Topical Past Paper Questions Worksheets

IGCSE Chemistry (0620)

Paper 3 (Core)

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 3 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: 3
- Number of pages: 780
- Number of questions: 351

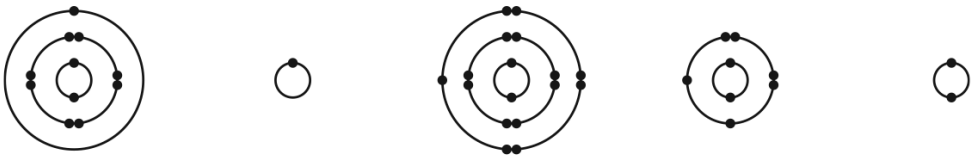
Contents

Chapter 1

Atoms, elements and compounds

1. 0620_s17_qp_33 Q: 1

(a) The electronic structures of five atoms, **A**, **B**, **C**, **D** and **E**, are shown.



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

Answer the following questions about these atoms.
Each atom may be used once, more than once or not at all.

Which atom, **A**, **B**, **C**, **D** or **E**,

(i) is in Group VIII of the Periodic Table, ... [1]

(ii) is a chlorine atom, ... [1]

(iii) has 17 protons in its nucleus, ... [1]

(iv) is an atom of an element in the same period as carbon, ... [1]

(v) is an atom of a metal? ..... [1]

(b) Complete the table to show the number of electrons, neutrons and protons in the magnesium atom and calcium ion shown.

	number of electrons	number of neutrons	number of protons
$^{26}_{12}Mg$	12		
$^{44}_{20}Ca^{2+}$		24	

[3]

[Total: 8]

2. 0620_s18_qp_31 Q: 6

This question is about isotopes.

(a) An atom of an isotope of fluorine is represented by the symbol shown.

$^{19}_{9}F$

Describe the structure of an atom of this isotope of fluorine.
In your answer, include:

- the position of the protons, neutrons and electrons in the atom
- the number of protons, neutrons and electrons present in the atom.

.....

.....

.....

.....

.....

.....

..... [5]

(b) Complete the sentence about isotopes using words from the list.

atomic **compound** **element** **ions** **molecular** **nucleons**

Isotopes are atoms of the same ..... which have the same

..... number but different numbers of ..... .

[3]

(c) Give **one** medical use of radioactive isotopes.

..... [1]

(d) Which **one** of the following isotopes is used as a source of energy?
Draw a circle around the correct answer.

$^{127}_{53}I$ $^{235}_{92}U$ $^{131}_{54}Xe$ $^{66}_{30}Zn$

[1]

[Total: 10]

3. 0620_s18_qp_32 Q: 6

This question is about isotopes.

(a) An atom of an isotope of nitrogen is represented by the symbol shown.

$$^{15}_{7}N$$

Describe the structure of an atom of this isotope of nitrogen.
In your answer, include:

- the position of the protons, neutrons and electrons in the atom
- the number of protons, neutrons and electrons present in the atom.

.....

.....

.....

.....

.....

.....

..... [5]

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

.....

.....

..... [2]

(c) Give **one** industrial use of radioactive isotopes.

..... [1]

[Total: 8]

4. 0620_s18_qp_33 Q: 6

This question is about isotopes.

(a) An atom of an isotope of oxygen is represented by the symbol shown.

$$^{17}_{8}O$$

Describe the structure of an atom of this isotope of oxygen.
In your answer, include:

- the position of the protons, neutrons and electrons in the atom
- the number of protons, neutrons and electrons present in the atom.

.....

.....

.....

.....

.....

.....

..... [5]

(b) Which **two** statements about isotopes are correct?
Tick **two** boxes.

Isotopes of the same element have different numbers of protons.	☐
Isotopes of the same element have different numbers of neutrons.	☐
Isotopes are always radioactive.	☐
The isotope $^{235}_{92}U$ is a source of energy.	☐
$^{14}_{6}C$ and $^{14}_{7}N$ are isotopes of each other.	☐

[2]

(c) What is meant by the term *nucleon number*?

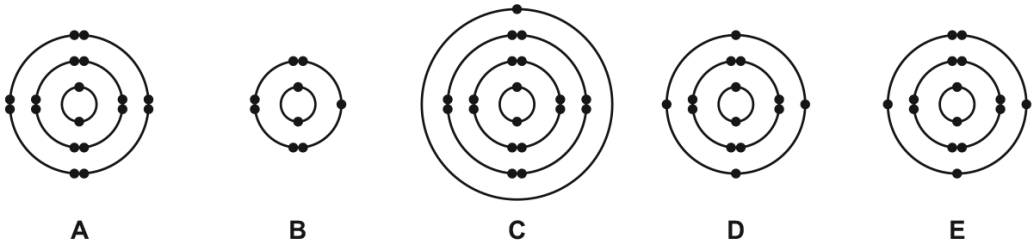
.....

..... [1]

[Total: 8]

5. 0620_s17_qp_31 Q: 1

(a) The electronic structures of five atoms, **A**, **B**, **C**, **D** and **E**, are shown.



Answer the following questions about these atoms.
Each atom may be used once, more than once or not at all.

Which atom, **A**, **B**, **C**, **D** or **E**,

(i) has a complete outer shell of electrons, ... [1]

(ii) has a proton number of 15, ... [1]

(iii) has 4 shells containing electrons, ... [1]

(iv) is a fluorine atom, ... [1]

(v) is an atom of a metallic element? ..... [1]

(b) Complete the table to show the number of electrons, neutrons and protons in the chlorine atom and bromide ion shown.

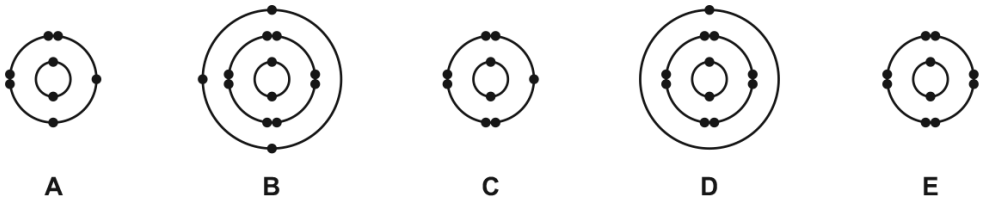
	number of electrons	number of neutrons	number of protons
$^{35}_{17}Cl$	17		
$^{79}_{35}Br^-$		44	

[3]

[Total: 8]

6. 0620_s17_qp_32 Q: 1

(a) The electronic structures of five atoms, **A**, **B**, **C**, **D** and **E**, are shown.



Answer the following questions about these atoms.
Each atom may be used once, more than once or not at all.

Which atom, **A**, **B**, **C**, **D** or **E**,

(i) has a total of 8 electrons, ... [1]

(ii) is in Group III of the Periodic Table, ... [1]

(iii) has 13 protons, ... [1]

(iv) is a noble gas, ... [1]

(v) forms a stable ion with a single negative charge? ..... [1]

(b) Complete the table to show the number of electrons, neutrons and protons in the sulfur atom and oxide ion shown.

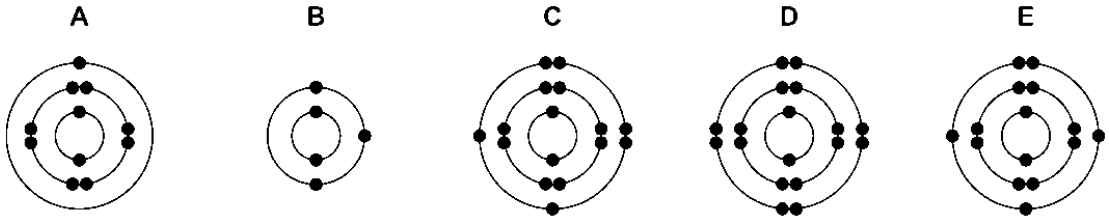
	number of electrons	number of neutrons	number of protons
$^{34}_{16}S$	16		
$^{18}_{8}O^{2-}$		10	

[3]

[Total: 8]

7. 0620_s21_qp_32 Q: 1

(a) The electronic structures of five atoms, **A**, **B**, **C**, **D** and **E**, are shown.



Answer the following questions about these electronic structures.
Each electronic structure may be used once, more than once or not at all.

State which electronic structure, **A**, **B**, **C**, **D** or **E**, represents:

(i) an atom in Group III of the Periodic Table

..... [1]

(ii) an atom of a noble gas

..... [1]

(iii) an atom that forms a stable ion with a single positive charge

..... [1]

(iv) an atom that contains only two shells of electrons

..... [1]

(v) an atom with a proton number of 16.

..... [1]

(b) Complete the table to show the number of electrons, neutrons and protons in the silicon atom and sodium ion shown.

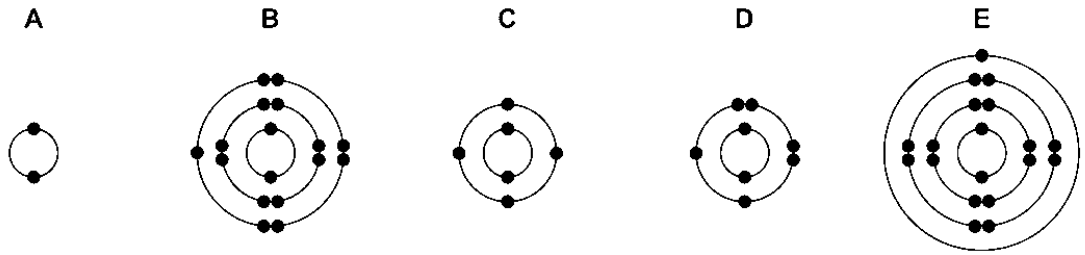
	number of electrons	number of neutrons	number of protons
$^{30}_{14}Si$	14		
$^{23}_{11}Na^{+}$		12	

[3]

[Total: 8]

8. 0620_s21_qp_33 Q: 1

(a) The electronic structures of five atoms, **A**, **B**, **C**, **D** and **E**, are shown.



Answer the following questions about these electronic structures.
Each electronic structure may be used once, more than once or not at all.

State which electronic structure, **A**, **B**, **C**, **D** or E, represents:

(i) an atom of an element in Group VI of the Periodic Table

..... [1]

(ii) an atom of a reactive metal

..... [1]

(iii) an atom with a proton number of 17

..... [1]

(iv) an atom that forms a stable ion with a charge of 2–

..... [1]

(v) an atom of oxygen.

..... [1]

(b) Complete the table to show the number of electrons, neutrons and protons in the bromine atom and fluoride ion shown.

	number of electrons	number of neutrons	number of protons
$^{81}_{35}Br$	35		
$^{19}_{9}F^-$		10	

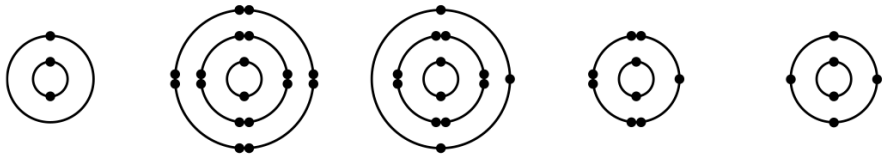
[3]

[Total: 8]

9. 0620_m19_qp_32 Q: 1

This question is about electronic structures.

(a) The electronic structures of five atoms, **A**, **B**, **C**, **D** and **E**, are shown.



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

Answer the following questions about these electronic structures.
Each electronic structure may be used once, more than once or not at all.

State which electronic structure, **A**, **B**, **C**, **D** or **E**, represents an atom:

(i) of an element in Group III of the Periodic Table ..... [1]

(ii) of a monatomic gas ..... [1]

(iii) of carbon ..... [1]

(iv) which has 18 protons ..... [1]

(v) which forms a stable ion with a single negative charge. ..... [1]

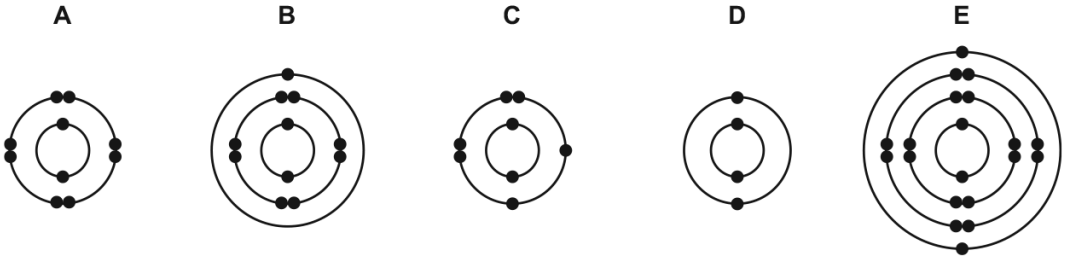
(b) Draw the electronic structure of a silicon atom.

[2]

[Total: 7]

10. 0620_w18_qp_32 Q: 1

(a) The electronic structures of five atoms, **A**, **B**, **C**, **D** and **E**, are shown.



Answer the following questions about these structures.
Each structure may be used once, more than once or not at all.
State which structure, **A**, **B**, **C**, **D** or **E**, represents:

(i) an atom in Group VIII of the Periodic Table ..... [1]

(ii) an atom of a reactive non-metal ..... [1]

(iii) an atom with a proton number of 11 ..... [1]

(iv) an atom with only **three** shells of electrons ..... [1]

(v) an atom which forms a stable ion with a single positive charge. ..... [1]

(b) Complete the table to show the number of electrons, neutrons and protons in the nitrogen atom and chromium ion shown.

	number of electrons	number of neutrons	number of protons
$^{15}_{7}N$	7		
$^{52}_{24}Cr^{2+}$		28	

[3]

[Total: 8]

11. 0620_w20_qp_33 Q: 3

Some properties of four substances, **A**, **B**, **C** and **D**, are shown in the table.

substance	electrical conductivity when solid	electrical conductivity when molten	melting point	solubility in water
A	does not conduct	does not conduct	low	insoluble
B	conducts	conducts	high	insoluble
C	does not conduct	does not conduct	very high	soluble
D	does not conduct	conducts	high	soluble

Answer these questions using only the information in the table.

(a) State which substance, **A**, **B**, **C** or **D**, is sulfur.

Explain your answer.

substance .....

explanation .....

.....

[3]

(b) State which substance, **A**, **B**, **C** or **D**, is sodium chloride.

Explain your answer.

substance .....

explanation .....

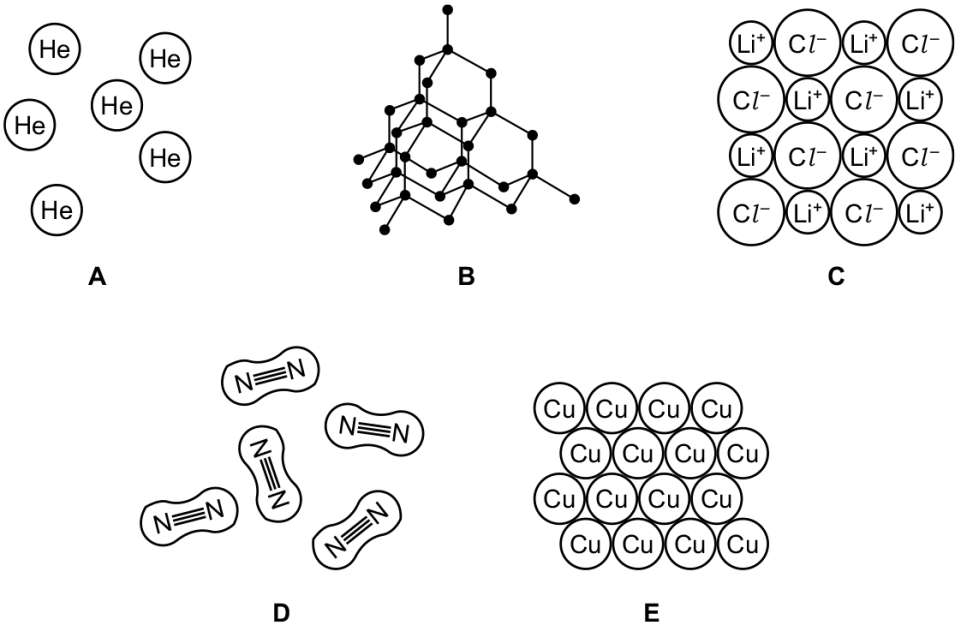
.....

[3]

[Total: 6]

12. 0620_s19_qp_31 Q: 1

The diagrams show part of the structures of five substances, **A**, **B**, **C**, **D** and **E**.



A **B** **C**

D **E**

(a) Answer the following questions about these structures.
Each structure may be used once, more than once or not at all.

(i) Which **two** of these structures, **A**, **B**, **C**, **D** or **E**, are covalently bonded?

..... and .....
[2]

(ii) Which **one** of these structures, **A**, **B**, **C**, **D** or **E**, is a diatomic molecule?

..... [1]

(iii) Which **one** of these structures, **A**, **B**, **C**, **D** or **E**, is a compound?

..... [1]

(iv) Which **one** of these structures, **A**, **B**, **C**, **D** or **E**, is very soluble in water?

..... [1]

(v) Which **one** of these structures, **A**, **B**, **C**, **D** or **E**, is used in cutting tools?

..... [1]

(vi) Which **one** of these structures, **A**, **B**, **C**, **D** or **E**, is used in electrical wiring?

..... [1]

(b) Substance **B** is an element.

What is meant by the term *element*?

.....

..... [1]

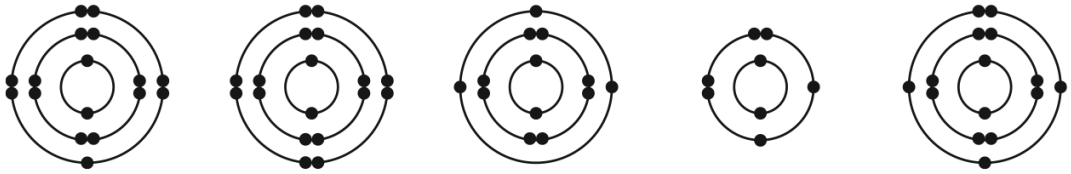
[Total: 8]

---

13. 0620_w18_qp_31 Q: 1

(a) The electronic structures of five atoms, **A**, **B**, **C**, **D** and **E**, are shown.

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



Answer the following questions about these structures.
Each structure may be used once, more than once or not at all.
State which structure, **A**, **B**, **C**, **D** or **E**, represents:

(i) an atom of a metallic element ..... [1]

(ii) an atom with a proton number of 13 ..... [1]

(iii) an atom of phosphorus ..... [1]

(iv) an atom with only **two** shells of electrons ..... [1]

(v) an atom which forms a stable ion with a single negative charge. ..... [1]

(b) Complete the table to show the number of electrons, neutrons and protons in the carbon atom and potassium ion shown.

	number of electrons	number of neutrons	number of protons
$^{14}_{6}C$	6		
$^{40}_{19}K^{+}$		21	

[3]

[Total: 8]

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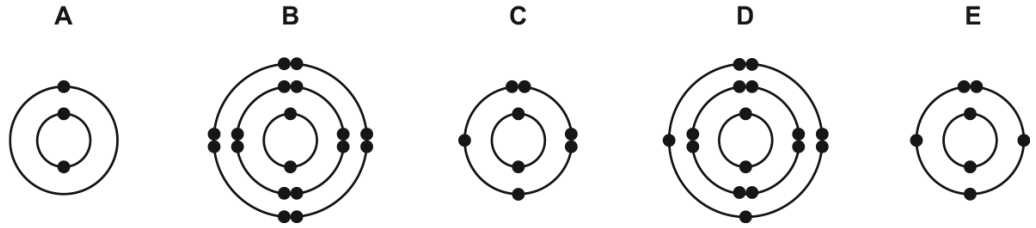
14. 0620_w18_qp_33 Q: 1

(a) The electronic structures of five atoms, **A**, **B**, **C**, **D** and **E**, are shown.



Answer the following questions about these structures.
Each structure may be used once, more than once or not at all.
State which structure, **A**, **B**, **C**, **D** or **E**, represents:

(i) an atom with a total of eight electrons ..... [1]

(ii) an atom in Group V of the Periodic Table ..... [1]

(iii) an atom with a complete outer shell of electrons ..... [1]

(iv) an atom of a metallic element ..... [1]

(v) an atom which forms a stable ion with a single positive charge. ..... [1]

(b) Complete the table to show the number of electrons, neutrons and protons in the neon atom and copper ion shown.

	number of electrons	number of neutrons	number of protons
$^{22}_{10}Ne$	10		
$^{65}_{29}Cu^{+}$		36	

[3]

[Total: 8]

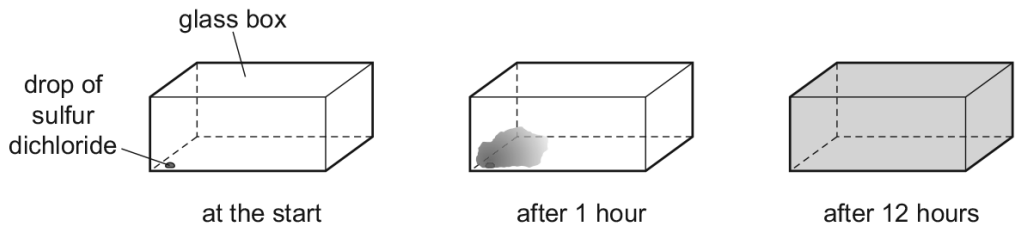
Chapter 2

Stoichiometry

15. 0620_w17_qp_32 Q: 7

Sulfur dichloride, SCl_2, is a red liquid which vaporises easily at room temperature and pressure.

(a) A drop of sulfur dichloride was placed in the corner of a glass box.
The glass box was closed and left for 12 hours.
After 12 hours a red vapour had spread to fill the whole box.



Explain these observations using the kinetic particle model.

.....

.....

.....

.....

..... [3]

(b) Sulfur dichloride can be made by passing chlorine through liquid disulfur dichloride, S_2Cl_2.

Complete the chemical equation for this reaction.

$$S_2Cl_2 + \text{.....} \rightarrow \text{.....}SCl_2$$

[2]

(c) Some changes of state of sulfur dichloride are shown.

$$SCl_2\ (\text{solid}) \underset{\textbf{P}}{\overset{\text{melting}}{\rightleftharpoons}} SCl_2\ (\text{liquid}) \underset{\textbf{Q}}{\overset{\text{evaporating}}{\rightleftharpoons}} SCl_2\ (\text{gas})$$

Name the changes of state represented by **P** and **Q**.

P .....

Q .....

[2]

[Total: 7]

16. 0620_s19_qp_31 Q: 3

(a) The table shows the percentage by mass of the elements on Earth and in the Universe.

element	percentage by mass on Earth	percentage by mass in the Universe
helium	0.0	21.0
hydrogen	0.1	76.0
iron	35.0	1.0
magnesium	14.0	0.1
oxygen	29.0	0.8
silicon	14.0	0.1
sulfur	2.9	0.1
other elements		0.9
total	100.0	100.0

Answer these questions using only the information in the table.

(i) Deduce the percentage by mass of other elements present on Earth.

..... % [1]

(ii) Which non-metallic element is present on Earth in the greatest percentage by mass?

..... [1]

(iii) Give **two** major differences in the percentage by mass of the elements on Earth and in the Universe.

1 .....

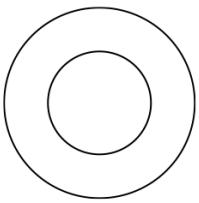
.....

2 .....

.....

[2]

(b) Complete the diagram to show the electron arrangement in an oxygen atom.



[1]

(c) Helium, neon and argon are noble gases.

(i) Explain, in terms of the electronic structure, why neon is unreactive.

.....

..... [1]

(ii) State **one** use of argon.

..... [1]

[Total: 7]

Appendix A

Answers

1. 0620_s17_ms_33 Q: 1

(a)(i)	**E**	**1**
(a)(ii)	**C**	**1**
(a)(iii)	**C**	**1**
(a)(iv)	**D**	**1**
(a)(v)	**A**	**1**
(b)	number of electrons in Ca^{2+} = 18	**1**
	number of neutrons in Mg = 14	**1**
	number of protons in Mg = 12 **AND** number of protons in Ca^{2+} = 20	**1**

2. 0620_s18_ms_31 Q: 6

(a)	One mark each for any 5 of: □ protons in the nucleus / centre (of the atom) □ neutrons in the nucleus / centre (of the atom) □ electrons outside the nucleus / electrons surrounding the nucleus / electrons orbiting the nucleus □ 9 protons □ 9 electrons □ 10 neutrons	**5**
(b)	element	**1**
	atomic	**1**
	nucleons	**1**
(c)	any suitable e.g. treating cancer / checking thyroid function / tracer (in the body)	**1**

(d)	$^{235}_{92}U$	**1**

3. 0620_s18_ms_32 Q: 6

(a)	One mark each for any 5 of: □ protons in the nucleus / centre (of the atom) / middle □ neutrons in the nucleus / centre (of the atom) / middle □ electrons outside the nucleus / electrons surrounding the nucleus / electrons orbiting the nucleus □ 7 protons □ 7 electrons □ 8 neutrons	5
(b)	atoms (of an element) with the same number of protons but different number of neutrons **IF** 2 marks not scored: 1 mark for idea of same number of protons but different number of neutrons	2
(c)	any suitable use e.g. measuring the thickness of paper / energy from nuclear reactors / finding leaks (in pipelines) / smoke alarms / energy production	1

4. 0620_s18_ms_33 Q: 6

(a)	One mark each for any 5 of: □ protons in the nucleus / centre (of the atom) □ neutrons in the nucleus / centre of the atom □ electrons outside the nucleus / electrons surrounding the nucleus / electrons orbiting the nucleus □ 8 protons □ 8 electrons □ 9 neutrons	5
(b)	2nd box down ticked	1
	4th box down ticked	1
(c)	number of protons plus neutrons in an atom	1

5. 0620_s17_ms_31 Q: 1

(a)(i)	**A**	1
(a)(ii)	**E**	1
(a)(iii)	**C**	1
(a)(iv)	**B**	1
(a)(v)	**C**	1
(b)	number of electrons in Br^- = 36	1
	number of neutrons in *Cl* = 18	1
	number of protons in *Cl* = 17 **AND** number of protons in Br^- = 35	1

6. 0620_s17_ms_32 Q: 1

(a)(i)	**A**	**1**
(a)(ii)	**B**	**1**
(a)(iii)	**B**	**1**
(a)(iv)	**E**	**1**
(a)(v)	**C**	**1**
(b)	number of electrons in O^{2-} ion = 10	**1**
	number of neutrons in S = 18	**1**
	number of protons in S = 16 **AND** in O^{2-} ion = 8	**1**

7. 0620_s21_ms_32 Q: 1

Question	Answer	Marks
(a)(i)	B	**1**
(a)(ii)	D	**1**
(a)(iii)	A	**1**
(a)(iv)	B	**1**
(a)(v)	C	**1**
(b)	number of electrons in Na ion =10 (1) number of neutrons in Si = 16 (1) number of protons in Si = 14 **AND** number of protons in Na ion = 11 (1)	**3**

8. 0620_s21_ms_33 Q: 1

Question	Answer	Marks
(a)(i)	D	**1**
(a)(ii)	E	**1**
(a)(iii)	B	**1**
(a)(iv)	D	**1**
(a)(v)	D	**1**
(b)	number of electrons in F ion = 10 (1) number of neutrons in Br = 46 (1) number of protons in Br = 35 **AND** number of protons in F ion = 9 (1)	**3**

9. 0620_m19_ms_32 Q: 1

(a)(i)	C	**1**
(a)(ii)	B	**1**
(a)(iii)	E	**1**
(a)(iv)	B	**1**
(a)(v)	D	**1**
(b)	4 electrons in outer shell (1) 2,8 in inner shell AND not more than 3 shells (1)	**2**

10. 0620_w18_ms_32 Q: 1

(a)(i)	**A**	**1**
(a)(ii)	**C**	**1**
(a)(iii)	**B**	**1**
(a)(iv)	**B**	**1**
(a)(v)	**B**	**1**
(b)	electrons in Cr^{2+}: 22 (1) neutrons in N: 8 (1) protons in N 7 **AND** Cr^{2+}: 24 (1)	**3**

11. 0620_w20_ms_33 Q: 3

Question	Answer	Marks
(a)	A (1) low melting point / lowest melting point (1) does not conduct when molten / does not conduct when liquid (1)	**3**
(b)	D (1) does not conduct when solid but conducts when molten / only conducts when molten (1) soluble in water (1)	**3**

12. 0620_s19_ms_31 Q: 1

(a)(i)	B / diamond (1) D / nitrogen / N_2 (1)	**2**
(a)(ii)	D / nitrogen / N_2	**1**
(a)(iii)	C / lithium chloride / LiC*l*	**1**
(a)(iv)	C / lithium chloride / LiC*l*	**1**
(a)(v)	B / diamond	**1**
(a)(vi)	E / copper / Cu	**1**
(b)	substance in which all the atoms have the same proton number / substance containing (only) one type of atom	**1**

13. 0620_w18_ms_31 Q: 1

(a)(i)	C	**1**
(a)(ii)	C	**1**
(a)(iii)	E	**1**
(a)(iv)	D	**1**
(a)(v)	A	**1**
(b)	electrons in K^+: 18 (1) neutrons in C–14: 8 (1) protons in C 6 **AND** K^+ 19 (1)	**3**

14. 0620_w18_ms_33 Q: 1

(a)(i)	C	1
(a)(ii)	E	1
(a)(iii)	B	1
(a)(iv)	A	1
(a)(v)	A	1
(b)	electrons in Cu^+: 28 (1) neutrons in Ne: 12 (1) protons Ne 10 **AND** Cu^+: 29 (1)	3

15. 0620_w17_ms_32 Q: 7

(a)	any 3 from: □ diffusion □ molecules move (from place to place) □ (molecules move) randomly □ molecules collide □ molecules spread out / mix up □ (bulk) movement of molecules from areas of where they are at higher concentration to where they are at lower concentration	3

(b)	Cl_2	1
	2 (SCl_2)	1
(c)	**P**: freezing	1
	Q: condensing / condensation	1

16. 0620_s19_ms_31 Q: 3

(a)(i)	5.0%	1
(a)(ii)	oxygen	1
(a)(iii)	any **two** from: □ more hydrogen in Universe (or reverse argument) □ more helium in Universe (or reverse argument) □ more oxygen on Earth (or reverse argument) □ more magnesium on Earth (or reverse argument) □ more iron on Earth (or reverse argument) □ more silicon on Earth (or reverse argument) □ more sulfur on Earth (or reverse argument)	2
(b)	2 electrons in inner shell **AND** 6 electrons in outer shell **AND** no additional shells of electrons	1
(c)(i)	has complete **outer** (electron) shell / has full **outer** (electron) shell / **outer** shell cannot gain or lose electron(s)	1
(c)(ii)	lamps / inert atmosphere (in metal extraction)	1