

Atomic structure and the Periodic Table

Question Paper 1

Level	IGCSE
Subject	Chemistry (0620/0971)
Exam Board	Cambridge International Examinations (CIE)
Topic	Atoms, elements and compounds
Sub-Topic	Atomic structure and the Periodic Table
Booklet	Question Paper 1

Time Allowed: 44 minutes

Score: /36

Percentage: /100

Grade Boundaries:

9	8	7	6	5	4	3	2	1
>85%	75%	68%	60%	53%	48%	40%	33%	<25%

- 1 Atom X has 8 more electrons than atom Y.

Student 1 says they are in the same group.

Student 2 says they are unreactive.

Which students can be correct?

	student 1	student 2
A	✓	✓
B	✓	x
C	x	✓
D	x	x

- 2 Which number is different for isotopes of the same element?

A number of electrons

B number of full shells

C number of nucleons

D number of protons

- 3 Which atom has two more electrons than an atom of a noble gas?

A aluminium

B bromine

C calcium

D rubidium

4 An element S has the proton number 18. The next element in the Periodic Table is an element T.

Which statement is correct?

- A** Element T has one more electron in its outer shell than element S.
- B** Element T has one more electron shell than element S.
- C** Element T is in the same group of the Periodic Table as element S.
- D** Element T is in the same period of the Periodic Table as element S.

5 Which numbers are added together to give the nucleon number of an ion?

- A** number of electrons + number of neutrons
- B** number of electrons + number of protons
- C** number of electrons + number of protons + number of neutrons
- D** number of protons + number of neutrons

6 Element V forms an acidic, covalent oxide.

Which row in the table shows how many electrons there could be in the outer shell of an atom of V?

	1	2	6	7
A	✓	x	x	x
B	✓	✓	x	x
C	x	x	x	✓
D	x	x	✓	✓

7 Element X has a nucleon (mass) number of 19 and a proton (atomic) number of 9.

To which group in the Periodic Table does it belong?

- A** I
- B** III
- C** VII
- D** 0

8 The table shows the structure of different atoms and ions.

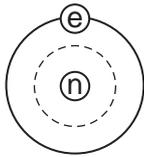
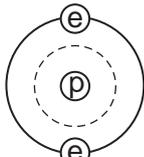
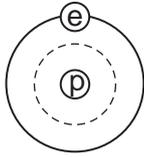
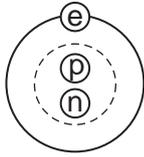
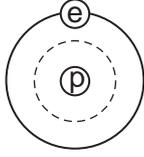
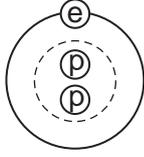
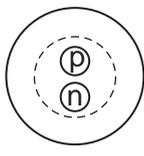
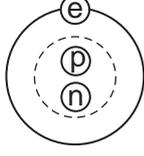
particle	proton number	nucleon number	number of protons	number of neutrons	number of electrons
Mg	12	24	12	W	12
Mg ²⁺	X	24	12	12	10
F	9	19	9	Y	9
F ⁻	9	19	9	10	Z

What are the values of W, X, Y and Z?

	W	X	Y	Z
A	10	10	9	9
B	10	12	10	9
C	12	10	9	10
D	12	12	10	10

9 Two isotopes of hydrogen are ${}^1_1\text{H}$ and ${}^2_1\text{H}$.

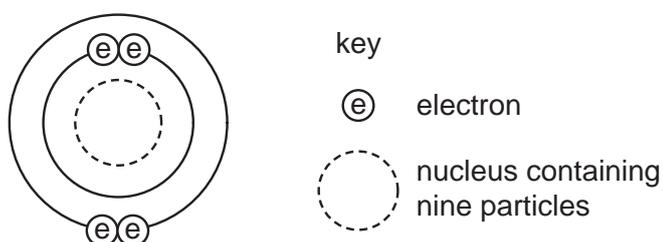
Which diagram shows the arrangement of particles in the two isotopes?

	${}^1_1\text{H}$	${}^2_1\text{H}$	
A			key ⊕ = an electron ⊕ = a proton ⊖ = a neutron ○ = a nucleus
B			
C			
D			

10 Which row shows the change that takes place when element X gains the new particle shown?

	particle gained	change
A	electron	an isotope of element X is formed
B	electron	the element one place to the right of X in the Periodic Table is formed
C	proton	an isotope of element X is formed
D	proton	the element one place to the right of X in the Periodic Table is formed

11 The diagram shows an atom.



What is the proton number and neutron number of the atom?

	proton number	neutron number
A	4	5
B	4	9
C	5	4
D	5	9

12 The symbols of two atoms may be written as shown.

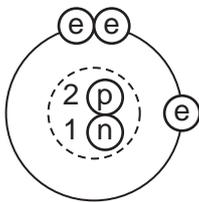
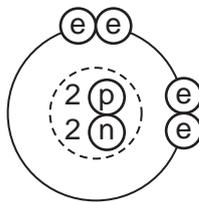
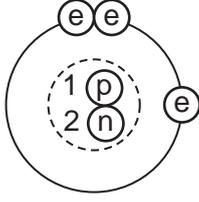
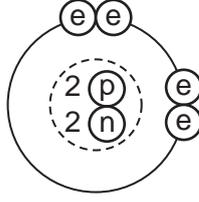
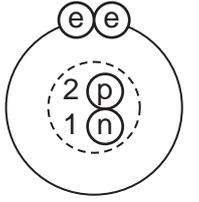
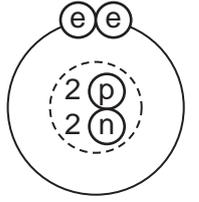
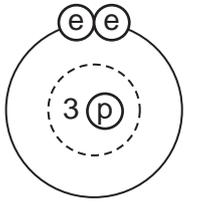
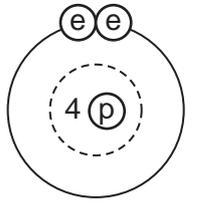


Which statement about these atoms is correct?

- A** They are different elements because they have different numbers of neutrons.
- B** They are different elements because they have different numbers of protons.
- C** They are isotopes of the same element because they have the same nucleon number.
- D** They are isotopes of the same element because they have the same proton number.

13 Two isotopes of helium are ${}^3_2\text{He}$ and ${}^4_2\text{He}$.

Which two diagrams show the arrangement of particles in these two isotopes?

	${}^3_2\text{He}$	${}^4_2\text{He}$	
A			<p>key</p> <p> = electron</p> <p> = proton</p> <p> = neutron</p> <p> = nucleus</p>
B			
C			
D			

16 The nucleon number and proton number of the lithium atom are shown by the symbol ${}^7_3\text{Li}$.

What is the correct symbol for the lithium ion in lithium chloride?

- A** ${}^6_2\text{Li}^-$
 B ${}^6_3\text{Li}^+$
 C ${}^7_3\text{Li}^+$
 D ${}^7_3\text{Li}^-$

17 Which statements comparing the properties of electrons, neutrons and protons are correct?

	neutrons and protons are both heavier than electrons	only electrons and neutrons are charged
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

18 Which row gives the number of electrons in the outer electron shell of fluorine and of neon?

	${}^{19}_9\text{F}$	${}^{20}_{10}\text{Ne}$
A	7	8
B	7	10
C	9	8
D	9	10

19 The nucleon number of an isotope of rubidium is 85.

How many protons, neutrons and electrons are present in an atom of this isotope?

	protons	neutrons	electrons
A	37	48	37
B	37	48	39
C	39	46	37
D	39	46	39

20 An element Y has the proton number 18.

The next element in the Periodic Table is an element Z.

Which statement is correct?

- A** Element Z has one more electron in its outer shell than element Y.
- B** Element Z has one more electron shell than element Y.
- C** Element Z is in the same group of the Periodic Table as element Y.
- D** Element Z is in the same period of the Periodic Table as element Y.

- 21 Which atom has twice as many neutrons as protons?
A ${}^1_1\text{H}$ **B** ${}^2_1\text{H}$ **C** ${}^3_1\text{H}$ **D** ${}^4_2\text{He}$
- 22 Elements X, Y and Z are in Group VII of the Periodic Table.
X is a gas.
Y is less reactive than Z
Z is a red liquid.
When X, Y and Z are put in order of increasing proton number, which order is correct?
A X → Y → Z **B** X → Z → Y **C** Y → X → Z **D** Y → Z → X
- 23 Element X has 7 protons.
Element Y has 8 more protons than X.
Which statement about element Y is correct?
A Y has more electron shells than X.
B Y has more electrons in its outer shell than X.
C Y is in a different group of the Periodic Table from X.
D Y is in the same period of the Periodic Table as X

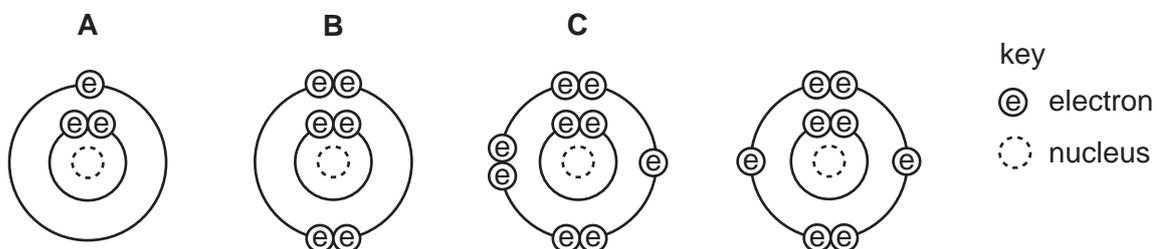
24 Which statements about a sodium atom, ${}_{11}^{23}\text{Na}$, are correct?

- 1 The number of protons and neutrons is the same.
- 2 The number of protons and electrons is the same.
- 3 The number of outer electrons is one.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

25 The diagrams show the electron arrangements in the atoms of four elements.

Which element does **not** form a covalent bond?



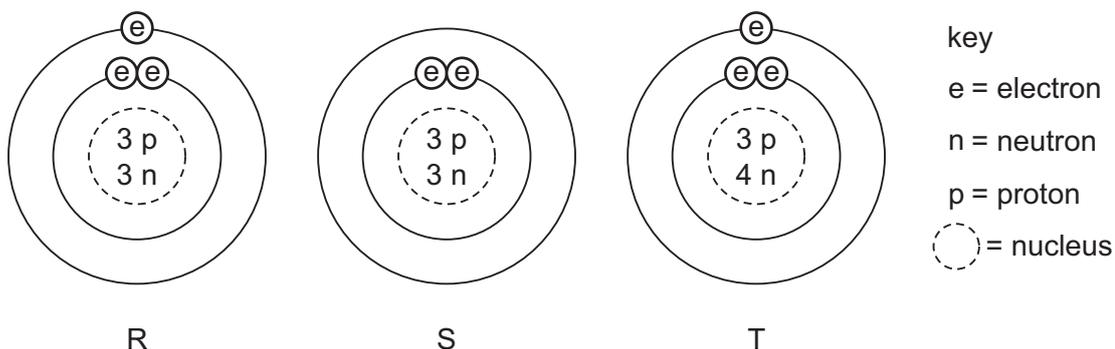
26 The atomic structures of four atoms are shown.

atom	number of neutrons	number of protons	number of electrons
W	6	6	6
X	7	7	7
Y	8	6	6
Z	8	8	8

Which pair of atoms are isotopes?

A W and X **B** W and Y **C** X and Y **D** Y and Z

27 The diagram shows the structure of three particles, R, S and T.



Which row describes these particles?

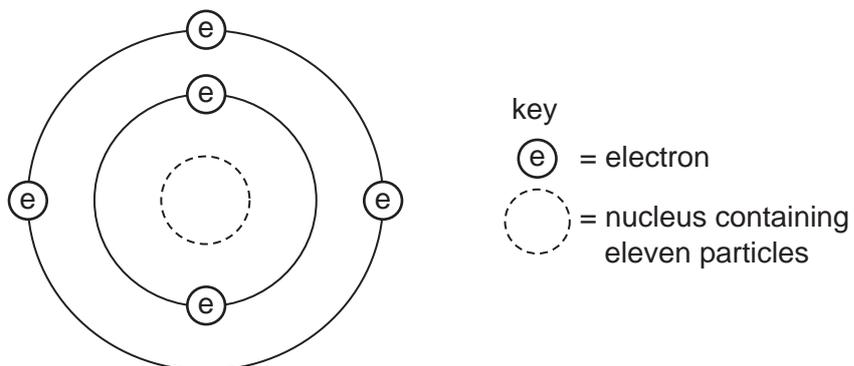
	ions	isotopes
A	R	S and T
B	R and S	T
C	S	R and T
D	T	R and S

28 Element X is represented by ${}_{13}^{27}\text{X}$.

Which statement about element X is correct?

- A** An atom of X contains 13 protons and 13 neutrons.
- B** An atom of X contains 27 protons and 13 electrons.
- C** X forms an ion by gaining electrons.
- D** X is placed in Group III of the Periodic Table.

29 The diagram shows an atom of an element.



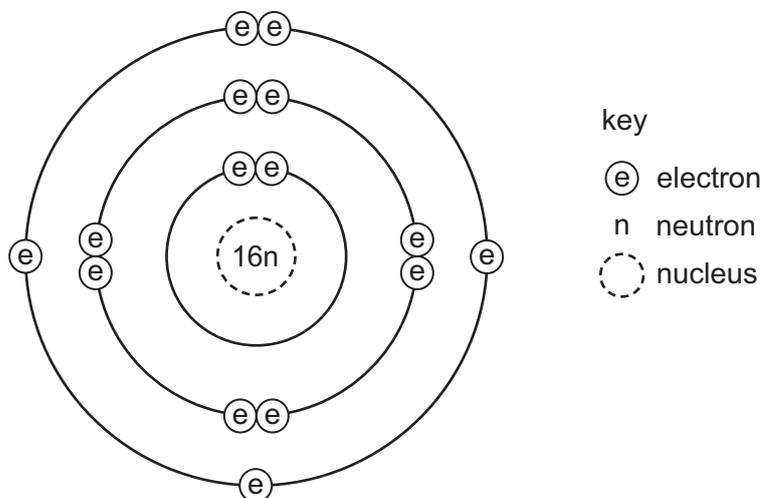
How many protons and neutrons are in the nucleus of the atom and in which group and period of the Periodic Table is the element found?

	number of protons	number of neutrons	group number	period number
A	5	6	3	2
B	5	11	2	3
C	6	5	3	2
D	6	11	2	3

30 What is different for isotopes of the same element?

- A** nucleon number
- B** number of electron shells
- C** number of electrons in the outer shell
- D** proton number

31 Which element has the atomic structure shown?



A Al

B P

C S

D Si

32 How many atoms of hydrogen are there in a molecule of ethanol, C_2H_5OH ?

A 1

B 2

C 5

D 6

33 Which statement about a neutron is **not** correct?

A It can be present in different numbers in atoms of the same element.

B It has no electrical charge.

C It is always found in the nucleus of an atom.

D It weighs much less than a proton.

- 34 Element X, ${}^{19}_9\text{X}$, forms a compound with element Y, ${}^{39}_{19}\text{Y}$.

Which statement describes the bonding in the compound formed?

- A X and Y share electrons.
 - B X gives away one electron to Y.
 - C Y gives away one electron to X.
 - D Y gives away two electrons to X.
- 35 The table shows the numbers of atoms present in the formula of some compounds.

Which row is **not** correct?

	numbers of atoms	formula
A	1 × calcium, 1 × carbon, 3 × oxygen	CaCO ₃
B	1 × carbon, 5 × hydrogen, 1 × oxygen	C ₂ H ₅ OH
C	1 × hydrogen, 1 × oxygen, 1 × sodium	NaOH
D	2 × hydrogen, 4 × oxygen, 1 × sulfur	H ₂ SO ₄

- 36 An element, X, can be represented as ${}^a_b\text{X}$.

Which statement is correct?

- A The number of protons in an atom of X is **a**.
- B The exact position of X in the Periodic Table can be found from **a**.
- C The relative atomic mass of X is **b**.
- D The total number of electrons in one atom of X is **b**.