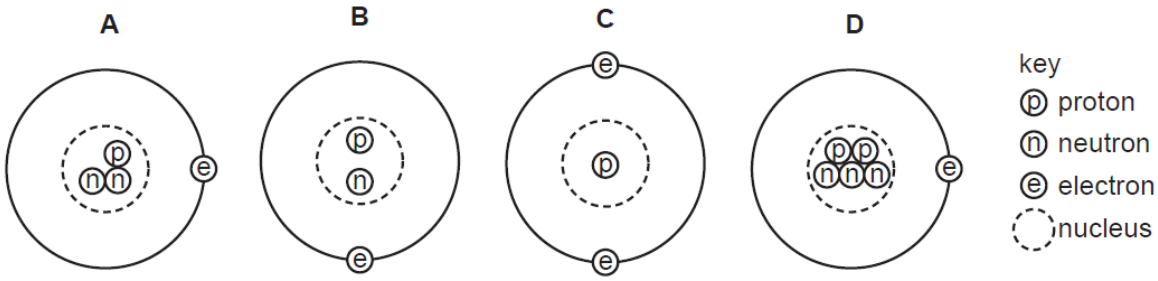
Atomic Structure

5 Students are asked to draw a diagram of an atom with symbol $^{3}_{1}X$.

Which diagram is correct?



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6 The table describes the structures of four particles.

particle	number of protons	number of neutrons	number of electrons
O	8	8	8
O^{2-}	8	8	**X**
Na	11	**Y**	11
Na^{+}	11	12	**Z**

What are the correct values of **X**, **Y** and **Z**?

	X	**Y**	**Z**
A	9	11	10
B	9	11	11
C	10	12	10
D	10	12	11

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8 Which atom has twice as many neutrons as protons?

A $^{1}_{1}H$ **B** $^{2}_{1}H$ **C** $^{3}_{1}H$ **D** $^{4}_{2}He$

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5 The table shows the nucleon numbers and proton numbers of some atoms.

nucleon number	35	37	40	39	40
proton number	17	17	18	19	19

How many are atoms of non-metallic elements?

A 1 **B** 2 **C** 3 **D** 4

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4 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

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4 What do the nuclei in hydrogen molecules contain?

A electrons and neutrons

B electrons and protons

C neutrons only

D protons only

0620_w/05/qp1

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5 Which statements about isotopic atoms of the same element are correct?

	different number of electrons	different number of neutrons
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

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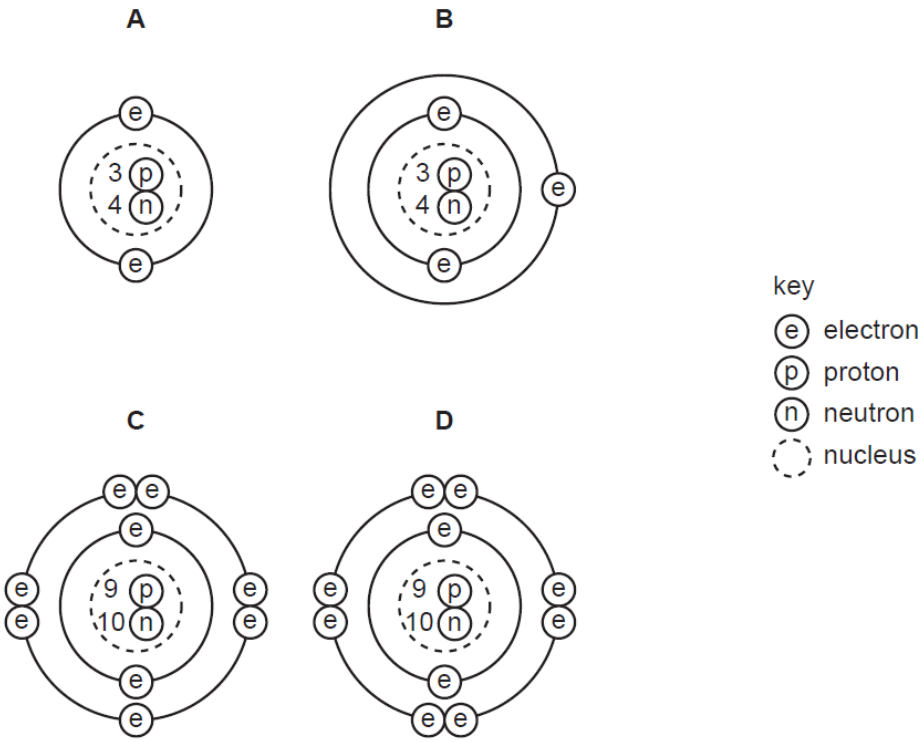
6 Which diagram shows a positively charged ion?



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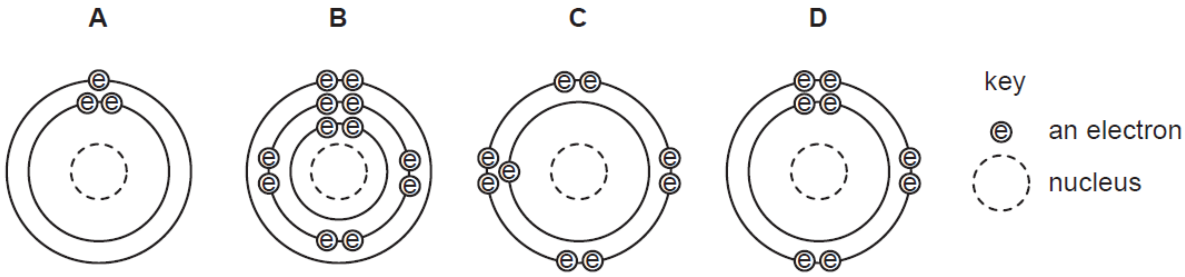
8 Which diagram shows an atom in the same group of the Periodic Table as sodium?



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5 Hydrogen and helium have isotopes, as shown.

In which of these isotopes does the nucleus have twice as many neutrons as protons?

A $^{2}_{1}H$

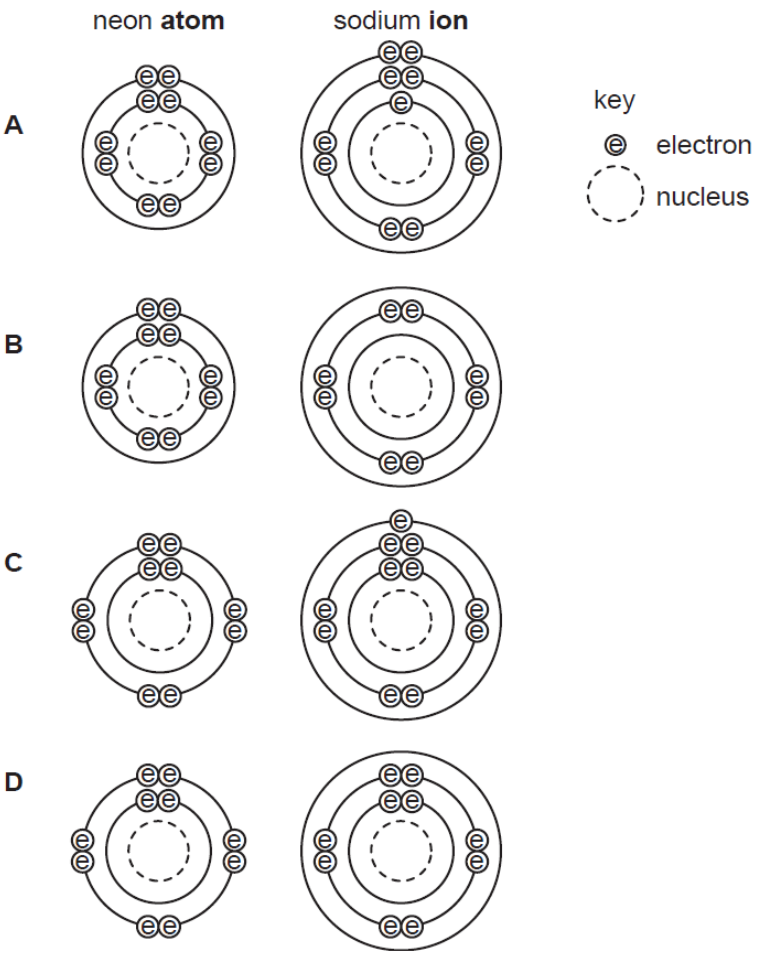
B $^{3}_{1}H$

C $^{3}_{2}He$

D $^{4}_{2}He$

0620_w/04/qp1

6 How are the electrons arranged in a neon **atom**, Ne, and a sodium **ion**, Na^+?



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5 The table shows the electronic structures of four elements.

Which element is a noble gas?

element	number of electrons	
	shell 1	shell 2
A	1	0
B	2	0
C	2	2
D	2	6

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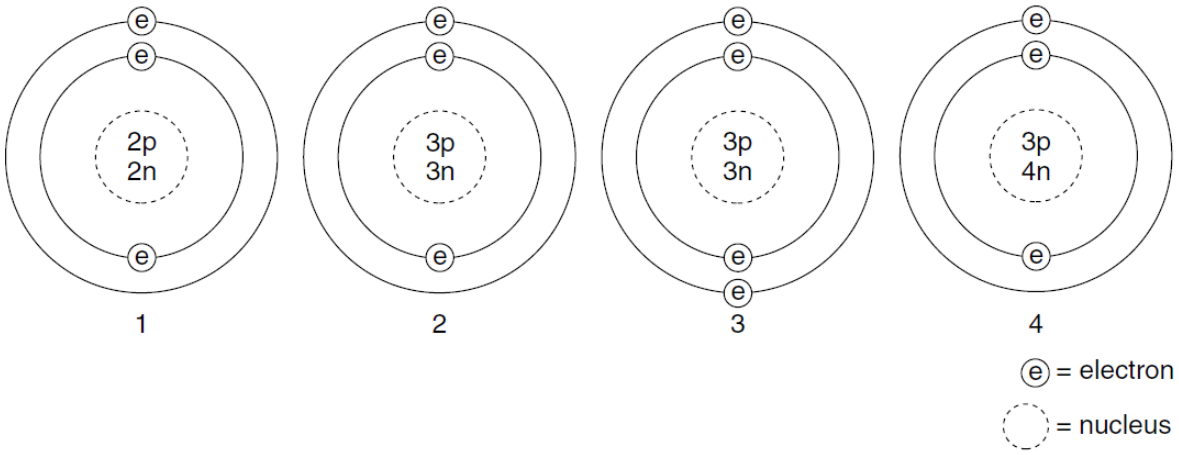
6 The diagrams show four particles.



Which two diagrams show **atoms** that are isotopes of each other?

A 1 and 2

B 1 and 3

C 2 and 3

D 2 and 4

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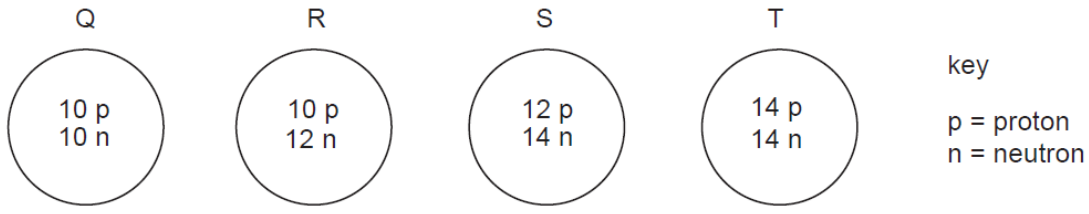
5 The diagrams show the nuclei of four different atoms.



Which two atoms are isotopes of each other?

A Q and R **B** Q and T **C** R and S **D** S and T

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6 Which atom has twice as many neutrons as protons?

A $^{1}_{1}H$ **B** $^{2}_{1}H$ **C** $^{3}_{1}H$ **D** $^{4}_{2}He$

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7 Which change takes place when an atom becomes a positive ion?

A An electron is added.

B An electron is removed.

C A proton is added.

D A proton is removed.

0620_w/02/qp1

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4 Which statements about a phosphorus atom, $^{31}_{15}P$, are correct?

1 The nucleon number is 16.

2 The number of outer electrons is 5.

3 The proton number is 15.

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

0620_s/14/qp12

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7 Element X is in Group I of the Periodic Table. X reacts with element Y to form an ionic compound.

Which equation shows the process that takes place when X forms ions?

A $X + e^- \rightarrow X^+$

B $X - e^- \rightarrow X^-$

C $X + e^- \rightarrow X^-$

D $X - e^- \rightarrow X^+$

0620_s/14/qp11

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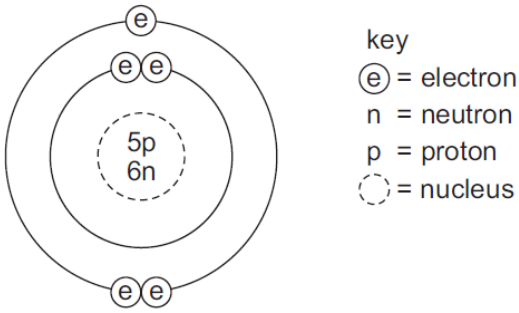
4 The diagram shows the structure of an atom of element X.



What is X?

A boron

B carbon

C sodium

D sulfur

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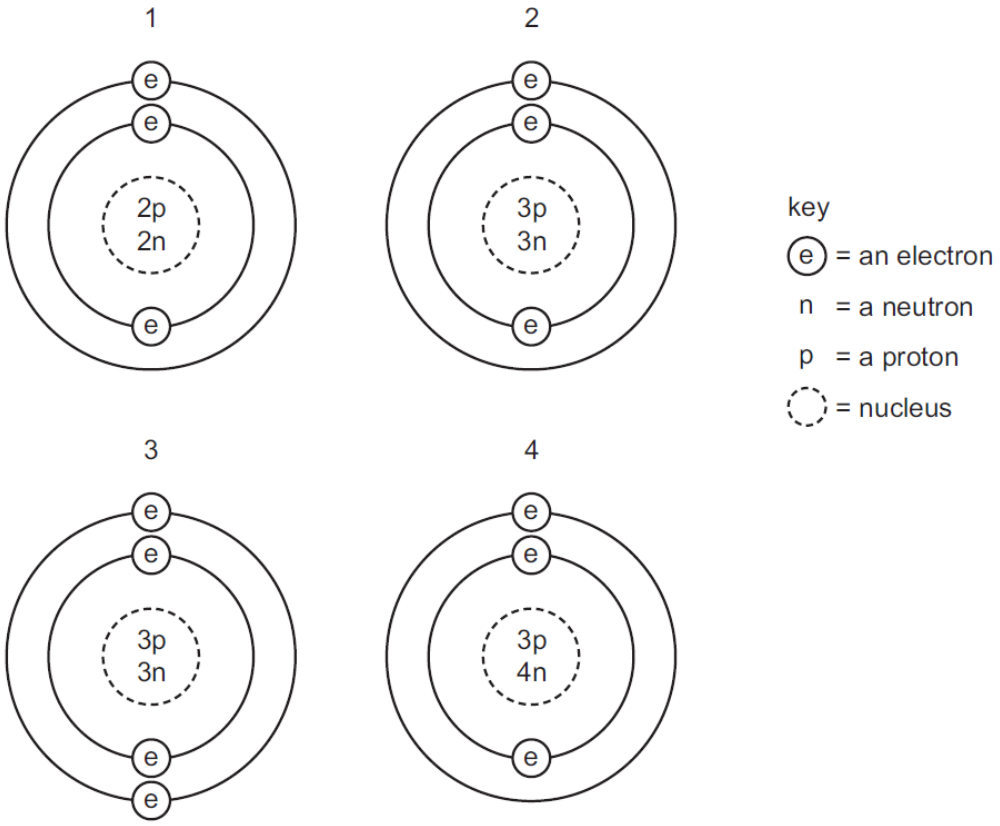
5 The diagrams show four particles.



Which two diagrams show **atoms** that are isotopes of each other?

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 2 and 4

0620_s/14/qp11

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4 Element X is represented by $^{27}_{13}X$.

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.

0620_s/13/qp11

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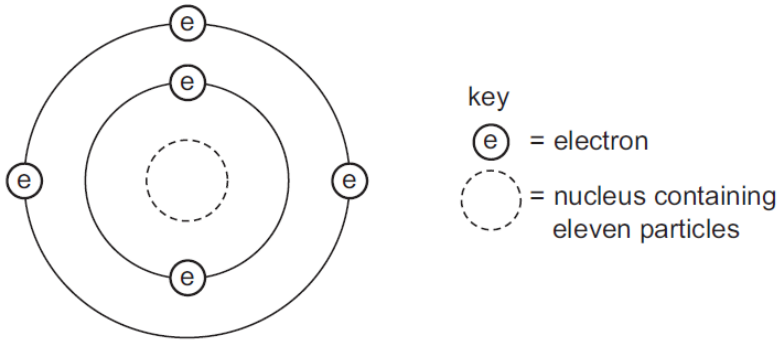
5 The diagram shows an atom of an element.



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

0620_s/13/qp12

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5 Which atom has twice as many neutrons as protons?

A $^{1}_{1}H$ **B** $^{2}_{1}H$ **C** $^{3}_{1}H$ **D** $^{4}_{2}He$

0620_s/12/qp11

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4 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.

0620_s/12/qp11

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7 The nucleon number and proton number of the lithium atom are shown by the symbol $^{7}_{3}Li$.

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

A $^{6}_{2}Li^{-}$ **B** $^{6}_{3}Li^{+}$ **C** $^{7}_{3}Li^{+}$ **D** $^{7}_{3}Li^{-}$

0620_s/11/qp11

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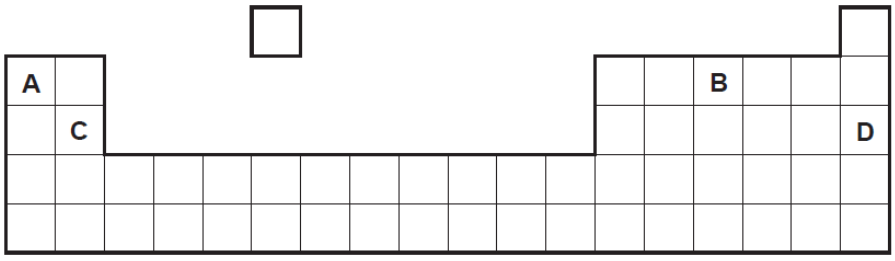
5 The diagram shows part of the Periodic Table.



Which element is correctly matched with its electronic structure?

	electronic structure
A	2,8,1
B	2,4
C	2,8,2
D	2,8

0620_s/11/qp11

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4 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

0620_s/10/qp11

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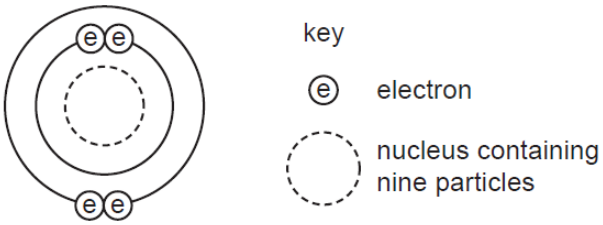
5 The diagram shows an atom.



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

0620_s/10/qp11

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

$$^{52}_{23}X \qquad ^{52}_{24}Y$$

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.

0620_s/10/qp11

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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

0620_s/09/qp11

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6 The electronic configuration of an ion is 2.8.8.

What could this ion be?

	S^{2-}	Ca^{2+}
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

0620_s/09/qp11

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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.

0620_s/09/qp11

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4 The nucleon number and proton number of the lithium atom are shown by the symbol $^{7}_{3}Li$.

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

A $^{6}_{2}Li^{-}$ **B** $^{6}_{3}Li^{+}$ **C** $^{7}_{3}Li^{+}$ **D** $^{7}_{3}Li^{-}$

0620_s/08/qp1

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5 The table shows the numbers of particles present in the nuclei of four atoms or ions.

	protons	neutrons	electron structure
1	18	22	2,8,8
2	19	20	2,8,8
3	19	21	2,8,8,1
4	20	20	2,8,8,2

Which two particles belong to the same element?

A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

0620_s/08/qp1

6 What are the nucleon numbers for carbon and magnesium?

	carbon	magnesium
A	6	12
B	6	24
C	12	12
D	12	24

0620_s/08/qp1

6 Element Y is in the second Period of the Periodic Table. An atom of element Z has six more protons than an atom of element Y.

Which statement **must** be correct?

A Elements Y and Z are in the same Period.

B Elements Y and Z have the same number of electrons in the first shell.

C Element Z has six more electrons in its outer shell than element Y.

D The nucleon number of element Z is six more than that of element Y.

0620_s/07/qp1

5 An atom has the symbol ${}^{p}_{q}\mathrm{X}$.

Which value determines the position of the element in the Periodic Table?

A p

B q

C $p - q$

D $p + q$

0620_s/07/qp1

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7 Which change to an atom occurs when it forms a positive ion?

A It gains an electron.

B It gains a proton.

C It loses an electron.

D It loses a proton.

0620_s/06/qp1

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5 Which numbers are added 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

0620_s/06/qp1

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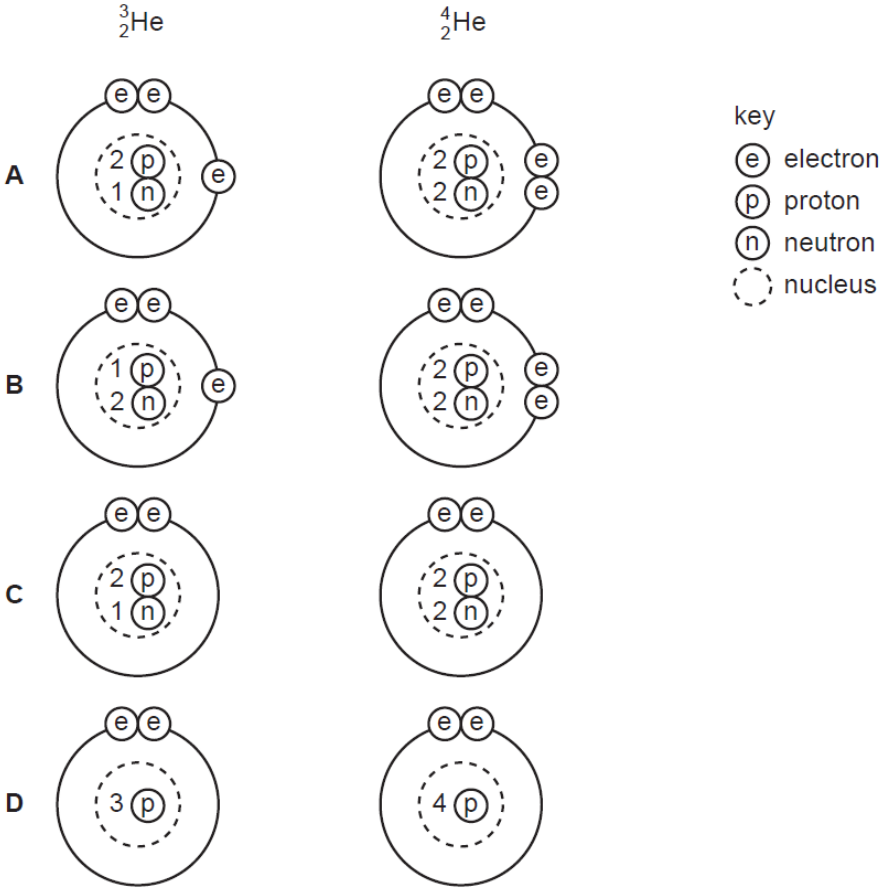
4 Two isotopes of helium are $^{3}_{2}He$ and $^{4}_{2}He$.

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



0620_s/05/qp1

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5 Which row gives the outer electronic shell of fluorine and of neon?

	$_{9}F$	$_{10}Ne$
A	7	8
B	7	10
C	9	8
D	9	10

0620_s/05/qp1

---

6 The electronic configuration of an ion is 2.8.8.

What could this ion be?

	S^{2-}	Ca^{2+}
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

0620_s/05/qp1

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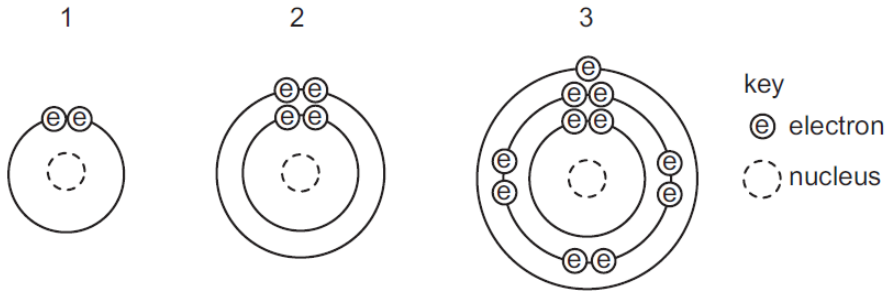
22 The diagrams show the arrangement of electrons in three different atoms.



Which atoms are metals?

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

0620_s/04/qp1

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11 The proton number of helium is 2.

What information does this give about helium?

A Its atom has two electrons.

B Its atom is twice as heavy as a hydrogen atom.

C It is a Group II element.

D Its molecule has two atoms.

0620_s/04/qp1

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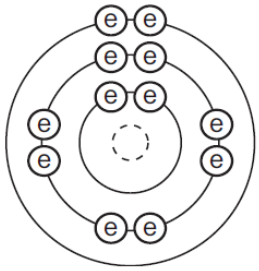
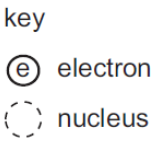
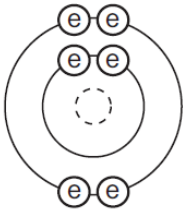
6 The electronic structure of an element is shown.



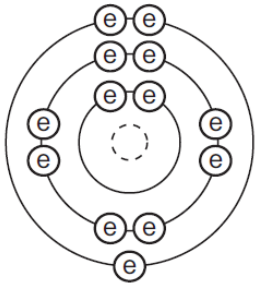


Which diagram shows the electronic structure of another element in the same group in the Periodic Table?

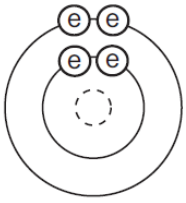
A



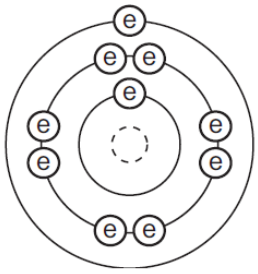
B



C



D



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9 The relative atomic mass of oxygen is 16 and that of hydrogen is 1.

This means that … (i) … of oxygen has the same mass as … (ii) … of hydrogen.

Which words correctly complete the gaps?

	gap (i)	gap (ii)
A	an atom	thirty-two molecules
B	an atom	eight molecules
C	a molecule	sixteen atoms
D	a molecule	eight atoms

0620_s/03/qp1

5 Which number in the table is –1?

particle	charge	relative mass
electron	**A**	**B**
neutron	**C**	1
proton	**D**	1

0620_s/03/qp1

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6 What is the electronic structure of an atom with a proton number 5 and a nucleon number 11?

A 1, 8, 2 **B** 2, 8, 1 **C** 2, 3 **D** 3, 2

0620_s/03/qp1

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7 What changes when an ion is made from an atom?

A the number of electrons only

B the number of neutrons only

C the number of protons only

D the number both of protons and of neutrons

0620_s/03/qp1

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10 An element, X, can be represented as $^{a}_{b}X$.

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**.

0620_w/14/qp13

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4 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.

0620_w/14/qp13

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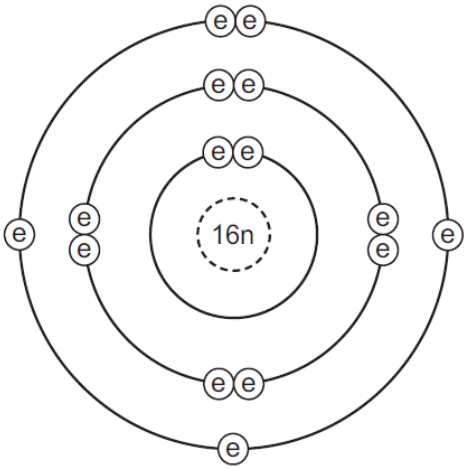
5 Which element has the atomic structure shown?



key
e electron
n neutron
nucleus

A Al **B** P **C** S **D** Si

0620_w/14/qp11

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4 What is different for isotopes of the same element?

A nucleon number

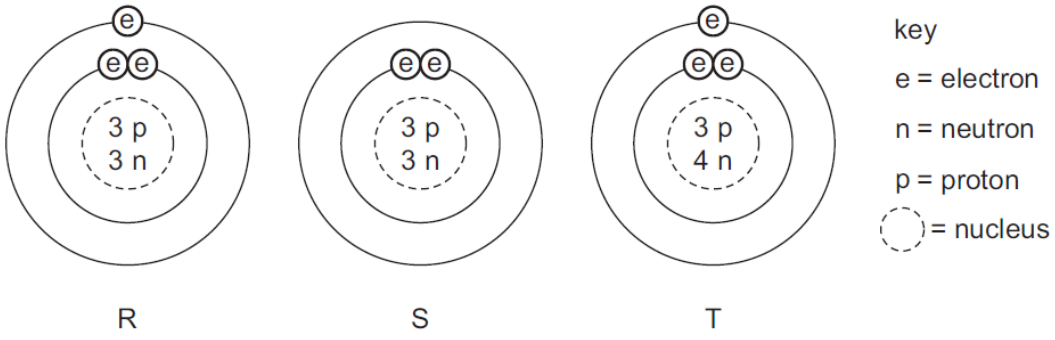
B number of electron shells

C number of electrons in the outer shell

D proton number

0620_w/14/qp11

5 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

0620_w/13/qp13

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4 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

0620_w/13/qp13

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21 Calcium, on the left of Period 4 of the Periodic Table, is more metallic than bromine on the right of this period.

Why is this?

Calcium has

A fewer electrons.

B fewer protons.

C fewer full shells of electrons.

D fewer outer shell electrons.

0620_w/13/qp11

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5 Which statements about a sodium atom, $^{23}_{11}Na$, 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

0620_w/13/qp11

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4 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

0620_w/13/qp11

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4 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

0620_w/12/qp13

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

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

0620_w/12/qp11

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4 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	✗	✗

0620_w/12/qp11

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7 The table describes the structures of four particles.

particle	number of protons	number of neutrons	number of electrons
O	8	8	8
O^{2-}	8	8	**X**
Na	11	**Y**	11
Na^{+}	11	12	**Z**

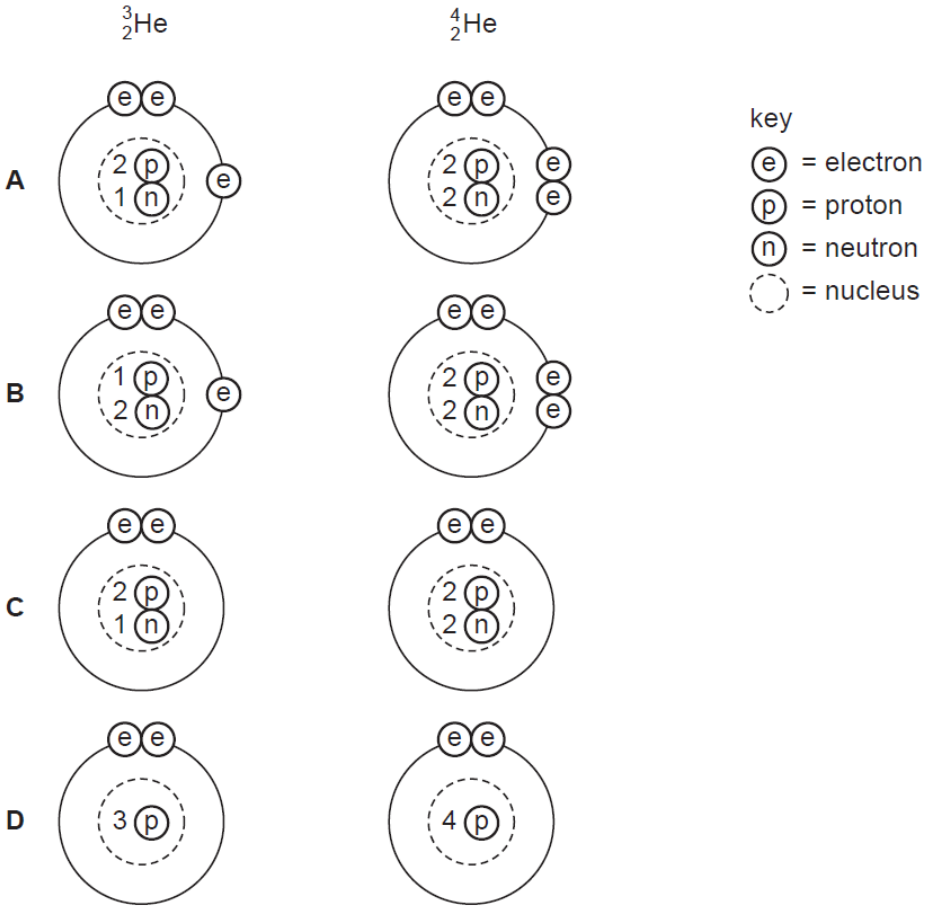
What are the correct values of **X**, **Y** and **Z**?

	X	**Y**	**Z**
A	9	11	10
B	9	11	11
C	10	12	10
D	10	12	11

0620_w/11/qp11

5 Two isotopes of helium are $^{3}_{2}He$ and $^{4}_{2}He$.

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



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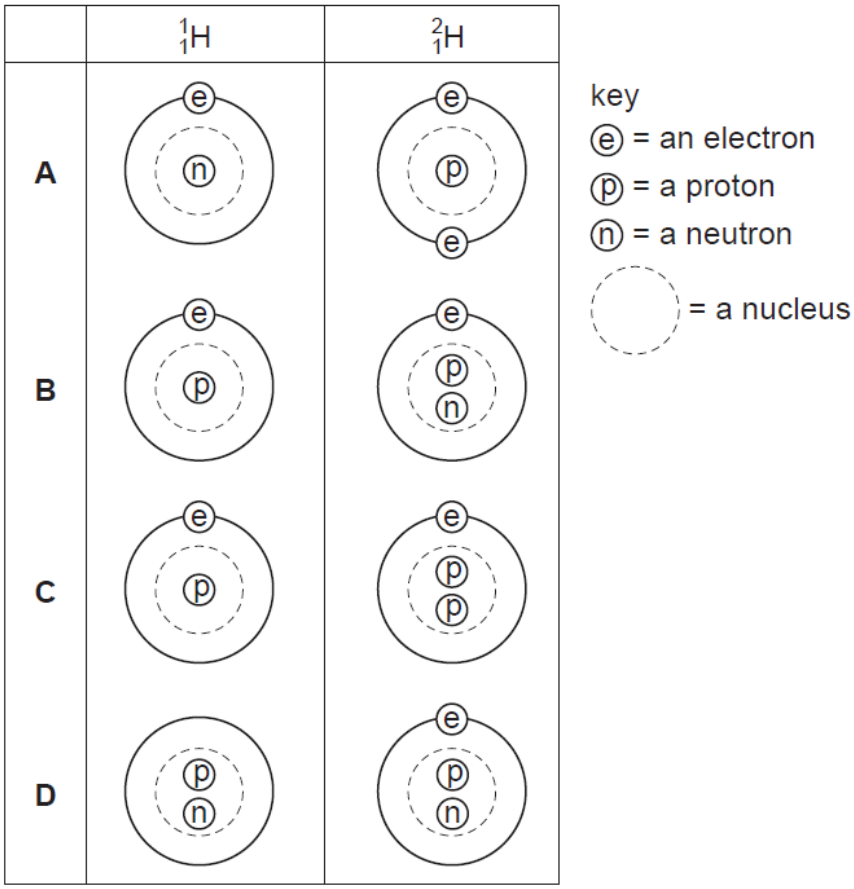
6 Two isotopes of hydrogen are $^{1}_{1}H$ and $^{2}_{1}H$.

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



0620_w/10/qp11

5 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

0620_w/10/qp11

---

4 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

0620_w/10/qp11

---

9 Which change to an atom occurs when it forms a positive ion?

A It gains electrons.

B It gains protons.

C It loses electrons.

D It loses protons.

0620_w/09/qp11

---

5 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

0620_w/09/qp11

---

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

A aluminium

B bromine

C calcium

D rubidium

0620_w/09/qp11

---

4 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	✓	✗
C	✗	✓
D	✗	✗

0620_w/09/qp11

---

26 What is the formula of a strontium ion?

A Sr^{2+} **B** Sr^{+} **C** Sr^{-} **D** Sr^{2-}

0620_w/08/qp1

---

8 Which particle is an ion?

	number of protons	number of neutrons	number of electrons
A	1	0	1
B	3	4	3
C	6	6	6
D	11	12	10

0620_w/08/qp1

---

5 What do the nuclei in hydrogen molecules contain?

A electrons and neutrons

B electrons and protons

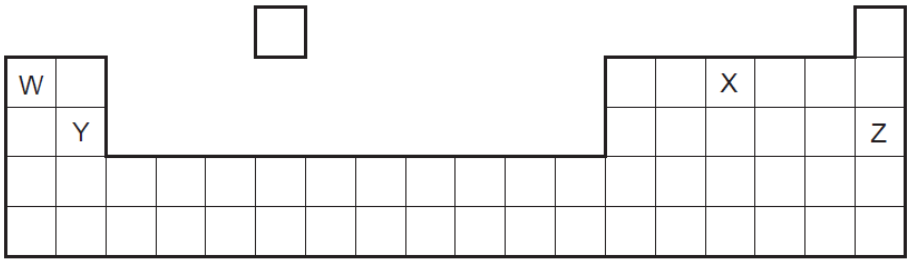
C neutrons only

D protons only

0620_w/08/qp1

---

6 The diagram shows part of the Periodic Table.



Which element is correctly matched with its electronic structure?

	element	electronic structure
A	W	2,8,1
B	X	2,4
C	Y	2,8,2
D	Z	2,8

0620_w/08/qp1

Chemical Bonding

29 The following statements are about alloys.

- Alloys are …X…. .
- …Y… alloys conduct electricity.

Which words complete the statements?

	X	Y
A	compounds	All
B	compounds	Some
C	mixtures	All
D	mixtures	Some

0620_w/07/qp1

---

7 The table shows the electronic structures of four atoms.

atom	electronic structure
W	2,8,1
X	2,8,4
Y	2,8,7
Z	2,8,8

Which two atoms combine to form a covalent compound?

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

0620_w/07/qp1

---

8 The following statement is about chemical bonds.

Covalent bonds are formed by the …1… of electrons. Covalent substances have …2… electrical conductivity.

Which words complete the statement?

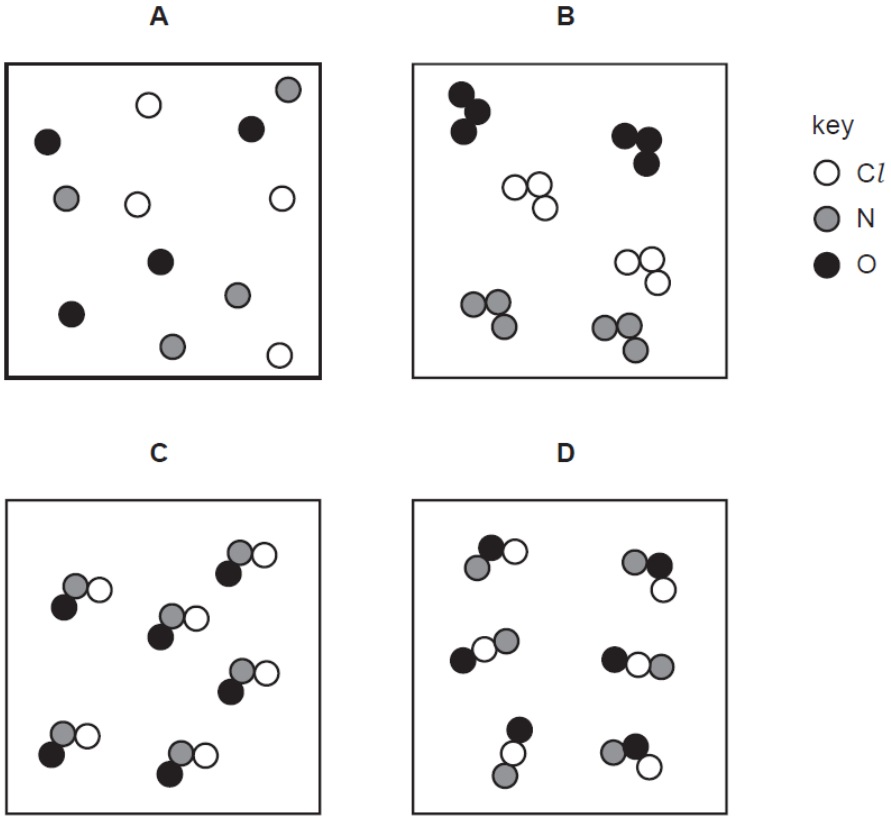
	1	2
A	sharing	high
B	sharing	low
C	transfer	high
D	transfer	low

0620_w/07/qp1

---

10 A gas has the molecular formula NOC*l*.

Which diagram could show molecules of the pure gas NOC*l*?



0620_w/06/qp1

9 Magnesium and sulphur each form a chloride.

What could be the formulae of these chlorides?

	magnesium	sulphur
A	Mg_2Cl	S_2Cl
B	Mg_2Cl	SCl_2
C	$MgCl_2$	S_2Cl
D	$MgCl_2$	SCl_2

0620_w/06/qp1

6 The table shows the electronic structures of four atoms.

atom	electronic structure
W	2,1
X	2,7
Y	2,8,4
Z	2,8,8

Which two atoms combine to form an ionic compound?

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

0620_w/06/qp1

---

7 Element X 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 X?

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

0620_w/06/qp1

---

8 The diagram shows the structure of hydrogen peroxide.

H—O—O—H

What is the total number of electrons used for bonding in this molecule?

A 3 **B** 4 **C** 6 **D** 8

0620_w/05/qp1

---

7 Bottles of sodium hydroxide, sodium chloride and sugar have lost their labels.

Students test a sample from each bottle. Their results are shown in the table.

bottle	addition of water	conductivity of solution
1	forms an alkaline solution	conducts electricity
2	forms a neutral solution	conducts electricity
3	forms a neutral solution	does not conduct electricity

What are the correct labels for each bottle?

	bottle 1	bottle 2	bottle 3
A	sodium hydroxide	sodium chloride	sugar
B	sodium hydroxide	sugar	sodium chloride
C	sodium chloride	sugar	sodium hydroxide
D	sugar	sodium hydroxide	sodium chloride

0620_w/05/qp1

---

26 Which substance is a metal?

	electrical conductivity (solid)	electrical conductivity (molten)
A	high	high
B	high	low
C	low	high
D	low	low

0620_w/04/qp1

---

7 Which compound has ionic bonds?

A hydrogen chloride

B methane

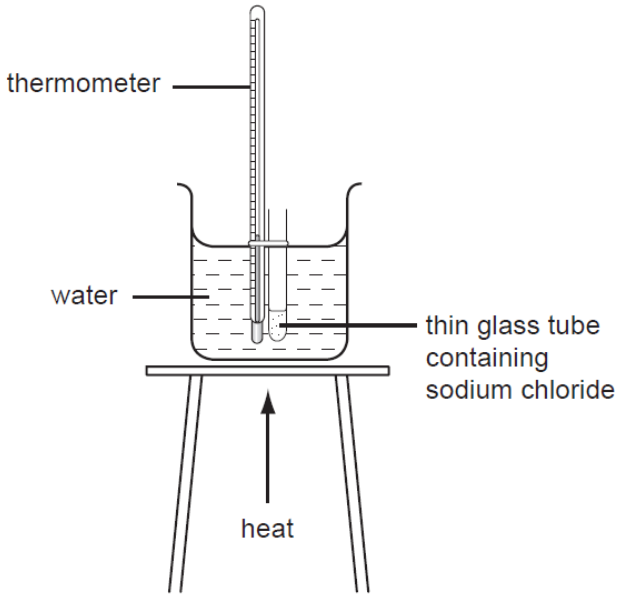
C sodium chloride

D water

0620_w/04/qp1

---

3 The apparatus shown **cannot** be used to determine the melting point of sodium chloride, Na^+Cl^-.



Why is this?

	melting point of sodium chloride is greater than 100 °C	sodium chloride dissolves in the water
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

0620_w/04/qp1

---

11 Carbon and chlorine form a chloride.

What is the formula of this chloride?

A CCl_2

B CCl_4

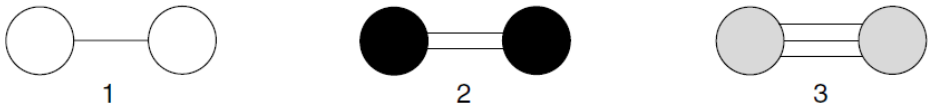
C $CaCl_2$

D $CaCl_4$

0620_w/03/qp1

---

9 The diagrams show the bonding in three covalent molecules.



Which of these molecules combine to form ammonia?

A 1 and 2

B 1 and 3

C 2 and 3

D 1, 2 and 3

0620_w/03/qp1

---

7 Which of the following can be used as a lubricant?

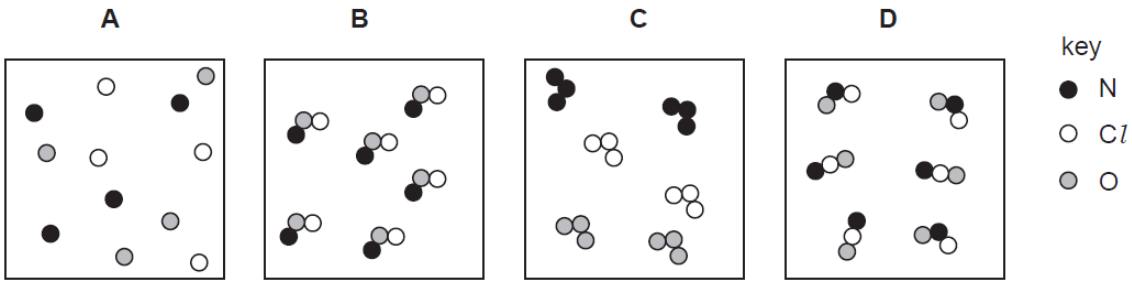
	graphite	a liquid fraction from petroleum
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

0620_w/03/qp1

---

10 A gas has the molecular formula NOC*l*.

Which diagram could show molecules of the pure gas NOC*l*?



0620_w/02/qp1

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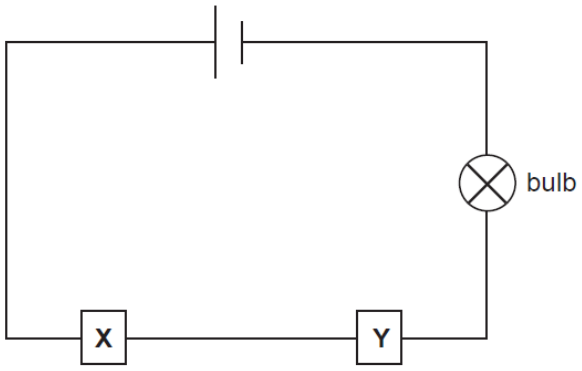
8 The diagram shows an electric circuit.



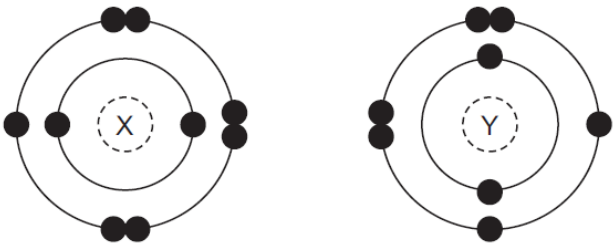
For which two substances at **X** and **Y** does the bulb light up?

	X	Y
A	copper	graphite
B	copper	poly(ethene)
C	rubber	graphite
D	rubber	poly(ethene)

0620_w/02/qp1

---

7 The electronic structures of two atoms, X and Y, are shown.



X and Y combine together to form a compound.

What is the type of bonding in the compound and what is the formula of the compound?

	type of bonding	formula
A	covalent	X_2Y
B	covalent	XY_2
C	ionic	XY_2
D	ionic	X_2Y

0620_s/14/qp12

---

11 Which substance will **not** conduct electricity?

A aluminium

B copper

C plastic

D steel

0620_s/14/qp11

---

9 A compound contains one atom of calcium, two atoms of hydrogen and two atoms of oxygen.

What is the correct chemical formula of the compound?

A CaO_2H_2 **B** HOCaOH **C** H_2CaO_2 **D** $Ca(OH)_2$

0620_s/14/qp11

---

8 Solid F is an element.
Solid G is a compound.
Neither solid conducts electricity but G conducts electricity when dissolved in water.

These properties suggest that F is ……1…… and that G is ……2…… with ……3…… bonds.

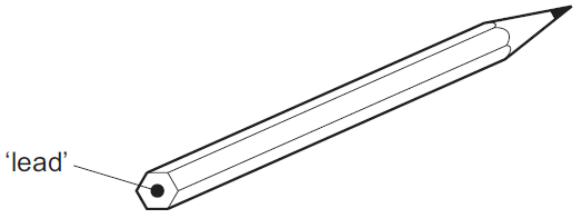
Which words correctly complete gaps 1, 2 and 3?

	1	2	3
A	diamond	AgC*l*	covalent
B	diamond	NaC*l*	ionic
C	graphite	AgC*l*	ionic
D	graphite	NaC*l*	covalent

0620_s/14/qp11

---

6 The 'lead' in a pencil is made of a mixture of graphite and clay.



When the percentage of graphite is increased, the pencil slides across the paper more easily.

Which statement explains this observation?

A Graphite has a high melting point.

B Graphite is a form of carbon.

C Graphite is a lubricant.

D Graphite is a non-metal.

0620_s/14/qp11

---

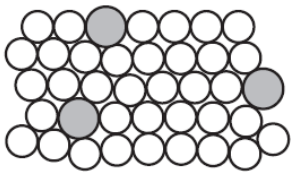
6 For which substance is the type of bonding **not** correct?

	substance	type of bonding		
		ionic	covalent	metallic
A	chlorine		✓	
B	potassium bromide	✓		
C	sodium			✓
D	sodium chloride		✓	

0620_s/13/qp11

---

29 The diagram represents the structure of substance S.



What is S?

A an alloy

B an ionic solid

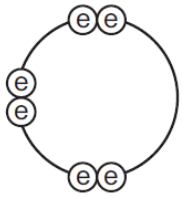
C a macromolecule

D a pure metal

0620_s/13/qp12

---

8 Element X has six electrons in its outer shell.



key

ⓔ = electron

How could the element react?

A by gaining two electrons to form a positive ion

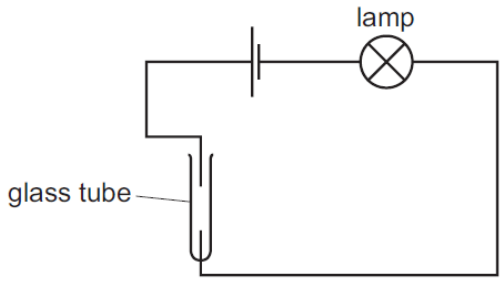
B by losing six electrons to form a negative ion

C by sharing two electrons with two electrons from another element to form two covalent bonds

D by sharing two electrons with two electrons from another element to form four covalent bonds

0620_s/13/qp12

9 The diagram shows an incomplete circuit.



Which substance causes the lamp to light when added to the glass tube?

A aqueous sodium chloride

B aqueous sugar

C solid sodium chloride

D solid sugar

0620_s/13/qp12

---

6 Electrons from each element are shared by both of the elements in a compound.

Which compound matches this description?

A lead bromide

B sodium chloride

C water

D zinc oxide

0620_s/13/qp12

---

22 Five elements have proton numbers 10, 12, 14, 16 and 18.

What are the proton numbers of the three elements that form oxides?

A 10, 12 and 14

B 10, 14 and 18

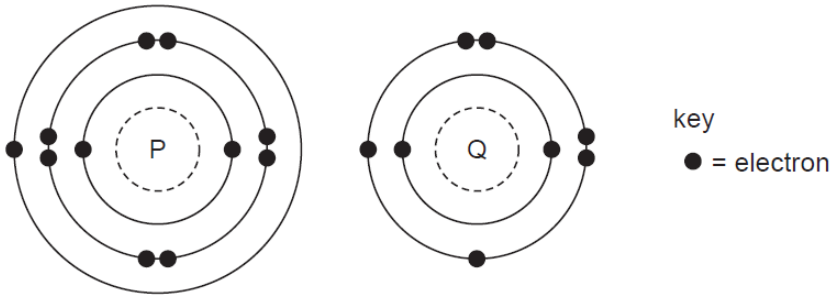
C 12, 14 and 16

D 14, 16 and 18

0620_s/12/qp11

---

7 The electronic structures of atoms P and Q are shown.



P and Q react to form an ionic compound.

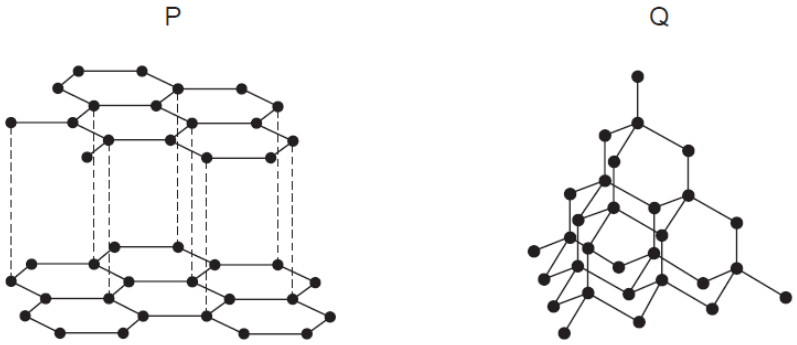
What is the formula of this compound?

A PQ_2 **B** P_2Q **C** P_2Q_6 **D** P_6Q_2

0620_s/12/qp11

---

8 The diagrams show the structures of two forms, P and Q, of a solid element.



What are suitable uses of P and Q, based on their structures?

	use of solid P	use of solid Q
A	drilling	drilling
B	lubricating	drilling
C	drilling	lubricating
D	lubricating	lubricating

0620_s/12/qp11

---

6 Which is a simple covalent molecule?

	conducts electricity		volatile
	when solid	when molten	
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

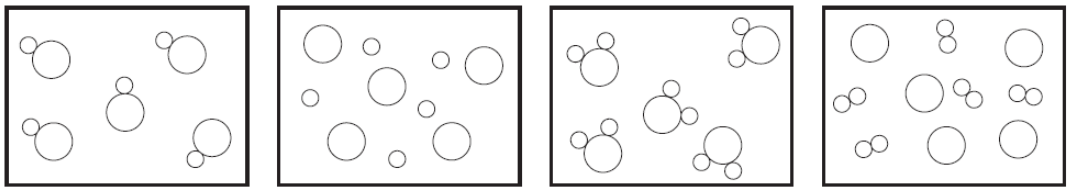
0620_s/12/qp11

---

6 In the diagrams, circles of different sizes represent atoms of different elements.

Which diagram represents hydrogen chloride gas?

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



0620_s/11/qp11

---

4 Which two elements react together to form an ionic compound?

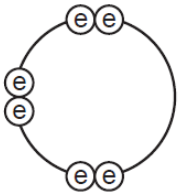
element	electronic structure
W	2,4
X	2,8
Y	2,8,1
Z	2,8,7

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

0620_s/11/qp11

---

8 Element X has six electrons in its outer shell.



How could the element react?

A by gaining two electrons to form a positive ion

B by losing six electrons to form a negative ion

C by sharing two electrons with two electrons from another element to form two covalent bonds

D by sharing two electrons with two electrons from another element to form four covalent bonds

0620_s/10/qp11

---

9 In which compounds are pairs of electrons shared between atoms?

1 sodium chloride

2 methane

3 lead bromide

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

0620_s/10/qp11

---

7 Which name is given to mixtures of metals?

A alloys

B compounds

C ores

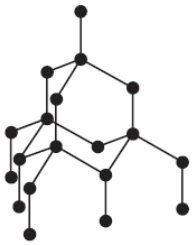
D salts

0620_s/10/qp11

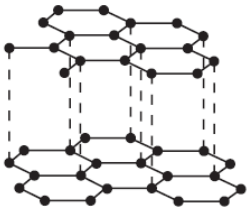
---

27 Which diagram represents the structure of an alloy?

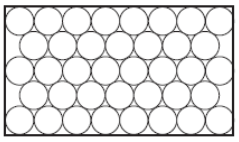
A



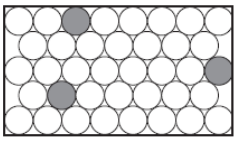
B



C



D



0620_s/09/qp11

---

8 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	✓	✗	✗	✗
B	✓	✓	✗	✗
C	✗	✗	✗	✓
D	✗	✗	✓	✓

0620_s/09/qp11

---

9 When sodium chloride is formed from its elements, each chlorine atom ……1…… one ……2…….

Which words correctly complete gaps 1 and 2?

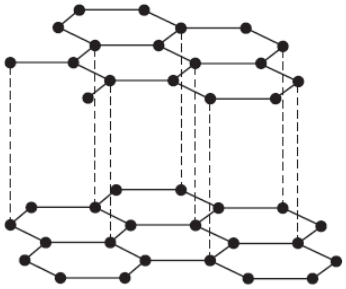
	1	2
A	gains	electron
B	gains	proton
C	loses	electron
D	loses	proton

0620_s/09/qp11

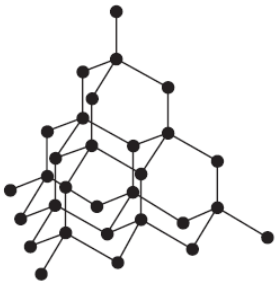
---

7 The diagrams show the structures of two forms, P and Q, of a solid element.

P



Q



What are suitable uses of P and Q, based on their structures?

	use of solid P	use of solid Q
A	drilling	drilling
B	drilling	lubricating
C	lubricating	drilling
D	lubricating	lubricating

0620_s/09/qp11

---

26 The proton numbers of four elements are shown.

Which element forms a singly charged positive ion in its salts?

element	proton number
A	34
B	35
C	36
D	37

0620_s/08/qp1

---

18 When written as formulae, which compound has the greatest number of oxygen atoms?

A calcium oxide

B copper(II) oxide

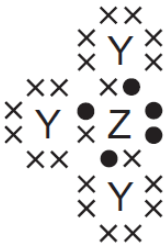
C iron(III) oxide

D potassium oxide

0620_s/08/qp1

---

8 The diagram shows the outer shell electron arrangement of compound J that contains the elements Y and Z.



What type of compound is J?

A an alloy

B a macromolecule

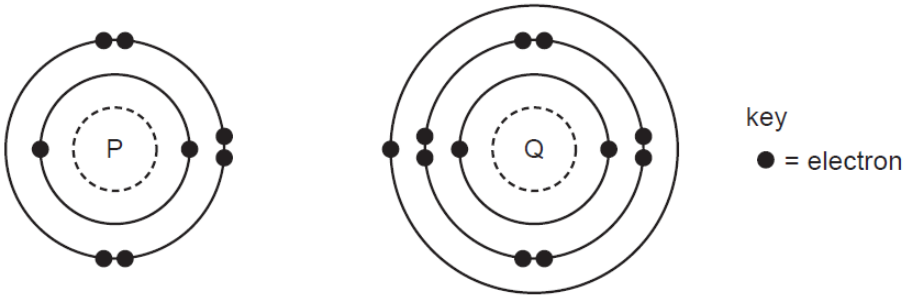
C covalent

D ionic

0620_s/08/qp1

---

9 The electronic structures of atoms P and Q are shown.



P and Q react to form an ionic compound.

What is the formula of this compound?

A PQ_2 **B** P_2Q **C** P_2Q_6 **D** P_6Q_2

0620_s/08/qp1

---

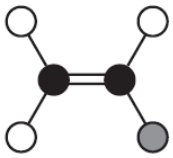
10 For which compound is the formula correct?

	compound	formula
A	ammonium chloride	NH_3Cl
B	copper(II) sulphide	CuS
C	iron(II) sulphide	Fe_3S
D	silver nitrate	Ag_2NO_3

0620_s/08/qp1

---

11 The diagram shows a molecule of vinyl chloride (used to make pvc).



key

- a carbon atom
- a chlorine atom
- a hydrogen atom

What is the formula of vinyl chloride?

A CH_2Cl_3 **B** CH_3Cl_2 **C** C_2HCl_3 **D** C_2H_3Cl

0620_s/08/qp1

---

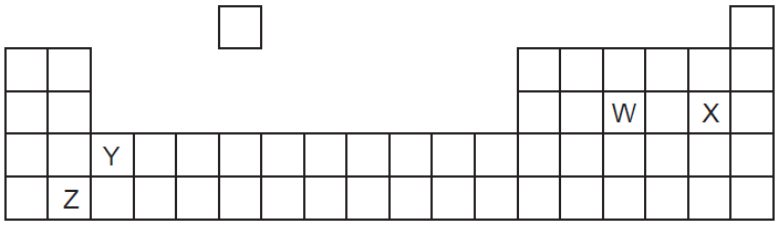
7 Which of the following can be used as a lubricant?

	graphite	a liquid fraction from petroleum
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

0620_s/08/qp1

---

23 The diagram shows an outline of part of the Periodic Table.



Which two elements could form a covalent compound?

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

0620_s/07/qp1

---

10 Boron, B, forms an oxide.

Which equation is correctly balanced?

A $2B + 3O_2 \rightarrow B_2O_3$

B $2B + 3O_2 \rightarrow 2B_2O_3$

C $4B + 2O_2 \rightarrow 2B_2O_3$

D $4B + 3O_2 \rightarrow 2B_2O_3$

0620_s/07/qp1

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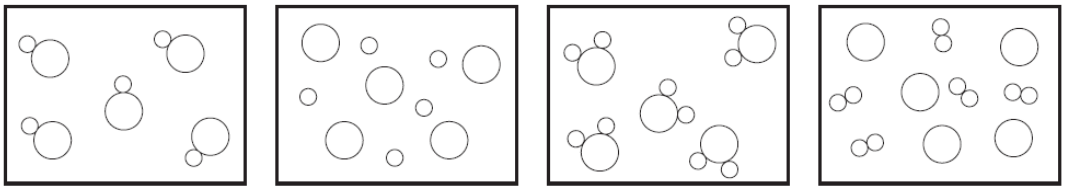
9 In the diagrams, circles of different sizes represent atoms of different elements.

Which diagram can represent hydrogen chloride gas?

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



0620_s/07/qp1

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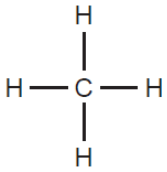
7 The diagram shows the structure of methane.



What is the total number of electrons used for bonding in this molecule?

A 2 **B** 4 **C** 8 **D** 10

0620_s/07/qp1

8 The diagram shows the structure of a substance.

What is represented?

A diamond

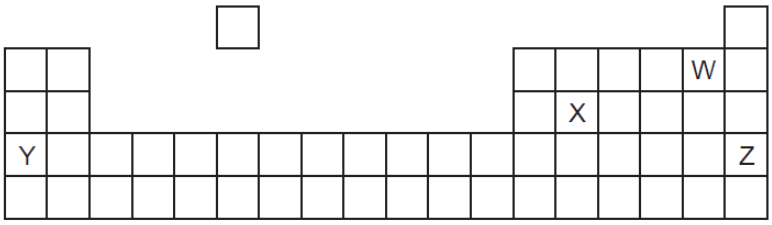
B ethane

C graphite

D poly(ethene)

0620_s/07/qp1

21 The diagram shows an outline of part of the Periodic Table.

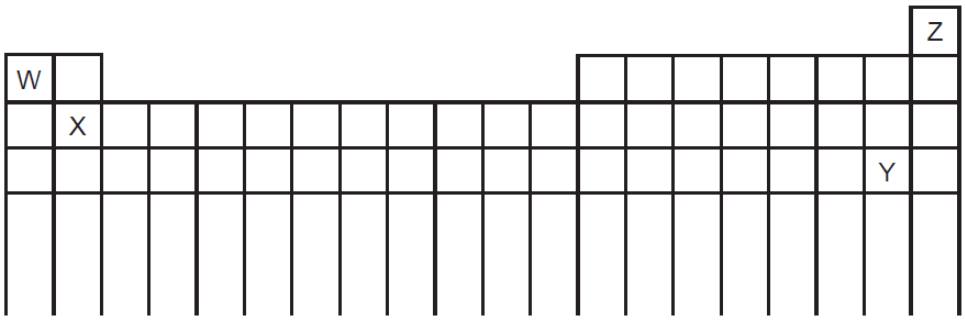


Which two elements could form a covalent compound?

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

0620_s/06/qp1

18 The diagram shows the positions of some elements in the Periodic Table.



Which elements form ionic bonds with oxygen?

A W only

B W and X only

C Y only

D Y and Z only

0620_s/06/qp1

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9 The diagrams show the molecules of three elements.

1 2 3

Which of these elements are present in water?

A 1 and 2 only

B 1 and 3 only

C 2 and 3 only

D 1, 2 and 3

0620_s/06/qp1

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8 For which compound is the formula correct?

	compound	formula
A	ammonia	NH_4
B	carbon dioxide	CO
C	potassium oxide	P_2O
D	zinc chloride	$ZnCl_2$

0620_s/06/qp1

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6 In the molecules CH_4, HCl and H_2O, which atoms use **all** of their outer shell electrons in bonding?

A C and Cl

B C and H

C Cl and H

D H and O

0620_s/06/qp1

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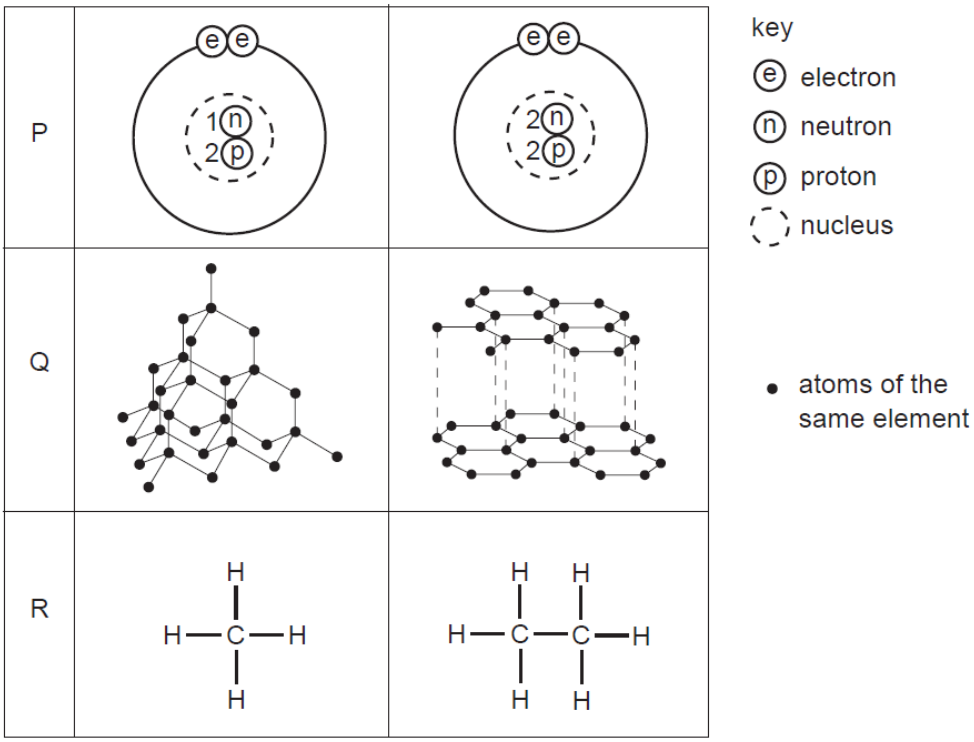
4 The rows P, Q and R in the table show three pairs of structures.



Which pair or pairs are isotopes?

A P only **B** P and Q only **C** Q only **D** Q and R only

0620_s/06/qp1

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3 Five elements have proton numbers 10, 12, 14, 16 and 18.

What are the proton numbers of the three elements that form oxides?

A 10, 12 and 14

B 10, 14 and 18

C 12, 14 and 16

D 14, 16 and 18

0620_s/06/qp1

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27 Mild steel is an alloy of iron and carbon.

How does the carbon affect the properties of mild steel?

A The carbon makes the alloy a better conductor of electricity than iron.

B The carbon makes the alloy harder than the iron.

C The carbon makes the alloy softer than the iron.

D The carbon stops the iron rusting.

0620_s/05/qp1

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10 For which compound is the formula correct?

	compound	formula
A	ammonia	NH_4
B	carbon monoxide	CO_2
C	iron(III) oxide	Fe_3O_2
D	zinc hydroxide	$Zn(OH)_2$

0620_s/05/qp1

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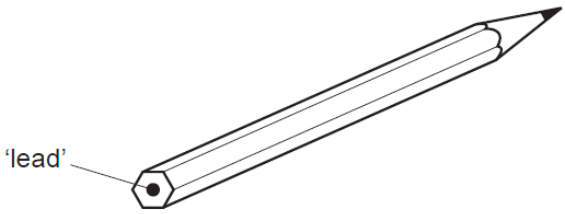
7 The 'lead' in a pencil is made of a mixture of graphite and clay.



If the percentage of graphite is increased, the pencil slides across the paper more easily.

Why is this?

A Graphite conducts electricity.

B Graphite is a form of carbon.

C Graphite is a lubricant.

D Graphite is a non-metal.

0620_s/05/qp1

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8 Which statement about gaseous hydrogen chloride and solid potassium chloride is correct?

A Hydrogen chloride is covalent but potassium chloride is ionic.

B Hydrogen chloride is ionic but potassium chloride is covalent.

C They are both covalent compounds.

D They are both ionic compounds.

0620_s/05/qp1

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9 Which two elements form an alloy when they are heated together?

A chlorine and hydrogen

B chlorine and zinc

C copper and hydrogen

D copper and zinc

0620_s/05/qp1

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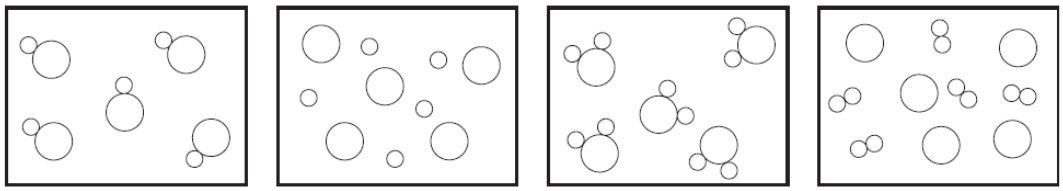
7 In the diagrams, circles of different sizes represent atoms of different elements.

Which diagram can represent hydrogen chloride gas?

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



0620_s/04/qp1

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8 How many electrons are shared between the atoms in a molecule of methane, CH_4, and in a molecule of water, H_2O?

	methane	water
A	4	2
B	4	4
C	8	2
D	8	4

0620_s/04/qp1

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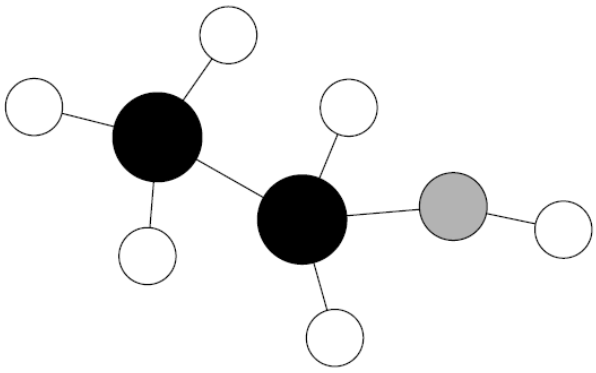
10 The diagram shows a model of a molecule containing carbon, hydrogen and oxygen.



How many atoms of each element are in the molecule?

	carbon	hydrogen	oxygen
A	1	6	2
B	2	5	1
C	2	6	1
D	6	2	1

0620_s/03/qp1

---

8 Strontium, Sr, is a metal that forms an ionic chloride $SrCl_2$.

Sulphur, S, is a non-metal that forms a covalent chloride SCl_2.

Which compound is likely to have the higher melting point (m.p.) and which is more soluble in water?

	higher m.p.	more soluble in water
A	$SrCl_2$	$SrCl_2$
B	$SrCl_2$	SCl_2
C	SCl_2	$SrCl_2$
D	SCl_2	SCl_2

0620_s/03/qp1

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8 Which substance is methane?

	volatility	electrical conductivity at room temperature	solubility in water
A	high	good	soluble
B	high	poor	insoluble
C	low	good	soluble
D	low	poor	insoluble

0620_w/14/qp13

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7 Element X, $^{19}_{9}X$, forms a compound with element Y, $^{39}_{19}Y$.

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.

0620_w/14/qp13

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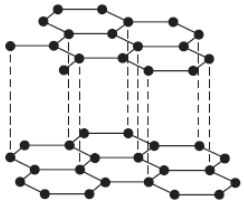
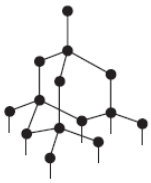
6 Slate has a layered structure and can easily be split into thin sheets.

Which diagram shows a structure most like that of slate?

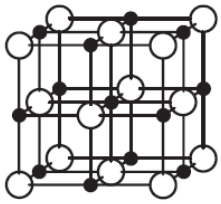
A



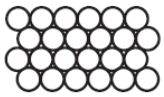
B



C



D



0620_w/14/qp11

7 Sodium chloride is an ionic solid.

Which statement is **not** correct?

A Ions are formed when atoms lose or gain electrons.

B Ions in sodium chloride are strongly held together.

C Ions with the same charge attract each other.

D Sodium chloride solution can conduct electricity.

0620_w/14/qp11

8 Caesium chloride and rubidium bromide are halide compounds of Group I elements.

Caesium chloride has the formula ……1……, a relative formula mass ……2…… that of rubidium bromide and bonds that are ……3…… .

Which words correctly complete gaps 1, 2 and 3?

	1	2	3
A	CaC*l*	different from	ionic
B	CaC*l*	the same as	covalent
C	CsC*l*	different from	ionic
D	CsC*l*	the same as	covalent

0620_w/14/qp11

7 The electronic structures of atoms P and Q are shown.

P and Q react to form an ionic compound.

What is the formula of the compound?

A Q_7P **B** QP **C** QP_3 **D** QP_7

0620_w/13/qp13

6 Which statement about the bonding in a molecule of water is **not** correct?

A Both hydrogen and oxygen have a noble gas configuration of electrons.

B Each hydrogen shares its one electron with oxygen.

C Oxygen shares one of its own electrons with each hydrogen.

D Oxygen shares two of its own electrons with each hydrogen.

0620_w/13/qp13

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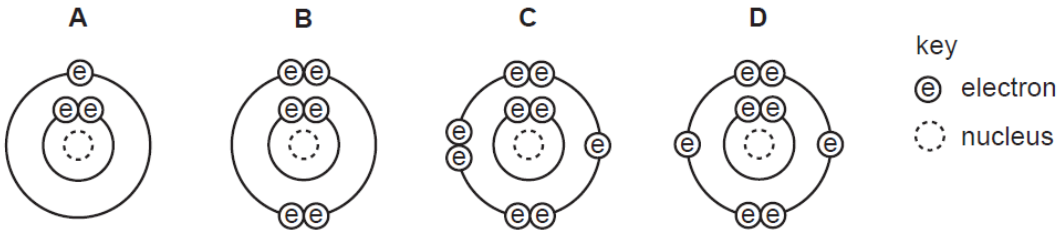
7 The diagrams show the electron arrangements in the atoms of four elements.

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



0620_w/13/qp11

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6 Rubidium is in Group I of the Periodic Table and bromine is in Group VII.

Rubidium reacts with bromine to form an ionic compound.

Which row shows the electron change taking place for rubidium and the correct formula of the rubidium ion?

	electron change	formula of ion formed
A	electron gained	Rb^+
B	electron gained	Rb^-
C	electron lost	Rb^+
D	electron lost	Rb^-

0620_w/13/qp11

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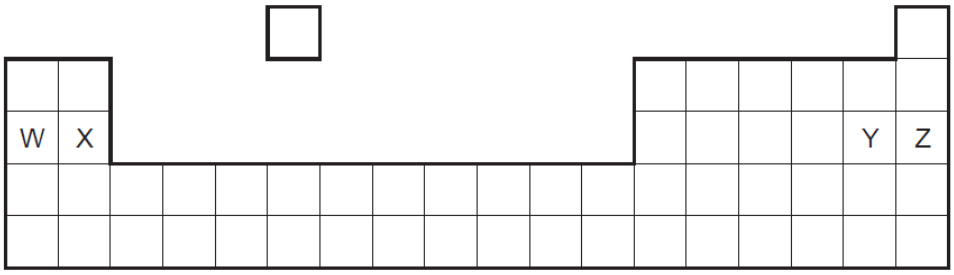
20 The diagram shows an outline of the Periodic Table.



Which ionic compound could be formed?

A W^+Y^- **B** W^+Z^- **C** X^+Y^- **D** X^+Z^-

0620_w/12/qp13

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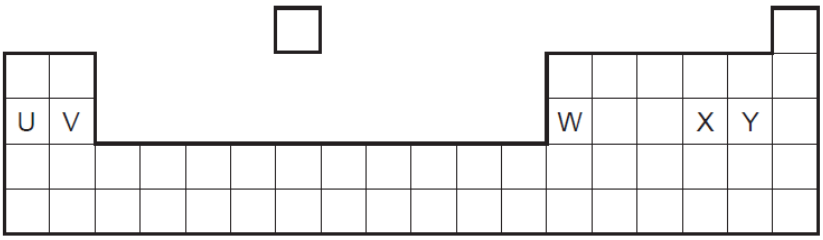
20 The diagram shows an outline of the Periodic Table.



Which of the elements U, V, W, X and Y would react together in the ratio of 1 : 1?

A U and X **B** U and Y **C** V and Y **D** W and X

0620_w/12/qp11

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7 The table shows the electronic structures of four atoms.

atom	electronic structure
W	2,1
X	2,7
Y	2,8,4
Z	2,8,8

Which two atoms combine to form an ionic compound?

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

0620_w/12/qp11

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6 In the molecules CH_4, HCl and H_2O, which atoms use **all** of their outer shell electrons in bonding?

A C and Cl **B** C and H **C** Cl and H **D** H and O

0620_w/12/qp11

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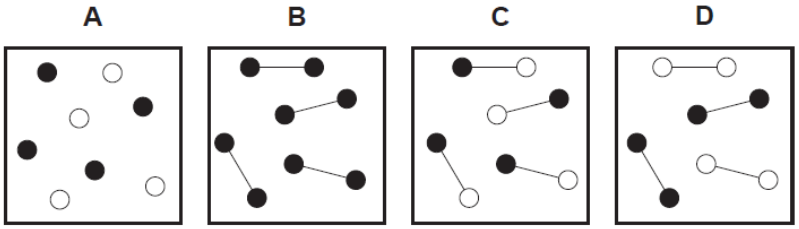
6 Two elements, represented by ○ and ●, form a compound.

Which diagram shows molecules of the compound?



0620_w/11/qp11

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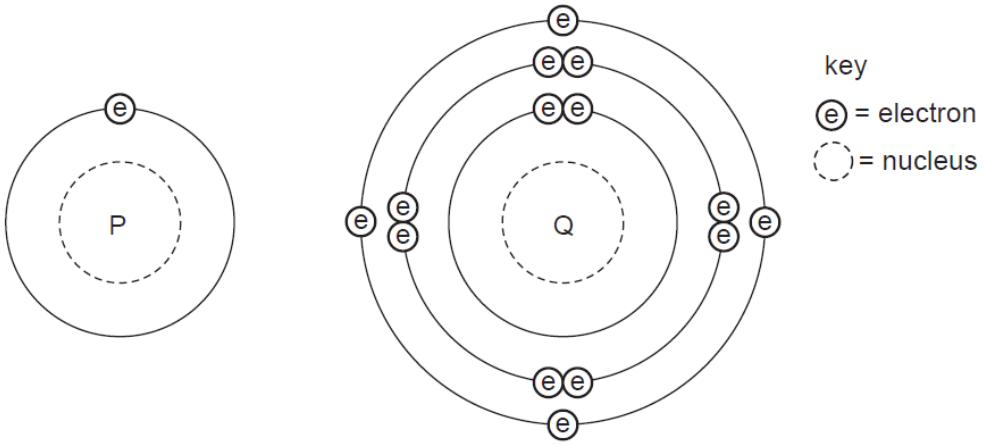
4 The diagram shows the electronic structures of atoms P and Q.



P and Q combine to form a molecule.

What is the formula of this molecule?

A PQ_4 **B** PQ **C** P_2Q **D** P_4Q

0620_w/11/qp11

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28 Which property do **all** metals have?

A Their boiling points are low.

B Their densities are low.

C They conduct electricity.

D They react with water.

0620_w/10/qp11

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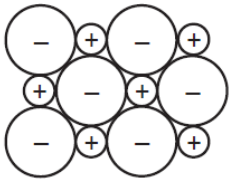
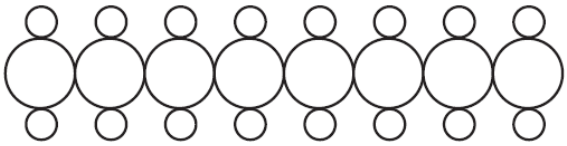
27 Which diagram could represent the structure of an alloy?

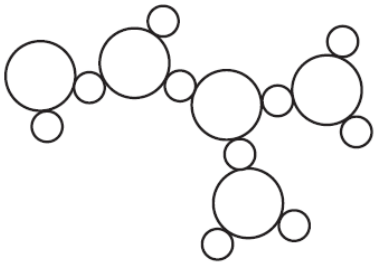
A



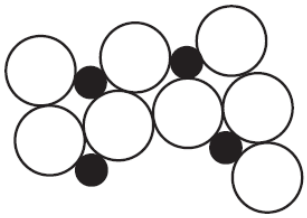
B



C



D



0620_w/10/qp11

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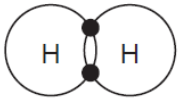
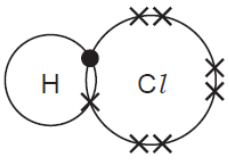
9 Which diagram does **not** show the outer shell electrons in the molecule correctly?

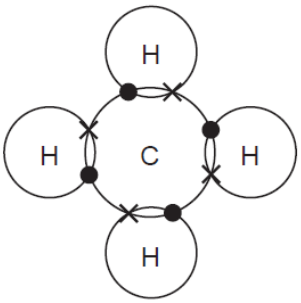
A



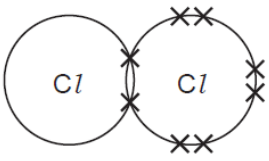
B



C



D



0620_w/10/qp11

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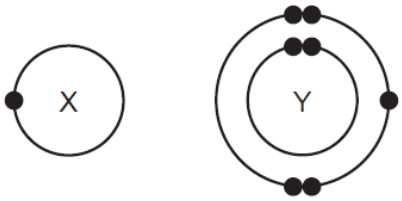
8 The electronic structures of atoms X and Y are shown.



X and Y form a covalent compound.

What is its formula?

A XY_5 **B** XY_3 **C** XY **D** X_3Y

0620_w/10/qp11

---

7 Element X is shiny and can be formed into a sheet by hammering.

Which row correctly describes the properties of element X?

	conducts electricity	melts below 25 °C
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

0620_w/10/qp11

---

30 Which property do **all** metals have?

A They are soluble in water.

B They conduct electricity.

C They have high melting points.

D They react with dilute sulfuric acid.

0620_w/09/qp11

---

9 Which change to an atom occurs when it forms a positive ion?

A It gains electrons.

B It gains protons.

C It loses electrons.

D It loses protons.

0620_w/09/qp11

---

7 Statements 1, 2 and 3 are about diamond and graphite.

1 They are different solid forms of the same element.

2 They each conduct electricity.

3 They have atoms that form four equally strong bonds.

Which statements are correct?

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

0620_w/09/qp11

---

8 Covalent bonds are formed when electrons are ……1…… . Covalent compounds have ……2…… electrical conductivity.

Which words correctly complete gaps 1 and 2?

	1	2
A	shared	high
B	shared	low
C	transferred	high
D	transferred	low

0620_w/09/qp11

---

29 A new isotope of a divalent metal is discovered. Some students are asked to predict its properties.

Which student's predictions are correct?

student	number of electrons in outer shell	bonding in the oxide
A	2	covalent
B	2	ionic
C	6	covalent
D	6	ionic

0620_w/08/qp1

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11 Carbon and chlorine form a chloride.

What is the formula of this chloride?

A CCl_2 **B** CCl_4 **C** $CaCl_2$ **D** $CaCl_4$

0620_w/08/qp1

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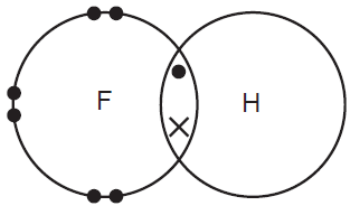
9 The diagram shows a molecule of hydrogen fluoride.



In the molecule hydrogen fluoride, HF,

A the hydrogen and fluorine share a pair of electrons.

B the hydrogen and fluorine share a pair of protons.

C the hydrogen gives the fluorine an electron.

D the hydrogen gives fluorine a proton.

0620_w/08/qp1

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7 Which of the following compounds exist?

	RaAr	RbBr
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

0620_w/08/qp1