PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

CHEMISTRY



EXAM QUESTION PACK

TOPIC 1: KEY CONCEPTS IN CHEMISTRY: ATOMIC STRUCTURE (PAPER 2)

SCORE	PERCENTAGE
/107	%

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Q1.

Atoms of neon are made up of subatomic particles.

(i) Figure 1 shows some information about the subatomic particles in neon atoms.

Complete Figure 1 with the missing information.

(3)

subatomic particle	relative charge	relative mass
proton	.....	1
neutron	0	.....
electron	.....	negligible

Figure 1

(ii) All atoms of neon have an atomic number of 10.

Describe what information about the number of subatomic particles can be obtained from the atomic number of neon.

(2)

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(iii) Explain why atoms of neon are electrically neutral.

(2)

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(Total for question = 7 marks)

Q2.

Atoms of neon are made up of subatomic particles.

(i) Figure 9 shows some information about the subatomic particles in neon atoms.

Complete Figure 9 with the missing information.

(3)

subatomic particle	relative charge	relative mass
proton	.....	1
neutron	0	.....
electron	.....	negligible

Figure 9

(ii) All atoms of neon have an atomic number of 10.

Describe what information about the number of subatomic particles can be obtained from the atomic number of neon.

(2)

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.....

(iii) Explain why atoms of neon are electrically neutral.

(2)

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(Total for question = 7 marks)

(**QU05a 1SC0/1CF, June 2025**)

Q3.

Each element has an atomic number.

(i) State what is meant by **atomic number.**

(1)

.....

.....

(ii) The atomic number of boron is 5.
Boron exists as two isotopes boron-10 and boron-11.

Use this information to explain why boron-10 and boron-11 are isotopes.

(2)

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(**Q24 1SC0/1CH, June 2013**)

Q4.

Each element has an atomic number.

(i) State what is meant by **atomic number.**

(1)

.....

.....

(ii) The atomic number of boron is 5.
Boron exists as two isotopes boron-10 and boron-11.

Use this information to explain why boron-10 and boron-11 are isotopes.

(2)

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(**Q15 1SC0/2CH, June 2013**)

Q5.

(a) The table shows the number of electrons, neutrons and protons in particles P, Q, R, S, T and V.

particle	number of		
	electrons	neutrons	protons
P	1	0	1
Q	3	4	3
R	8	8	8
S	13	14	13
T	18	16	16
V	18	20	20

(i) Which particle is a negatively charged ion?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** P

☒ **B** S

☒ **C** T

☒ **D** V

(ii) Which particles are atoms of metals?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** P and R

☒ **B** Q and R

☒ **C** Q and S

☒ **D** Q, S and V

(b) Each element has an atomic number.

(i) State what is meant by **atomic number.**

(1)

.....

.....

(ii) The atomic number of boron is 5.
Boron exists as two isotopes boron-10 and boron-11.

Use this information to explain why boron-10 and boron-11 are isotopes.

(2)

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(c) (i) Explain what is meant by the term relative atomic mass.

(2)

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(ii) A sample of boron contains

19.7% of boron-10.
80.3% of boron-11.

Use this information to calculate the relative atomic mass of boron.

(3)

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(Total for Question = 10 marks)

(**Q14 1SC0/1CH, June 2013**)

Q6.

(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

The particles in atoms are electrons, neutrons and protons.

The mass of an electron is

(1)

☒ **A** greater than the mass of a neutron

☒ **B** the same as the mass of a proton

☒ **C** smaller than the mass of a proton

☒ **D** the same as the mass of a neutron

(b) The atomic number of oxygen is 8.

The mass number of an atom of oxygen is 17.

Describe the number and type of particles in the nucleus of this atom.

(2)

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(c) Sulfur and oxygen are both in group 6 of the periodic table.

Explain, in terms of their electronic configurations, why they are both in group 6.

(2)

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(d) An atom of phosphorus contains 15 electrons.

Describe how these 15 electrons are arranged in a phosphorus atom.

(2)

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(e) Phosphorus oxide is a compound that contains covalent bonds.

(i) Describe what is meant by a **covalent bond.**

(2)

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(ii) The formula of a molecule of phosphorus oxide is P_4O_{10}

Give the empirical formula of this oxide.

(1)

.....

(Total for Question = 10 marks)

(**Q46 1SC0/1CH, June 2013**)

Q7.

(a) The table shows the number of electrons, neutrons and protons in particles P, Q, R, S, T and V.

particle	number of		
	electrons	neutrons	protons
P	1	0	1
Q	3	4	3
R	8	8	8
S	13	14	13
T	18	16	16
V	18	20	20

(i) Which particle is a negatively charged ion?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** P

☒ **B** S

☒ **C** T

☒ **D** V

(ii) Which particles are atoms of metals?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** P and R

☒ **B** Q and R

☒ **C** Q and S

☒ **D** Q, S and V

(b) Each element has an atomic number.

(i) State what is meant by **atomic number.**

(1)

.....

.....

(ii) The atomic number of boron is 5.
Boron exists as two isotopes boron-10 and boron-11.

Use this information to explain why boron-10 and boron-11 are isotopes.

(2)

.....

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(c) (i) Explain what is meant by the term relative atomic mass.

(2)

.....

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.....

(ii) A sample of boron contains
19.7% of boron-10.
80.3% of boron-11.

Use this information to calculate the relative atomic mass of boron.

(3)

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(Total for Question = 10 marks)

(**Q04 1SC0/2CH, June 2013**)

Q8.

(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

The particles in atoms are electrons, neutrons and protons.

The mass of an electron is

(1)

☒ **A** greater than the mass of a neutron

☒ **B** the same as the mass of a proton

☒ **C** smaller than the mass of a proton

☒ **D** the same as the mass of a neutron

(b) The atomic number of oxygen is 8.

The mass number of an atom of oxygen is 17.

Describe the number and type of particles in the nucleus of this atom.

(2)

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.....

(c) Sulfur and oxygen are both in group 6 of the periodic table.

Explain, in terms of their electronic configurations, why they are both in group 6.

(2)

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.....

(d) An atom of phosphorus contains 15 electrons.

Describe how these 15 electrons are arranged in a phosphorus atom.

(2)

.....

.....

.....

.....

(e) Phosphorus oxide is a compound that contains covalent bonds.

(i) Describe what is meant by a **covalent bond.**

(2)

.....

.....

.....

.....

(ii) The formula of a molecule of phosphorus oxide is P_4O_{10}

Give the empirical formula of this oxide.

(1)

.....

(Total for Question = 10 marks)

(**Q43 1SC0/2CH, June 2013**)

Q9.

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

(2)

particle	relative mass
proton	1
neutron	
electron	

(b) Complete the sentence by putting a cross (☒) in the box next to your answer.

An atom has no overall charge because it contains

(1)

☒ **A** more protons than electrons

☒ **B** the same number of electrons and protons

☒ **C** the same number of electrons and neutrons

☒ **D** more neutrons than electrons

(c) The atomic number of lithium is 3.
The mass number of an atom of lithium is 7.

State the name and number of each of the particles in the nucleus of this atom.

(2)

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(**Q10 1SC0/2CF, June 2015**)

Q10.

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

(2)

particle	relative mass
proton	1
neutron	
electron	

(b) Complete the sentence by putting a cross (☒) in the box next to your answer.

An atom has no overall charge because it contains

(1)

☒ **A** more protons than electrons

☒ **B** the same number of electrons and protons

☒ **C** the same number of electrons and neutrons

☒ **D** more neutrons than electrons

(c) The atomic number of lithium is 3.
The mass number of an atom of lithium is 7.

State the name and number of each of the particles in the nucleus of this atom.

(2)

.....

.....

.....

(**Q22 1SC0/1CF, June 2015**)

Q11.

Lithium has two naturally occurring isotopes, lithium-6 and lithium-7.

A sample of lithium contains

7.59 % of lithium-6

92.41% of lithium-7.

Calculate the relative atomic mass of lithium in this sample.

Give your answer to two decimal places.
You must show your working.

(4)

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relative atomic mass of lithium = ...

(Total for question = 4 marks)

(**Q04c 1SC0/2CH, June 2019**)

Q12.

A sample of neon contains three isotopes

90.48% of neon-20

0.27% of neon-21

9.25% of neon-22

Using this information, calculate the relative atomic mass of this sample of neon.

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relative atomic mass = ...

(Total for question = 2 marks)

(**QU01b 1SC0/1CH, June 2025**)

Q13.

Titanium and iron are examples of transition metals.

Figure 4 shows the percentage abundance of each isotope in a sample of titanium.

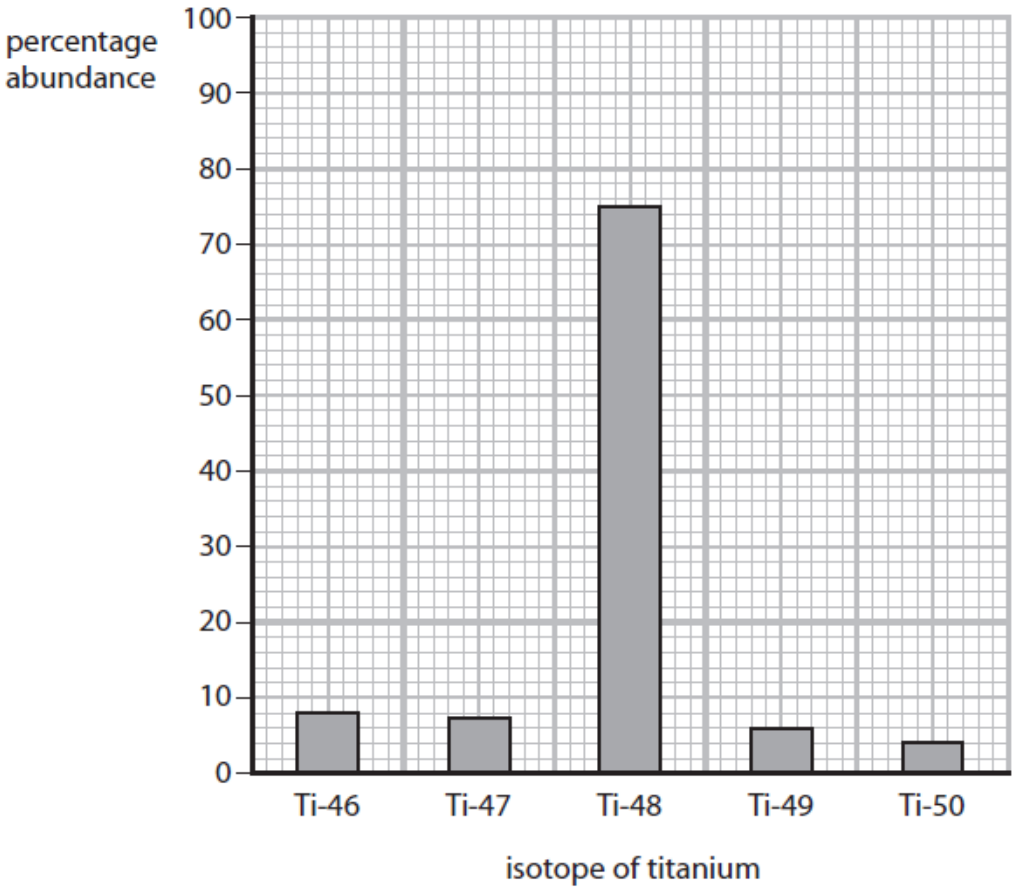


Figure 4

Calculate the relative atomic mass of titanium in this sample.

(3)

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relative atomic mass = ...

(Total for question = 3 marks)

(**Q04a 1SC0/1CH, Nov 2020**)

Q14.

Chlorine and carbon

(a) Chlorine has an atomic number of 17.
Chlorine-35 and chlorine-37 are two isotopes of chlorine.

(i) Complete the table to show the numbers of protons, neutrons and electrons in each of the isotopes.

(2)

	chlorine-35	chlorine-37
number of protons		
number of neutrons		
number of electrons		

(ii) A normal sample of chlorine contains only chlorine-35 and chlorine-37 atoms.

Explain why the relative atomic mass of chlorine is 35.5

(2)

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(b) Tetrachloromethane is a simple molecular, covalent compound. The formula of its molecule is CCl_4.

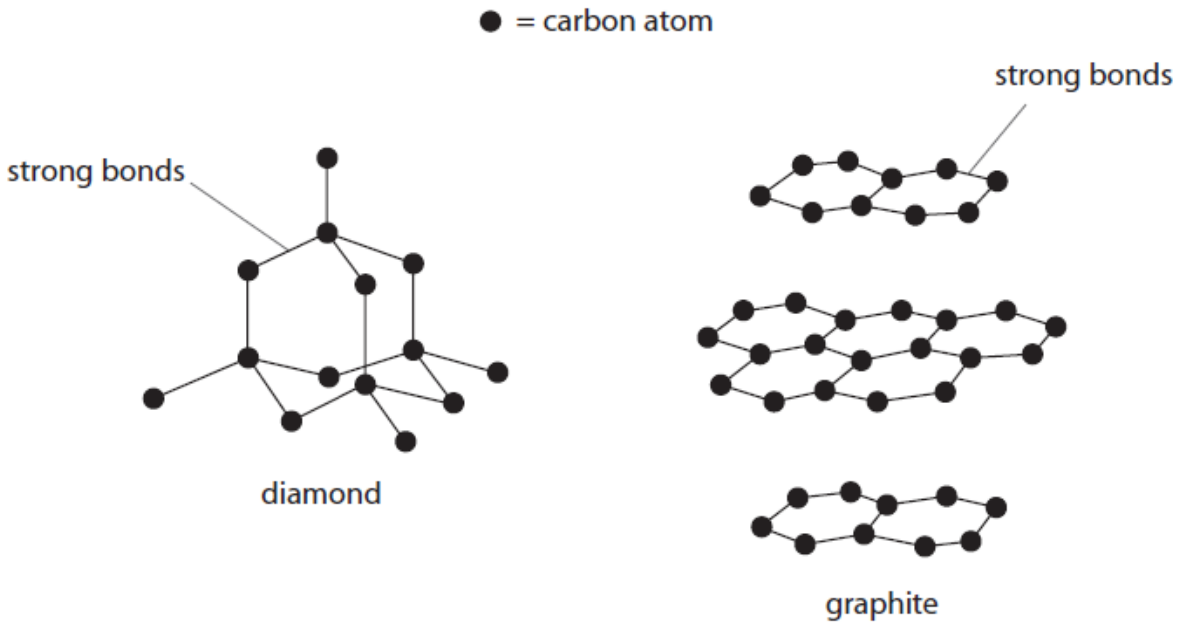
There are four electrons in the outer shell of a carbon atom.
There are seven electrons in the outer shell of a chlorine atom.

Draw a dot and cross diagram to show the bonding in a molecule of tetrachloromethane, CCl_4.

Show outer shell electrons only.

(2)

*(c) The diagrams show the arrangements of carbon atoms in diamond and in graphite.



Compare a use of diamond with a use of graphite, explaining each use in terms of the bonding and structure. In your answer you should use information from the diagrams.

(6)

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(Total for question = 12 marks)

(**Q06 1SC0/1CH, June 2014**)

Q15.

Chlorine and carbon

(a) Chlorine has an atomic number of 17.
Chlorine-35 and chlorine-37 are two isotopes of chlorine.

(i) Complete the table to show the numbers of protons, neutrons and electrons in each of the isotopes.

(2)

	chlorine-35	chlorine-37
number of protons		
number of neutrons		
number of electrons		

(ii) A normal sample of chlorine contains only chlorine-35 and chlorine-37 atoms.

Explain why the relative atomic mass of chlorine is 35.5

(2)

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.....

(b) Tetrachloromethane is a simple molecular, covalent compound. The formula of its molecule is CCl_4.

There are four electrons in the outer shell of a carbon atom.

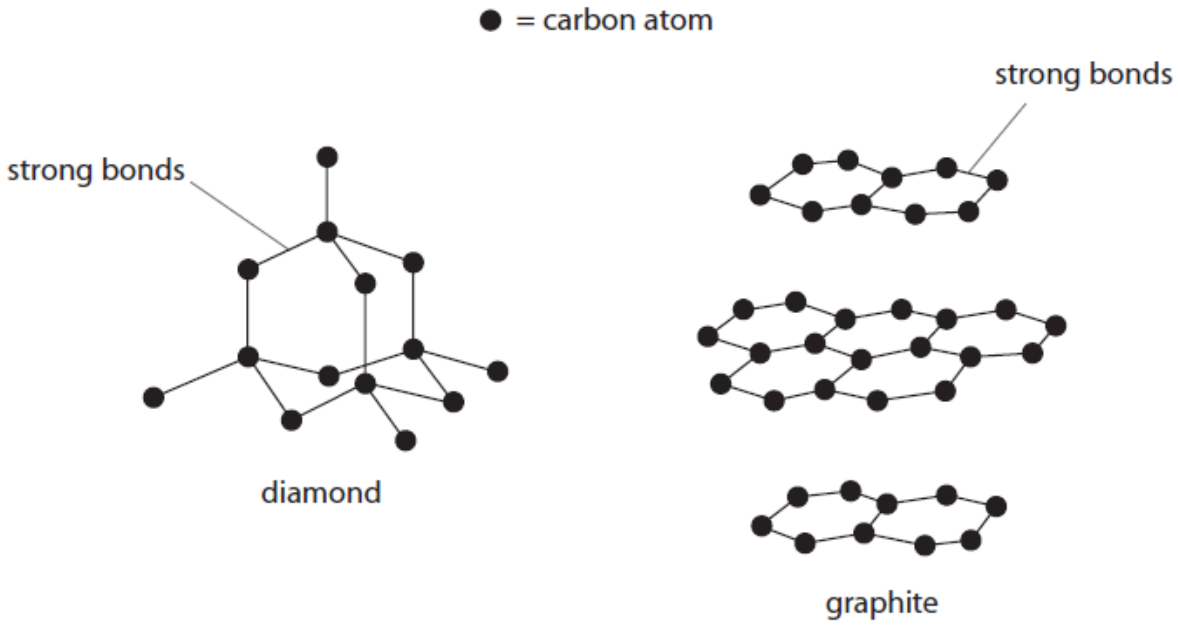
There are seven electrons in the outer shell of a chlorine atom.

Draw a dot and cross diagram to show the bonding in a molecule of tetrachloromethane, CCl_4.

Show outer shell electrons only.

(2)

*(c) The diagrams show the arrangements of carbon atoms in diamond and in graphite.



Compare a use of diamond with a use of graphite, explaining each use in terms of the bonding and structure. In your answer you should use information from the diagrams.

(6)

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(Total for question = 12 marks)

(**Q05 1SC0/2CH, June 2014**)

Q16.

Magnesium has atomic number 12. Magnesium exists as magnesium-24, magnesium-25 and magnesium-26 atoms.

Explain, in terms of protons and neutrons, why these atoms are isotopes of magnesium.

(2)

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(Total for question = 2 marks)

(**Q05c 1SC0/2CF, SAM 2016**)

Q17.

Elements and atoms

Beryllium, Be, has atomic number 4.

(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

From its position in the periodic table (page 2), beryllium is most likely to be a

(1)

☒ **A** metal

☒ **B** halogen

☒ **C** compound

☒ **D** gas at room temperature

(ii) Give the symbol of an atom of another element in the same period of the periodic table as beryllium.

(1)

.....

(b) The atomic number of beryllium is 4.

The mass number of an atom of beryllium is 9.

(i) State the numbers of protons, electrons and neutrons in this atom of beryllium.

(3)

..... protons

..... electrons

..... neutrons

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The relative charge on an electron is

(1)

☒ **A** +1

☒ **B** 0

☒ **C** −1

☒ **D** −2

(c) The electronic configuration of phosphorus is 2.8.5.

Explain, in terms of its electronic configuration, why phosphorus is in group 5 of the periodic table.

(2)

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(Total for question = 8 marks)

(**Q02 1SC0/2CF, June 2014**)

Q18.

Elements and atoms

Beryllium, Be, has atomic number 4.

(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

From its position in the periodic table (page 2), beryllium is most likely to be a

(1)

☒ **A** metal

☒ **B** halogen

☒ **C** compound

☒ **D** gas at room temperature

(ii) Give the symbol of an atom of another element in the same period of the periodic table as beryllium.

(1)

.....

(b) The atomic number of beryllium is 4.

The mass number of an atom of beryllium is 9.

(i) State the numbers of protons, electrons and neutrons in this atom of beryllium.

(3)

..... protons

..... electrons

..... neutrons

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The relative charge on an electron is

(1)

☒ **A** +1

☒ **B** 0

☒ **C** −1

☒ **D** −2

(c) The electronic configuration of phosphorus is 2.8.5.

Explain, in terms of its electronic configuration, why phosphorus is in group 5 of the periodic table.

(2)

.....

.....

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.....

(Total for question = 8 marks)

(**Q02 1SC0/1CF, June 2014**)

Q19.

Gallium metal is a conductor of electricity.

Explain how metals conduct electricity.

(2)

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(Total for question = 2 marks)

(**Q03e 1SC0/1CF, Nov 2020**)

Q20.

A sample of potassium contains three isotopes, potassium-39, potassium-40 and potassium-41.

Explain the meaning of the term **isotopes**.

(2)

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.....

(Total for question = 2 marks)

(**QU06d 1SC0/2CF, June 2023**)

Q21.

A sample of potassium contains three isotopes, potassium-39, potassium-40 and potassium-41.

(i) Explain the meaning of the term **isotopes**.

(2)

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(ii) This sample of potassium contains

93.25% potassium-39

0.02% potassium-40

6.73% potassium-41

Calculate the relative atomic mass of this sample of potassium.

(2)

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.....

relative atomic mass = ...

(Total for question = 4 marks)

(**QU02d 1SC0/2CH, June 2023**)

Q22.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

In Figure 5, the letters **A**, **E**, **G**, **J**, **X** and **Z** show the positions of six elements in the periodic table.

These letters are not the symbols of the atoms of these elements.

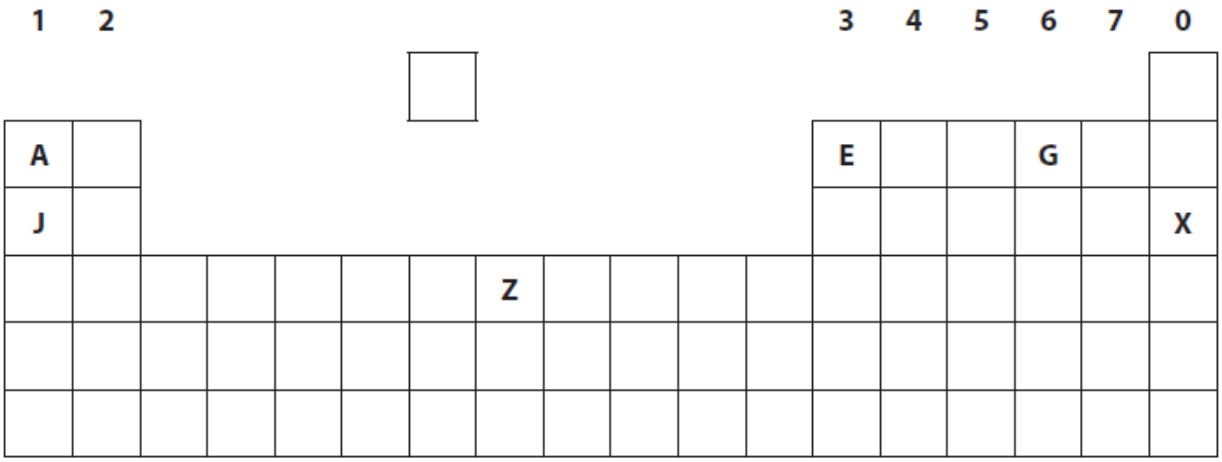


Figure 5

Element **E** has an atomic number of 5.
In a sample of **E** there are two isotopes. One isotope has a mass number of 10 and the other isotope has a mass number of 11.

(i) Explain, in terms of subatomic particles, what is meant by the term **isotopes**.

(2)

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.....

(ii) All atoms of element **E** in this sample contain

(1)

☒ **A** 5 protons

☒ **B** 5 neutrons

☒ **C** 6 protons

☒ **D** 6 neutrons

(Total for question = 3 marks)

(**Q05b 1SC0/1CF, June 2019**)

Q23.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

In Figure 1, the letters **A**, **E**, **G**, **J**, **X** and **Z** show the positions of six elements in the periodic table.

These letters are not the symbols of the atoms of these elements.

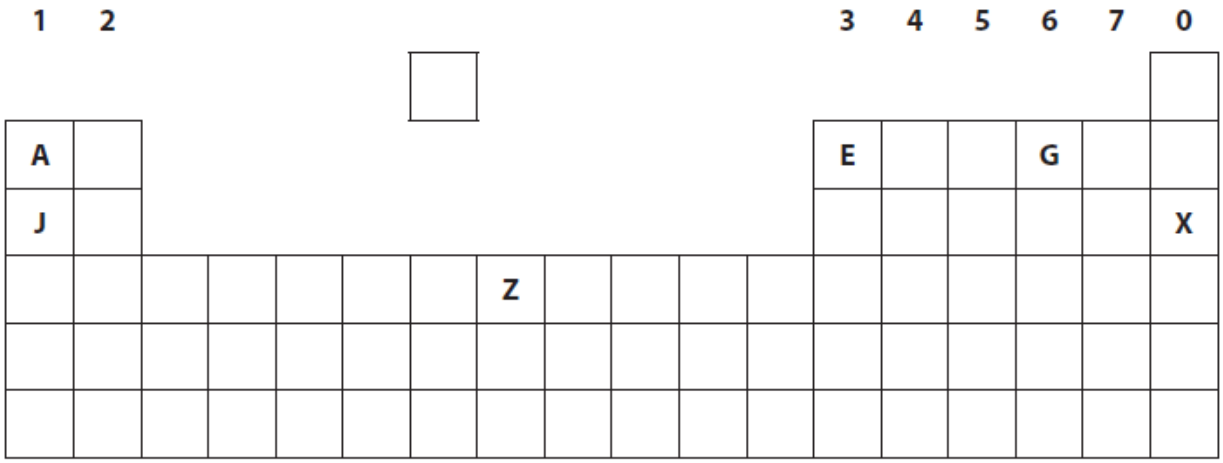


Figure 1

Element **E** has an atomic number of 5.
In a sample of **E** there are two isotopes. One isotope has a mass number of 10 and the other isotope has a mass number of 11.

(i) Explain, in terms of subatomic particles, what is meant by the term **isotopes**.

(2)

.....

.....

.....

.....

(ii) All atoms of element E in this sample contain

(1)

☒ **A** 5 protons

☒ **B** 5 neutrons

☒ **C** 6 protons

☒ **D** 6 neutrons

(Total for question = 3 marks)

Q24.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Calcium has an atomic number of 20.
A calcium atom has a mass number of 40.

(i) Which row of the table shows the number of protons and number of neutrons in this atom of calcium?

(1)

		number of protons	number of neutrons
☒	**A**	20	20
☒	**B**	40	20
☒	**C**	20	60
☒	**D**	60	20

(ii) Figure 6 shows the arrangement of electrons in an atom of calcium.

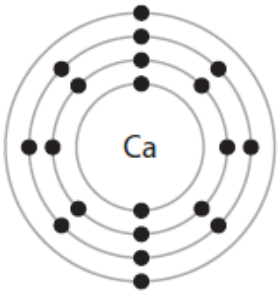


Figure 6

Explain, using the information in Figure 6, in which period of the periodic table calcium can be found.

(2)

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(Total for question = 3 marks)

(**Q05a 1SC0/1CH, Nov 2020**)

Q25.

The nucleus of an atom is made up of protons and neutrons.
Atoms of chlorine contain 17 protons.

Figure 4 shows some information about a proton, a neutron and an electron.

	relative mass	relative charge
proton	1	+1
neutron	1	0
electron	very small	−1

Figure 4

(i) Explain, using the information in Figure 3 and Figure 4, why atoms of chlorine have no overall charge.

(2)

.....

.....

.....

(ii) Atoms of chlorine-37 have a mass number of 37.

Calculate the number of neutrons in atoms of chlorine-37.

(1)

.....

number of neutrons = ...

(iii) There are two isotopes of chlorine, chlorine-35 and chlorine-37.

Explain the meaning of the term **isotopes**.

(2)

.....

.....

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.....

(Total for question = 5 marks)

(**Q02b 1SC0/1CF, Nov 2020**)

Q26.

Potassium and caesium are in the same group of the periodic table.

Explain, in terms of electrons, why potassium and caesium are in the same group.

(2)

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(Total for question = 2 marks)

(**Q01b 1SC0/2CH, Nov 2020**)

Q27.

The elements beryllium, magnesium, calcium, strontium and barium are in group 2 of the periodic table.

There are three common isotopes of magnesium.

(i) These isotopes are shown in Figure 3.

Complete Figure 3 to show the number of protons and neutrons in an atom of each of the other two isotopes.

(2)

isotope	mass number	number of protons in an atom	number of neutrons in an atom
magnesium-24	24	12	12
magnesium-25	25		
magnesium-26	26		

Figure 3

(ii) A sample of magnesium contains 78.60% magnesium-24, 10.11% magnesium-25 and 11.29% magnesium-26.

Use this information to calculate the relative atomic mass of magnesium in this sample. Give your answer to 3 significant figures.

(4)

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relative atomic mass = ...

(Total for question = 6 marks)

(**Q04d 1SC0/1CH, SAM**)

Q28.

This question is about some of the elements in groups 1 and 2 of the periodic table.

The atomic number of lithium is 3.
The mass number of a lithium atom is 7.

Which row of the table shows the number of protons, neutrons and electrons in an atom of lithium-7?

(1)

	number of protons	number of neutrons	number of electrons
☐ **A**	3	3	4
☐ **B**	3	4	3
☐ **C**	4	3	7
☐ **D**	7	4	3

(Total for question = 1 mark)

(**Q05a 1SC0/2CF, SAM 2016**)

Q29.

The atomic number of phosphorus, P, is 15.

One atom of phosphorus has a relative atomic mass of 31.

Give the number of protons, neutrons and electrons in this atom of phosphorus.

(3)

number of protons = ...

number of neutrons = ...

number of electrons = ...

(Total for question = 3 marks)

(**QU01d 1SC0/2CF, June 2023**)

Q30.

The scientist John Dalton lived over 200 years ago.

John Dalton suggested an early model of atoms.

When Dalton first described atoms he said that

- all elements are made of atoms
- atoms are not formed of any smaller particles
- all atoms of the same element are identical.

Give two differences between Dalton's model of atoms and today's model of atoms.

(2)

1 .....

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2 .....

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(Total for question = 2 marks)

(**Q01a 1SC0/1CH, Nov 2021**)

Q31.

The scientist John Dalton lived over 200 years ago.

John Dalton suggested an early model of atoms.

When Dalton first described atoms he said that

- all elements are made of atoms
- atoms are not formed of any smaller particles
- all atoms of the same element are identical.

Give two differences between Dalton's model of atoms and today's model of atoms.

(2)

1 .....

.....

.....

2 .....

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(Total for question = 2 marks)

(**Q05a 1SC0/1CF, Nov 2021**)

Q32.

Sulfur and oxygen are both in group 6 of the periodic table.

Explain, in terms of their electronic configurations, why they are both in group 6.

(2)

.....

.....

.....

.....

(**Q19 1SC0/1CF, June 2013**)

Q33.

Sulfur and oxygen are both in group 6 of the periodic table.

Explain, in terms of their electronic configurations, why they are both in group 6.

(2)

.....

.....

.....

.....

(**Q15 1SC0/2CF, June 2013**)

Q34.

A chlorine atom contains 17 electrons, 18 neutrons and 17 protons.

(i) State the mass number of this chlorine atom.

(1)

.....

(ii) Give the electronic configuration of this chlorine atom.

(1)

.....

(Total for question = 2 marks)

(**Q04 1SC0/2CH, June 2018**)

Q35.

A chlorine atom contains 17 electrons, 18 neutrons and 17 protons.

(i) State the mass number of this chlorine atom.

(1)

.....

(ii) Give the electronic configuration of this chlorine atom.

(1)

.....

(Total for question = 2 marks)

(**Q20 1SC0/2CF, June 2018**)

Q36.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The particles in atoms are electrons, neutrons and protons.

The mass of an electron is

(1)

☒ **A** greater than the mass of a neutron

☒ **B** the same as the mass of a proton

☒ **C** smaller than the mass of a proton

☒ **D** the same as the mass of a neutron

(**Q17 1SC0/1CF, June 2013**)

Q37.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The particles in atoms are electrons, neutrons and protons.

The mass of an electron is

(1)

☒ **A** greater than the mass of a neutron

☒ **B** the same as the mass of a proton

☒ **C** smaller than the mass of a proton

☒ **D** the same as the mass of a neutron

(**Q13 1SC0/2CF, June 2013**)