Topical Past Paper Questions Worksheets

IGCSE Chemistry (0620) Paper 4

Exam Series: Feb/Mar 2017 – May/Jun 2023

Format Type A:
Answers to all questions are provided as an appendix

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Introduction

Each Topical Past Paper Questions Compilation contains a comprehensive collection of hundreds of questions and corresponding answer schemes, presented in worksheet format. The questions are carefully arranged according to their respective chapters and topics, which align with the latest IGCSE or AS/A Level subject content. Here are the key features of these resources:

1. The workbook covers a wide range of topics, which are organized according to the latest syllabus content for Cambridge IGCSE or AS/A Level exams.
2. Each topic includes numerous questions, allowing students to practice and reinforce their understanding of key concepts and skills.
3. The questions are accompanied by detailed answer schemes, which provide clear explanations and guidance for students to improve their performance.
4. The workbook's format is user-friendly, with worksheets that are easy to read and navigate.
5. This workbook is an ideal resource for students who want to familiarize themselves with the types of questions that may appear in their exams and to develop their problem-solving and analytical skills.

Overall, Topical Past Paper Questions Workbooks are a valuable tool for students preparing for IGCSE or AS/A level exams, providing them with the opportunity to practice and refine their knowledge and skills in a structured and comprehensive manner. To provide a clearer description of this book's specifications, here are some key details:

- Title: Cambridge IGCSE Chemistry (0620) Paper 4 Topical Past Paper Questions
- Subtitle: Exam Practice Worksheets With Answer Scheme
- Examination board: Cambridge Assessment International Education (CAIE)
- Subject code: 0620
- Years covered: Feb/Mar 2017 – May/Jun 2023
- Paper: 4
- Number of pages: 693
- Number of questions: 282

Contents

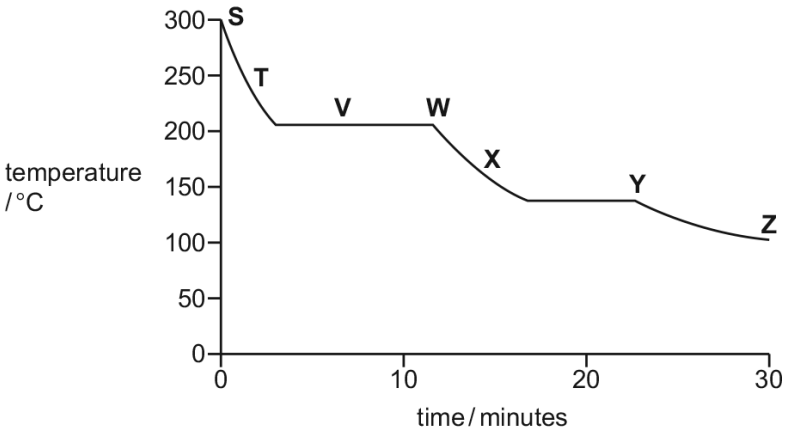
Chapter 1

States of matter

1.1 Solids, liquids and gases

1. 0620_w17_qp_41 Q: 2

The graph shows how the temperature of a substance changes as it is cooled over a period of 30 minutes. The substance is a gas at the start.



Each letter on the graph may be used once, more than once or not at all.

(a) Which letter, **S**, **T**, **V**, **W**, **X**, **Y** or **Z**, shows when

(i) the particles in the substance have the most kinetic energy,

..... [1]

(ii) the particles in the substance are furthest apart,

..... [1]

(iii) the substance exists as both a gas and a liquid?

..... [1]

(b) Use the graph to estimate the freezing point of the substance.

..... °C [1]

(c) Name the change of state directly from a solid to a gas.

..... [1]

(d) When smoke is viewed through a microscope, the smoke particles in the air appear to jump around.

(i) What term describes this movement of the smoke particles?

..... [1]

(ii) Explain why the smoke particles move in this way.

.....

.....

..... [2]

[Total: 8]

1.2 Diffusion

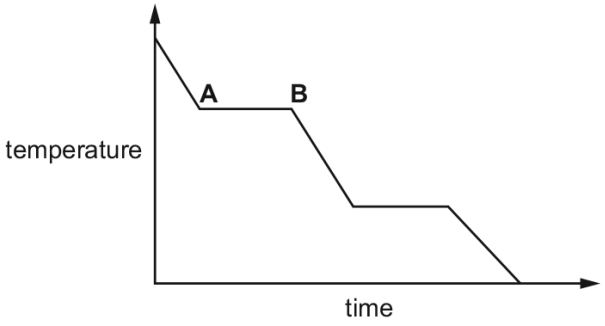
2. 0620_s20_qp_43 Q: 5

(a) Complete the table about solids, liquids and gases.

	particle separation	particle arrangement	type of motion
solid		regular	vibrate only
liquid	touching		random
gas	apart	random	

[3]

(b) The graph shows the change in temperature as a sample of a gas is cooled.



Name the change of state taking place between **A** and **B**.

..... [1]

(c) A bottle of liquid perfume is left open at the front of a room.

After some time, the perfume is smelt at the back of the room.

Name the **two** physical processes taking place.

1 .....

2 .....

[2]

[Total: 6]

3. 0620_w17_qp_42 Q: 1

(a) Dust particles in the air move around in a random way.

(i) What term describes the random movement of the dust particles?

..... [1]

(ii) Identify the particles in the air which cause the random movement of the dust particles.

..... [2]

(iii) Explain why the dust particles move in this way.

.....

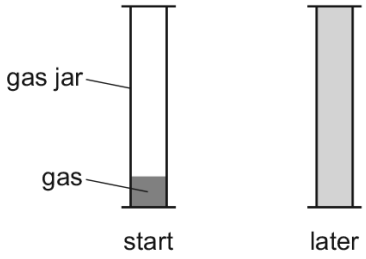
.....

..... [2]

(b) When chlorine gas, Cl_2, is put into a gas jar, it spreads out to fill the gas jar.

When bromine gas, Br_2, is put into a gas jar, it also spreads out to fill the gas jar.

The process takes longer for bromine gas than for chlorine gas.



(i) What term describes the way that the gas particles spread out?

..... [1]

(ii) Use **data** from the Periodic Table to explain why bromine gas takes longer to fill a gas jar than chlorine gas.

.....

.....

..... [2]

(iii) Explain why increasing the temperature increases the rate at which the gas particles spread out.

.....

..... [1]

[Total: 9]

Chapter 2

Atoms, elements and compounds

2.1 Elements, compounds and mixtures

4. 0620_w17_qp_43 Q: 1

Substances can be classified as elements, compounds or mixtures.

State whether each of the following is an element, a compound or a mixture.

(a) brass ..... [1]

(b) gold ..... [1]

(c) butane ..... [1]

(d) air ..... [1]

[Total: 4]

2.2 Atomic structure and the Periodic Table

5. 0620_s21_qp_41 Q: 2

Complete the table to:

- deduce the number of protons, electrons and neutrons in the magnesium atom and copper ion shown
- identify the atom or ion represented by the final row.

	number of protons	number of electrons	number of neutrons
$^{25}_{12}Mg$	12		
$^{65}_{29}Cu^{2+}$			36
	17	18	20

[Total: 5]

---

6. 0620_s21_qp_43 Q: 2

Complete the table to:

- deduce the number of protons, electrons and neutrons in the boron atom and chloride ion shown
- identify the atom or ion represented by the final row.

formula	number of protons	number of electrons	number of neutrons
$^{11}_{5}B$		5	
$^{35}_{17}Cl^{-}$	17		
	24	21	30

[Total: 5]

---

7. 0620_s18_qp_42 Q: 3

Complete the following table.

particle	number of protons	number of electrons	number of neutrons	number of nucleons
$^{23}_{11}Na$	11	11	.....	23
$^{37}_{17}Cl^{-}$	.....	.....	20	.....
$^{56}_{26}$.....	26	24	30	56

[6]

[Total: 6]

---

8. 0620_w17_qp_41 Q: 1

The table gives information about five particles. The particles are all atoms or ions.

particle	number of protons	number of neutrons	number of electrons
A	6	8	6
B	12	12	12
C	13	14	10
D	8	8	10
E	11	12	11

Answer the following questions using the information in the table.
Each particle may be used once, more than once or not at all.

(a) Which particle, **A**, **B**, **C**, **D** or **E**,

(i) is an atom with atomic number 12,

..... [1]

(ii) is an atom with nucleon number 14,

..... [1]

(iii) is an ion with a positive charge,

..... [1]

(iv) has only **one** electron in its outer shell?

..... [1]

(b) **D** is an ion of an element.

Identify the element and write the formula of **D**.

..... [2]

[Total: 6]

2.3 Isotopes

9. 0620_s22_qp_41 Q: 2

(a) Atoms are made of protons, neutrons and electrons. Atoms of the same element are known as isotopes.

(i) Complete the table.

particle	relative charge	relative mass
electron		$\frac{1}{1840}$
neutron		
proton	+1	

[2]

(ii) $^{24}_{12}Mg$ and $^{25}_{12}Mg$ are isotopes of magnesium.

Complete the table to show the numbers of electrons, neutrons and protons in these isotopes of magnesium.

isotope	number of electrons	number of neutrons	number of protons
$^{24}_{12}Mg$			
$^{25}_{12}Mg$			

[2]

(iii) Explain why magnesium ions have a charge of 2+.

.....

..... [1]

(b) Mg^{2+} ions have the electronic structure 2,8.

Give the formula of the following particles which have the same electronic structure as Mg^{2+} ions.

- a cation (positive ion)

.....

- an anion (negative ion)

.....

- an atom

.....

[3]

[Total: 8]

10. 0620_s22_qp_43 Q: 2

(a) $^{32}_{16}S$ and $^{33}_{16}S$ are isotopes of sulfur.

Use your knowledge of protons, neutrons and electrons to answer the following questions.

(i) Describe how these isotopes of sulfur are the same and how they are different.

same .....

.....

different .....

.....

[3]

(ii) Explain why each of these isotopes have an overall charge of zero.

.....

..... [1]

(iii) Explain why both isotopes have the same chemical properties.

.....

..... [1]

(b) Sulfide ions, S^{2-}, have the electronic structure 2,8,8.

(i) Explain why sulfide ions have a charge of 2–.

.....

..... [1]

(ii) Give the formula of:

- an anion which has the same electronic structure as S^{2-}

.....

- a cation which has the same electronic structure as S^{2-}.

.....

[2]

[Total: 8]

11. 0620_w22_qp_43 Q: 1

Atoms and ions are made from small particles called electrons, neutrons and protons.

(a) Complete the table.

particle	relative charge	relative mass
electron	–1	$\frac{1}{1840}$
neutron		
proton		

[2]

(b) Information about atoms and ions, **A**, **B** and **C**, is shown in the table.

Complete the table.

atom or ion	number of electrons	number of neutrons	number of protons	symbol
A	18		20	$^{42}_{20}Ca^{2+}$
B		18		$^{35}_{17}Cl$
C	18	16	16	

[6]

[Total: 8]

12. 0620_m19_qp_42 Q: 2

(a) The table gives information about some atoms or ions, **A**, **B** and **C**.

Complete the table.

	number of protons	number of electrons	electronic structure	charge
A	11	10	2,8	
B		18		0
C		10	2,8	–1

[4]

(b) (i) Carbon is an element.

Define the term *element*.

.....

..... [1]

(ii) $^{12}_{6}C$, $^{13}_{6}C$ and $^{14}_{6}C$ are isotopes of carbon.

Complete the table.

	number of protons	number of neutrons
$^{12}_{6}C$		
$^{13}_{6}C$		
$^{14}_{6}C$		

[2]

[Total: 7]

13. 0620_s19_qp_41 Q: 1

This question is about the structures of atoms and ions.

(a) Define the term *proton number*.

.....

..... [2]

(b) (i) Complete the table to show the number of protons, neutrons and electrons present in atoms of $^{24}_{12}Mg$ and $^{26}_{12}Mg$.

	number of protons	number of neutrons	number of electrons
$^{24}_{12}Mg$			
$^{26}_{12}Mg$			

[2]

(ii) What term is used to describe atoms of the same element, such as $^{24}_{12}Mg$ and $^{26}_{12}Mg$?

..... [1]

(iii) Explain why the chemical properties of $^{24}_{12}Mg$ and $^{26}_{12}Mg$ are the same.

.....

..... [2]

(c) Complete the table to identify the atoms and ions which have the following numbers of protons, neutrons and electrons.

	number of protons	number of neutrons	number of electrons
$^{23}_{11}Na^+$	11	12	10
	4	5	4
	17	20	18

[4]

(d) State the electronic structure of the following atom and ion.

Al .....

S^{2-} .....

[2]

[Total: 13]

14. 0620_s19_qp_43 Q: 1

Atoms contain particles called electrons, neutrons and protons.

(a) Complete the table.

particle	where the particle is found in an atom	relative mass	relative charge
	orbiting the nucleus	$\frac{1}{1840}$	
			+1
	in the nucleus		

[3]

(b) How many electrons, neutrons and protons are there in the ion shown?

$$^{44}_{20}Ca^{2+}$$

number of electrons .....

number of neutrons .....

number of protons .....

[3]

[Total: 6]

15. 0620_w19_qp_43 Q: 1

(a) Atoms are made of smaller particles called electrons, neutrons and protons.

Complete the table.

particle	relative charge	relative mass
electron		$\frac{1}{1840}$
neutron		
proton	+1	

[2]

(b) The table gives information about atoms and ions **A**, **B** and **C**.

Complete the table.

	number of electrons	number of neutrons	number of protons	symbol
A		14	13	$^{27}_{13}Al$
B			12	$^{25}_{12}Mg^{2+}$
C	10	10	9	

[6]

[Total: 8]

16. 0620_w18_qp_41 Q: 2

The table gives some information about four different particles, **A**, **B**, **C** and **D**.

particle	number of electrons	number of neutrons	number of protons	electronic structure	charge on particle
A	11	12	11	2,8,1	0
B		14	11	2,8,1	0
C	18	20		2,8,8	0
D	18	20	17		

(a) Complete the table. The first row has been done for you. [4]

(b) Give **two** particles from the table which are isotopes of each other.

..... [1]

(c) Element **Z** is in the same group of the Periodic Table as **A** and is less reactive than **A**.

State the identity of element **Z**.

..... [1]

(d) **C** is unreactive.

Use information from the table to explain why.

..... [1]

[Total: 7]

17. 0620_s17_qp_43 Q: 1

Six different atoms can be represented as follows.

$^{3}_{1}\mathbf{A}$ $^{3}_{2}\mathbf{D}$ $^{12}_{6}\mathbf{E}$ $^{13}_{6}\mathbf{G}$ $^{14}_{7}\mathbf{J}$ $^{19}_{9}\mathbf{L}$

(a) Answer the following questions using atoms from the list. Each atom may be used once, more than once or not at all.

Select **one** atom from the six shown which

(i) has exactly seven protons,

..... [1]

(ii) has exactly six neutrons,

..... [1]

(iii) has more protons than neutrons,

..... [1]

(iv) has the electronic structure [2,5],

..... [1]

(v) is an atom of an element from Group VII of the Periodic Table,

..... [1]

(vi) is an atom of a noble gas.

..... [1]

(b) Two of the six atoms shown are isotopes of each other.

(i) What is meant by the term *isotopes*?

.....

..... [2]

(ii) Which **two** of the six atoms shown are isotopes of each other?

..... [1]

(iii) Why do isotopes have identical chemical properties?

.....

..... [1]

[Total: 10]

2.4 Ions and ionic bonds

18. 0620_w21_qp_42 Q: 3

Atoms contain protons, neutrons and electrons.

(a) Complete the table to show the relative mass and the relative charge of a proton, a neutron and an electron.

	relative mass	relative charge
proton		
neutron		
electron	$\frac{1}{1840}$	

[3]

(b) The table shows the number of protons, neutrons and electrons in some atoms and ions.

Complete the table.

atom or ion	number of protons	number of neutrons	number of electrons
$^{32}_{16}S$			
$^{39}_{19}K^{+}$			
	35	44	36

[5]

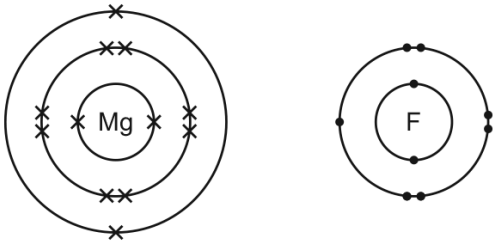
[Total: 8]

19. 0620_s20_qp_42 Q: 2

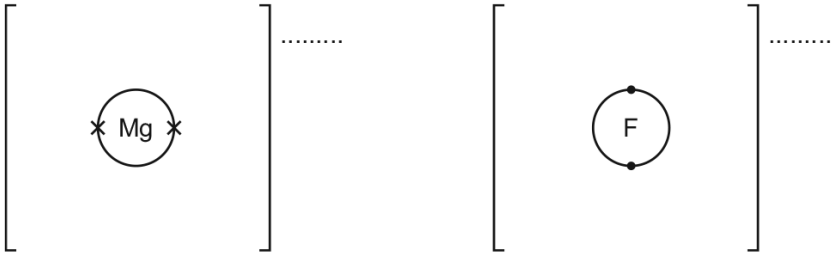
Fluorine forms both ionic and covalent compounds.

(a) Magnesium reacts with fluorine to form the ionic compound magnesium fluoride.

The electronic structures of an atom of magnesium and an atom of fluorine are shown.



(i) Complete the dot-and-cross diagrams to show the electronic structures of one magnesium ion and one fluoride ion. Show the charges on the ions.



[3]

(ii) What is the formula of magnesium fluoride?

..... [1]

(iii) Magnesium fluoride does **not** conduct electricity when it is solid.

What can be done to solid magnesium fluoride to make it conduct electricity?

In your answer explain why magnesium fluoride conducts electricity when this change is made.

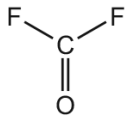
.....

.....

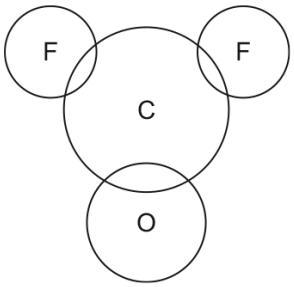
.....

..... [2]

(b) Carbonyl fluoride, COF_2, is a covalent compound. The structure of a molecule of COF_2 is shown.



Complete the dot-and-cross diagram to show the electron arrangement in a molecule of carbonyl fluoride. Show outer shell electrons only.



[3]

(c) The melting points of magnesium fluoride and carbonyl fluoride are shown.

	melting point / °C
magnesium fluoride	1263
carbonyl fluoride	–111

(i) Explain, using your knowledge of structure and bonding, why magnesium fluoride has a high melting point.

.....

.....

.....

..... [2]

(ii) Explain, using your knowledge of structure and bonding, why carbonyl fluoride has a low melting point.

.....

.....

.....

..... [2]

[Total: 13]

20. 0620_w17_qp_43 Q: 2

(a) (i) Define the term *molecule*.

.....

..... [2]

(ii) Define the term *element*.

.....

..... [1]

(b) The table shows the composition of four atoms or ions, **A**, **B**, **C** and **D**.

	number of protons	number of neutrons	number of electrons
A	10	10	10
B	10	12	10
C	12	10	10
D	13	14	10

(i) What is the atomic number of **A**?

..... [1]

(ii) What is the nucleon number of **B**?

..... [1]

(iii) Which of **A**, **B**, **C** and **D** are isotopes of each other?

..... [1]

(iv) Which of **A**, **B**, **C** and **D** are atoms?

..... [1]

(v) Which of **A**, **B**, **C** and **D** are positive ions?

..... [1]

(c) Complete the table.

	number of protons	number of electrons
Na		
S^{2-}		
Cl_2		

[3]

[Total: 11]

Appendix A

Answers

1. 0620_w17_ms_41 Q: 2

(a)(i)	**S**	**1**
(a)(ii)	**S**	**1**
(a)(iii)	**V**	**1**
(b)	any value in the range 130–145 °C	**1**
(c)	sublimation	**1**
(d)(i)	Brownian motion	**1**
(d)(ii)	nitrogen / oxygen / carbon dioxide / air molecules hit / bombard the smoke particles	**1**
	(the bombarding particles) move randomly	**1**

2. 0620_s20_ms_43 Q: 5

(a)		particle separation	particle arrangement	type of motion	**3**
	solid	touching			
	liquid		random		
	gas			random	
(b)	condensing				**1**
(c)	evaporation diffusion				**2**

3. 0620_w17_ms_42 Q: 1

(a)(i)	Brownian (motion)	**1**
(a)(ii)	molecules	**1**
	nitrogen / N_2 / N **OR** oxygen / O_2 / O	**1**
(a)(iii)	nitrogen **OR** oxygen (particles) collide with / bombard / hit the dust (particles)	**1**
	(the bombarding particles) move **randomly**	**1**
(b)(i)	diffusion	**1**
(b)(ii)	Br_2 has an M_r of 160 **AND** Cl_2 has an M_r of 71 / bromine has an A_r of 80 **AND** chlorine has an A_r of 35.5	**1**
	(heavier) bromine (molecules / particles) diffuses more slowly	**1**
(b)(iii)	particles have more energy / move faster	**1**

4. 0620_w17_ms_43 Q: 1

(a)	mixture	**1**
(b)	element	**1**
(c)	compound	**1**
(d)	mixture	**1**

5. 0620_s21_ms_41 Q: 2

Question	Answer	Marks
	Mg: 12 **and** 13 (1) Cu^{2+}: 29 **and** 27 (1) 37(**above**) **and**17(**below**) (1) C*l* (1) 1– (1)	**5**

6. 0620_s21_ms_43 Q: 2

Question	Answer	Marks
	B: 5 and 6 (1) Cl^-: 18 and 18 (1) 54 and 24 (1) Cr (1) 3^+ (1)	**5**

7. 0620_s18_ms_42 Q: 3

particles	number of protons	number of electrons	number of neutrons	number of nucleons
			12 (1)	
	17 (1)	18 (1)		37 (1)
Fe (1) 2+ (1)				

6

8. 0620_w17_ms_41 Q: 1

(a)(i)	**B**	**1**
(a)(ii)	**A**	**1**
(a)(iii)	**C**	**1**
(a)(iv)	**E**	**1**
(b)	O^{2-} **M1** O **M2** $^{2-}$	**2**

9. 0620_s22_ms_41 Q: 2

Question	Answer	Marks
(a)(i)	charge: –1 / 0 / ; relative mass: ; 1 ; 1 **(1)** **(1)** **Mark by column**	**2**

Question	Answer	Marks
(a)(ii)	<table><tr><td>12</td><td>12</td><td>12 (1)</td></tr><tr><td>12</td><td>13</td><td>12 (1)</td></tr></table> **Mark by row**	2
(a)(iii)	(they have) 2 more protons than electrons **OR** (they have) 2 fewer electrons than protons **OR** (they have) 12 protons and 10 electrons	1
(b)	Na^+ **or** Al^{3+} (1) F^- or O^{2-} or N^{3-} (1) Ne (1)	3

10. 0620_s22_ms_43 Q: 2

Question	Answer	Marks
(a)(i)	number of protons (are the same) / 16 protons (1) number of electrons (are the same) / 16 electrons (1) number of neutrons (are different) / 16,17 neutrons (1)	3
(a)(ii)	**number** of protons is the same as (the number of) electrons	1
(a)(iii)	same **number** of (outer shell) electrons	1
(b)(i)	(they have) **two** more electrons than protons	1
(b)(ii)	P^{3-} **OR** Cl^- (1) K^+ **OR** Ca^{2+} (1)	2

11. 0620_w22_ms_43 Q: 1

Question	Answer	Marks
(a)	<table><tr><th>**M1** relative charge</th><th>**M2** relative mass</th></tr><tr><td>0</td><td>1</td></tr><tr><td>+1</td><td>1</td></tr></table> 1 mark for each correct column	2
(b)	**M1** 22 (1) **M2** 17 (1) **M3** 17 (1) **M4** 32 and 16 (1) **M5** S (1) **M6** 2^- / $^-2$ / $^{--}$ (1)	6

12. 0620_m19_ms_42 Q: 2

(a)	<table><tr><th>number of protons</th><th>electrons</th><th>electronic structure</th><th>charge on particle</th></tr><tr><td>11</td><td>10</td><td>2,8</td><td>**M4 1+ / +1(1)**</td></tr><tr><td>**M1 18(1)**</td><td>18</td><td>**M3 2,8,8(1)**</td><td>0</td></tr><tr><td>**M2 9(1)**</td><td>10</td><td>2,8</td><td>1-</td></tr></table>	**4**
(b)(i)	*element* **EITHER** (substance) made of **atoms** with the same atomic number / number of protons / proton number **OR** a substance that cannot be split up / broken down into two or more simple(r) substances by chemical means	**1**
(b)(ii)	**M1** 6 protons in all three rows(1) **M2** 6,7 and 8 neutrons(1)	**2**

13. 0620_s19_ms_41 Q: 1

(a)	number of protons (1) protons in the nucleus (of an atom) (1)	**2**
(b)(i)	12p 12n 12e (1) 12p 14n 12e (1)	**2**
(b)(ii)	isotope(s)	**1**
(b)(iii)	same number of electrons (1) (same number) of electrons in the outer shell (1)	**2**
(c)	$^{9}_{4}Be$ any element symbol with a single negative charge (1) use of C*l* (1) use of $^{37}_{17}$ (1)	**4**
(d)	2 8 3 (1) 2 8 8 (1)	**2**

14. 0620_s19_ms_43 Q: 1

(a)	<table><tr><th>particle</th><th>where found in an atom</th><th>relative mass</th><th>relative charge</th></tr><tr><td>electron</td><td>orbiting nucleus</td><td>1/1840</td><td>–1</td></tr><tr><td>proton</td><td>(in the) nucleus</td><td>1</td><td>+1</td></tr><tr><td>neutron</td><td>in the nucleus</td><td>1</td><td>0 / nil</td></tr></table>	**3**
(b)	**M1** electrons **18** **M2** neutrons **24** **M3** protons **20**	**3**

15. 0620_w19_ms_43 Q: 1

(a)	<table><tr><th>particle</th><th>charge</th><th>relative mass</th></tr><tr><td>electron</td><td>M1 –1</td><td></td></tr><tr><td>neutron</td><td>M2 0</td><td>M3 1</td></tr><tr><td>proton</td><td></td><td>M4 1</td></tr></table> (1) (1) **Mark by column**	**2**
(b)	<table><tr><th>number of electrons</th><th>number of neutrons</th><th>number of protons</th><th>symbol</th></tr><tr><td>M1 13 (1)</td><td></td><td></td><td></td></tr><tr><td>M2 10 (1)</td><td>M3 13 (1)</td><td></td><td></td></tr><tr><td></td><td></td><td></td><td>M4 19 9 (1) M5 F (1) M6 – (1)</td></tr></table>	**6**

16. 0620_w18_ms_41 Q: 2

(a)	**M1** 11 **M2** 18 **M3** 2.8.8 **M4** –1	**4**
(b)	A **and** B	**1**
(c)	Li / Lithium	**1**
(d)	it has a complete **or** full **or** 8 electrons in the outer shell	**1**

17. 0620_s17_ms_43 Q: 1

(a)(i)	**J**	**1**
(a)(ii)	**E**	**1**
(a)(iii)	**D**	**1**
(a)(iv)	**J**	**1**
(a)(v)	**L**	**1**
(a)(vi)	**D**	**1**
(b)(i)	(atoms with) same **number** of protons / atomic number / of same element	**1**
	different **numbe**r of neutrons / different mass number / different nucleon number	**1**
(b)(ii)	**E AND G**	**1**
(b)(iii)	they have the same number of electrons in their outer shell	**1**

18. 0620_w21_ms_42 Q: 3

Question	Answer	Marks
(a)	1 mark for each correct row Name / Relative mass / Relative charge Proton / 1 / +1 Neutron / 1 / 0 Electron / 1 / 1840 / –1	3
(b)	Particle / Number of protons / Number of neutrons / Number of electrons $^{32}_{16}S$ / 16 / 16 / 16 $^{39}_{19}K^{+}$ / 19 / 20 / 18 $^{79}_{35}Br^{-}$ / 35 / 44 / 36 M1 = row 1 (1) M2 = row 2 (1) M3 =Br (1) M4 = $^{79}_{35}$ (on left of any symbol) (1) M5 = charge (on any symbol) (1)	5

19. 0620_s20_ms_42 Q: 2

(a)(i)	magnesium 2.8 (all crosses) (1) fluorine 2.8 (seven dots and one cross in outer shell) (1) Mg^{2+} **and** F^{-}(1)	3
(a)(ii)	MgF_2	1
(a)(iii)	heat until molten **or** dissolve in water (1) moving ions / mobile ions (1)	2

(b)	two single bonds (1) one double bond (1) six non-bonding electrons on both F atoms and four non- bonding electrons on O atom to complete the octet in each case (1)	3
(c)(i)	forces of attraction between oppositely charged ions / ionic bonds (1) strong / need a lot of energy to break / weaken (1)	2
(c)(ii)	forces of attraction between molecules (1) weak / need a small of energy to break / weaken (1)	2

20. 0620_w17_ms_43 Q: 2

(a)(i)	(two or more) **atoms**	1
	combined / joined / sharing electrons (by a covalent bond) / bonded	1
(a)(ii)	substance that cannot be split up / broken down / decomposed (into anything simpler) **OR** (substance) made of **atoms** with the same atomic number / number of protons / proton number	1
(b)(i)	10	1
(b)(ii)	22	1
(b)(iii)	A **AND** B	1
(b)(iv)	A **AND** B	1
(b)(v)	C **AND** D	1
(c)	number of protons / number of electrons Na / 11 / 11 S^{2-} / 16 / 18 Cl_2 / 34 / 34	3