



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

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**CHEMISTRY**

**5070/01**

Paper 1 Multiple Choice

**October/November 2008**

**1 hour**

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.

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



- 1 The table shows the boiling points of the elements found in a sample of liquid air.

element	argon	helium	neon	nitrogen	oxygen
boiling point/°C	-186	-269	-246	-196	-183

Which elements would be gaseous at  $-190^{\circ}\text{C}$ ?

- A** argon, helium and nitrogen  
**B** argon, nitrogen and oxygen  
**C** helium, neon and nitrogen  
**D** helium, neon and oxygen
- 2 Which method could be used to obtain charcoal from a mixture of powdered charcoal with sodium chloride?
- A** chromatography  
**B** filtration after shaking with water  
**C** heating the mixture  
**D** distillation
- 3 Naturally occurring bromine has a relative atomic mass of 80 and consists entirely of two isotopes of relative isotopic masses 79 and 81.
- What can be deduced about naturally-occurring bromine from this information only?
- A** Bromine isotopes have different numbers of protons.  
**B** Bromine contains the two isotopes in equal proportions.  
**C** Bromine has different oxidation states.  
**D** Bromine is radioactive.
- 4 Which statement describes the conversion of magnesium atoms to magnesium ions?
- A** The change is reduction, because there has been a gain of electrons.  
**B** The change is oxidation, because there has been a loss of electrons.  
**C** The change is reduction, because there has been a loss of electrons.  
**D** The change is oxidation, because there has been a gain of electrons.

- 5 Which property shows that a liquid is pure?
- A** It turns anhydrous copper(II) sulphate blue.
- B** It is colourless and odourless.
- C** It has no effect on red or blue litmus paper.
- D** It boils at a fixed temperature at a given pressure.

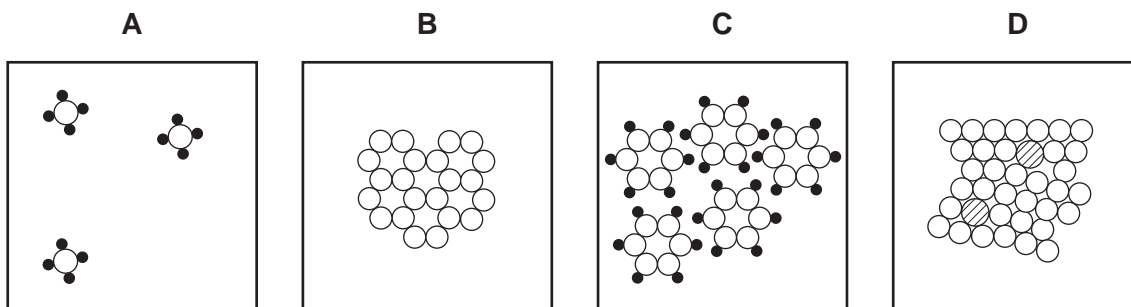
- 6 Solution **X** contains a simple salt.

The table shows the results of some tests on solution **X**.

test	observation
addition of aqueous sodium hydroxide	green precipitate forms
addition of acidified barium nitrate	white precipitate forms

What is the name of the salt in solution **X**?

- A** iron(II) chloride
- B** iron(III) chloride
- C** iron(II) sulphate
- D** iron(III) sulphate
- 7 Which diagram represents the arrangement of particles in a gas?



- 8 Which gas diffuses at the same rate as nitrogen gas?
- A** carbon dioxide
- B** carbon monoxide
- C** neon
- D** sulphur dioxide

- 9 Which gas **can** be removed from the exhaust gases of a petrol-powered car by its catalytic converter?
- A carbon monoxide
  - B carbon dioxide
  - C nitrogen
  - D steam

- 10 Which statement about diamond and graphite is correct?
- A Both diamond and graphite are used as abrasives.
  - B Diamond and graphite have different arrangements of carbon atoms.
  - C The carbon atoms in graphite have a different number of neutrons from those in diamond.
  - D The carbon atoms in both graphite and diamond have four covalent bonds.

- 11 A substance **Q** conducts electricity both when solid and molten.

What is **Q**?

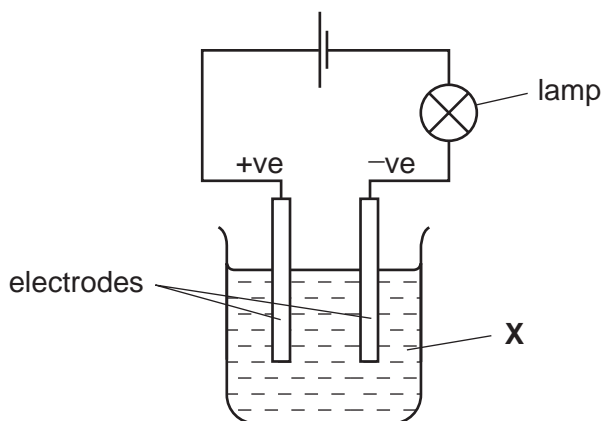
- A an alloy
  - B a hydrocarbon
  - C a metal oxide
  - D a salt
- 12 In one molecule of carbon dioxide, CO<sub>2</sub>, what is the total number of electrons present and how many are involved in bonding between the carbon and oxygen atoms?

	total number of electrons	electrons involved in bonding
<b>A</b>	16	4
<b>B</b>	16	8
<b>C</b>	22	4
<b>D</b>	22	8

- 13 Which statement explains why magnesium oxide has a very high melting point?
- A Magnesium atoms and oxygen atoms are joined by strong covalent bonds.
  - B The crystal lattice of magnesium oxide resembles that of diamond.
  - C The magnesium ions are strongly attracted to the oxide ions.
  - D The reaction between magnesium and oxygen is strongly exothermic.

- 14 When added to 20 cm<sup>3</sup> of 0.5 M sulphuric acid, which substance would give a neutral solution?
- A 20 cm<sup>3</sup> of 0.5 M sodium hydroxide  
 B 10 cm<sup>3</sup> of 0.5 M sodium hydroxide  
 C 40 cm<sup>3</sup> of 1.0 M sodium hydroxide  
 D 20 cm<sup>3</sup> of 1.0 M sodium hydroxide

- 15 When the experiment shown is set up, the bulb lights, but there are no decomposition products at the electrodes.

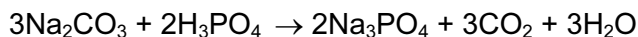


What is **X**?

- A aqueous sodium chloride  
 B bromine  
 C molten sodium chloride  
 D mercury
- 16 What are the products formed at the electrodes during the electrolysis of molten magnesium chloride between carbon electrodes?

	positive electrode	negative electrode
<b>A</b>	oxygen	magnesium
<b>B</b>	magnesium	chlorine
<b>C</b>	chlorine	magnesium
<b>D</b>	chlorine	hydrogen

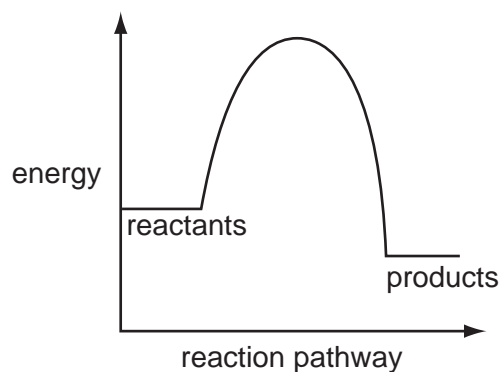
17 Carbon dioxide can be obtained as shown in the equation.



How many moles of phosphoric acid,  $\text{H}_3\text{PO}_4$ , are needed to produce 1.5 mol of carbon dioxide?

- A** 0.5                      **B** 1.0                      **C** 1.5                      **D** 2.0

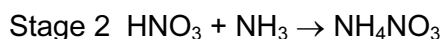
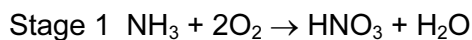
18 The diagram shows the reaction pathway for a given reaction without the use of a catalyst.



Which information correctly describes the effect of the catalyst on the activation energy and enthalpy change for the reaction?

	activation energy	enthalpy change
<b>A</b>	decrease	decrease
<b>B</b>	increase	no change
<b>C</b>	increase	increase
<b>D</b>	decrease	no change

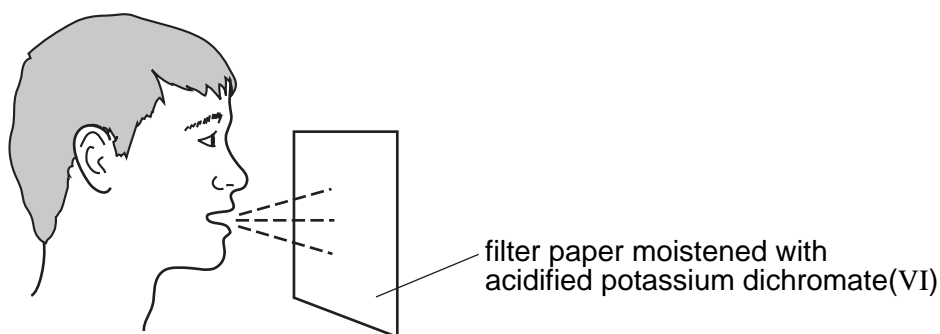
19 The fertiliser ammonium nitrate ( $\text{NH}_4\text{NO}_3$ ,  $M_r = 80$ ) is manufactured from ammonia ( $\text{NH}_3$ ,  $M_r = 17$ ) by a two-stage process.



What is the maximum mass of fertiliser that can be made if only 17 tonnes of ammonia is available?

- A** 34 tonnes              **B** 40 tonnes              **C** 80 tonnes              **D** 97 tonnes

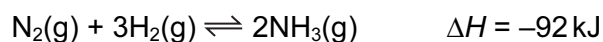
- 20 Acidified potassium dichromate(VI) can be used to detect the presence of ethanol vapour in the breath of a person who has consumed an ethanol-containing drink.



A colour change from orange to green is observed if ethanol is present.

This shows that ethanol is

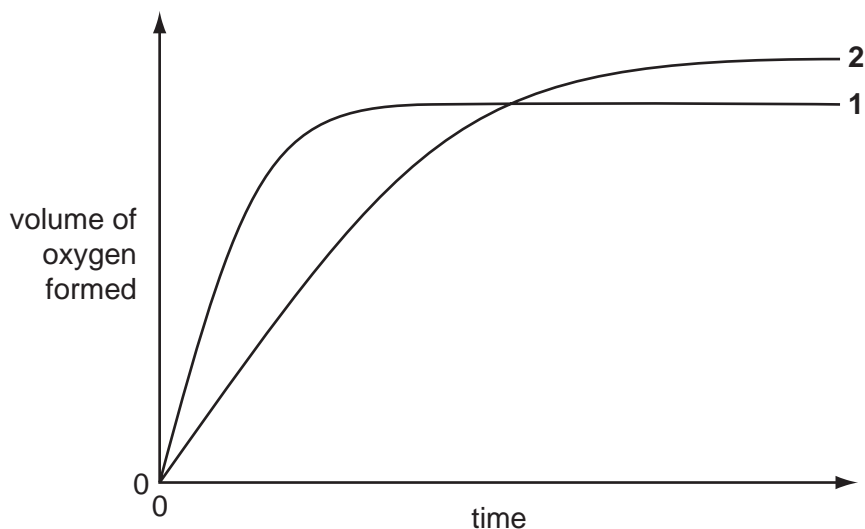
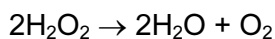
- A an alkali.
  - B an indicator.
  - C an oxidising agent.
  - D a reducing agent.
- 21 In the Haber process, nitrogen and hydrogen react to form ammonia.



Which factor increases **both** the speed of reaction **and** the amount of ammonia produced?

- A addition of a catalyst
- B decreasing the temperature
- C increasing the pressure
- D increasing the temperature

- 22 In the graph, curve 1 was obtained by observing the decomposition of 100 cm<sup>3</sup> of 1.0 mol/dm<sup>3</sup> hydrogen peroxide solution, catalysed by manganese(IV) oxide.



Which alteration to the original experimental conditions would produce curve 2?

- A lowering the temperature
  - B adding some 0.1 mol/dm<sup>3</sup> hydrogen peroxide solution
  - C using less manganese(IV) oxide
  - D using a different catalyst
- 23 In which reaction is sulphur dioxide acting as an oxidising agent?
- A  $\text{SO}_2 + 2\text{H}_2\text{O} + \text{Cl}_2 \rightarrow \text{H}_2\text{SO}_4 + 2\text{HCl}$
  - B  $\text{SO}_2 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_3 + \text{H}_2\text{O}$
  - C  $2\text{SO}_2 + \text{O}_2 \rightarrow 2\text{SO}_3$
  - D  $\text{SO}_2 + 2\text{H}_2\text{S} \rightarrow 2\text{H}_2\text{O} + 3\text{S}$
- 24 Which element will burn in oxygen to form an acidic oxide?
- A calcium
  - B carbon
  - C iron
  - D magnesium



25 Which process does **not** involve either oxidation or reduction?

- A formation of ammonium sulphate from ammonia and sulphuric acid
- B formation of nitrogen monoxide from ammonia
- C formation of sulphuric acid from sulphur
- D formation of zinc from zinc blende (ZnS)

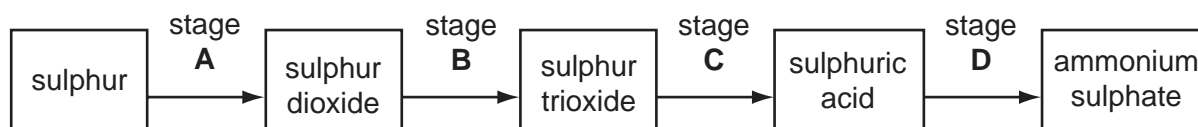
26 Different solids were added to separate portions of warm dilute sulphuric acid.

For which solid is the observation correct?

	solid	observation
<b>A</b>	ammonium sulphate	alkaline gas produced
<b>B</b>	copper	gas evolved ignited with a pop
<b>C</b>	magnesium oxide	solid dissolved with no effervescence
<b>D</b>	zinc carbonate	gas evolved relights glowing splint

27 Ammonium sulphate is an important fertiliser.

During which stage in the manufacture of ammonium sulphate does a neutralisation reaction occur?



28 One mole of compound **X** gives three moles of ions in aqueous solution. **X** reacts with ammonium carbonate to give an acidic gas.

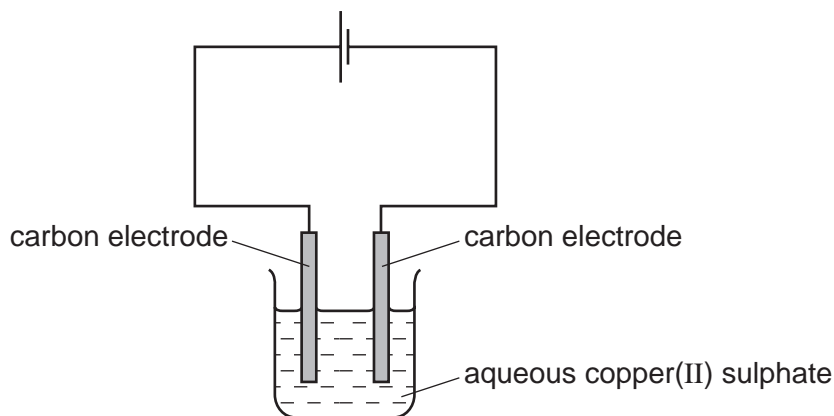
What is compound **X**?

- A calcium hydroxide
- B ethanoic acid
- C sodium hydroxide
- D sulphuric acid

29 Which property would all the hydrogen compounds of the Group VII elements possess?

- A be covalent
- B be solids at room temperature
- C form alkaline aqueous solutions
- D conduct electricity when molten

30 Aqueous copper(II) sulphate is electrolysed using inert electrodes as shown.



Which ionic equations show the reactions at the electrodes?

- 1  $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$
- 2  $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$
- 3  $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$
- 4  $4\text{OH}^- \rightarrow 2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^-$

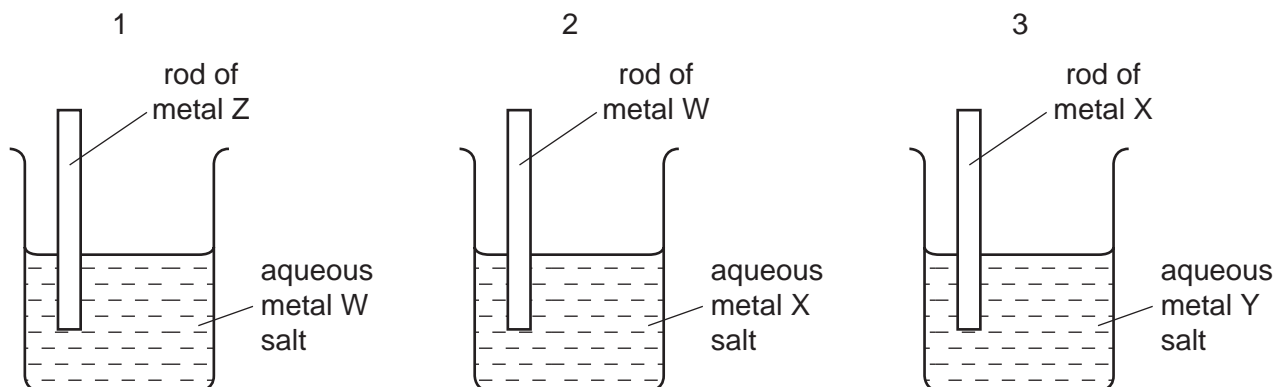
- A 1 and 2 only    B 1 and 4 only    C 2 and 3 only    D 3 and 4 only

31 The element chromium liberates hydrogen from dilute hydrochloric acid although it does not react with cold water. When a piece of chromium is placed in lead(II) nitrate solution, crystals of lead appear.

What is the order of **decreasing** reactivity of the metals lead, calcium and chromium?

- A calcium, chromium, lead
- B calcium, lead, chromium
- C chromium, calcium, lead
- D lead, chromium, calcium

32 Three different beakers are set up as shown.



In beaker 1 metal W is displaced from solution.

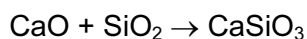
In beaker 2 metal X is displaced from solution.

In beaker 3 metal Y is displaced from solution.

What is the order of **decreasing** reactivity of the four metals?

	most reactive	→			least reactive
<b>A</b>	W	X	Y	Z	
<b>B</b>	Z	W	X	Y	
<b>C</b>	Z	X	W	Y	
<b>D</b>	X	Y	W	Z	

33 What is the function of silica,  $\text{SiO}_2$ , in the equation shown below?



- A** a basic oxide
- B** a reducing agent
- C** an acidic oxide
- D** an oxidising agent

34 Alloys are usually harder than the metals from which they are made.

Which difference between the metals explains the greater hardness of alloys?

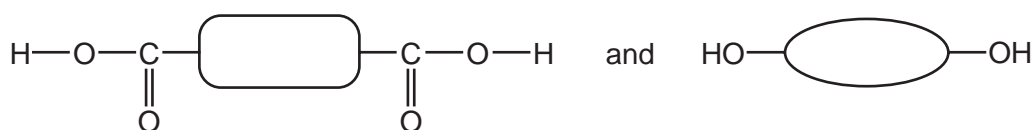
- A** atomic radius
- B** boiling point
- C** density
- D** malleability

35 Information about the gases present in the atmospheres of four planets is given below.

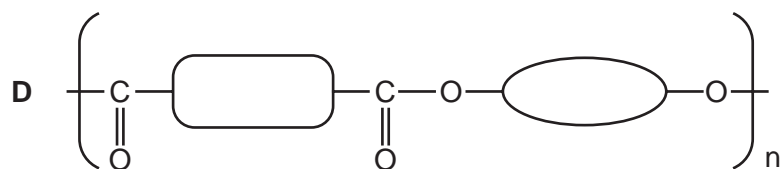
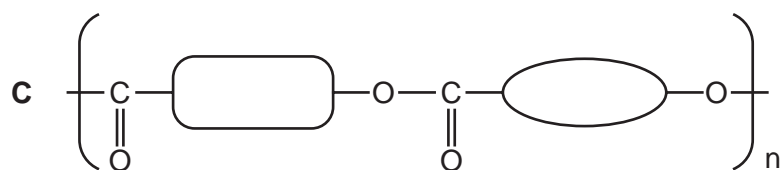
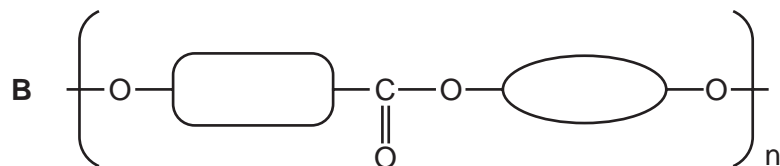
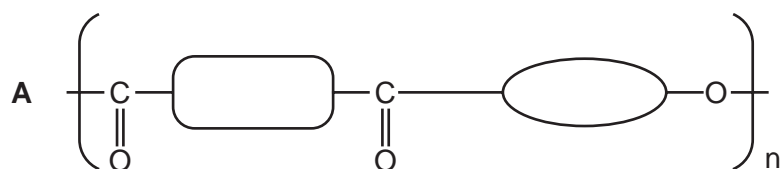
Which planet's atmosphere contains the four elements found in all proteins?

	composition of atmosphere		
<b>A</b>	CH <sub>4</sub>	NH <sub>3</sub>	HCl
<b>B</b>	CH <sub>4</sub>	NH <sub>3</sub>	H <sub>2</sub> O
<b>C</b>	CH <sub>4</sub>	SO <sub>2</sub>	HCl
<b>D</b>	SO <sub>2</sub>	NH <sub>3</sub>	H <sub>2</sub> O

36 *Terylene* (a polyester) is made by condensation polymerisation of the two monomers shown.



What is the repeat unit of the polymer?



37 Which molecule does **not** undergo an addition reaction with alkenes?

- A** ammonia, NH<sub>3</sub>
- B** bromine, Br<sub>2</sub>
- C** hydrogen, H<sub>2</sub>
- D** steam, H<sub>2</sub>O

38 Which set of information describes the formation of ethanol by the process of fermentation?

	substances fermented	gas evolved during fermentation
<b>A</b>	carbohydrates	carbon dioxide
<b>B</b>	carbohydrates	carbon monoxide
<b>C</b>	hydrocarbons	carbon dioxide
<b>D</b>	hydrocarbons	carbon monoxide

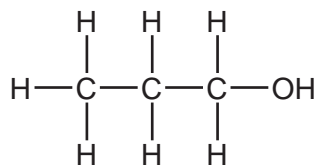
39 The following stages happen during eutrophication.

- 1 increase in growth of algae
- 2 increase in nitrate concentration
- 3 death of aquatic plants
- 4 decrease in dissolved oxygen

In which order do these stages occur?

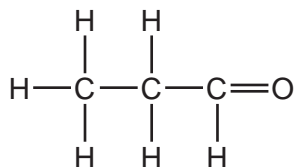
- A** 1 → 2 → 3 → 4
- B** 1 → 2 → 4 → 3
- C** 2 → 1 → 3 → 4
- D** 2 → 1 → 4 → 3

40 This is the structure of propan-1-ol.

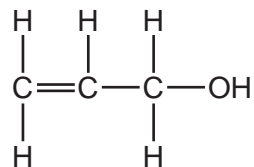


Which of the following is an isomer of propan-1-ol?

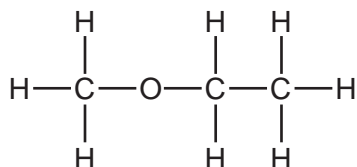
**A**



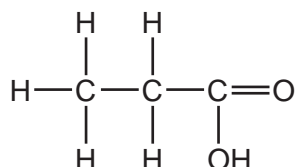
**B**



**C**



**D**



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### DATA SHEET

#### The Periodic Table of the Elements

		Group																						
I	II	III	IV	V	VI	VII	0					0												
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					4 <b>He</b> Helium 2											
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> Sulphur 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											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											65 <b>Zn</b> Zinc 30	64 <b>Cu</b> Copper 29	59 <b>Ni</b> Nickel 28	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	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54		
133 <b>Cs</b> Caesium 55	137 <b>Ba</b> Barium 56											190 <b>Os</b> Osmium 76	186 <b>Re</b> Rhenium 75	184 <b>W</b> Tungsten 74	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	210 <b>Rn</b> Radon 86
226 <b>Ra</b> Radium 88	227 <b>Ac</b> Actinium 89											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	238 <b>Np</b> Neptunium 93	238 <b>Pu</b> Plutonium 94	238 <b>Am</b> Americium 95	238 <b>Cm</b> Curium 96	238 <b>Bk</b> Berkelium 97	238 <b>Cf</b> Californium 98	238 <b>Es</b> Einsteinium 99	238 <b>Fm</b> Fermium 100	238 <b>Md</b> Mendelevium 101	238 <b>No</b> Nobelium 102	238 <b>Lr</b> Lawrencium 103

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

Key

a	X	b
a = relative atomic mass		
b = proton (atomic) number		

X = atomic symbol

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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