

## Location Entry Codes

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As part of CIE's continual commitment to maintaining best practice in assessment, CIE uses different variants of some question papers for our most popular assessments with large and widespread candidature. The question papers are closely related and the relationships between them have been thoroughly established using our assessment expertise. All versions of the paper give assessment of equal standard.

The content assessed by the examination papers and the type of questions is unchanged.

This change means that for this component there are now two variant Question Papers, Mark Schemes and Principal Examiner's Reports where previously there was only one. For any individual country, it is intended that only one variant is used. This document contains both variants which will give all Centres access to even more past examination material than is usually the case.

The diagram shows the relationship between the Question Papers, Mark Schemes and Principal Examiners' Reports that are available.

Question Paper	Mark Scheme	Principal Examiner's Report
Introduction	Introduction	Introduction
First variant Question Paper	First variant Mark Scheme	First variant Principal Examiner's Report
Second variant Question Paper	Second variant Mark Scheme	Second variant Principal Examiner's Report

### Who can I contact for further information on these changes?

Please direct any questions about this to CIE's Customer Services team at:

[international@cie.org.uk](mailto:international@cie.org.uk)

The titles for the variant items should correspond with the table above, so that at the top of the first page of the relevant part of the document and on the header, it has the words:

- First variant Question Paper / Mark Scheme / Principal Examiner's Report

or

- Second variant Question Paper / Mark Scheme / Principal Examiner's Report

as appropriate.



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

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**CHEMISTRY**

**0620/11**

Paper 1 Multiple Choice

**May/June 2009**

**45 Minutes**

Additional Materials:      Multiple Choice Answer Sheet  
   Soft clean eraser  
   Soft pencil (type B or HB is recommended)



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**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

**Read the instructions on the Answer Sheet very carefully.**

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 16.

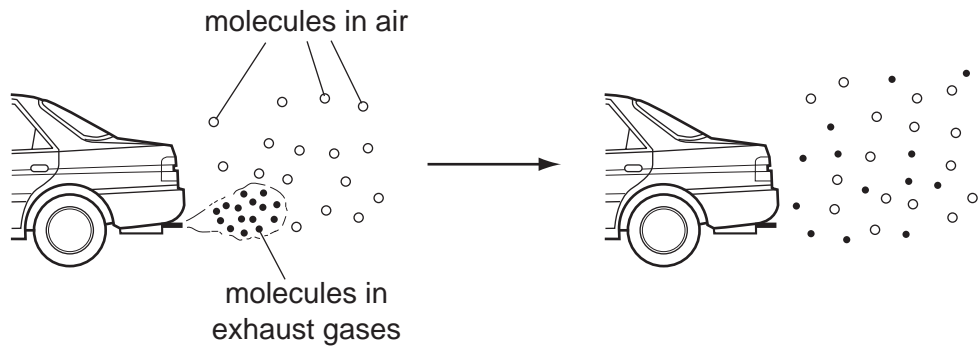
You may use a calculator.

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This document consists of **15** printed pages and **1** blank page.



- 1 The diagram shows how the molecules in the exhaust gases diffuse into the air.



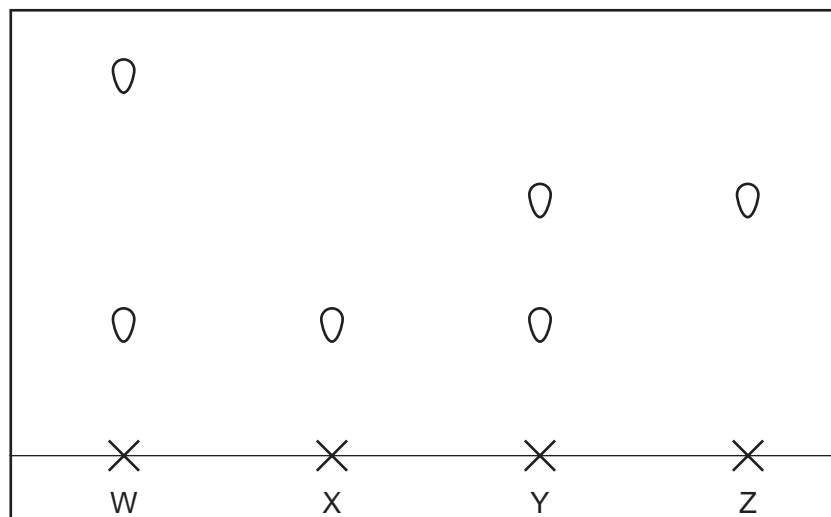
Which statement describes what happens to these molecules next?

- A The molecules fall to the ground because they are heavier than air molecules.
  - B The molecules go back together as they cool.
  - C The molecules spread further into the air.
  - D The molecules stay where they are.
- 2 A student takes 2 g samples of calcium carbonate and adds them to 20 cm<sup>3</sup> samples of dilute hydrochloric acid at different temperatures. She measures how long it takes for the effervescence to stop.

Which apparatus does she use?

	balance	clock	filter funnel	measuring cylinder	thermometer
<b>A</b>	✓	✓	✓	✓	✗
<b>B</b>	✓	✓	✗	✓	✓
<b>C</b>	✓	✗	✓	✓	✓
<b>D</b>	✗	✓	✓	✗	✓

- 3 The diagram shows the paper chromatograms of four substances, W, X, Y and Z.



Which two substances are pure?

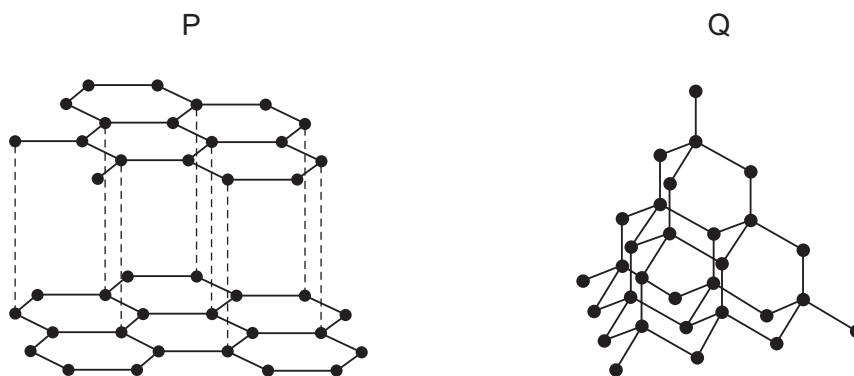
- A** W and X      **B** W and Y      **C** X and Y      **D** X and Z
- 4 An element S has the proton number 18. The next element in the Periodic Table is an element T.  
Which statement is correct?
- A** Element T has one more electron in its outer shell than element S.  
**B** Element T has one more 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 The electronic configuration of an ion is 2.8.8.

What could this ion be?

	$S^{2-}$	$Ca^{2+}$
<b>A</b>	✓	✓
<b>B</b>	✓	x
<b>C</b>	x	✓
<b>D</b>	x	x

7 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
<b>A</b>	drilling	drilling
<b>B</b>	drilling	lubricating
<b>C</b>	lubricating	drilling
<b>D</b>	lubricating	lubricating

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?

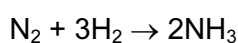
	1	2	6	7
<b>A</b>	✓	x	x	x
<b>B</b>	✓	✓	x	x
<b>C</b>	x	x	x	✓
<b>D</b>	x	x	✓	✓

- 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
<b>A</b>	gains	electron
<b>B</b>	gains	proton
<b>C</b>	loses	electron
<b>D</b>	loses	proton

- 10 Nitrogen and hydrogen react together to form ammonia.



When completely converted, 7 tonnes of nitrogen gives 8.5 tonnes of ammonia.

How much nitrogen will be needed to produce 34 tonnes of ammonia?

- A** 7 tonnes      **B** 8.5 tonnes      **C** 28 tonnes      **D** 34 tonnes
- 11 Which relative molecular mass,  $M_r$ , is **not** correct for the molecule given?

	molecule	$M_r$
<b>A</b>	ammonia, $\text{NH}_3$	17
<b>B</b>	carbon dioxide, $\text{CO}_2$	44
<b>C</b>	methane, $\text{CH}_4$	16
<b>D</b>	oxygen, $\text{O}_2$	16

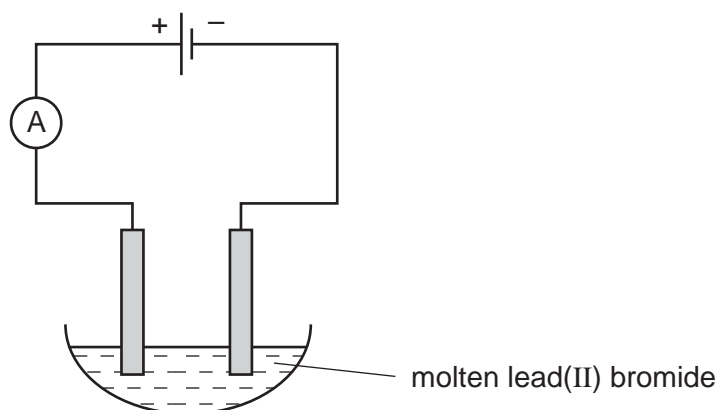
- 12 Aluminium is extracted from its oxide by electrolysis.

The oxide is dissolved in .....1..... cryolite and aluminium is deposited at the .....2.....

Which words correctly complete gaps 1 and 2?

	1	2
<b>A</b>	aqueous	cathode
<b>B</b>	aqueous	anode
<b>C</b>	molten	cathode
<b>D</b>	molten	anode

13 Molten lead(II) bromide is electrolysed as shown.



Which ions are discharged at each electrode?

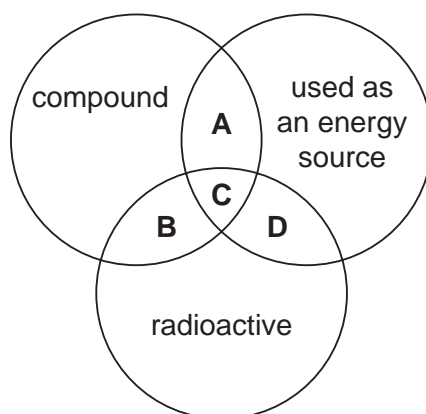
	positive electrode	negative electrode
<b>A</b>	$\text{Pb}^+$	$\text{Br}^{2-}$
<b>B</b>	$\text{Pb}^{2+}$	$\text{Br}^-$
<b>C</b>	$\text{Br}^{2-}$	$\text{Pb}^+$
<b>D</b>	$\text{Br}^-$	$\text{Pb}^{2+}$

14 Which of these elements could be formed at the anode when a molten salt is electrolysed?

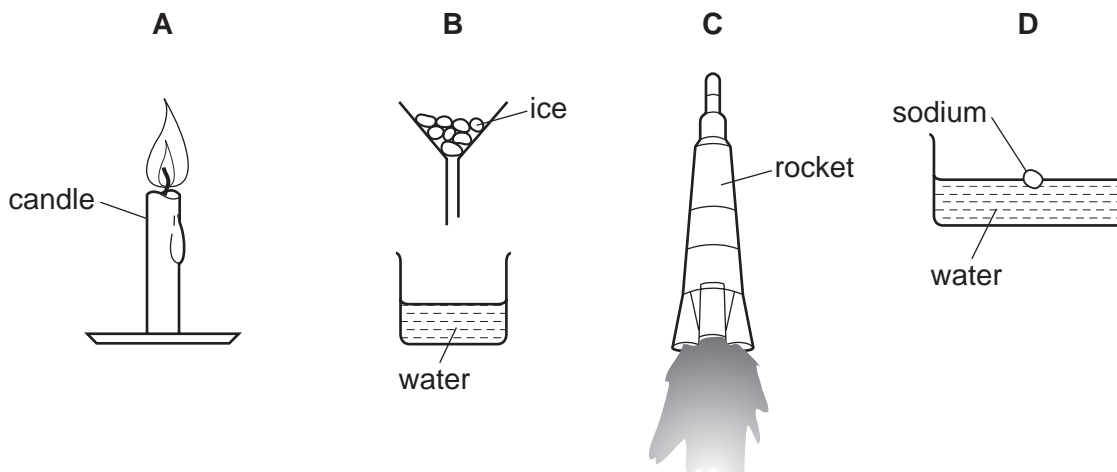
- A** copper
- B** iodine
- C** lithium
- D** strontium

15 The diagram shows some properties that substances may have.

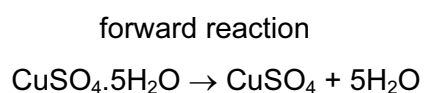
To which labelled part of the diagram does  $^{235}\text{U}$  belong?



16 Which diagram shows a process in which an endothermic change is taking place?



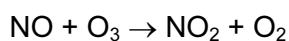
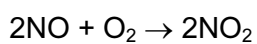
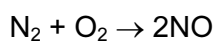
17 The equation shows a reaction that is reversed by changing the conditions.



How can the forward reaction be reversed?

	by adding water	by heating
<b>A</b>	✓	✓
<b>B</b>	✓	x
<b>C</b>	x	✓
<b>D</b>	x	x

18 The reactions shown may occur in the air during a thunder storm.



Which line shows what happens to the reactant molecules in each of these reactions?

	$\text{N}_2$	$\text{NO}$	$\text{O}_3$
<b>A</b>	oxidised	oxidised	oxidised
<b>B</b>	oxidised	oxidised	reduced
<b>C</b>	reduced	reduced	oxidised
<b>D</b>	reduced	reduced	reduced



19 Which does **not** increase the speed of a reaction?

- A adding a catalyst
- B increasing the concentration of one of the reactants
- C increasing the particle size of one of the reactants
- D increasing the temperature

20 Aqueous sodium hydroxide is added to a solution of a salt. A blue precipitate is formed which does not dissolve in excess.

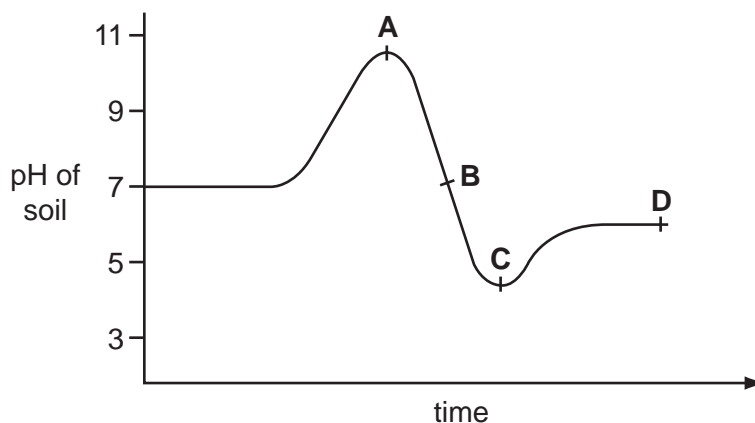
Aluminium foil is added to the mixture and the mixture is warmed. A gas is produced that turns damp red litmus paper blue.

What is the name of the salt?

- A ammonium nitrate
- B ammonium sulfate
- C copper(II) nitrate
- D copper(II) sulfate

21 The graph shows how the pH of soil in a field changed over time.

At which point was the soil neutral?



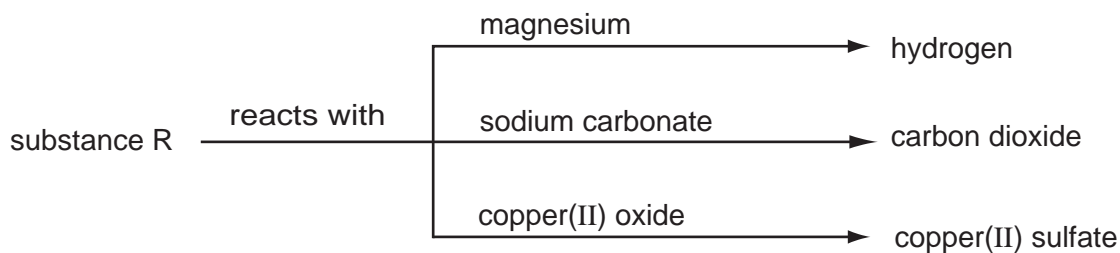
22 An element E is burned in air. A white solid oxide is formed.

The oxide is tested with damp red litmus paper. The paper turns blue.

What is element E?

- A calcium
- B carbon
- C iodine
- D sulfur

23 Some reactions of a substance, R, are shown in the diagram.



What type of substance is R?

- A an acid
  - B a base
  - C an element
  - D a salt
- 24 Which statement describes the trends going down group VII of the Periodic Table?
- A The boiling point and melting point both decrease.
  - B The boiling point and melting point both increase.
  - C The boiling point decreases but the melting point increases.
  - D The boiling point increases but the melting point decreases.
- 25 An inert atmosphere is needed in a lamp to lengthen the useful life of the metal filament.

Why is argon, rather than helium, used for this purpose?

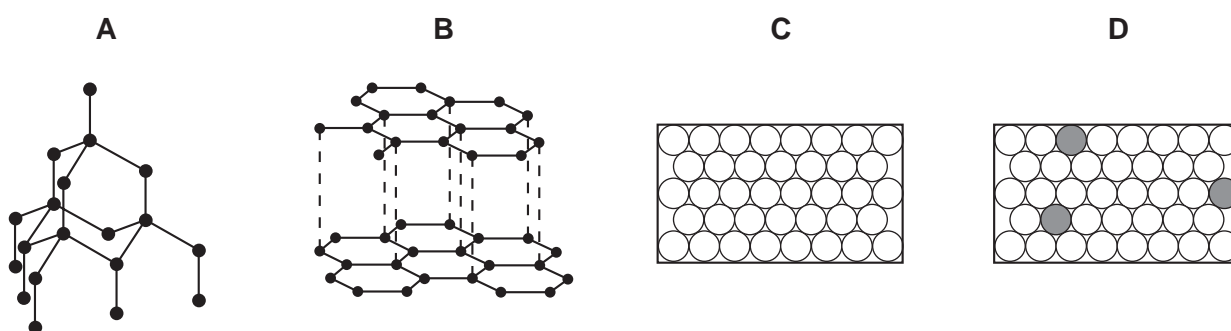
	argon is more abundant in the air	argon is less dense than helium
<b>A</b>	✓	✓
<b>B</b>	✓	✗
<b>C</b>	✗	✓
<b>D</b>	✗	✗

26 The sulfate of element F is green.

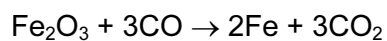
Which other properties is element F likely to have?

	density	melting point
<b>A</b>	high	high
<b>B</b>	high	low
<b>C</b>	low	high
<b>D</b>	low	low

27 Which diagram represents the structure of an alloy?



28 In a blast furnace, iron(III) oxide is converted to iron and carbon monoxide is converted to carbon dioxide.



What happens to each of these reactants?

- A** Both iron(III) oxide and carbon monoxide are oxidised.
- B** Both iron(III) oxide and carbon monoxide are reduced.
- C** Iron(III) oxide is oxidised and carbon monoxide is reduced.
- D** Iron(III) oxide is reduced and carbon monoxide is oxidised.

29 The table gives information about three different metals G, H and J.

metal	does it react with		key
	water	steam	
G	X	X	✓ = does react X = does not react
H	✓	✓	
J	X	✓	

What is the order of reactivity of these metals?

	most reactive	→	least reactive
<b>A</b>	G	H	J
<b>B</b>	H	G	J
<b>C</b>	H	J	G
<b>D</b>	J	H	G

30 Which property do all metals have?

- A** They are hard.
- B** They conduct electricity.
- C** They form acidic oxides.
- D** They react with water.

31 Stainless steel is an alloy of iron and other metals. It is strong and does not rust but it costs much more than normal steel.

What is **not** made from stainless steel?

- A** cutlery
- B** pipes in a chemical factory
- C** railway lines
- D** saucepans

32 Substance K reacts with sodium carbonate to form a gas.

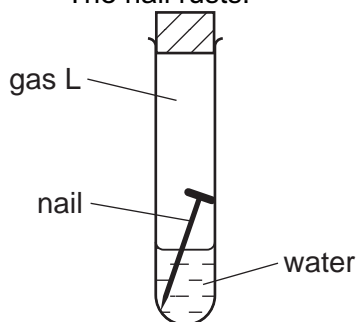
The gas turns limewater cloudy.

What is substance K and which process takes place in the reaction?

	K	process
<b>A</b>	ethanol	combustion
<b>B</b>	ethanol	neutralisation
<b>C</b>	hydrochloric acid	combustion
<b>D</b>	hydrochloric acid	neutralisation

33 An iron nail is placed in a closed test-tube, containing gas L.

The nail rusts.



What is gas L?

- A** carbon dioxide
- B** hydrogen
- C** nitrogen
- D** oxygen

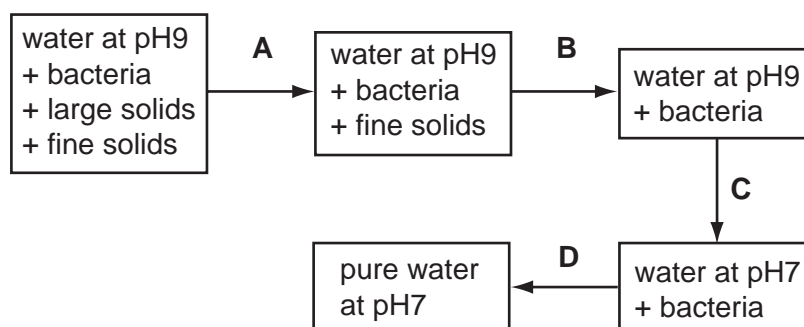
34 Which statements are correct?

- 1 Carbon monoxide is responsible for the production of 'acid rain'.
- 2 Oxides of nitrogen are present in car exhausts.
- 3 Sulfur dioxide can be produced by the combustion of fossil fuels.

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

35 The diagram shows stages in the purification of water.

Which stage uses chlorine?



36 Which element is **not** added to a fertiliser?

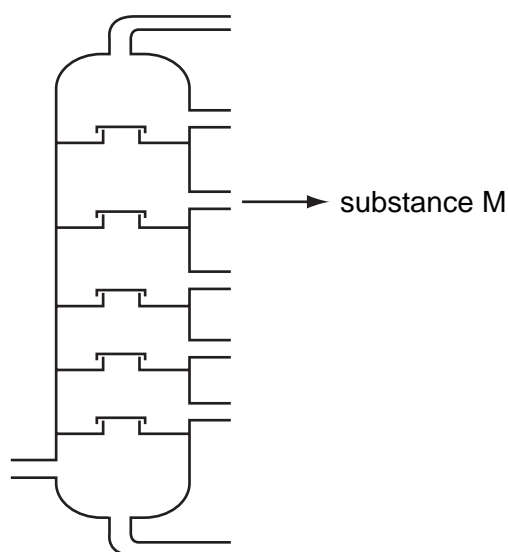
- A aluminium
- B nitrogen
- C phosphorus
- D potassium

37 A compound has the formula  $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$ .

Which row in the table shows the type of compound and the colour change when aqueous bromine is added?

	type of compound	colour change
<b>A</b>	saturated	brown to colourless
<b>B</b>	saturated	colourless to brown
<b>C</b>	unsaturated	brown to colourless
<b>D</b>	unsaturated	colourless to brown

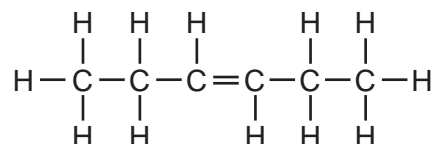
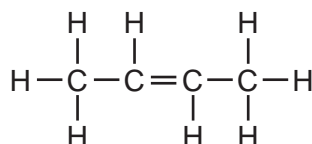
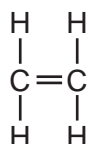
- 38 The diagram shows an industrial process. Substance M is one of the substances produced by this process and is used as aircraft fuel.



What is this process and what is substance M?

	process	substance M
<b>A</b>	fractional distillation	paraffin
<b>B</b>	fractional distillation	petrol
<b>C</b>	thermal decomposition	paraffin
<b>D</b>	thermal decomposition	petrol

- 39 The structures of three compounds are shown.



Why do these substances all belong to the same homologous series?

- A** They all contain an even number of carbon atoms.  
**B** They all contain the same functional group.  
**C** They are all hydrocarbons.  
**D** They are all saturated.
- 40 Which bond is **not** in a molecule of ethanoic acid?

- A** C–O      **B** C=O      **C** C=C      **D** O–H





**DATA SHEET**  
**The Periodic Table of the Elements**

		Group																																																																																							
		I	II	III	IV	V	VI	VII	VIII	IX	X																																																																														
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7 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4																																																																																								
23 <b>Na</b> Sodium 11	24 <b>Mg</b> Magnesium 12																																																																																								
39 <b>K</b> Potassium 19	40 <b>Ca</b> Calcium 20	45 <b>Sc</b> Scandium 21	48 <b>Ti</b> Titanium 22	51 <b>V</b> Vanadium 23	52 <b>Cr</b> Chromium 24	55 <b>Mn</b> Manganese 25	56 <b>Fe</b> Iron 26	59 <b>Co</b> Cobalt 27	59 <b>Ni</b> Nickel 28	64 <b>Cu</b> Copper 29	65 <b>Zn</b> Zinc 30	70 <b>Ga</b> Gallium 31	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	80 <b>Br</b> Bromine 35	84 <b>Kr</b> Krypton 36																																																																								
85 <b>Rb</b> Rubidium 37	88 <b>Sr</b> Strontium 38	89 <b>Y</b> Yttrium 39	91 <b>Zr</b> Zirconium 40	93 <b>Nb</b> Niobium 41	96 <b>Mo</b> Molybdenum 42	101 <b>Ru</b> Ruthenium 44	106 <b>Pd</b> Palladium 46	108 <b>Ag</b> Silver 47	112 <b>Cd</b> Cadmium 48	115 <b>In</b> Indium 49	119 <b>Sn</b> Tin 50	122 <b>Sb</b> Antimony 51	128 <b>Te</b> Tellurium 52	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54																																																																										
133 <b>Cs</b> Caesium 55	137 <b>Ba</b> Barium 56	139 <b>La</b> Lanthanum 57	178 <b>Hf</b> Hafnium 72	181 <b>Ta</b> Tantalum 73	184 <b>W</b> Tungsten 74	190 <b>Os</b> Osmium 76	195 <b>Pt</b> Platinum 78	197 <b>Au</b> Gold 79	201 <b>Hg</b> Mercury 80	204 <b>Tl</b> Thallium 81	207 <b>Pb</b> Lead 82	209 <b>Bi</b> Bismuth 83	210 <b>Po</b> Polonium 84	210 <b>At</b> Astatine 85	222 <b>Rn</b> Radon 86																																																																										
226 <b>Fr</b> Francium 87	226 <b>Ra</b> Radium 88	227 <b>Ac</b> Actinium 89																																																																																							
		<table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px;">a</td> <td style="width: 20px; height: 20px;">X</td> <td>a = relative atomic mass</td> </tr> <tr> <td style="width: 20px; height: 20px;">b</td> <td style="width: 20px; height: 20px;">X</td> <td>X = atomic symbol</td> </tr> <tr> <td style="width: 20px; height: 20px;">b</td> <td style="width: 20px; height: 20px;">X</td> <td>b = proton (atomic) number</td> </tr> </table>										a	X	a = relative atomic mass	b	X	X = atomic symbol	b	X	b = proton (atomic) number																																																																					
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		<table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px;">140</td> <td style="width: 20px; height: 20px;">Ce</td> <td>Cerium 58</td> </tr> <tr> <td style="width: 20px; height: 20px;">141</td> <td style="width: 20px; height: 20px;">Pr</td> <td>Praseodymium 59</td> </tr> <tr> <td style="width: 20px; height: 20px;">144</td> <td style="width: 20px; height: 20px;">Nd</td> <td>Niodymium 60</td> </tr> <tr> <td style="width: 20px; height: 20px;">150</td> <td style="width: 20px; height: 20px;">Sm</td> <td>Samarium 62</td> </tr> <tr> <td style="width: 20px; height: 20px;">152</td> <td style="width: 20px; height: 20px;">Eu</td> <td>Europlum 63</td> </tr> <tr> <td style="width: 20px; height: 20px;">157</td> <td style="width: 20px; height: 20px;">Gd</td> <td>Gadolinium 64</td> </tr> <tr> <td style="width: 20px; height: 20px;">159</td> <td style="width: 20px; height: 20px;">Tb</td> <td>Terbium 65</td> </tr> <tr> <td style="width: 20px; height: 20px;">162</td> <td style="width: 20px; height: 20px;">Dy</td> <td>Dysprosium 66</td> </tr> <tr> <td style="width: 20px; height: 20px;">165</td> <td style="width: 20px; height: 20px;">Ho</td> <td>Holmium 67</td> </tr> <tr> <td style="width: 20px; height: 20px;">167</td> <td style="width: 20px; height: 20px;">Er</td> <td>Erbium 68</td> </tr> <tr> <td style="width: 20px; height: 20px;">169</td> <td style="width: 20px; height: 20px;">Tm</td> <td>Thulium 69</td> </tr> <tr> <td style="width: 20px; height: 20px;">173</td> <td style="width: 20px; height: 20px;">Yb</td> <td>Ytterbium 70</td> </tr> <tr> <td style="width: 20px; height: 20px;">175</td> <td style="width: 20px; height: 20px;">Lu</td> <td>Lutetium 71</td> </tr> <tr> <td style="width: 20px; height: 20px;">232</td> <td style="width: 20px; height: 20px;">Th</td> <td>Thorium 90</td> </tr> <tr> <td style="width: 20px; height: 20px;">238</td> <td style="width: 20px; height: 20px;">U</td> <td>Uranium 92</td> </tr> <tr> <td style="width: 20px; height: 20px;">238</td> <td style="width: 20px; height: 20px;">Pa</td> <td>Protactinium 91</td> </tr> <tr> <td style="width: 20px; height: 20px;">94</td> <td style="width: 20px; height: 20px;">Pu</td> <td>Plutonium 94</td> </tr> <tr> <td style="width: 20px; height: 20px;">95</td> <td style="width: 20px; height: 20px;">Am</td> <td>Americium 95</td> </tr> <tr> <td style="width: 20px; height: 20px;">96</td> <td style="width: 20px; height: 20px;">Cm</td> <td>Curium 96</td> </tr> <tr> <td style="width: 20px; height: 20px;">97</td> <td style="width: 20px; height: 20px;">Bk</td> <td>Berkelium 97</td> </tr> <tr> <td style="width: 20px; height: 20px;">98</td> <td style="width: 20px; height: 20px;">Cf</td> <td>Californium 98</td> </tr> <tr> <td style="width: 20px; height: 20px;">99</td> <td style="width: 20px; height: 20px;">Es</td> <td>Einsteinium 99</td> </tr> <tr> <td style="width: 20px; height: 20px;">100</td> <td style="width: 20px; height: 20px;">Fm</td> <td>Fermium 100</td> </tr> <tr> <td style="width: 20px; height: 20px;">101</td> <td style="width: 20px; height: 20px;">Md</td> <td>Mendelevium 101</td> </tr> <tr> <td style="width: 20px; height: 20px;">102</td> <td style="width: 20px; height: 20px;">No</td> <td>Nobelium 102</td> </tr> <tr> <td style="width: 20px; height: 20px;">103</td> <td style="width: 20px; height: 20px;">Lr</td> <td>Lawrencium 103</td> </tr> </table>										140	Ce	Cerium 58	141	Pr	Praseodymium 59	144	Nd	Niodymium 60	150	Sm	Samarium 62	152	Eu	Europlum 63	157	Gd	Gadolinium 64	159	Tb	Terbium 65	162	Dy	Dysprosium 66	165	Ho	Holmium 67	167	Er	Erbium 68	169	Tm	Thulium 69	173	Yb	Ytterbium 70	175	Lu	Lutetium 71	232	Th	Thorium 90	238	U	Uranium 92	238	Pa	Protactinium 91	94	Pu	Plutonium 94	95	Am	Americium 95	96	Cm	Curium 96	97	Bk	Berkelium 97	98	Cf	Californium 98	99	Es	Einsteinium 99	100	Fm	Fermium 100	101	Md	Mendelevium 101	102	No	Nobelium 102	103	Lr	Lawrencium 103
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The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

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**CHEMISTRY**

**0620/12**

Paper 1 Multiple Choice

**May/June 2009**

**45 minutes**

Additional Materials:      Multiple Choice Answer Sheet  
   Soft clean eraser  
   Soft pencil (type B or HB is recommended)



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**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

**Read the instructions on the Answer Sheet very carefully.**

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 16.

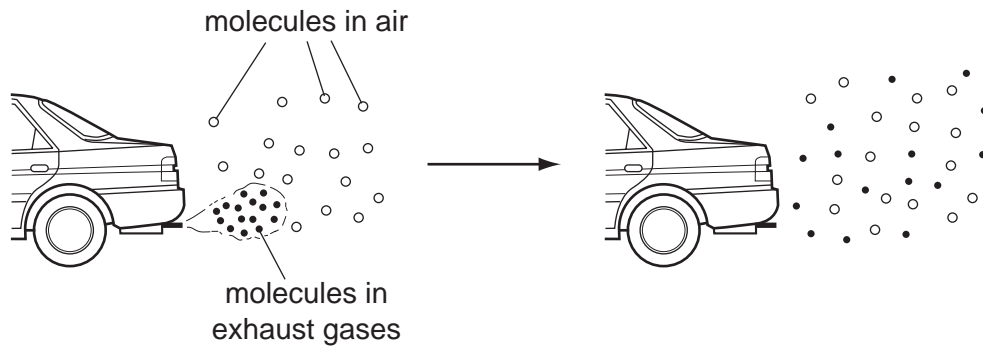
You may use a calculator.

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This document consists of **15** printed pages and **1** blank page.

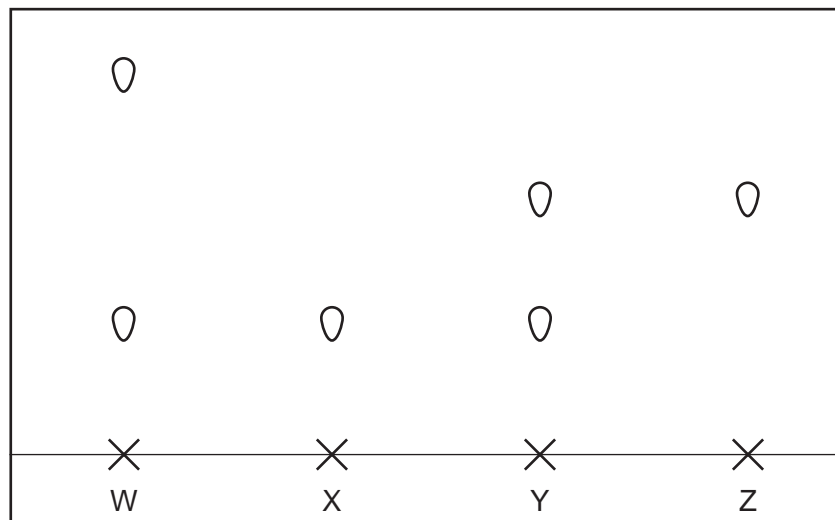


- 1 The diagram shows how the molecules in the exhaust gases diffuse into the air.



Which statement describes what happens to these molecules next?

- A The molecules fall to the ground because they are heavier than air molecules.
  - B The molecules go back together as they cool.
  - C The molecules spread further into the air.
  - D The molecules stay where they are.
- 2 The diagram shows the paper chromatograms of four substances, W, X, Y and Z.



Which two substances are pure?

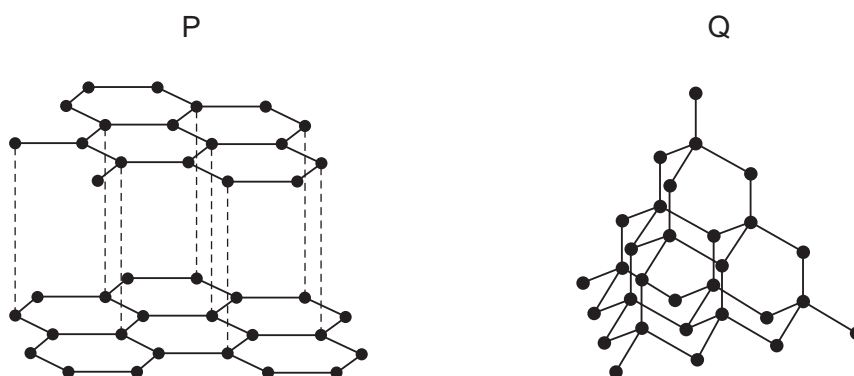
- A W and X
- B W and Y
- C X and Y
- D X and Z

- 3 A student takes 2 g samples of calcium carbonate and adds them to 20 cm<sup>3</sup> samples of dilute hydrochloric acid at different temperatures. She measures how long it takes for the effervescence to stop.

Which apparatus does she use?

	balance	clock	filter funnel	measuring cylinder	thermometer
<b>A</b>	✓	✓	✓	✓	✗
<b>B</b>	✓	✓	✗	✓	✓
<b>C</b>	✓	✗	✓	✓	✓
<b>D</b>	✗	✓	✓	✗	✓

- 4 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
<b>A</b>	drilling	drilling
<b>B</b>	drilling	lubricating
<b>C</b>	lubricating	drilling
<b>D</b>	lubricating	lubricating

- 5 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.

- 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
<b>A</b>	✓	x	x	x
<b>B</b>	✓	✓	x	x
<b>C</b>	x	x	x	✓
<b>D</b>	x	x	✓	✓

- 7 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

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

Which words correctly complete gaps 1 and 2?

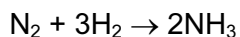
	1	2
<b>A</b>	gains	electron
<b>B</b>	gains	proton
<b>C</b>	loses	electron
<b>D</b>	loses	proton

- 9 The electronic configuration of an ion is 2.8.8.

What could this ion be?

	S <sup>2-</sup>	Ca <sup>2+</sup>
<b>A</b>	✓	✓
<b>B</b>	✓	x
<b>C</b>	x	✓
<b>D</b>	x	x

- 10 Nitrogen and hydrogen react together to form ammonia.



When completely converted, 7 tonnes of nitrogen gives 8.5 tonnes of ammonia.

How much nitrogen will be needed to produce 34 tonnes of ammonia?

- A** 7 tonnes      **B** 8.5 tonnes      **C** 28 tonnes      **D** 34 tonnes

- 11 Which relative molecular mass,  $M_r$ , is **not** correct for the molecule given?

	molecule	$M_r$
<b>A</b>	ammonia, $\text{NH}_3$	17
<b>B</b>	carbon dioxide, $\text{CO}_2$	44
<b>C</b>	methane, $\text{CH}_4$	16
<b>D</b>	oxygen, $\text{O}_2$	16

- 12 Which of these elements could be formed at the anode when a molten salt is electrolysed?

- A** copper  
**B** iodine  
**C** lithium  
**D** strontium

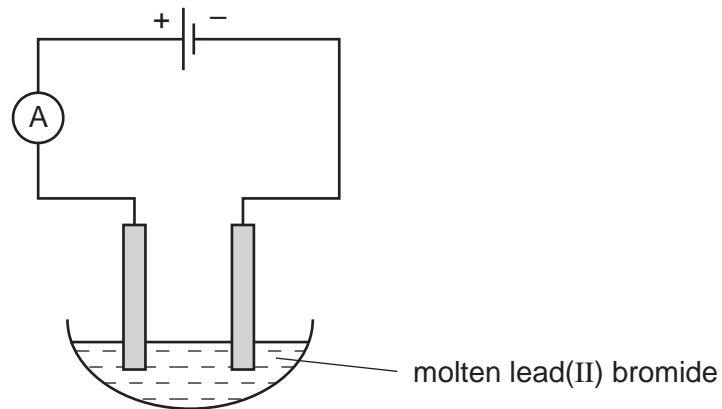
- 13 Aluminium is extracted from its oxide by electrolysis.

The oxide is dissolved in .....1..... cryolite and aluminium is deposited at the .....2.....

Which words correctly complete gaps 1 and 2?

	1	2
<b>A</b>	aqueous	cathode
<b>B</b>	aqueous	anode
<b>C</b>	molten	cathode
<b>D</b>	molten	anode

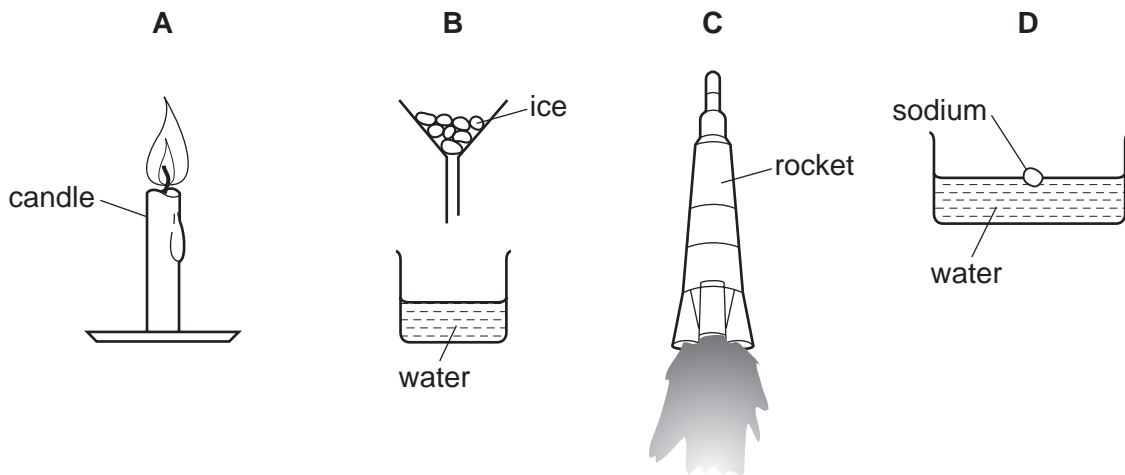
14 Molten lead(II) bromide is electrolysed as shown.



Which ions are discharged at each electrode?

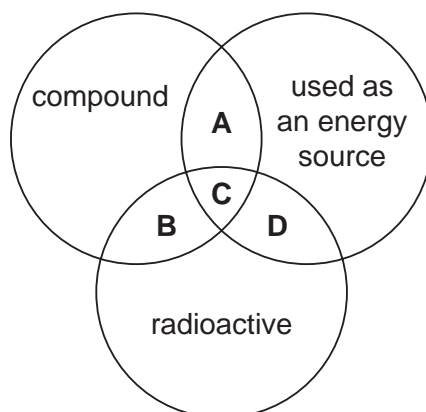
	positive electrode	negative electrode
<b>A</b>	$\text{Pb}^+$	$\text{Br}^{2-}$
<b>B</b>	$\text{Pb}^{2+}$	$\text{Br}^-$
<b>C</b>	$\text{Br}^{2-}$	$\text{Pb}^+$
<b>D</b>	$\text{Br}^-$	$\text{Pb}^{2+}$

15 Which diagram shows a process in which an endothermic change is taking place?



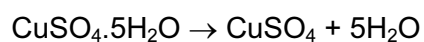
16 The diagram shows some properties that substances may have.

To which labelled part of the diagram does  $^{235}\text{U}$  belong?



17 The equation shows a reaction that is reversed by changing the conditions.

forward reaction



How can the forward reaction be reversed?

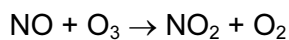
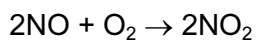
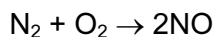
	by adding water	by heating
<b>A</b>	✓	✓
<b>B</b>	✓	x
<b>C</b>	x	✓
<b>D</b>	x	x

18 Which does **not** increase the speed of a reaction?

- A** adding a catalyst
- B** increasing the concentration of one of the reactants
- C** increasing the particle size of one of the reactants
- D** increasing the temperature



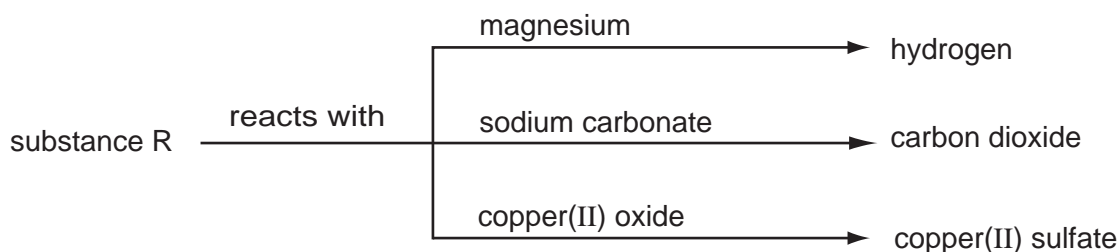
19 The reactions shown may occur in the air during a thunder storm.



Which line shows what happens to the reactant molecules in each of these reactions?

	$\text{N}_2$	$\text{NO}$	$\text{O}_3$
<b>A</b>	oxidised	oxidised	oxidised
<b>B</b>	oxidised	oxidised	reduced
<b>C</b>	reduced	reduced	oxidised
<b>D</b>	reduced	reduced	reduced

20 Some reactions of a substance, R, are shown in the diagram.



What type of substance is R?

- A** an acid
- B** a base
- C** an element
- D** a salt

21 An element E is burned in air. A white solid oxide is formed.

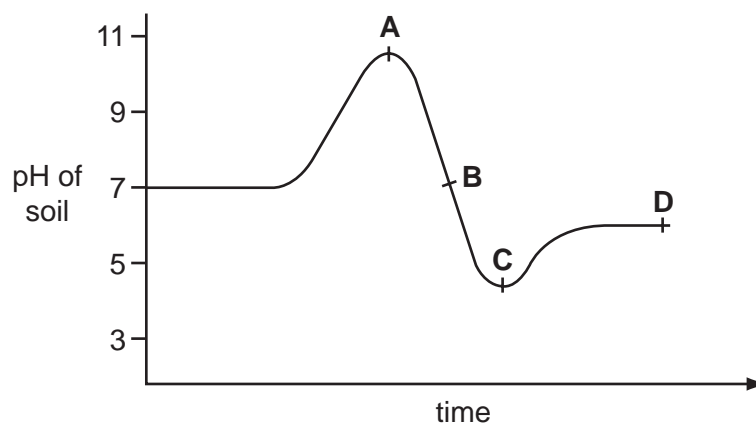
The oxide is tested with damp red litmus paper. The paper turns blue.

What is element E?

- A** calcium
- B** carbon
- C** iodine
- D** sulfur

22 The graph shows how the pH of soil in a field changed over time.

At which point was the soil neutral?



23 Aqueous sodium hydroxide is added to a solution of a salt. A blue precipitate is formed which does not dissolve in excess.

Aluminium foil is added to the mixture and the mixture is warmed. A gas is produced that turns damp red litmus paper blue.

What is the name of the salt?

- A ammonium nitrate
- B ammonium sulfate
- C copper(II) nitrate
- D copper(II) sulfate

24 Which statement describes the trends going down group VII of the Periodic Table?

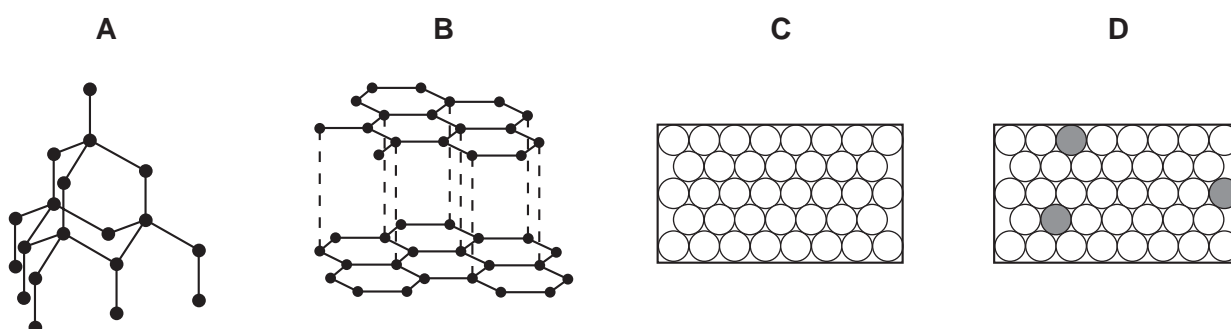
- A The boiling point and melting point both decrease.
- B The boiling point and melting point both increase.
- C The boiling point decreases but the melting point increases.
- D The boiling point increases but the melting point decreases.

25 The sulfate of element F is green.

Which other properties is element F likely to have?

	density	melting point
<b>A</b>	high	high
<b>B</b>	high	low
<b>C</b>	low	high
<b>D</b>	low	low

26 Which diagram represents the structure of an alloy?

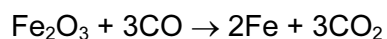


27 An inert atmosphere is needed in a lamp to lengthen the useful life of the metal filament.

Why is argon, rather than helium, used for this purpose?

	argon is more abundant in the air	argon is less dense than helium
<b>A</b>	✓	✓
<b>B</b>	✓	✗
<b>C</b>	✗	✓
<b>D</b>	✗	✗

28 In a blast furnace, iron(III) oxide is converted to iron and carbon monoxide is converted to carbon dioxide.



What happens to each of these reactants?

- A** Both iron(III) oxide and carbon monoxide are oxidised.
- B** Both iron(III) oxide and carbon monoxide are reduced.
- C** Iron(III) oxide is oxidised and carbon monoxide is reduced.
- D** Iron(III) oxide is reduced and carbon monoxide is oxidised.

29 Which property do all metals have?

- A They are hard.
- B They conduct electricity.
- C They form acidic oxides.
- D They react with water.

30 Stainless steel is an alloy of iron and other metals. It is strong and does not rust but it costs much more than normal steel.

What is **not** made from stainless steel?

- A cutlery
- B pipes in a chemical factory
- C railway lines
- D saucepans

31 The table gives information about three different metals G, H and J.

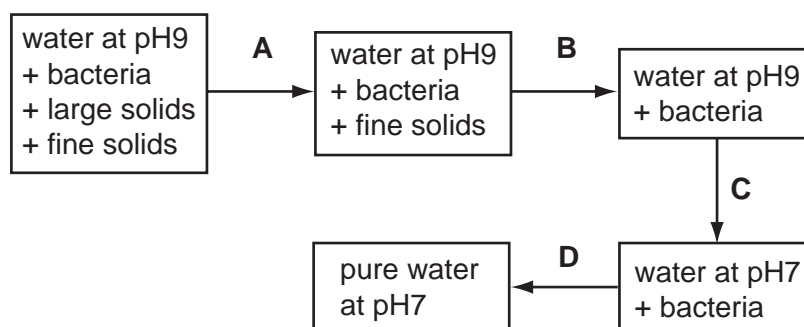
metal	does it react with		key
	water	steam	
G	x	x	✓ = does react
H	✓	✓	x = does not react
J	x	✓	

What is the order of reactivity of these metals?

	most reactive	→	least reactive
A	G		J
B	H		J
C	H		G
D	J		G

32 The diagram shows stages in the purification of water.

Which stage uses chlorine?



33 Which statements are correct?

- 1 Carbon monoxide is responsible for the production of 'acid rain'.
- 2 Oxides of nitrogen are present in car exhausts.
- 3 Sulfur dioxide can be produced by the combustion of fossil fuels.

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

34 Substance K reacts with sodium carbonate to form a gas.

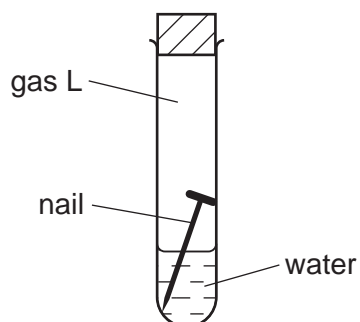
The gas turns limewater cloudy.

What is substance K and which process takes place in the reaction?

	K	process
<b>A</b>	ethanol	combustion
<b>B</b>	ethanol	neutralisation
<b>C</b>	hydrochloric acid	combustion
<b>D</b>	hydrochloric acid	neutralisation

35 An iron nail is placed in a closed test-tube, containing gas L.

The nail rusts.



What is gas L?

- A carbon dioxide
- B hydrogen
- C nitrogen
- D oxygen

36 A compound has the formula  $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$ .

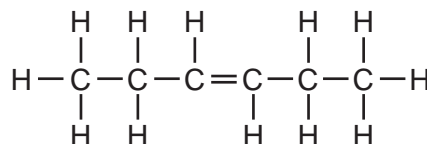
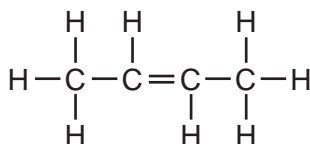
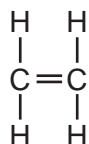
Which row in the table shows the type of compound and the colour change when aqueous bromine is added?

	type of compound	colour change
A	saturated	brown to colourless
B	saturated	colourless to brown
C	unsaturated	brown to colourless
D	unsaturated	colourless to brown

37 Which element is **not** added to a fertiliser?

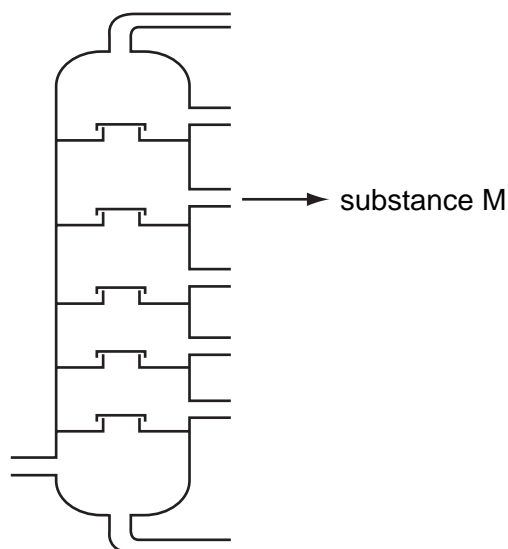
- A aluminium
- B nitrogen
- C phosphorus
- D potassium

38 The structures of three compounds are shown.



Why do these substances all belong to the same homologous series?

- A** They all contain an even number of carbon atoms.  
**B** They all contain the same functional group.  
**C** They are all hydrocarbons.  
**D** They are all saturated.
- 39 Which bond is **not** in a molecule of ethanoic acid?
- A** C–O                      **B** C=O                      **C** C=C                      **D** O–H
- 40 The diagram shows an industrial process. Substance M is one of the substances produced by this process and is used as aircraft fuel.



What is this process and what is substance M?

	process	substance M
<b>A</b>	fractional distillation	paraffin
<b>B</b>	fractional distillation	petrol
<b>C</b>	thermal decomposition	paraffin
<b>D</b>	thermal decomposition	petrol





**DATA SHEET**  
**The Periodic Table of the Elements**

		Group																																																																																												
I	II	III	IV	V	VI	VII	O																																																																																							
7 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4	1 <b>H</b> Hydrogen 1	11 <b>B</b> Boron 5	12 <b>C</b> Carbon 6	14 <b>N</b> Nitrogen 7	16 <b>O</b> Oxygen 8	19 <b>F</b> Fluorine 9	20 <b>Ne</b> Neon 10	23 <b>Na</b> Sodium 11	24 <b>Mg</b> Magnesium 12	27 <b>Al</b> Aluminium 13	28 <b>Si</b> Silicon 14	31 <b>P</b> Phosphorus 15	32 <b>S</b> Sulfur 16	35.5 <b>Cl</b> Chlorine 17	40 <b>Ar</b> Argon 18	39 <b>K</b> Potassium 19	40 <b>Ca</b> Calcium 20	45 <b>Sc</b> Scandium 21	48 <b>Ti</b> Titanium 22	51 <b>V</b> Vanadium 23	52 <b>Cr</b> Chromium 24	55 <b>Mn</b> Manganese 25	56 <b>Fe</b> Iron 26	59 <b>Co</b> Cobalt 27	59 <b>Ni</b> Nickel 28	64 <b>Cu</b> Copper 29	65 <b>Zn</b> Zinc 30	70 <b>Ga</b> Gallium 31	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	80 <b>Br</b> Bromine 35	84 <b>Kr</b> Krypton 36	85 <b>Rb</b> Rubidium 37	88 <b>Sr</b> Strontium 38	89 <b>Y</b> Yttrium 39	91 <b>Zr</b> Zirconium 40	93 <b>Nb</b> Niobium 41	96 <b>Mo</b> Molybdenum 42	101 <b>Ru</b> Ruthenium 44	106 <b>Pd</b> Palladium 46	112 <b>Cd</b> Cadmium 48	115 <b>In</b> Indium 49	119 <b>Sn</b> Tin 50	122 <b>Sb</b> Antimony 51	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54	133 <b>Cs</b> Caesium 55	137 <b>Ba</b> Barium 56	139 <b>La</b> Lanthanum 57	178 <b>Hf</b> Hafnium 72	181 <b>Ta</b> Tantalum 73	184 <b>W</b> Tungsten 74	190 <b>Os</b> Osmium 76	192 <b>Ir</b> Iridium 77	195 <b>Pt</b> Platinum 78	197 <b>Au</b> Gold 79	201 <b>Hg</b> Mercury 80	204 <b>Tl</b> Thallium 81	207 <b>Pb</b> Lead 82	209 <b>Bi</b> Bismuth 83	210 <b>Po</b> Polonium 84	210 <b>At</b> Astatine 85	226 <b>Ra</b> Radium 88	227 <b>Ac</b> Actinium 89	227 <b>Fr</b> Francium 87	140 <b>Ce</b> Cerium 58	141 <b>Pr</b> Praseodymium 59	144 <b>Nd</b> Neodymium 60	150 <b>Sm</b> Samarium 62	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	159 <b>Tb</b> Terbium 65	162 <b>Dy</b> Dysprosium 66	165 <b>Ho</b> Holmium 67	167 <b>Er</b> Erbium 68	169 <b>Tm</b> Thulium 69	173 <b>Yb</b> Ytterbium 70	175 <b>Lu</b> Lutetium 71	232 <b>Th</b> Thorium 90	238 <b>U</b> Uranium 92	91 <b>Pa</b> Protactinium 91	93 <b>Np</b> Neptunium 93	94 <b>Pu</b> Plutonium 94	95 <b>Am</b> Americium 95	96 <b>Cm</b> Curium 96	97 <b>Bk</b> Berkelium 97	98 <b>Cf</b> Californium 98	99 <b>Es</b> Einsteinium 99	100 <b>Fm</b> Fermium 100	101 <b>Md</b> Mendelevium 101	102 <b>No</b> Nobelium 102	103 <b>Lr</b> Lawrencium 103

\* 58-71 Lanthanoid series  
† 90-103 Actinoid series

a	<b>X</b>	a = relative atomic mass
b	<b>X</b>	X = atomic symbol
		b = proton (atomic) number

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).

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