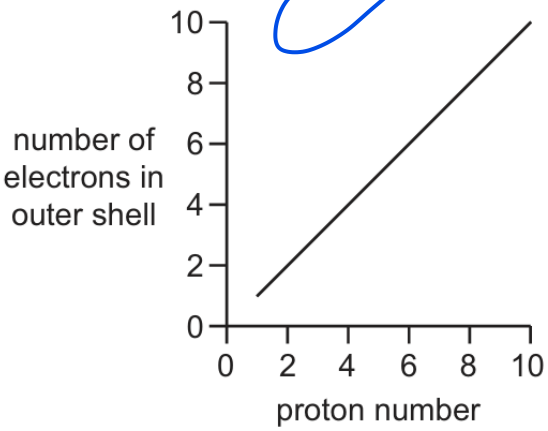
Which row shows the correct number of protons and electrons in the ion of an element in Group II of the Periodic Table?

	number of protons	number of electrons
A	9	10
B	12	10
C	14	14
D	16	18

9

Which graph shows the number of electrons in the outer shell of an atom, plotted against the proton (atomic) number for the first ten elements in the Periodic Table?

A



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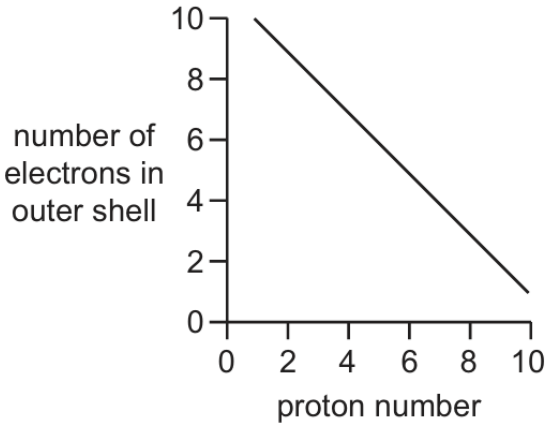

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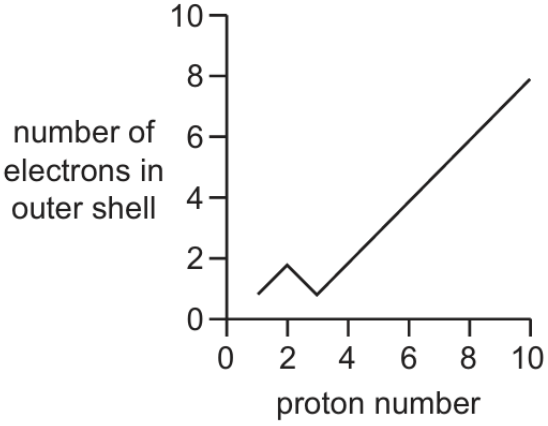

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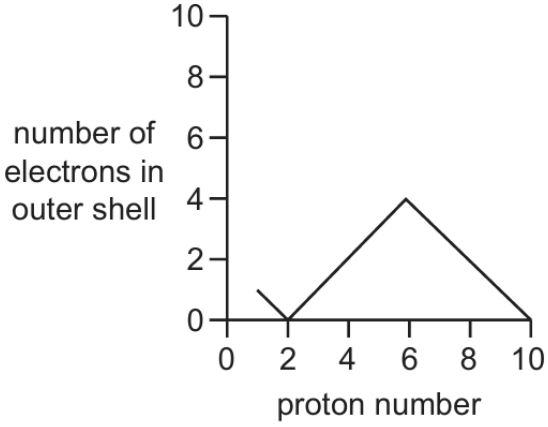


10

An atom of which element gains three electrons when it forms an ion?

A aluminium

B iron

C nitrogen

D silicon

11

In terms of electrons, what happens when potassium combines with iodine to form a compound?

A The atoms of both elements each lose one electron.

B The atoms of both elements each gain one electron.

C The potassium atoms each lose one electron and the iodine atoms each gain one electron.

D The potassium atoms each gain one electron and the iodine atoms each lose one electron.

12

An atom, X, contains 16 protons.

Which statement about X is correct?

A It cannot form an ion.

B It contains 6 electrons in the outer shell.

C It contains 6 neutrons.

D It has relative atomic mass of 16.

13

Naturally-occurring bromine has a relative atomic mass of 80 and consists entirely of two isotopes of relative atomic masses 79 and 81.

What can be deduced about naturally-occurring bromine from this information only?

A Bromine contains the two isotopes in equal proportions.

B Bromine has different oxidation states.

C Bromine isotopes have different numbers of protons.

D Bromine is radioactive.

14

An atom of which element has the same electronic configuration as the strontium ion?

A calcium

B krypton

C rubidium

D selenium

15

Element Q has 4 electrons in its outer shell and has 69 neutrons. Q conducts electricity.

What is Q?

A carbon (C)

B lead (Pb)

C thulium (Tm)

D tin (Sn)

16

Which statement describes positive ions?

A Positive ions have more electrons than neutrons.

B Positive ions have more protons than neutrons.

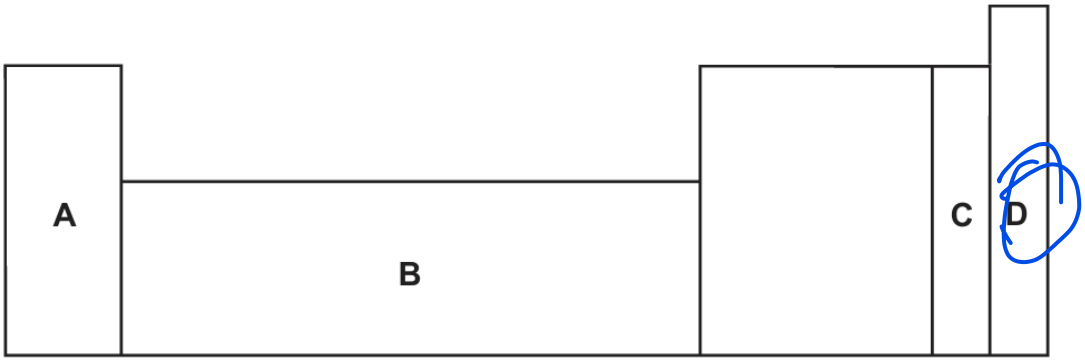
C Positive ions have more electrons than protons.

D Positive ions have more protons than electrons.

17

An element does not conduct electricity and exists as diatomic molecules.

Where in the Periodic Table is the element found?



18

In the Periodic Table, how does the metallic character of the elements vary from left to right across a period?

A It decreases.

B It increases.

C It increases then decreases.

D It stays the same.

19

An aluminium atom has a nucleon number of 27 and a proton number of 13.

How many neutrons does this aluminium atom contain?

A 13 **B** 14 **C** 27 **D** 40

20

An atom of element Q contains 19 electrons, 19 protons and 20 neutrons.

What is Q?

A calcium

B potassium

C strontium

D yttrium

21

The table shows the atomic structure of four atoms.

Which atom is **not** a metal?

	electrons	neutrons	protons
A	18	22	18
B	19	20	19
C	19	21	19
D	20	20	20

22

Which statement about atoms is correct?

A Atoms contain protons and electrons in the nucleus.

B Neutrons are negatively charged.

C Protons are positively charged.

D The nucleon number is the number of neutrons.

23

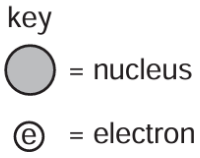
Which diagram correctly shows the ions present in the compound potassium fluoride?

A K^+ F

B K F^+

C K^+ F

D K F^+



24

What do the nuclei of $^{1}_{1}H$ hydrogen atoms contain?

A electrons and neutrons

B electrons and protons

C neutrons only

D protons only

25

The table shows the nucleon number and the number of neutrons in one atom of isotopes W, X, Y and Z.

isotope	nucleon number	number of neutrons
W	3	18
X	3	20
Y	3	20
Z	4	22

Which statement about W, X, Y and Z is correct?

A W and X are isotopes of the same element.

B X and Y are isotopes of elements in the same group of the Periodic Table.

C Y and Z are isotopes of elements in the same period of the Periodic Table.

D Z has a higher proton number than Y.

26

Atoms contain electrons, neutrons and protons.

What is the definition of nucleon number?

A the number of neutrons in the nucleus of an atom

B the number of protons in the nucleus of an atom

C the total number of neutrons and protons in the nucleus of an atom

D the total number of particles in an atom

Section:2

1

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)

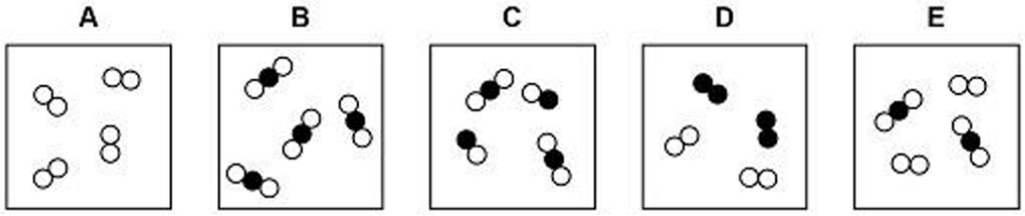
2

This question is about elements, compounds and mixtures.

Figure 1 shows five different substances, **A**, **B**, **C**, **D** and **E**.

○ and ● represent atoms of different elements.

Figure 1



Use **Figure 1** to answer parts (a) to (c)

(a) Which substance is only one compound?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(b) Which substance is a mixture of elements?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(c) Which substance is a mixture of an element and a compound?

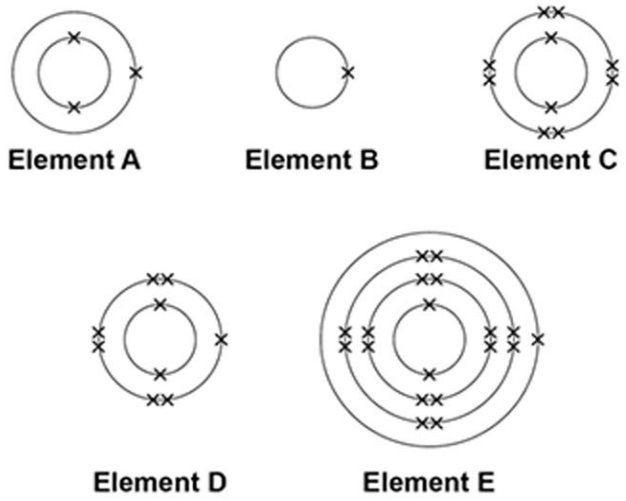
Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

3

The electronic structure of the atoms of five elements are shown in the figure below.

The letters are **not** the symbols of the elements.



Choose the element to answer the question. Each element can be used once, more than once or not at all.

Use the periodic table to help you.

(a) Which element is hydrogen?

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(b) Which element is a halogen?

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(c) Which element is a metal in the same group of the periodic table as element **A**?

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(d) Which element exists as single atoms?

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(e) There are two isotopes of element **A**. Information about the two isotopes is shown in the table below.

Mass number of the isotope	6	7
Percentage abundance	92.5	7.5

Use the information in the table above above to calculate the relative atomic mass of element **A**.
Give your answer to 2 decimal places.

_____

_____

_____

_____

_____

_____

_____

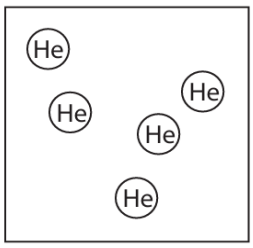
4

(a) Substances can be classified as elements, compounds or mixtures.

Each of the diagrams below represents either an element, a compound or a mixture.

State which one of these is represented by each diagram.

(i)



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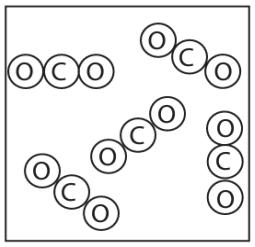
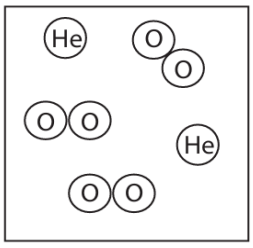
(ii)



(1)

(iii)



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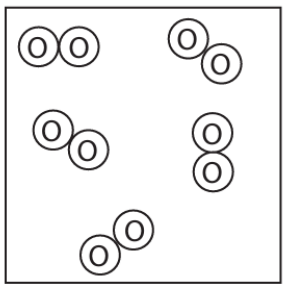
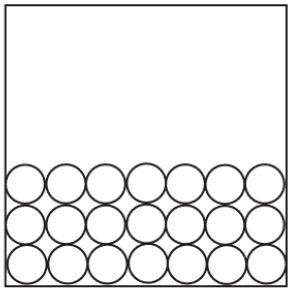
(iv) 

(1)

(b) Substances can also be classified as solids, liquids or gases.

Each of the diagrams below represents either a solid, a liquid or a gas.

State which one of these is represented by each diagram.

(i) 

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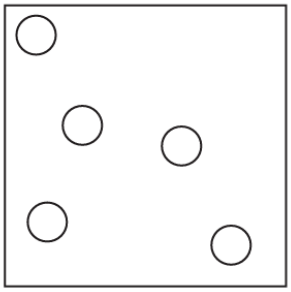
(ii) 

(1)

Important!

Pre-read and memorise the names of these common **ions:**

FORMULAE OF IONIC COMPOUNDS

An ion is a species in which the number of electrons is not equal to the number of protons. An ion thus has an overall charge, characteristic of the difference in the number of protons and electrons. Ions with a positive charge are known as **cations** and ions with a negative charge are known as **anions**.

Compounds made up of ions are known as **salts**. They are all electrically neutral, so must all contain at least one anion and at least one cation.

Salts do not have molecular formulae, as they do not form molecules. They are written as formulae unit.

The **unit formula** of an ionic compound is the formula which shows the simplest whole number ratio in which the ions in the compound exist. This depends on the charges of the ions involved. Some important ions and their charges are shown below:

i) Cations

Charge	Formula	Name
+1	Na^+	Sodium
+1	K^+	Potassium
+1	Ag^+	Silver
+1	H^+	Hydrogen
+1	NH_4^+	Ammonium
+1	Cu^+	Copper(I)
+2	Mg^{2+}	Magnesium
+2	Ca^{2+}	Calcium
+2	Fe^{2+}	Iron(II)
+2	Zn^{2+}	Zinc
+2	Pb^{2+}	Lead(II)
+2	Cu^{2+}	Copper(II)
+2	Ni^{2+}	Nickel(II)
+3	Al^{3+}	Aluminium
+3	Cr^{3+}	Chromium(III)
+3	Fe^{3+}	Iron(III)

Note that some atoms can form more than one stable cation. In such cases it is necessary to specify the charge that is on the cation by writing the charge in brackets after the name of the metal.

ii) anions

Charge	Formula	Name
-1	OH^-	Hydroxide
-2	SO_4^{2-}	Sulphate (sulphate VI)
-2	SO_3^{2-}	Sulphite (sulphate IV)
-2	CO_3^{2-}	Carbonate
-1	NO_3^-	Nitrate
-1	HCO_3^-	Hydrogencarbonate
-3	PO_4^{3-}	Phosphate (V)

These names end in **"-ide"**

1. <u>Halide</u>

a) Chloride (Cl^-)
b) Bromide (Br^-)
c) Iodide(I^-)

2. Oxide (O^{2-})
3. Nitride (N^{3-})
4. Phosphide (P^{3-})