New Document 1

Name: _____

Class: _____

Date: _____

Time: **44 minutes**

Marks: **43 marks**

Comments:

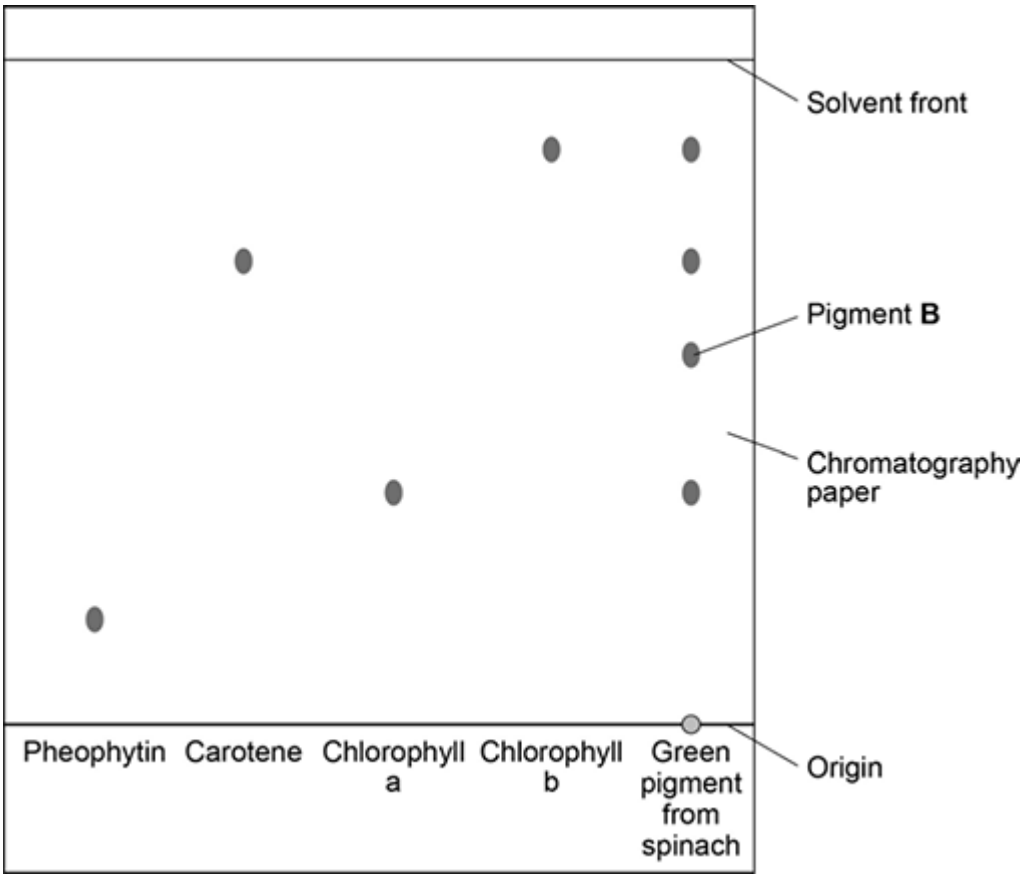
Q1.

A student used paper chromatography to identify the pigments in spinach leaves.

She used propanone as a solvent.

Figure 1 shows the student's results.

Figure 1



(a) Name the mobile phase and the stationary phase in the student's experiment.

Mobile phase _____

Stationary phase _____

_____

(2)

(b) What does **Figure 1** tell you about the green pigment from spinach?

_____

_____

_____

_____

_____

_____

(3)

(c) Write the equation that links distance moved by solvent, distance moved by solute and R_f value.

_____

(1)

(d) Use **Figure 1** to calculate the R_f value for pigment **B**.

_____

_____

_____

_____

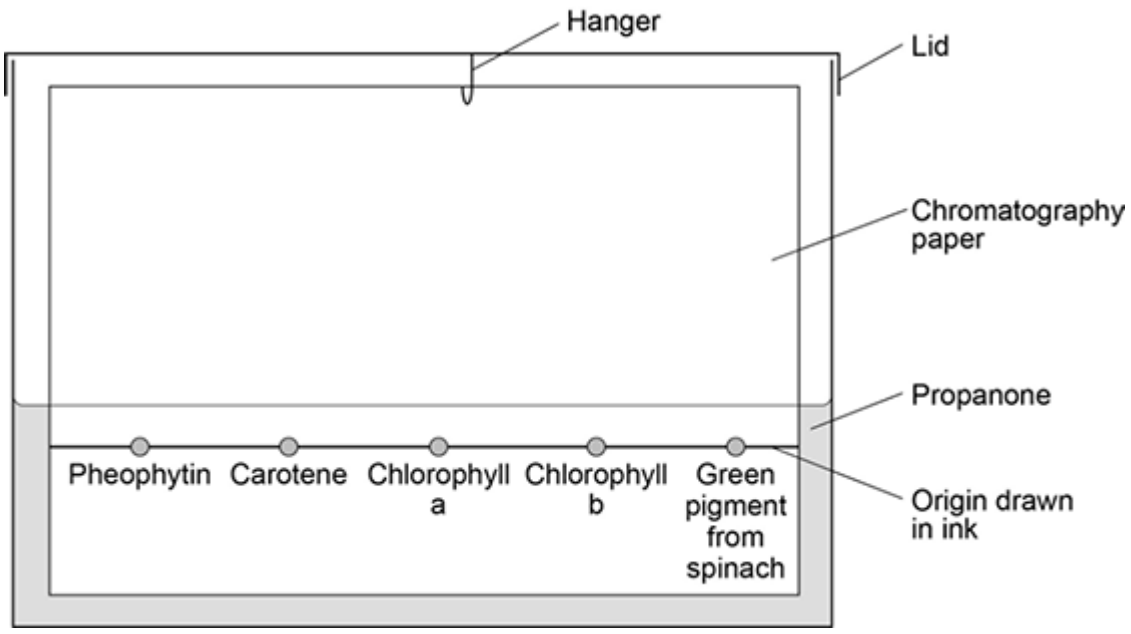
_____

R_f value = _____

(3)

(e) Another student set up the apparatus shown in **Figure 2**.

Figure 2



This student did not set up the apparatus correctly.

Identify the errors the student made.

Explain how the errors she made would affect her results.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 13 marks)

Q2.

This question is about atomic structure and elements.

(a) Complete the sentences.

(i) The atomic number of an atom is the number of _____

(1)

(ii) The mass number of an atom is the number of _____

_____

(1)

(b) Explain why an atom has no overall charge.

Use the relative electrical charges of sub-atomic particles in your explanation.

_____

_____

_____

_____

(2)

(c) Explain why fluorine and chlorine are in the same group of the periodic table.

Give the electronic structures of fluorine and chlorine in your explanation.

_____

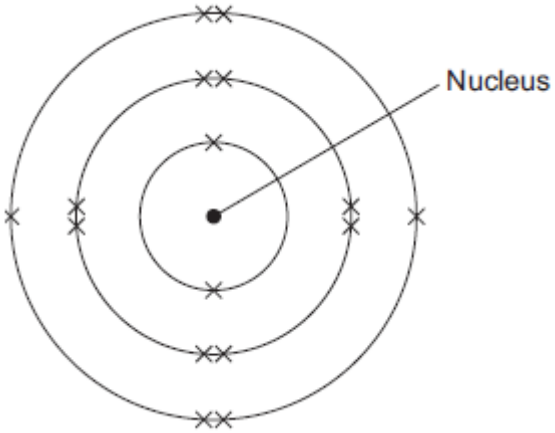
_____

_____

_____

(2)

(d) The diagram shows the electronic structure of an atom of a non-metal.



What is the chemical symbol of this non-metal?

Tick (✓) **one** box.

Ar ☐

O ☐

S ☐

Si ☐

(1)

(e) When elements react, their atoms join with other atoms to form compounds.

Complete the sentences.

(i) Compounds formed when non-metals react with metals consist of particles called _____ .

(1)

(ii) Compounds formed from only non-metals consist of particles called _____ .

(1)

(Total 9 marks)

Q3.

In 1866 John Newlands produced an early version of the periodic table.

Part of Newlands' periodic table is shown below.

Column	**1**	**2**	**3**	**4**	**5**	**6**	**7**

H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe

Newlands' periodic table arranged all the known elements into columns in order of their atomic weight.

Newlands was trying to show a pattern by putting the elements into columns.

(a) Iron (Fe) does **not** fit the pattern in column 7.

Give a reason why.

_____

_____

(1)

(b) In 1869 Dmitri Mendeleev produced his version of the periodic table.

Why did Mendeleev leave gaps for undiscovered elements in his periodic table?

_____

_____

(1)

(c) Newlands and Mendeleev placed the elements in order of atomic weight.

Complete the sentence.

The modern periodic table places the elements in order of

_____ .

(1)

(d) Lithium, sodium and potassium are all in Group 1 of the modern periodic table.

Explain why.

_____

_____

_____

_____

(2)

(Total 5 marks)

Q4.

This question is about the halogens (Group 7).

(a) How do the boiling points of the halogens change down the group from fluorine to iodine?

_____

_____

(1)

(b) Sodium bromide is produced by reacting sodium with bromine.

Sodium bromide is an ionic compound.

(i) Write down the symbols of the **two** ions in sodium bromide.

_____

(1)

(ii) Chlorine reacts with sodium bromide solution to produce bromine and one other product.

Complete the word equation for the reaction.

chlorine + sodium bromide ⟶ bromine + _____

(1)

(iii) Why does chlorine displace bromine from sodium bromide?

_____

_____

(1)

(iv) Use the Chemistry Data Sheet to help you to answer this question.

Suggest which halogen could react with sodium chloride solution to produce chlorine.

_____

(1)

(Total 5 marks)

Q5.

(a) The symbols for seven different elements are shown in **Figure 1**.

Figure 1

																	He
	Be																
Na														S		Ar	
	Ca						Fe										

Choose the correct symbol from **Figure 1** to answer each question.

You may use each symbol once, more than once or not at all.

Write the symbol that represents:

(i) a Group 1 element

_____

(1)

(ii) a transition metal

_____

(1)

(iii) an element with electrons in the same number of energy levels as an atom of argon (Ar)

_____

(1)

(iv) an element which forms an oxide that dissolves in water to form an acidic solution

_____

(1)

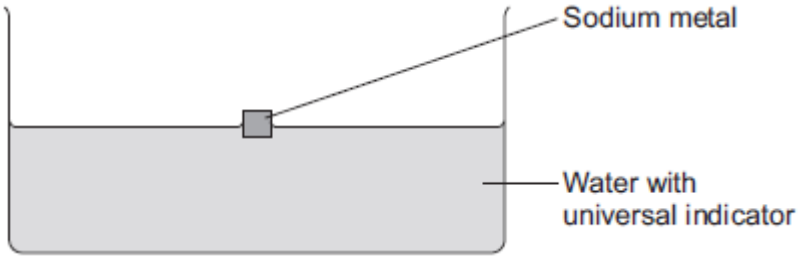
(v) an element that forms a chloride with the formula XCl

_____

(1)

(b) A teacher put a cube of sodium metal into water containing universal indicator, as shown in **Figure 2**.

Figure 2



The equation for the reaction is:

$$2Na(s) + 2H_2O(l) \longrightarrow 2NaOH\ (aq) + H_2(g)$$

sodium + water ⟶ sodium hydroxide + hydrogen

(i) The sodium floated on the surface of the water. The universal indicator turned purple.

Give **three other** observations that would be seen during the reaction.

1. _____

_____

2. _____

_____

3. _____

_____

(3)

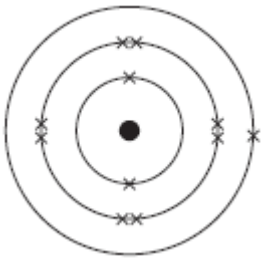
(ii) Name the ion that made the universal indicator turn purple.

_____

(1)

(c) **Figure 3** represents the electronic structure of a sodium atom.

Figure 3



In the space below, draw the electronic structure of a sodium ion. Include the charge on the ion.

(2)

(Total 11 marks)

Mark schemes

Q1.

(a) **mobile phase** propanone

1

stationary phase paper

1

(b) any **three** from:

- contains chlorophyll a, b and carotene
- contains Pigment B
- does not contain pheophytin
- contains (at least) one unknown substance
- contains five substances
- contains a substance that does not dissolve in the solvent

3

(c) $Rf = \frac{\textit{distance moved by substance}}{\textit{distance moved by solvent}}$

1

(d) both measurements correct

solvent front = 9.0 cm and pigment B distance = 5.0 cm

1

R_f = 5.0 / 9.0

1

= 0.56

allow ecf from incorrect measurements

1

(e) origin line drawn in ink

1

so it will run **or** dissolve in the solvent **or** split up

1

spots under solvent **or** solvent above spots / origin line

1

so they will mix with solvent **or** wash off paper **or** colour the solvent **or** dissolve in the solvent

1

[13]

Q2.

(a) (i) protons

allow "protons or electrons", but do not allow "protons and electrons"

1

(ii) protons plus / and neutrons

1

(b) (because the relative electrical charges are) −(1) for an electron and +(1) for a

proton

allow electrons are negative and protons are positive

1

and the number of electrons is equal to the number of protons

if no other mark awarded, allow 1 mark for the charges cancel out

1

(c) (the electronic structure of) fluorine is 2,7 and chlorine is 2,8,7

allow diagrams for the first marking point

1

(so fluorine and chlorine are in the same group) because they have the same number of or 7 electrons in their highest energy level or outer shell

if no other mark awarded, allow 1 mark for have the same / similar properties

1

(d) S

1

(e) (i) ions

1

(ii) molecules

1

[9]

Q3.

(a) (iron) is a metal

accept transition element

allow (iron) had different properties (to oxygen and sulfur)

ignore electrons

1

(b) so that elements with similar properties could be placed together

allow to make the pattern fit

ignore undiscovered elements

1

(c) atomic number(s)

allow proton number(s)

1

(d) all have one electron in the outer shell (highest energy level)

allow same number of electrons in the outer shell (highest energy level)

1

(so they) have similar properties

or

react in the same way

allow specific reactions e.g. with water

1

[5]

Q4.

(a) increase

1

(b) (i) Na^+ **and** Br^-

both required

1

(ii) sodium chloride

allow NaCl

*do **not** allow sodium chlorine*

1

(iii) chlorine is more reactive than bromine

allow converse argument

allow symbols Cl, Cl_2, Br and Br_2

allow chlorine / it is more reactive

*do **not** allow chloride **or** bromide*

1

(iv) fluorine

allow F / F_2.

*do **not** allow fluoride.*

1

[5]

Q5.

(a) (i) Na

allow sodium / phonetic spelling

if more than one answer is given apply list principle

1

(ii) Fe

allow iron / phonetic spelling

if more than one answer is given apply list principle

1

(iii) Na **or** S

allow sodium or sulfur / sulphur / phonetic spelling

if more than one answer is given apply list principle

1

(iv) S

allow sulfur / sulphur / phonetic spelling

if more than one answer is given apply list principle

1

(v) Na

allow sodium / phonetic spelling

if more than one answer is given apply list principle

1

(b) (i) any **three** from:

- effervescence / fizzing **or** bubbles **or** gas produced

*do **not** allow incorrectly named gas*

- sodium melts **or** turns into a ball
- sodium moves (on the surface)
- steam / mist / vapour is produced

  ignore heat / temperature / flame / spark
- sodium gets smaller / disappears

  allow dissolves
- colour of indicator is darker / more intense near the sodium

  Must be linked to near the sodium.

3

(ii) hydroxide **or** OH^-

allow OH without a charge

*do **not** allow OH^+*

1

(c)

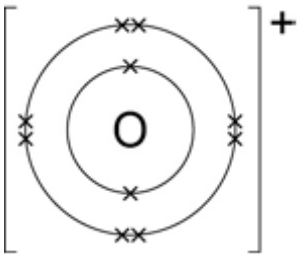


diagram showing electron configuration of ion is 2,8

1

charge on ion is +

Bracket not necessary

$[2,8]^+$ is worth 1 mark as there is no diagram

1

[11]