

C2 The Periodic Table Homework task 1

Q1.

This question is about the periodic table.

- (a) **Figure 1** shows part of Mendeleev's version of the periodic table.

Figure 1

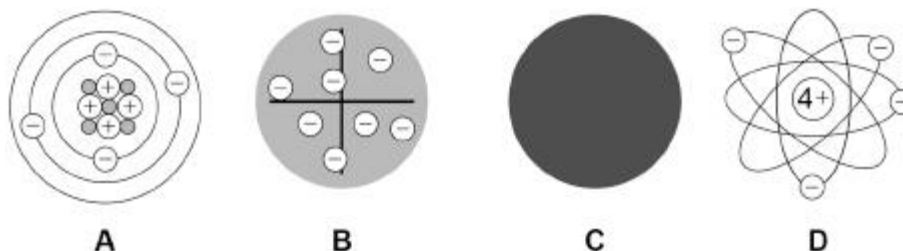
H							
Li	Be	B	C	N	O	F	
Na	Mg	Al	Si	P	S	Cl	
K	Ca		Ti	V	Cr	Mn	Fe Co Ni
	Cu	Zn			As	Se	Br
Rb	Sr	Y	Zr	Nb	Mo		Ru Rh Pd
	Ag	Cd	In	Sn	Sb	Te	I

Which group of elements had **not** been discovered when Mendeleev's version of the periodic table was published?

(1)

Figure 2 represents different models of the atom.

Figure 2



- (b) Which model represents the plum pudding model?

Tick (✓) **one** box.

A
B
C
D

(1)

- (c) Which model resulted from Chadwick's experimental work?

Tick (✓) **one** box.

A
B
C
D

(1)

Potassium has different isotopes.

(d) What is meant by 'isotopes'?

You should refer to subatomic particles.

(2)

(e) The table below shows the mass numbers and the percentage abundance of two isotopes of potassium.

Mass number	Percentage abundance
39	93.1
41	6.9

Calculate the relative atomic mass (A_r) of potassium.

Give your answer to 1 decimal place.

Relative atomic mass (1 decimal place) = _____

(3)

(Total 8 marks)

Q2. This question is about groups in the periodic table.

Neon and argon are Group 0 elements.

(a) What name is given to Group 0?

(1)

(b) Give **one** similarity of the electronic structure of neon and the electronic structure of argon.

(1)

- (c) Give **one** difference between the electronic structure of neon and the electronic structure of argon.

(1)

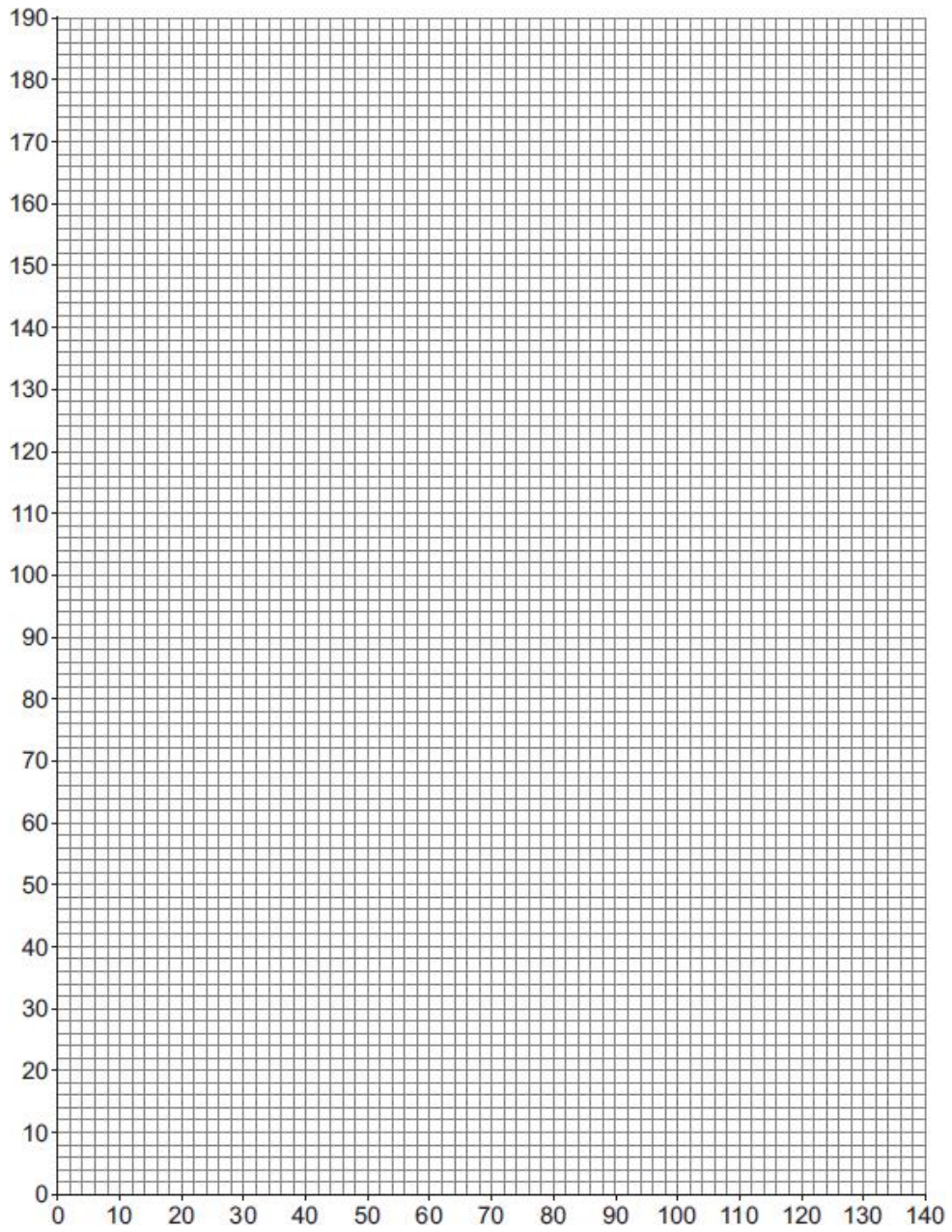
- (d) The table below shows information about elements in Group 1.

Element	Relative atomic mass	Melting point in °C
Lithium	7	181
Sodium	23	98
Potassium	39	64
Rubidium	85	39
Caesium	133	29

Complete the graph below.

You should:

- label both axes
- plot the data from the table above.



(3)

(e) Give **one** conclusion from the data in the graph above.

(1)

(Total 7 marks)

Higher Tier Questions

Q3.

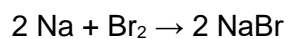
This question is about halogens.

Bromine reacts with sodium to produce sodium bromide.

- (a) Describe the structure of and bonding in sodium bromide.

(2)

- (b) The equation for the reaction is:



1 g of bromine reacts with sodium.

Calculate the number of bromine molecules in 1 g of bromine.

1 mole of bromine contains 6.02×10^{23} bromine molecules.

Relative formula mass (M_r) of bromine = 160

Number of bromine molecules = _____

(3)

(c) The table below shows the boiling points of some halogens.

Halogen	Boiling point in °C
Bromine	60
Chlorine	-34
Fluorine	-188

Explain the trend in the boiling points of the halogens.

(4)

(Total 9 marks)

Q4.

This question is about elements in the periodic table.

(a) What order did scientists use to arrange elements in early periodic tables?

(1)

(b) In the early periodic tables some elements were placed in the wrong groups.

Mendeleev overcame this in his periodic table.

Give **one** way Mendeleev did this.

(1)

The table shows the boiling points of fluorine, chlorine and bromine.

Element	Boiling point in °C
Fluorine	-186
Chlorine	-34
Bromine	+59

(c) Explain why the boiling points in the table are low.

(2)

(d) Explain the trend in the boiling points in the table above.

(3)

(e) Explain why neon is unreactive.

Give the electronic structure of neon in your answer.

(2)

(f) How many atoms are there in 1 g of argon?

The Avogadro constant is 6.02×10^{23} per mole.

Relative atomic mass (A_r): Ar = 40

Number of atoms in 1 g = _____

(2)

(Total 11 marks)

Mark schemes

Q1.

- (a) (Group) 0
or
noble gases 1
- (b) B 1
- (c) A 1
- (d) (atoms with the) same number of protons
allow atoms with the same atomic number
allow atoms of the same element
ignore the same number of electrons 1
- (but with) different numbers of neutrons
ignore (but with) different mass numbers
*do **not** accept (but with) different relative atomic mass* 1
- (e)
$$\frac{(39 \times 93.1) + (41 \times 6.9)}{100}$$

= 39.138 1
= 39.1 1
allow correctly rounded answer to 1 decimal place from an incorrect calculation using all the values given in the question 1

[8]

Q2.

- (a) noble gases 1
- (b) (both have) complete outer energy levels
allow shell for energy level
allow 8 electrons in the outer / second energy level
allow 2 electrons in the innermost energy level 1
- (c) (different) number of energy levels / shells
allow different (total) number of electrons
*allow neon is 2,8 **and** argon is 2,8,8* 1

- (d) (y-axis) melting point in °C
and
(x-axis) relative atomic mass
- 1

all five points plotted correctly

allow a tolerance of $\pm \frac{1}{2}$ a small square

allow 1 mark for four points plotted correctly

2

- (e) the higher the relative atomic mass, the lower the melting point

allow converse

allow going down Group 1 the melting point decreases

ignore negative correlation

1

[7]

Q3.

- (a) giant structure of ions
- 1

with strong electrostatic forces of attraction

if no other mark awarded allow 1 mark for ionic bonding

1

- (b) (moles bromine = $\frac{1}{160}$)
0.00625
- 1

(molecules of bromine =)
 $0.00625 \times 6.02 \times 10^{23}$

allow correct use of an incorrectly calculated value for moles of bromine

1

(molecules of bromine =)
 3.76×10^{21} (molecules)

allow 3.7625×10^{21} (molecules)

1

allow converse

- (c) boiling point decreases up the group

allow boiling point decreases down the table

1

(because) the relative formula / molecular mass decreases

or

(because) the size of the molecule decreases

1

(so) the intermolecular forces decrease (in strength)

allow (so) the forces between molecules decrease (in strength)

1

(so) less energy is needed to overcome the intermolecular forces

allow (so) less energy is needed to separate the molecules

*do **not** accept a reference to breaking bonds unless specifically between molecules*

1

[9]

Q4.

(a) atomic weight

*do **not** accept atomic mass or A_r*

1

(b) left gaps / spaces

or

changed the order based on atomic weights

allow placed them in correct groups according to properties

*do **not** accept reference to atomic number*

1

(c) weak forces between the molecules

or

weak intermolecular forces

allow weak intermolecular bonds

*do **not** accept incorrect references to covalent bonds*

1

(so) little energy required to overcome / break the forces between molecules

or

(so) little energy required to overcome / break the intermolecular forces

allow (so) little energy required to separate the molecules

allow (so) little energy required to overcome / break the intermolecular bonds

ignore less energy

1

(d)

allow converse explanation in terms of boiling point

(the) molecules get larger going down the group

1

(so the) forces between the molecules increase

or

(so the) intermolecular forces increase

1

(so the) boiling points increase going down the group

or

(so the) boiling points increase with increasing relative atomic mass

allow (so) more energy is needed to separate the molecules

1

(e) 2,8

allow diagram or description

1

(so) stable arrangement of electrons

or

(so) full outer shell

1

(f)

an answer of 1.51×10^{22} scores 2 marks

$$\frac{1}{40} \times 6.02 \times 10^{23}$$

or

$$0.025 \times 6.02 \times 10^{23}$$

1

$$1.51 \times 10^{22}$$

allow 1.505×10^{22}

1

[11]