

1

The periodic table on the Data Sheet may help you to answer this question.

- (a) Newlands and Mendeleev both designed periodic tables in which the elements were put in the order of their relative atomic masses.

When the elements are put in this order a few of them are placed incorrectly when compared with a modern periodic table.

- (i) Give **one** example of a pair of elements that would be placed incorrectly if they were in the order of their relative atomic masses.

..... and

(1)

- (ii) Explain why placing these two elements in the order of their relative atomic masses would **not** be correct.

.....
.....

(1)

- (b) In the modern periodic table the elements are put in order of their atomic (proton) numbers.

Explain how the positions of the elements in the periodic table are linked to the electronic structure of their atoms.

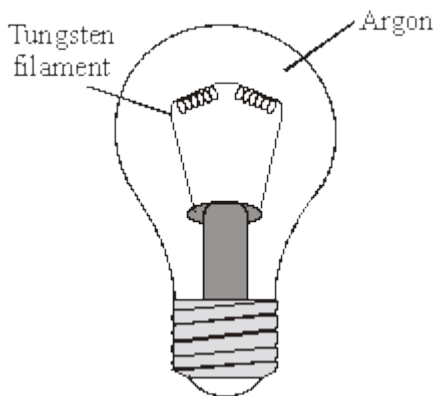
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(2)

(Total 4 marks)

2

The diagram shows an electric light bulb.



When electricity is passed through the tungsten filament it gets very hot and gives out light.

(a) What reaction would take place if the hot tungsten was surrounded by air?

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(1)

(b) State why argon is used in the light bulb. Explain your answer in terms of the electronic structure of an argon atom.

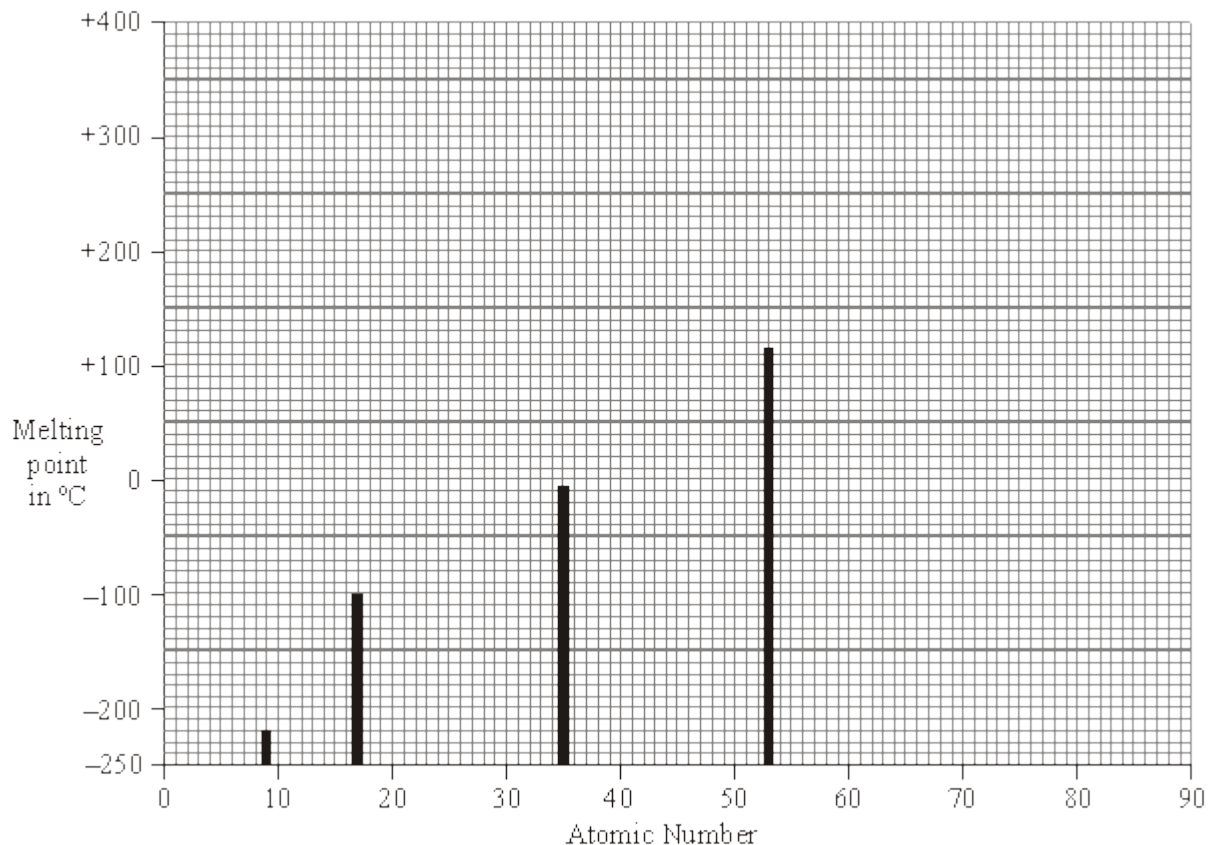
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(3)

(Total 4 marks)

4

(a) The bar graph shows the melting points of the elements in Group 7 plotted against their atomic numbers.



(i) How do the melting points of the Group 7 elements change as the atomic number increases?

.....

(1)

(ii) The melting point of astatine (atomic number = 85) is not shown on the bar graph. Estimate the melting point of astatine.

..... °C

(1)

Draw a bar for this value on the bar graph.

(1)

- (b) The water from wells in Japan contains bromide ions.

Bromine is extracted from this water. The bromine is displaced by adding another Group 7 element.

- (i) Place a tick (✓) next to the name of **one** Group 7 element that could be used to displace bromine from this water.

	Group 7	(✓)
Most reactive	Fluorine	
↑	Chlorine	
↑	Bromine	
↑	Iodine	
↑	Astatine	
Least reactive		

(1)

- (ii) State why you have chosen this element.

.....

(1)

- (iii) One sample of this water contained 2 g of bromine per litre of water.

How many litres of this water would be needed to make 1 kg of bromine?
 (1 kg = 1000 g)

.....
 litres

(1)

(Total 6 marks)**5**

Mendeleev constructed a periodic table in 1869.

In his periodic table:

- most of the elements were put in order of increasing relative atomic mass;
- elements with similar properties were put into groups;
- Mendeleev changed the order of some elements to put them with similar elements;
- spaces were left for elements that Mendeleev thought would be discovered in the future.

One space was in Group 3 between the elements aluminium and indium.

Group 3
Boron
Aluminium
?
Indium
Thallium

Mendeleev called this undiscovered element 'eka-aluminium'. This element is now known as gallium. In 1871, he also predicted some of the properties of gallium.

The table shows the properties of aluminium and indium, along with some of the predictions made by Mendeleev for gallium.

	Appearance	Metal or non-metal	Boiling point in °C	Density in g per cm³	Relative atomic mass
Aluminium	silvery white	metal	2467	2.7	27
Predicted properties of gallium	silvery white	metal	?	?	68
Indium	silvery white	metal	2080	7.31	115

- (i) Suggest **two** reasons why other scientists in 1871 did not accept Mendeleev's periodic table.

Reason 1

.....

Reason 2

.....

(2)

- (ii) Suggest why the discovery of gallium in 1875 convinced other scientists that Mendeleev's table was correct.

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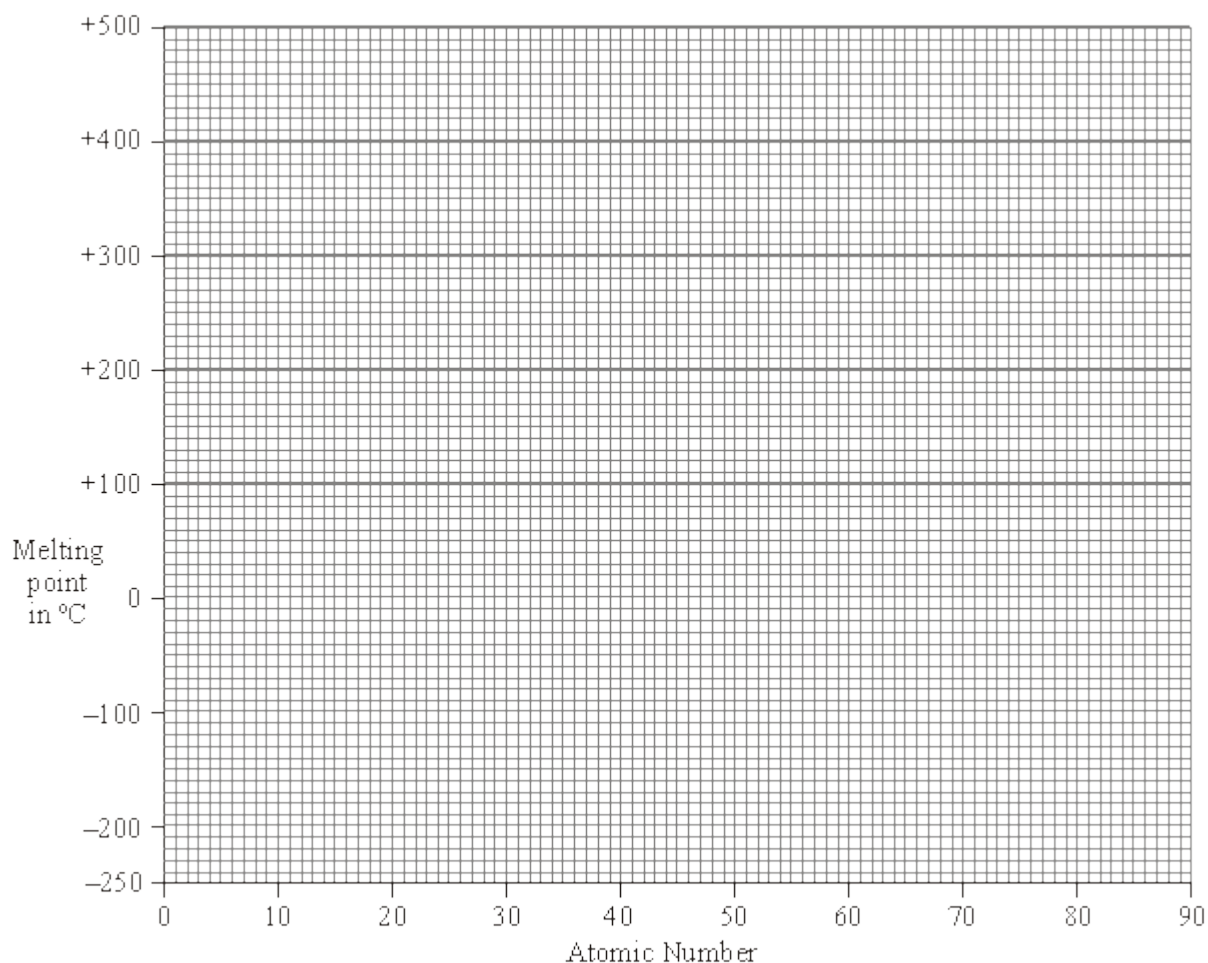
(1)
(Total 3 marks)

6

- (a) The table gives the melting points of some of the elements of Group 7.

Element	Atomic number	Melting point in °C
Fluorine	9	-220
Chlorine	17	-101
Bromine	35	-7
Iodine	53	114
Astatine	85	?

(i) Plot a graph of the melting point against atomic number.



Draw a line of best fit.

Extend your line to estimate a value for the melting point of astatine.

(2)

(ii) Estimate the melting point of astatine. °C

(1)

(iii) Which of the Group 7 elements are solids at 20 °C?

.....

(1)

(b) (i) Draw a diagram to show the arrangement of electrons in an atom of fluorine.

(1)

(ii) The elements of Group 7 have similar chemical properties.

Explain, in terms of electrons, why they have similar chemical properties.

.....

.....

(1)

(c) Xenon is a very unreactive element.

(i) Explain, in terms of electrons, why xenon is so unreactive.

.....

.....

.....

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(2)

(ii) Fluorine reacts with xenon but iodine does not.

Explain, in terms of atomic structure, why fluorine is more reactive than iodine.

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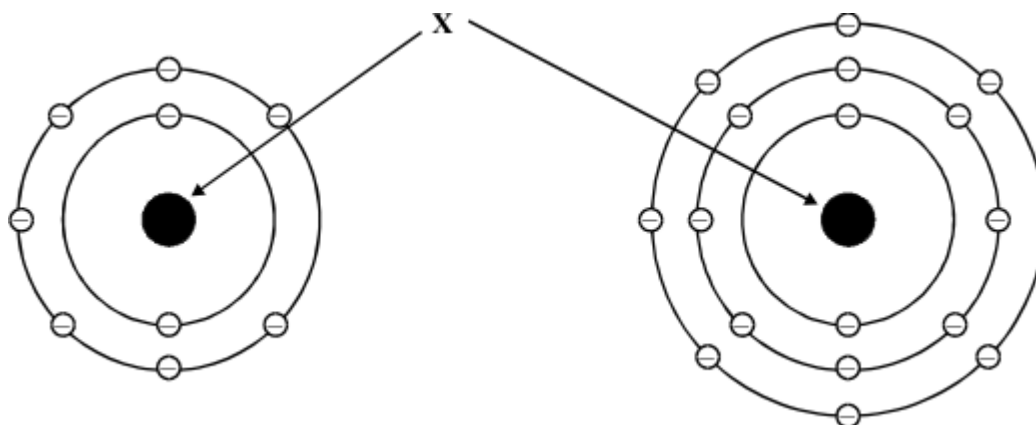
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(3)

(Total 11 marks)

7

The diagrams show the electronic arrangement of the atoms of two elements.



(i) Name the part of the atoms labelled X.

.....

(1)

(ii) Why are these two elements in the same group of the Periodic Table?

.....
.....

(1)
(Total 2 marks)

8

Fluorine is more reactive than chlorine. Fluorine reacts with most elements in the Periodic Table. However, fluorine does not react with argon.

Atomic numbers: F 9; Cl 17; Ar 18.

(a) To which group of the Periodic Table do fluorine and chlorine belong?

.....

(1)

(b) (i) Give **one** use for argon.

.....

(1)

(ii) Explain why the noble gas argon is unreactive.

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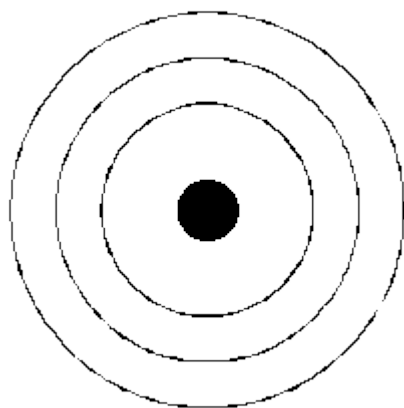
(2)

(c) (i) Give **one** use for chlorine.

.....

(1)

(ii) Draw the electron arrangement of a chlorine atom.



(2)

(iii) Explain why fluorine is more reactive than chlorine.

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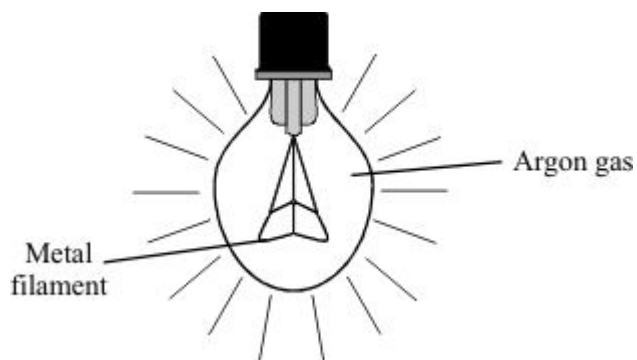
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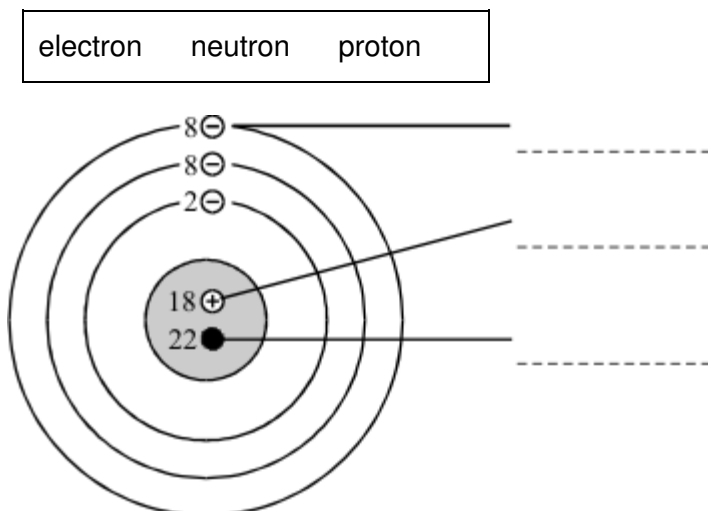
(Total 10 marks)

9

The diagram shows a light bulb.



- (a) (i) An argon atom has the structure shown. Use the words in the box to label the particles in the atom. Each word should only be used **once**.



(2)

- (ii) Argon is unreactive. Why?

.....

(1)

- (b) Oxygen would **not** be a suitable gas to use in a light bulb. Explain why.

.....

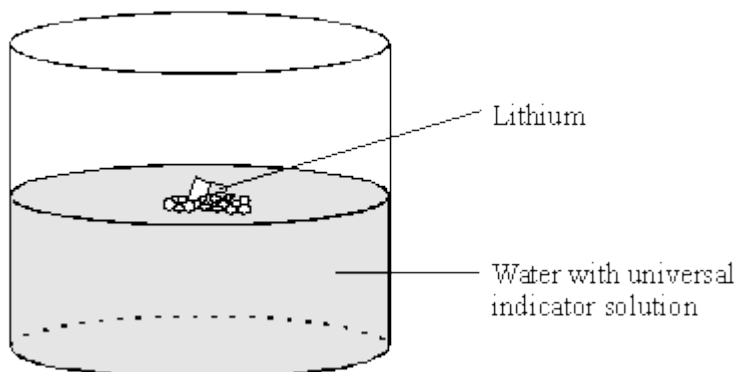
(2)

(Total 5 marks)

10

Lithium is a very reactive metal.

- (a) Lithium reacts with cold water.

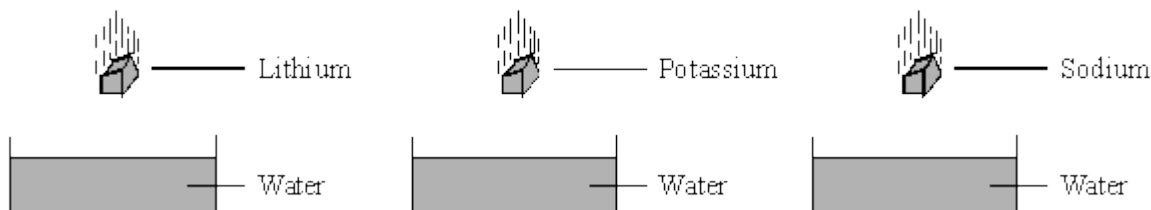


- (iii) Why do the electron arrangements of lithium, sodium and potassium make them react in a similar way?

.....

(1)

- (iv) Small pieces of lithium, potassium and sodium are added to water.



What is the order of reactivity for these three metals? Put the most reactive metal first.

.....

(1)

- (v) Complete and balance the chemical equation for the reaction of sodium with water.



(2)

(Total 10 marks)**13**

The Periodic Table contains groups of elements that have similar chemical properties.

- (a) The halogens are in Group 7 of the Periodic Table.

- (i) Complete the table. Iodine has been done for you.

Halogen	Colour of vapour
chlorine	
	red-brown
iodine	purple

(2)

(ii) Why do the halogens have similar chemical properties?

.....

(1)

(b) The alkali metals are in Group 1 of the Periodic Table. State what is formed when any alkali metal reacts with water.

.....

(2)

(Total 5 marks)**14**

Fluorine is a very useful element. It is placed in group 7 of the Periodic Table.

Use your knowledge of the elements in group 7 to help you answer these questions. You may find that information in the Data Sheet may help you with this question.

(a) Name another element in group 7 of the Periodic Table.

.....

(1)

(b) Cylinders filled with fluorine molecules are commercially available. What would you expect the formula of a fluorine molecule to be?

.....

(1)

(c) Fluoride ions are added to drinking water to help prevent tooth decay. What is the charge on fluoride ions in the water?

.....

(1)

(d) Fluorine reacts with the non-metal sulphur to make sulphur hexafluoride (SF_6).

(i) What type of bonding would you expect in sulphur hexafluoride?

.....

(1)

- (ii) Explain the reason for your answer to part (i).

.....

.....

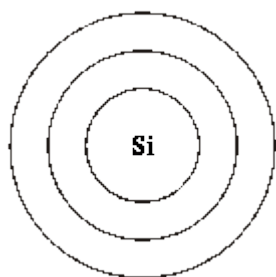
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(1)
(Total 5 marks)

15

Silicon is an extremely important element. More than a million tonnes of silicon are produced each year. Silicon is made by reducing silicon oxide (sand) with carbon (coke).

- (a) (i) Complete the diagram below to show the arrangement of electrons in an atom of silicon. The Data Sheet may help you with this question.



(2)

- (ii) Which electrons in the silicon atom take part in chemical reactions with other atoms?

.....

.....

(1)

- (iii) What features of all the atoms of the elements in group 4 of the Periodic Table might give them similar chemical properties?

.....

.....

(1)

(b) Silicon is difficult to classify as a metal or a non-metal because it has properties which resemble both. Some of the properties of silicon are listed below.

- Silicon is a shiny blue/grey solid.
- Silicon is placed in Group 4 of the Periodic Table.
- Silicon has a relative atomic mass of 28.
- Silicon has a very high melting point (1410°C).
- Silicon has a very high boiling point (2355°C).
- Silicon conducts electricity.
- Silicon oxide will neutralise alkalis.
- Silicon forms compounds in which the silicon atoms are bonded to other atoms by covalent bonds.

(i) Select **two** properties from the list above in which silicon resembles a metal.

1.

2.

(2)

(ii) Select **two** properties from the list above in which silicon resembles a non-metal.

1.

2.

(2)

(Total 8 marks)

16

Fluorine is the most reactive element in group 7 of the Periodic Table.

Fluorine reacts with all the other elements in the Periodic Table except some of the noble gases. It does not react with helium, neon and argon, but it does react with xenon. Many substances burst into flames when exposed to fluorine.

(a) (i) The electronic structure of chlorine is 2.8.7. What is the electronic structure of fluorine?

.....

(1)

(ii) What is the electronic structure of the chloride ion Cl^- ?

.....

(1)

(iii) Explain why fluorine is more reactive than chlorine.

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(4)

(b) (i) What does the information at the start of this question suggest about the reactivity of the elements in group 0?

.....
.....

(1)

(ii) A chemist did an experiment to find out if fluorine reacts with xenon. The two gases were mixed in a glass container. The only product detected was silicon fluoride. Explain what happened.

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.....
.....

(2)

(iii) The experiment was repeated many years later but the gases were mixed in a different type of container. A white solid was obtained which was xenon fluoride.

Predict whether you think (1) krypton and (2) radon will react with fluorine. Explain the reasons for your predictions.

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(5)

(Total 14 marks)

17

Use the Periodic Table on the Data Sheet to help you to answer this question.

(a) State **one** similarity and **one** difference in the electronic structure of the elements:

(i) across the Period from sodium to argon;

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.....
.....

(2)

(ii) down Group 7 from fluorine to astatine.

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

(2)

(b) (i) State the trend in reactivity of the Group 1 elements.

.....

(1)

(ii) Explain this trend in terms of atomic structure.

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(3)

- (c) Hydrogen is an element which is difficult to fit into a suitable position in the Periodic Table. Give reasons why hydrogen could be placed in either Group 1 or Group 7.

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(3)
(Total 11 marks)

18

Read the following information about an element X.

The element X melts above 600°C. It conducts electricity at room temperature. It burns in oxygen to form an oxide. When the oxide is mixed with water it turns Universal Indicator blue.

The oxide of X is a white solid at room temperature. It has the formula XO and contains the ion X²⁺.

The element X reacts with chlorine to form a chloride with a high melting point. The chloride conducts electricity when molten and it is soluble in water.

- (a) From the information give **three** pieces of evidence which suggest that X is a metal.

1

.....

2

.....

3

.....

(3)

- (b) In which Group of the Periodic Table should X be placed? Give a reason for your answer.

Group

Reason

.....

(2)

(c) Predict the formula for the chloride of X.

(1)

(Total 6 marks)**19**

(a) Why do the elements in Group 1 of the Periodic Table have similar chemical properties?

.....

(1)

(b) Explain why the reactivity of the elements in Group 1 increases down the group.

.....

(2)

(Total 3 marks)**20**

Calcium and magnesium are elements. They are found in the Earth's crust as compounds, often carbonates and sulphates. Magnesium is also found as its chloride.

(a) Calcium and magnesium are in the same Group in the Periodic Table.
 State which Group this is.

.....

(1)

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

(i) Write the chemical formula of magnesium chloride.

.....

(1)

(ii) Name the type of bonding in magnesium chloride.

.....

(1)

(Total 3 marks)

21

X is an element with the following properties:

- melts at -220°C and boils at -188°C ;
- does not conduct electricity at room temperature;
- forms molecular compounds with non-metals;
- forms ionic salts with metals in which its ion has a 1–charge.

(a) Would you expect X to be a solid, a liquid or a gas at 20°C ?

.....

(1)

(b) Predict the formula of the product formed when X reacts with aluminium.

(The aluminium ion is Al^{3+} and the X ion is X^{-} .)

Select your answer from the list below.

AIX**AIX₂****AIX₃****Al₃X****Al₂X₃**

Predicted formula

(1)

(c) To which Group of the Periodic Table does the element X belong?

.....

(1)**(Total 3 marks)****22**

Sodium and potassium are both in Group 1 of the Periodic Table.

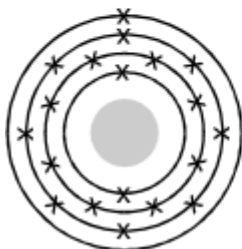
(a) Explain, by reference to their electronic structures, why both elements are placed in Group 1.

.....

.....

(1)

- (b) Use the Data Sheet to help you to answer this question.
The diagrams below represent the electronic structures of some atoms and ions.

**A****B****C****D****E****F**

Which one of the structures, **A - F**

- (i) represents a sodium **atom**,

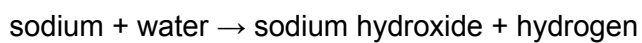
(1)

- (ii) represents a potassium **ion**?

(1)

- (c) Sodium and potassium both react with cold water.

- (i) The word equation represents the reaction of sodium with water.



Complete and balance the symbol equation for this reaction.

**(2)**

(ii) How does the reactivity of potassium with water differ from that of sodium with water?

.....

Explain this difference in reactivity by reference to the electronic structures of the potassium and sodium atoms.

.....

.....

.....

.....

.....

.....

(4)
(Total 9 marks)

23

One definition of an element is:

“A substance that cannot be broken down into simpler substances by chemical methods”

The table below shows some of the ‘substances’ which Antoine Lavoisier thought were elements. He divided the ‘substances’ into four groups. He published these groups in 1789.

The modern names of some of the ‘substances’ are given in brackets.

ACID-MAKING ELEMENTS	GAS-LIKE ELEMENTS	METALLIC ELEMENTS		EARTHY ELEMENTS
sulphur	light	cobalt	mercury	lime (calcium oxide)
phosphorus	caloric (heat)	copper	nickel	magnesia (magnesium oxide)
charcoal (carbon)	oxygen	gold	platina (platinum)	barytes (barium sulphate)
	azote (nitrogen)	iron	silver	argilla (aluminium oxide)
	hydrogen	lead	tin	silex (silicon dioxide)
		magnese	tungsten	
		zinc		

Dmitri Mendeleev devised a Periodic Table of the elements in 1869. A modern version of this table is shown on the Data Sheet.

Give **two** ways in which Mendeleev’s table is more useful than Lavoisier’s.

1

.....

2

.....

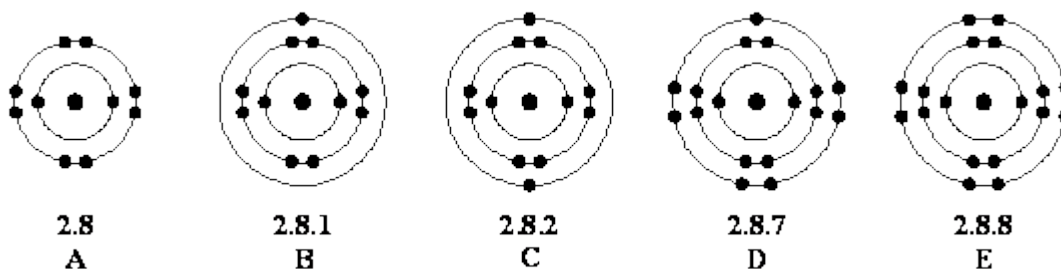
(Total 2 marks)

24

Use the Data Sheet to help you answer this question.

When sodium reacts with water it forms sodium ions.

The diagrams below represent the electron arrangements of some atoms and ions.



Which of the diagrams, **A** to **E**, represents the electron arrangement of each of the following?

(i) A sodium atom, Na

(ii) A sodium ion, Na⁺

(Total 2 marks)

25

Part of the Periodic Table which Mendeleev published in 1869 is shown below.

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
Period 1	H						
Period 2	Li	Be	B	C	N	O	F
Period 3	Na	Mg	Al	Si	P	S	Cl
Period 4	K Cu	Ca Zn	* *	Ti *	V As	Cr Se	Mn Br
Period 5	Rb Ag	Sr Cd	Y In	Zr Sn	Nb Sb	Mo Te	* I

Use the Data Sheet to help you to answer this question.

(a) (i) Give the symbols of **two** elements in Group 1 of Mendeleev's Periodic Table which are **not** found in Group 1 of the modern Periodic Table.

..... and

(1)

(ii) Name these **two** elements.

..... and

(2)

- (b) Which group of elements in the modern Periodic Table is missing on Mendeleev's table?

.....

(1)

- (c) Mendeleev left several gaps in his Periodic Table. These gaps are shown as asterisks(*) on the table above.

Suggest why Mendeleev left these gaps.

.....

.....

.....

(1)

- (d) Complete the following sentence.

In the **modern** Periodic Table the elements are arranged in the order of their

..... numbers.

(1)

- (e) Mendeleev placed lithium, sodium and potassium in Group 1 of his Periodic Table. This was because they have similar properties.

Some properties of elements are given in the table.

Four of them are properties of lithium, sodium and potassium. One of these properties has been ticked for you. Place a tick next to the other three properties.

PROPERTY	
They react with water to give alkaline solutions.	
They are gases.	
They are non-metals.	
They form an ion with a 1+ charge.	
They react with water and give off hydrogen.	✓
They form an ion with a 1- charge.	
They are metals.	
They react with water to give acidic solutions.	

(3)

- (f) What happens when a small piece of sodium reacts with water?
You should describe what you would see and state what substances are formed.

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.....

.....

(3)
(Total 12 marks)

26

Part of the Periodic Table which Mendeleev published in 1869 is shown below.

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
Period 1	H						
Period 2	Li	Be	B	C	N	O	F
Period 3	Na	Mg	Al	Si	P	S	Cl
Period 4	K Cu	Ca Zn	* *	Ti *	V As	Cr Se	Mn Br
Period 5	Rb Ag	Sr Cd	Y In	Zr Sn	Nb Sb	Mo Te	* I

Use the Data Sheet to help you to answer this question.

- (a) Name **two** elements in Group 1 of Mendeleev's Periodic Table which are not found in Group 1 of the modern Periodic Table.

..... and

(2)

- (b) Which group of elements in the modern Periodic Table is missing on Mendeleev's table?

.....

(1)

(c) Mendeleev left several gaps in his Periodic Table. These gaps are shown as asterisks(*) on the table above.

Suggest why Mendeleev left these gaps.

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

(1)

(d) Complete the following sentence.

In the **modern** Periodic Table the elements are arranged in the order of their

..... numbers.

(1)

(Total 5 marks)

27

(a) What is the name given to the block of elements in the middle of the Periodic Table which includes vanadium?

.....

(1)

(b) Some of the properties of vanadium are shown in this list.

- It has a high melting point.
- It is a solid at room temperature.
- It is a conductor of electricity.
- It is a good conductor of heat.
- It forms coloured compounds.
- It forms crystalline compounds.
- It forms compounds that are catalysts.

Select **two** properties, from the list above, which are **not** typical of a Group 1 metal.

1

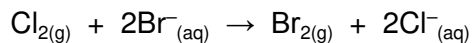
2

(2)

(Total 3 marks)

28

In sea water the bromine is present as bromide ions (Br^-). The equation below shows how chlorine can be used to displace bromine from sea water.



Explain, as fully as you can, why chlorine can displace bromine from sea water. To obtain full marks your answer should refer to electronic structure.

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.....

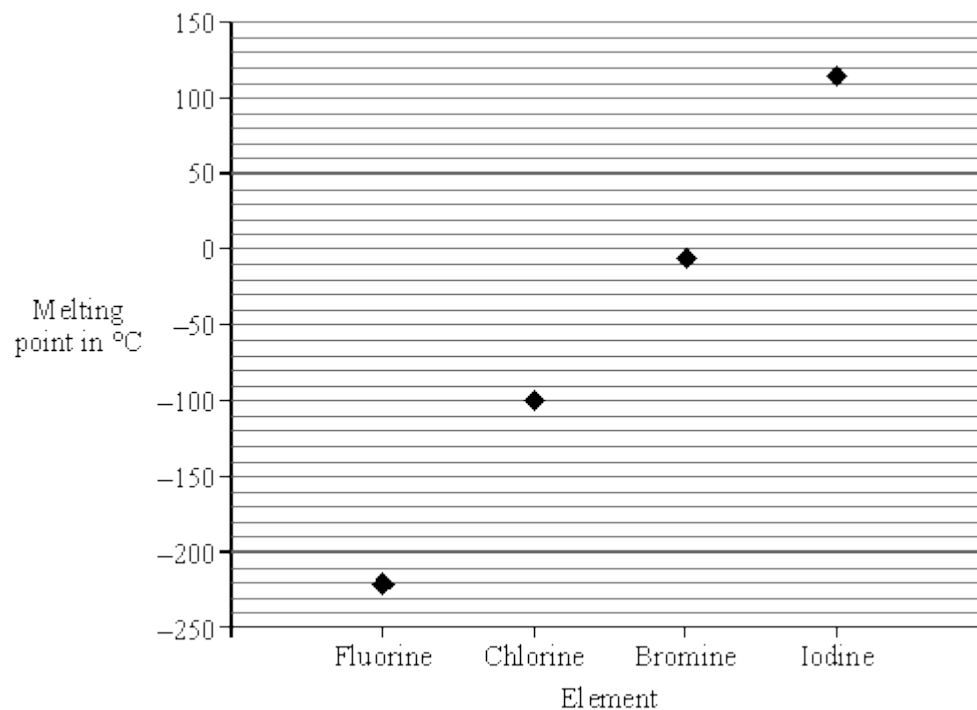
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.....

(Total 3 marks)

29

The graph shows the melting point of four elements in Group 7 of the periodic table.



(a) What is the melting point of fluorine?

.....

(1)

(b) Room temperature is 20°C.

Which element is solid at room temperature?

.....

(1)

(c) Look at the periodic table on the Data Sheet.

Using data from the graph, describe the trend of melting points of the elements in Group 7.

.....

.....

.....

.....

(2)

(d) The elements in Group 7 are non-metals.

Which **two** of the following are properties of non-metals?

Place a tick (✓) in the box against each correct property.

Brittle (if solid)

Good conductor of heat

High boiling point

Poor conductor of electricity

(2)
(Total 6 marks)

30

The elements in Group 1 are known as the alkali metals.

Which **three** of the following are properties of alkali metals?

Place a tick (✓) in the box against each correct property.

- Hard, tough and strong
- Low density
- Form hydroxides that dissolve in water
- React quickly with water
- Used as catalysts
- Used to make electric cables

(Total 3 marks)**31**

Use the periodic table on the Data Sheet to answer these questions.

The table below gives the electronic structures of four elements, **W**, **X**, **Y** and **Z**.

Element	Electronic structure
W	2,5
X	2,7
Y	2,8,8
Z	2,8,8,1

- (a) Which element **W**, **X**, **Y** or **Z**:
- is a Group 0 gas?
 - is nitrogen?
 - is a Group 7 gas?
 - reacts violently with water?

(3)

(b) Which **two** Groups of the periodic table do **not** contain any non-metals?

.....

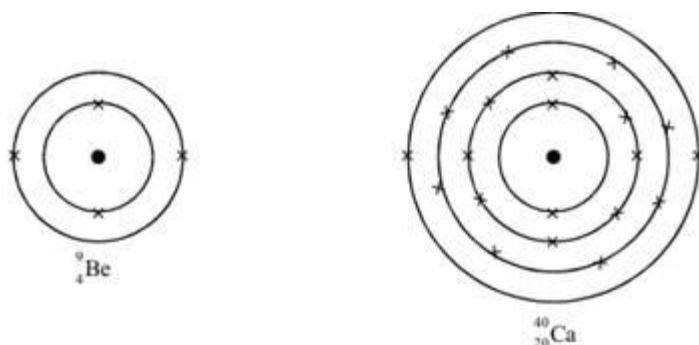
(1)

(Total 4 marks)

32

Beryllium and calcium are metals in Group 2 of the periodic table.

The diagrams show their electronic structures.



(a) Why do beryllium and calcium have similar chemical properties?

.....

(1)

(b) Calcium is more reactive than beryllium.

Suggest an explanation for this in terms of the electronic structure of the two elements.

.....

(2)

(Total 3 marks)

33

- (a) Helium is used to fill party balloons.

Which **two** of the following are properties that make helium suitable for filling party balloons?

Place a tick (✓) in the box against each suitable property.

Coloured

Exists as individual atoms

Less dense than air

Poor conductor of heat

Very unreactive

(2)

- (b) The table shows the names of some gases.

Use the correct formulae from the box to complete the table. The first one has been done for you.

CH ₄	CO ₂	H ₂	HCl	NH ₃	O ₂
-----------------	-----------------	----------------	-----	-----------------	----------------

Gas	Formula
Oxygen	O ₂
Carbon dioxide	
Hydrogen chloride	
Ammonia	

(3)
(Total 5 marks)

34

Use the Periodic Table of Elements on the Data Sheet to help you to answer this question.

Francium (Fr) is a very rare element. It is estimated that there is only 25 g of francium in the Earth's crust. Francium is radioactive and has a half-life of only a few minutes.

Mendeleev predicted the existence of francium in the 1870s but the element was not discovered until 1939.

(a) Explain why Mendeleev was able to predict the existence of francium in the 1870s.

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

(2)

(b) Suggest why there is not much experimental evidence for the properties of francium.

.....
.....

(1)

(c) (i) If you could react francium with water, how would the reaction compare with that of sodium with water?

.....
.....

(1)

(ii) Explain the reason for your answer.

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

(2)

(Total 6 marks)

35

Use the periodic table on the Data Sheet to help you to answer these questions.

(a) Write the symbol for helium.

.....

(1)

- (b) Write the name of an element in Group 4.

.....

(1)

- (c) Write the name of the element which has a relative atomic **mass** of 64.

.....

(1)

- (d) Write the name of the element with the next highest atomic number after Te (tellurium) in the periodic table.

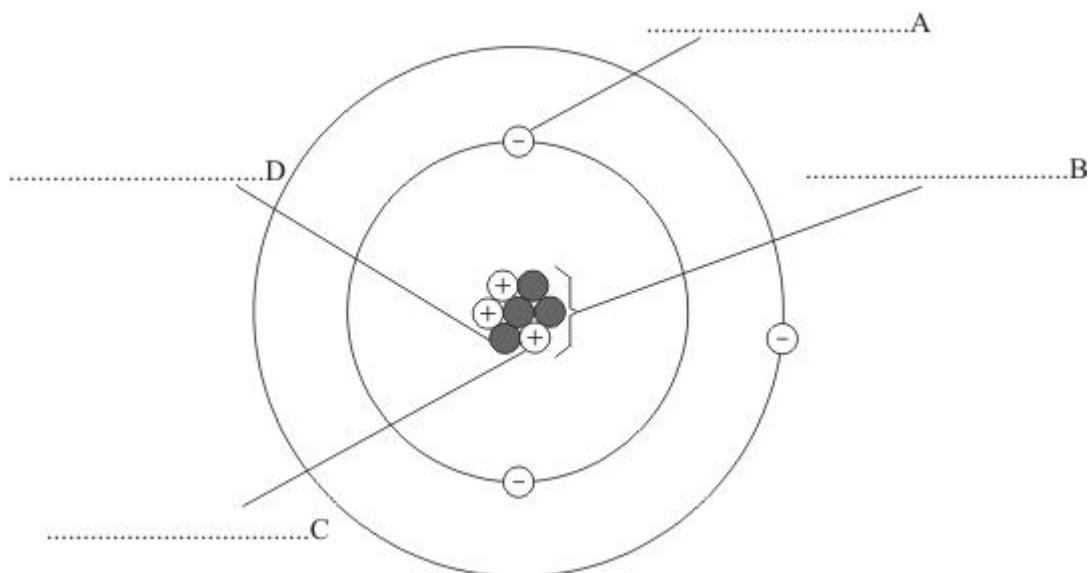
.....

(1)

(Total 4 marks)

36

The diagram shows an atom.



- (a) On the diagram, write the names of structures **A**, **B**, **C** and **D**.

(4)

- (b) To which Group of the periodic table does this atom belong?

.....

Give **one** reason for your answer.

.....

.....

(2)

(c) Name the element which is made up of this type of atom.

.....

(1)

(Total 7 marks)

37

The table shows some properties of four Group 7 elements.

Element	Boiling point in °C	Melting point in °C	State at room temperature	Reaction with hydrogen	
				Description	Product
Fluorine	- 218	- 188	gas	Explosive reaction in dim light	Hydrogen fluoride
Chlorine	- 34	- 101	gas	Explosive reaction in sunlight	Hydrogen chloride
Bromine	+ 59	- 7		Reacts if heated	
Iodine	+ 185	+ 114		Reacts if heated strongly	Hydrogen iodide

(a) What is the state at room temperature of:

(i) bromine;

(ii) iodine?

(2)

(b) Which **one** of the four elements is most reactive?

.....

(1)

(c) Name the compound formed when hydrogen reacts with bromine.

.....

(1)

(Total 4 marks)

38

The table shows how Group 7 elements react with hydrogen.

Element	Reaction with hydrogen	
	Description	Product
Fluorine	Explosive reaction in dim light	Hydrogen fluoride
Chlorine	Explosive reaction in sunlight	Hydrogen chloride
Bromine	Reacts if heated	Hydrogen bromide
Iodine	Reacts if heated strongly	Hydrogen iodine

Explain the difference in the rates of the reaction of fluorine with hydrogen and of iodine with hydrogen.

.....

.....

.....

.....

(Total 2 marks)

39

John Newland produced a periodic table in 1866. The first 21 elements in his table are shown in the diagram.

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

Use the periodic table on the Data Sheet to help you to answer these questions.

- (a) In which **two** columns of Newland's periodic table do all the elements have similar properties?

.....

(1)

- (b) The modern periodic table is arranged in a different order to Newland's table.

- (i) What order is used in the modern periodic table?

.....

(1)

- (ii) Argon has a higher relative atomic mass than potassium. Explain why.

.....

.....

(1)

- (iii) Describe the changes in the number of electrons in the atoms of elements in the period which begins with potassium and ends with krypton.

.....

.....

.....

(2)

(Total 5 marks)

40

The table gives some properties of the element silicon.

Melting point	1410 °C
Relative atomic mass	28
Conductivity	Conducts electricity
Compounds	Forms compounds with covalent bonds
Position in periodic table	Group 4
Reaction with water	Unreactive
Density	Relatively low

- (a) Give **two** ways in which silicon is similar to the alkali metals.

1

.....

2

.....

(2)

- (b) Give **two** ways in which the properties of silicon are different from those of the alkali metals.

1

.....

2

.....

(2)

(Total 4 marks)

41

Use the periodic table on the Data Sheet to help you to answer these questions.

- (a) Write the symbol for helium.

.....

(1)

- (b) Write the name of an element in Group 4.

.....

(1)

- (c) Write the name of the element which has a relative atomic **mass** of 64.

.....

(1)

- (d) Write the name of the element with the next highest atomic number after Te (tellurium) in the periodic table.

.....

(1)

(Total 4 marks)

42

- (a) The table shows how Group 7 elements react with hydrogen.

Element	Reaction with hydrogen	
	Description	Product
Fluorine	Explosive reaction in dim light	Hydrogen fluoride
Chlorine	Explosive reaction in sunlight	Hydrogen chloride
Bromine	Reacts if heated	Hydrogen bromide
Iodine	Reacts if heated strongly	Hydrogen iodine

- (i) Explain why all the Group 7 elements react in a similar way with hydrogen.

.....

.....

.....

.....

(2)

- (ii) Explain the difference in the rates of the reaction of fluorine with hydrogen, and of iodine with hydrogen.

.....

.....

.....

.....

(2)

(b) Explain why Group 0 elements are monatomic.

.....

.....

.....

.....

(2)
(Total 6 marks)

43

Part of the Periodic Table is shown. It includes the symbols for six elements.

Li			C			F	
Na							
K	Ca						

Alkali metals

Halogens

(a) Write the symbol for carbon.

(1)

(b) (i) Put the symbol Cl, for chlorine, into its correct position in the Table.

(1)

(ii) Bromine, chlorine, fluorine and iodine are halogens. Which one of these halogens is least reactive?

.....

(1)

(c) The alkali metals form Group 1 in the Periodic Table. Write the symbol of the most reactive alkali metal shown in the Table above.

.....

(1)

(d) Write the symbol for an element which is in the same Group as sodium.

.....

(1)
(Total 5 marks)

44

- (a) Choose from the names of elements in the box the answers to the questions which follow.

aluminium	carbon	chlorine	copper
helium	iron	magnesium	sodium

Give the name of:

- (i) an alkali metal

.....

(1)

- (ii) a halogen

.....

(1)

- (iii) a noble gas

.....

(1)

- (b) The alkali metals are in Group 1 of the Periodic Table. The elements in Group 1 have a number of similar properties.

- (i) Describe **one chemical** property which they have in common.

.....

(1)

- (ii) Describe **one physical** property which they have in common.

.....

(1)

(Total 5 marks)

45

- Part of the Periodic Table is shown below. Use the information to help you answer the questions which follow.

H							He
Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar

- (a) Write the symbol for:
- (i) chlorine;
 - (ii) sodium.
- (2)**
- (b) (i) What is the symbol of the element which is in Group 2 and Period 3?
.....
- (ii) What name is given to Group 7?
.....
- (2)**
- (c) The arrangement of electrons in sulphur (S) is 2.8.6.
Write the arrangement of electrons for:
- (i) neon (Ne);
 - (ii) aluminium (Al).
- (1)**
(1)
- (d) The Periodic Table is an arrangement of elements in order of increasing atomic number.
What is the atomic number of an element?
.....
- (1)**
- (e) What is the name of the uncharged particle in the nucleus of an atom?
.....
- (1)**
(Total 8 marks)

46

Potassium reacts violently with cold water.

It forms an alkaline solution of potassium hydroxide and hydrogen.



- (a) In what physical state is hydrogen given off?

Choose your answer from the words in the box.

gas	liquid	solid	solution
-----	--------	-------	----------

.....

(1)

- (b) (i) What type of substance will neutralise potassium hydroxide solution?

.....

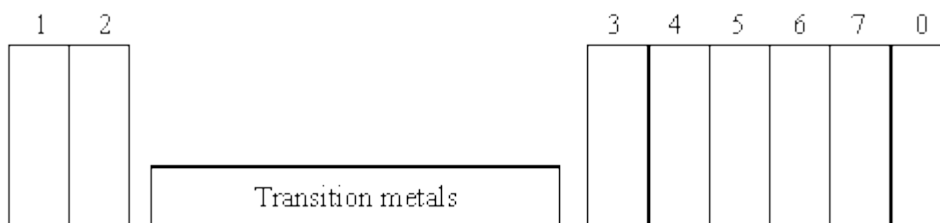
(1)

- (ii) What is the pH of the neutral solution?

.....

(1)

- (c) In the Periodic Table there are eight main groups.



What is the number of the group that has potassium in it?

.....

(1)

- (d) Sodium is in the same group as potassium.

- (i) How does sodium react with cold water and what is formed?

.....

.....

(2)

- (ii) How can you prove that an alkaline solution is formed when sodium reacts with water?

.....

.....

(2)

(e) Lithium reacts more slowly with cold water than sodium.

State **two** ways the reaction can be made to go faster.

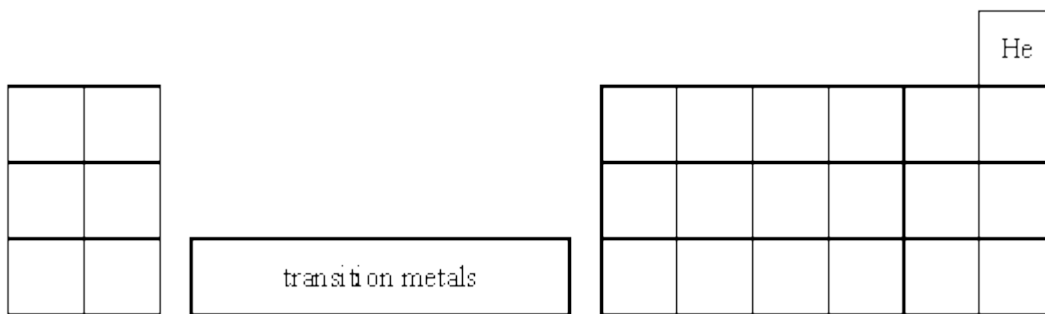
1

2

(2)
(Total 10 marks)

47

Part of the Periodic Table is shown below. The symbol for helium is given.



(a) (i) What name is given to the group that contains helium?

.....

(1)

(ii) Give **one** use for helium and explain why it is used.

.....

.....

(2)

(iii) What is the name of another element in the same group as helium?

.....

(1)

(iv) Write the symbol for this element.

.....

(1)

(b) Give the names of **two** other elements not in Group 0 that are gases at room temperature.

..... and

(2)

(c) The alkali metals are in Group I of the Periodic Table.

Give the name and the symbol of **one** alkali metal.

Name Symbol

(2)

(d) Alkali metals have low melting points.

Give another physical property of the alkali metals.

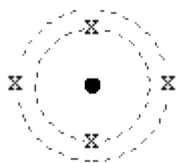
.....

(1)

(Total 10 marks)

48

(a) The diagram shows the electronic structure of a particular element.



In a similar way, show the electronic structure of another element from the same group in the periodic table and name the element you select.

Name of element selected

(4)

- (b) The element lithium gives a moderate reaction with cold water, releasing hydrogen and forming a solution of lithium hydroxide.

Describe how sodium is similar to and how it is different from lithium in its chemical reaction with cold water.

Explain any similarity or difference in terms of their atomic structure.

Similarity.

Reason.

.....

.....

Difference.

Reason.

.....

.....

(5)
(Total 9 marks)

49

The table shows the properties of four elements from Group VII of the Periodic Table.

Element	Proton Number	Electronic structure	Boiling point (°C)	Melting point (°C)	State at 20°C	Reaction with hydrogen	
						Ease	Product
Fluorine		2.7	-188	-218	gas	Explosive reaction in dull light	hydrogen fluoride
Chlorine	17		-34	-101		Explosive reaction in sunlight	hydrogen chloride
Bromine	35	2.8.18.7	+59	-7		React if heated	hydrogen bromide
Iodine	53	2.8.18.18.7	+185	+114	solid	React if heated strongly	hydrogen iodide

- (a) Complete the spaces in the table.

(4)

- (b) Comment briefly on the trend in melting points for these four elements.

.....

.....

(1)

(c) Explain, in as much detail as you can:

(i) why the reactions of these elements with hydrogen are similar.

.....

(ii) why their reactivity with hydrogen decreases from fluorine to iodine.

.....

(4)
 (Total 9 marks)

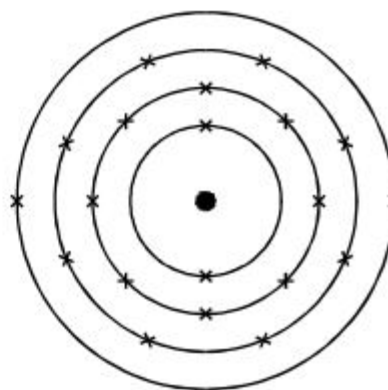
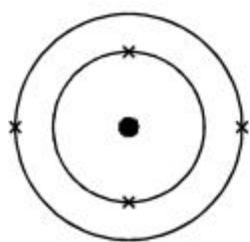
50

Three elements in Group 2 of the periodic table are beryllium (Be), magnesium (Mg) and calcium (Ca). Their mass numbers and proton numbers are shown below. The electronic structure is shown for beryllium and calcium.

9
 Be
 4

24
 Mg
 12

40
 Ca
 20



(a) In a similar way, draw the electronic structure for magnesium.

(3)

- (b) • The three elements have similar chemical properties
- The reactivity of these elements with non-metals, increases from beryllium to magnesium to calcium.

Explain these two statements in terms of atomic structure.

.....

.....

.....

.....

.....

.....

(6)
(Total 9 marks)

51

The electronic structures of five elements, V, W, X, Y and Z are shown below.

$\frac{V}{2.1}$	$\frac{W}{2.6}$	$\frac{X}{2.8.4}$	$\frac{Y}{2.5}$	$\frac{Z}{2.8.6}$
-----------------	-----------------	-------------------	-----------------	-------------------

- (a) (i) Write the letters of the **two** elements which belong to the same group in the Periodic Table
 - (ii) To which group do they belong?
- (2)
- (b) Write the letters of **two** elements that are gases
- (1)
- (c) Lithium, sodium and potassium are the first three elements in Group 1 of the Periodic Table.
 - (i) Lithium reacts with cold water to produce lithium hydroxide and hydrogen. Describe how the reaction between sodium and water is **(A)** similar and **(B)** different to that between lithium and water.

(A) Similar

.....

.....

(B) Different

.....

(3)

(ii) Potassium is much more reactive than lithium.

Explain this in terms of their electronic structures.

.....

(3)

(Total 9 marks)

52

The diagram shows part of the periodic table.

Group 1		Group 2		Group 3		Group 4	Group 5	Group 6	Group 7	Group 0
23 sodium 11	24 magnesium 12	27 aluminium 13	28 silicon 14	31 phosphorous 15	32 sulphur 16	35 chlorine 17	40 argon 18			

Choose from the elements shown in the table:

(a) one metal

(1)

(b) a noble gas

(1)

(c) a coloured gas

(1)

(Total 3 marks)

53

Sodium reacts with water to produce hydrogen gas and a solution of sodium hydroxide.

Complete the **word** equation for this reaction (do **not** use symbols or formulae).

..... + +

(Total 3 marks)

54

The idea of a periodic table of the elements was started by John Newlands about 140 years ago.

He wrote down the elements he knew about in order, starting with the lightest atoms.

Then he arranged them into seven groups, like this:

1	2	3	4	5	6	7
H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca				

- (a) Write down **three** differences between the groups in Newlands' periodic table and the groups in the modern periodic table (up to the element Ca, which is calcium).

.....

(3)

- (b) Suggest one reason why this part of Newlands' table was different from the modern one.

.....

(1)

(Total 4 marks)

55

The idea of a periodic table of the elements was started by John Newlands about 140 years ago.

He wrote down the elements he knew about in order, starting with the lightest atoms.

Then he arranged them into seven groups, like this:

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H	Li	Be	B	C	N	O
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Cl	K	Ca				

- (a) Write down **three** differences between the groups in Newlands' periodic table and the groups in the modern periodic table (up to the element Ca, which is calcium).

.....

.....

.....

.....

.....

(3)

- (b) Suggest **one** reason why this part of Newlands' table was different from the modern one.

.....

.....

(1)

- (c) Dimitri MendeléeV later developed the periodic table of the elements. He arranged the elements according to their properties and their relative atomic masses.

The diagram shows where MendeléeV put tellurium (Te) and iodine (I) in his table because of their properties.

(The diagram uses present day symbols and the atomic numbers of the elements have been added to MendeléeV's table.)

	GROUP 6	GROUP 7
	${}_{8}^{16}\text{O}$	${}_{9}^{19}\text{F}$
	${}_{16}^{32}\text{S}$	${}_{17}^{35.5}\text{Cl}$
		${}_{35}^{80}\text{Br}$
	${}_{52}^{128}\text{Te}$	${}_{53}^{127}\text{I}$

- (i) What is wrong with this arrangement of tellurium and iodine in terms of their relative atomic masses?

.....

(1)

- (ii) Explain why this is not a problem in the modern periodic table.

.....

(2)

(Total 7 marks)

56

These are the electronic structures of the atoms of three different elements.

2.8.1
element A

2.8.8
element B

2.8.8.1
element C

(a) Identify elements A and B.

Element A is

Element B is

(2)

(b) (i) Why is element C more reactive than element A?

.....

.....

.....

.....

.....

.....

(2)

(ii) Why is element B unreactive?

.....

.....

.....

(2)

(Total 6 marks)

57

The diagram shows some of the elements in Groups I and 7 of the Periodic Table.

Group							0
1	2	3	4	5	6	7	
Li						F	
Na						Cl	
K						Br	
						I	

- (a) The elements in Group 1 have similar chemical properties.

Describe **one** chemical reaction which shows that lithium, sodium and potassium react in the same sort of way.

You should say what you would react them with and what substances would be produced.

- What you would react them with

.....

- Substances produced

.....

.....

(3)

- (b) All the elements in Group 7 react with hydrogen.

Fluorine reacts in the dark, explosively, at very low temperatures.

Chlorine reacts explosively in sunlight, at room temperature.

Bromine, in light, only reacts if heated to about 200°C.

Suggest the conditions needed for hydrogen and iodine to react.

Give reasons for your answer.

.....

.....

.....

(2)

- (c) Hydrogen and chlorine react to produce hydrogen chloride.

Balance the symbol equation for the reaction.



(1)

- (d) Use your understanding of atomic structure to explain the trend in reactivity in the Group 7 elements.

.....

.....

.....

.....

(2)

(Total 8 marks)