Atomic structure

Question Paper

Level	O Level
Subject	Chemistry
Exam Board	Cambridge International Examinations
Topic	The Particulate Nature of Matter
Sub-Topic	Atomic structure
Booklet	Question Paper

Time Allowed: **40 minutes**

Score: **/33**

Percentage: **/100**

1 The symbols for two ions are shown.

$$^{19}_{9}F^{-} \qquad\qquad ^{21}_{11}Na^{+}$$

Which statement is correct?

A The fluoride ion contains more electrons than the sodium ion.

B The sodium ion contains more neutrons than the fluoride ion.

C The two ions contain the same number of electrons as each other.

D The two ions contain the same number of protons as each other.

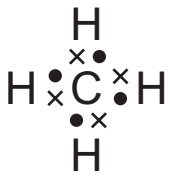
2 Which dot-and-cross diagram, showing all the outer shell electrons of each atom, is **not** correct?

A

B

C

D



3 An oxygen atom contains 8 electrons, 8 protons and 10 neutrons.

What is the nucleon number of this atom?

A 8 **B** 10 **C** 16 **D** 18

4 A radioactive isotope of carbon has more nucleons than the non-radioactive isotope, $^{12}_{6}C$.

How many protons, neutrons and electrons could there be in this **radioactive** isotope of carbon?

	protons	neutrons	electrons
A	6	6	6
B	6	8	6
C	8	6	8
D	8	8	8

5 A hydride is a compound containing **only** two elements, one of which is hydrogen.

Which element can form the greatest number of different hydrides?

A carbon

B chlorine

C nitrogen

D oxygen

6 The table contains information on the structure of four particles.

particle	proton number	number of protons	number of neutrons	number of electrons
Mg	12	12	W	12
Mg^{2+}	12	12	12	X
F	Y	9	10	9
F^-	9	9	10	Z

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

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

7 Which element requires the largest number of electrons for one mole of the metal to be formed from its aqueous ions during electrolysis?

A aluminium

B calcium

C copper

D sodium

8 Naturally-occurring bromine has a relative atomic mass of 80 and consists entirely of two isotopes of relative atomic masses 79 and 81.

What can be deduced about naturally-occurring bromine from this information only?

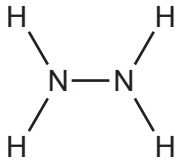
A Bromine contains the two isotopes in equal proportions.

B Bromine has different oxidation states.

C Bromine isotopes have different numbers of protons.

D Bromine is radioactive.

9 The diagram shows the structural formula of the covalent molecule hydrazine, N_2H_4.



Consider **all** the electrons in a molecule of hydrazine.

Which description fits the arrangement of these electrons in the molecule?

	total number of electrons involved in bonding	total number of electrons not involved in bonding
A	5	4
B	5	8
C	10	4
D	10	8

10 An atom, X, contains 16 protons.

Which statement about X is correct?

A It cannot form an ion.

B It contains 6 electrons in the outer shell.

C It contains 6 neutrons.

D It has relative atomic mass of 16.

11 Which statement about the particles O^{2-}, F^{-}, Ne, Na^{+} and Mg^{2+} is true?

They all

A contain more electrons than protons.

B contain more neutrons than protons.

C contain the same number of electrons.

D contain the same number of neutrons.

12 Which statement about both chlorine atoms and chloride ions is correct?

A They are chemically identical.

B They are isotopes of chlorine.

C They have the same number of protons.

D They have the same physical properties.

13 A researcher notices that atoms of an element are releasing energy.

Why are the atoms releasing energy?

A The atoms are absorbing light.

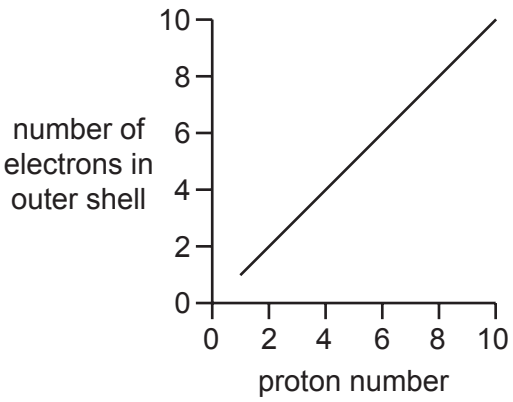
B The atoms are evaporating.

C The atoms are radioactive.

D The atoms react with argon in the air.

14 Which graph shows the number of electrons in the outer shell of an atom, plotted against the proton (atomic) number for the first ten elements in the Periodic Table?

A



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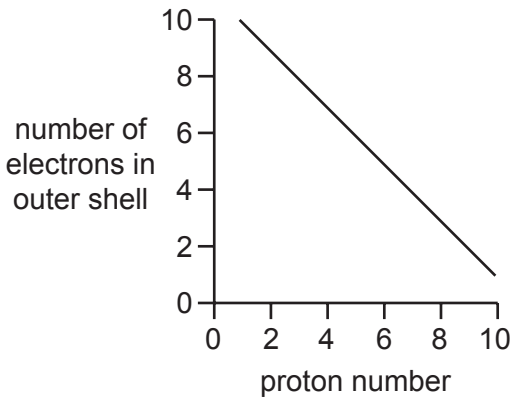

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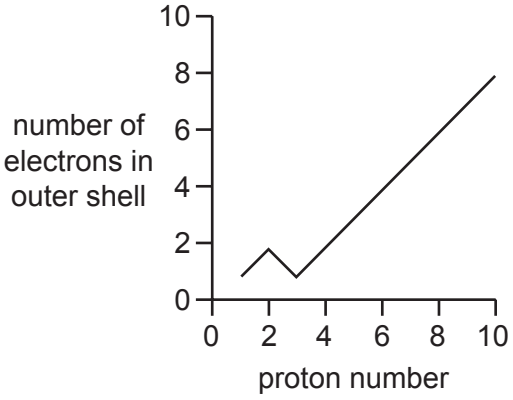

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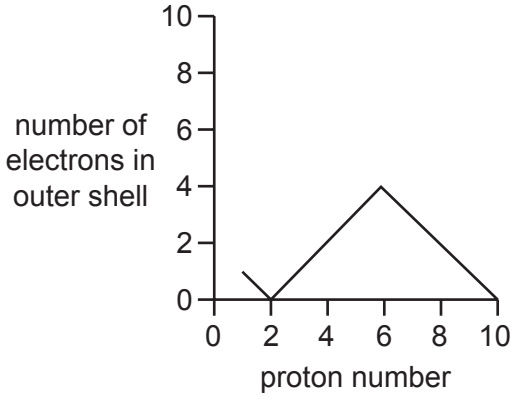


15 Hydrogen can form both H^+ ions and H^- ions.

Which one of the statements below is correct?

A An H^+ ion has more protons than an H^- ion.

B An H^+ ion has no electrons.

C An H^- ion has one more electron than an H^+ ion.

D An H^- ion is formed when a hydrogen atom loses an electron.

16 An element X forms a positive ion with the electronic structure 2,8,8.

What is the proton (atomic) number of X?

A 16 **B** 17 **C** 18 **D** 19

17 Which statement about the numbers of particles in atoms is correct?

Apart from hydrogen, most atoms contain

A more neutrons than protons.

B more protons than neutrons.

C more electrons than protons.

D more protons than electrons.

18 In which option do the three particles each have the same number of electrons?

A Cl^- Br^- I^-

B F^- Ne Na^+

C K^+ Ca^{2+} Br^-

D Li^+ Na^+ K^+

19 The atoms $^{64}_{29}Cu$ and $^{65}_{30}Zn$ have the same

A nucleon number.

B number of electrons.

C number of neutrons.

D proton number.

20 In one molecule of carbon dioxide, CO_2, what is the total number of electrons present and how many are involved in bonding between the carbon and oxygen atoms?

	total number of electrons	electrons involved in bonding
A	16	4
B	16	8
C	22	4
D	22	8

21 What is the structure of the ion $^{90}_{38}Sr^{2+}$?

	protons	neutrons	electrons
A	38	52	36
B	38	52	38
C	38	90	36
D	52	38	36

22 Metals have positive ions in a 'sea of electrons'.

Which metal atom provides most electrons for the sea?

A aluminium

B calcium

C magnesium

D sodium

23 In which compound does the element *X* have the highest oxidation state?

A X_2O **B** X_4O **C** XO_2 **D** XO_4

24 Which atom has the same electronic configuration as the strontium ion?

A calcium

B krypton

C rubidium

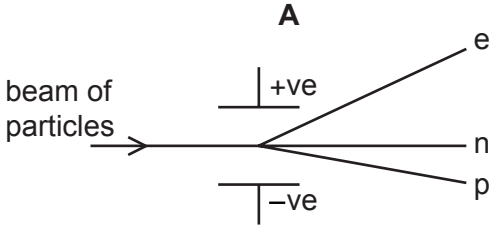
D selenium

25 A beam of particles contains neutrons, n, protons, p, and electrons, e.

The beam is passed between charged plates.

Which diagram shows how the particles are affected by the plates?

A



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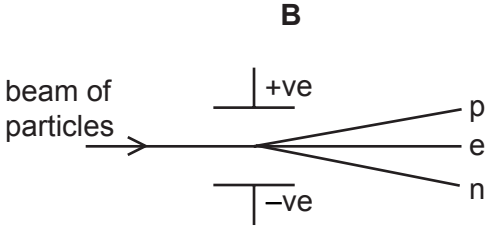

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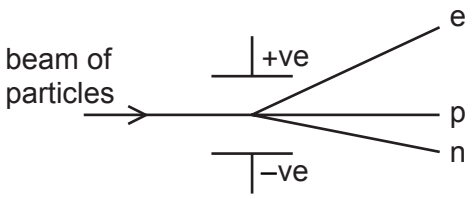

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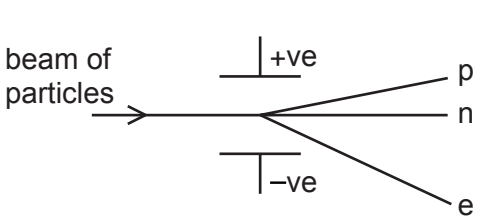

26 The atoms $^{31}_{15}P$ and $^{32}_{16}S$ have the same

A nucleon number.

B number of electrons.

C number of neutrons.

D number of protons.

27 An element X has two isotopes, ^{238}X and ^{235}X.

How does ^{238}X differ from ^{235}X?

A It has 3 more protons and 3 more electrons.

B It has 3 more protons, but no more electrons.

C It has 3 more neutrons and 3 more electrons.

D It has 3 more neutrons, but no more electrons.

28 The formulae of the ions of four elements are shown below.

O^{2-} F^{-} Li^{+} Mg^{2+}

Which statement about these ions is correct?

They all have

A the same number of electrons in their outer shells.

B the same electronic structure as a noble gas.

C the same number of protons in their nuclei.

D more electrons than protons.

29 Two particles **X** and **Y** have the composition shown in the table.

particle	number of electrons	number of neutrons	number of protons
X	10	8	8
Y	18	18	17

The particles **X** and **Y** are

A metal atoms.

B non-metal atoms.

C negative ions.

D positive ions.

30 What is the nucleon number of the isotope of uranium, $^{235}_{92}U$?

A 92 **B** 143 **C** 235 **D** 327

31 The letters X, Y and Z represent different atoms.

$^{40}_{19}X$ $^{39}_{19}Y$ $^{40}_{20}Z$

What can be deduced from the proton numbers and nucleon numbers of X, Y and Z?

A X and Y are the same element.

B X and Z are the same element.

C X has more protons than Y.

D Z has more neutrons than Y.

32 Which of the following contains the same number of electrons as an atom of neon?

A Cl^-

B Li

C Li^+

D O^{2-}

33 An atom of element **X** is represented by $^{7}_{3}\mathbf{X}$.

Which statement about an atom of **X** is correct?

A It is in Group III of the Periodic Table.

B It is in Group VII of the Periodic Table.

C The total number of protons and electrons is 6.

D The total number of protons and neutrons is 10.