

CONVENT OF THE HOLY INFANT JESUS SECONDARY
Preliminary Examination in preparation for
the General Certificate of Education Ordinary Level 2022

CANDIDATE
NAME

CLASS

REGISTER
NUMBER

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CHEMISTRY

6092/01

Paper 1 Multiple Choice

14 September 2022

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, class and register number on the Multiple Choice Answer Sheet provided.

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 on the question paper.

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

The use of an approved scientific calculator is expected, where appropriate.

1 One of the instructions for an experiment reads as follows.

Quickly add 50 cm³ of acid.

What is the best piece of apparatus to use?

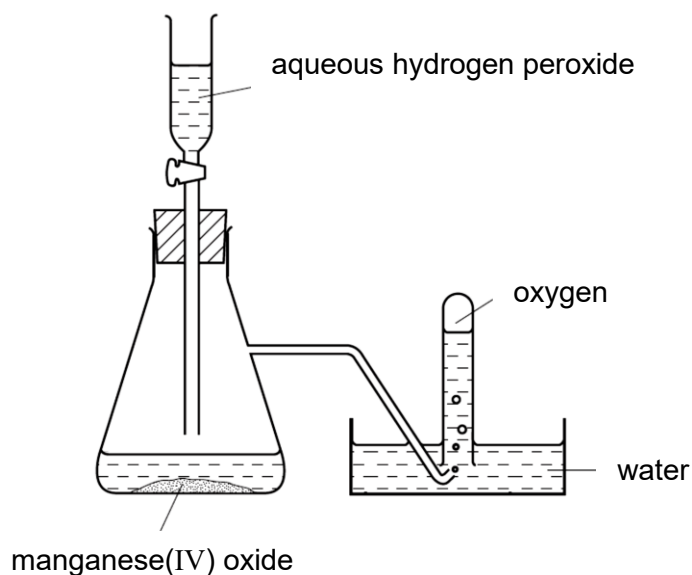
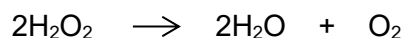
- A** a burette
B a conical flask
C a measuring cylinder
D a pipette

2 You have been given a liquid mixture of benzene (C_6H_6) and a dilute solution of sodium chloride in water. Benzene boils at 80°C .

Which method should be used in the respective sequence to obtain samples of benzene and sodium chloride crystals?

	first method	second method
A	filtration	crystallisation
B	use a separating funnel	evaporation
C	distillation	filtration
D	evaporation	sublimation

3 Oxygen was prepared from hydrogen peroxide and collected as shown in the diagram.



The first few tubes of gas were rejected because the gas was contaminated by

- A** water vapour. **B** hydrogen peroxide.
C hydrogen. **D** nitrogen.

- 4 What is the best method to separate a mixture of sodium chloride crystals and iodine crystals?

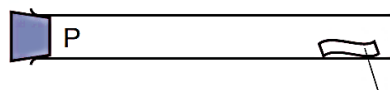
A sublimation B fractional distillation
C filtration D crystallisation

- 5 An aqueous solution of zinc sulfate is tested by adding reagents.

Which observation is correct?

	reagent added to zinc sulfate	observations
A	acidified aqueous barium nitrate	forms a yellow precipitate
B	aqueous ammonia	forms white precipitate, insoluble in excess of the reagent
C	aqueous sodium hydroxide	forms a white precipitate, soluble in excess of the reagent
D	powdered copper	forms a grey precipitate

- 6 A gas is released at point P in the apparatus shown.



damp universal indicator paper

Which gas turns the damp universal indicator paper red **most** quickly?

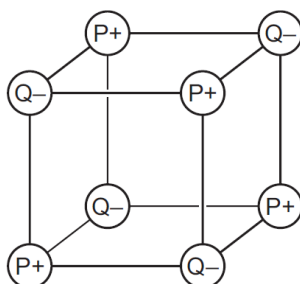
A ammonia
B methane
C hydrogen chloride
D sulfur dioxide

7 Which statement about the atoms of all isotopes of chlorine is correct?

- A They have different number of electrons in the outer shell.
- B They have the same mass.
- C They have the same number of neutrons.
- D They gain one electron to form ions.

8 Two elements, P and Q, are in the same period of the Periodic Table.

P and Q react together to form an ionic compound. Part of the lattice of this compound is shown.



Which statement is correct?

- A An ion of P has more electrons than an ion of Q.
- B An ion of P and ion of Q has different number of electron shells.
- C An ion of Q has more protons than electrons.
- D Element P is non-metallic.

9 Students are asked to state

- the number of electrons used to form covalent bonds in a molecule of methanoic acid,
- the electrical conductivity when the acid is dissolved in water.

Which row is correct?

	number of electrons	electrical conductivity in water
A	5	poor
B	6	good
C	8	poor
D	10	good

- 10** Which pair of statements about diamond and graphite is correct?
- A** They are allotropes of carbon. They are both macromolecules.
- B** They each conduct electricity. They can both be used as electrode.
- C** Diamond has covalent bonds. Graphite has ionic bonds.
- D** Diamond is hard with high melting point. Graphite is soft with low melting point.

- 11** These two statements are about metals, their properties and bonding.

statement 1 Metal conduct electricity when solid.

statement 2 In metals, a lattice of positive ions exists in a 'sea of electrons' which can move throughout the metal.

Which answer is correct?

- A** Both statements are correct and statement 2 explains statement 1.
- B** Both statements are correct but statement 2 does not explain statement 1.
- C** Statement 1 is correct but statement 2 is incorrect.
- D** Statement 2 is correct but statement 1 is incorrect.
- 12** 40 cm³ of the gaseous oxide of element Y requires 60 cm³ of oxygen for complete combustion to produce 80 cm³ of the gaseous oxide YO₂.
- What is the molecular formula of the original oxide given that all gas volumes are measured at room temperature and pressure?
- A** YO **B** Y₂O **C** Y₂O₃ **D** Y₂O₅
- 13** N₂O₄ is a poisonous gas. It can be removed safely by reaction with aqueous sodium hydroxide.



What is the minimum volume of 0.8 mol/dm³ aqueous sodium hydroxide needed remove 0.02 mol of N₂O₄?

- A** 12.5 cm³ **B** 25.0 cm³ **C** 50.0 cm³ **D** 100.0 cm³

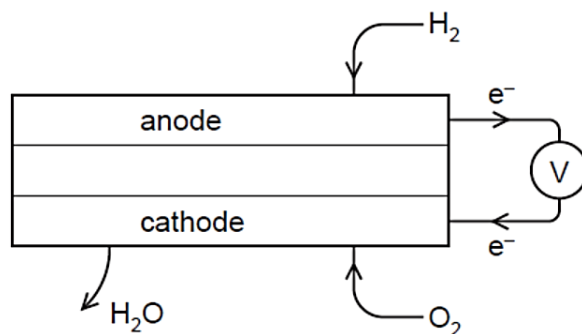
- 14 Iron(II) oxide is produced by heating iron(II) carbonate.



What is the percentage yield of iron(II) oxide if 150 g of iron(II) carbonate produces 50 g of iron(II) oxide?

- A $\frac{50 \times 116 \times 100}{150 \times 72}$
- B $\frac{50 \times 150 \times 72}{116}$
- C $\frac{50 \times 150 \times 72 \times 100}{116}$
- D $\frac{50 \times 116}{150 \times 72}$

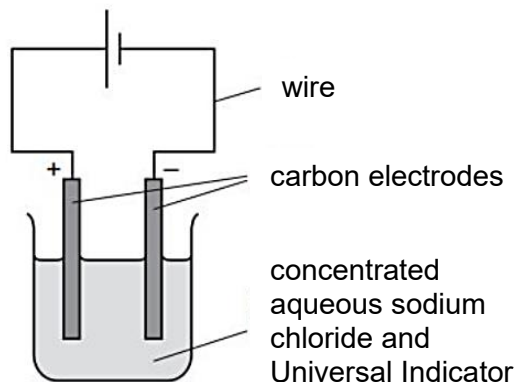
- 15 An alternative fuel for cars is hydrogen. Hydrogen can be used in a fuel cell as shown.



Which statement about the fuel cell is correct?

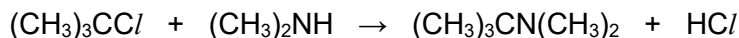
- A Hydrogen gas is oxidised at the negative electrode to form water.
- B Hydrogen gas is reduced at the positive electrode to form water.
- C Oxygen gas is oxidised at the positive electrode to form water.
- D Oxygen gas is reduced at the negative electrode to form water.
- 16 What is the ionic half-equation for the reaction that occurs at the cathode when molten lead(II) chloride is electrolysed?
- A $\text{Pb}^{2+} + 2\text{e}^- \rightarrow \text{Pb}$
- B $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$
- C $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$
- D $\text{Pb} \rightarrow \text{Pb}^{2+} + 2\text{e}^-$

- 17 A few drops of Universal Indicator were added to a beaker of concentrated aqueous sodium chloride and the solution was electrolysed using carbon electrodes.



What statement is correct?

- A A grey solid is deposited at the anode.
- B A yellowish-green gas is evolved at the cathode.
- C The colour of Universal Indicator at the anode is colourless.
- D The colour of Universal Indicator at the cathode is red.
- 18 A student wishes to use bond energies to calculate the enthalpy change for the reaction shown below.

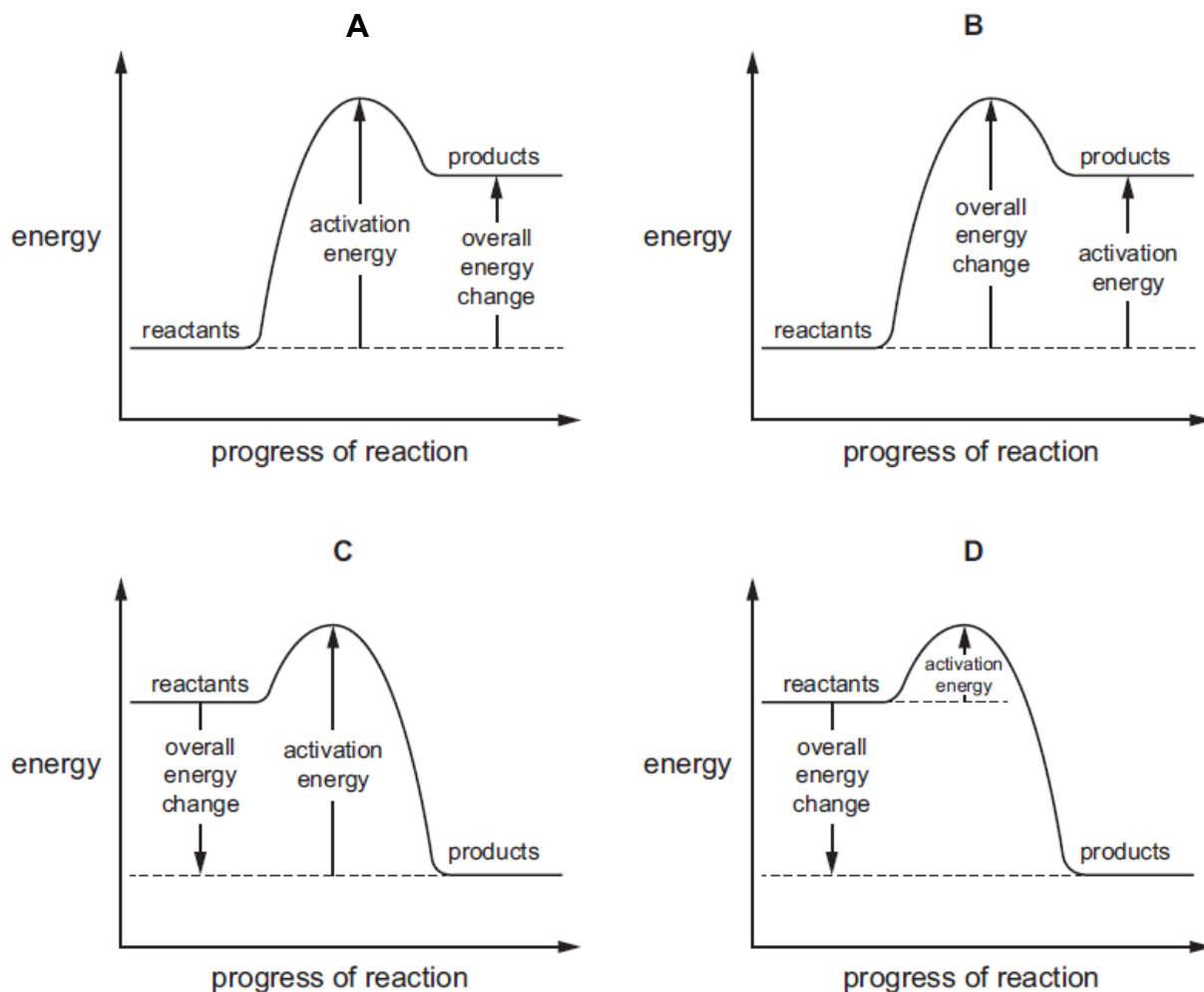


Which inventory shows the most efficient means of doing the calculation to compute energies of bonds broken and formed?

- A bonds broken: 15 C—H, 3 C—C, 2 C—N, 1 C—Cl, 1 N—H;
bonds formed: 15 C—H, 3 C—C, 2 C—N
- B bonds broken: 1 C—Cl, 1 N—H;
bonds formed: 1 C—N, 1 H—Cl
- C bonds broken: 14 C—H, 3 C—C, 2 C—N;
bonds formed: 14 C—H, 3 C—C, 2 C—N, 1 C—Cl, 1 N—H
- D bonds broken: 1 C—N, 1 H—Cl;
bonds formed: 1 C—Cl, 1 N—H

[Turn over

19 Which diagram is a correctly labelled energy level diagram for an endothermic reaction?



20 Magnesium reacts with dilute hydrochloric acid.

Which statement about the particles in the reaction is correct?

- A** Increasing the concentration of acid increases the collision rate but has no effect on the activation energy.
- B** Increasing the concentration of acid increases the collision rate and the activation energy.
- C** Increasing the temperature of the reaction increases the activation energy.
- D** Increasing the temperature of the reaction decreases the collision rate.

- 21** Ethanoic acid, nitric acid, propanoic acid and sulfuric acid each dissolve in water to form an acidic solution.

If Universal Indicator is placed in a 0.1 mol/dm^3 solution of each acid, which solution will produce a colour indicating the lowest pH?

- A** ethanoic acid
- B** nitric acid
- C** propanoic acid
- D** sulfuric acid

- 22** Dilute hydrochloric acid was added to substance X. No visible change was observed. However, the temperature of the mixture increased by 5°C .

What could be substance X?

- A** copper(II) oxide
- B** magnesium metal
- C** calcium carbonate
- D** sodium hydroxide

- 23** An excess of aqueous sodium chloride was added to aqueous lead(II) nitrate and the mixture was filtered.

Which row shows the identity of the residue and the substances present in the filtrate?

	residue	substances in filtrate
A	lead(II) chloride	sodium nitrate and lead(II) nitrate
B	lead(II) chloride	sodium nitrate and sodium chloride
C	sodium nitrate	lead(II) chloride and lead(II) nitrate
D	sodium nitrate	lead(II) chloride and sodium chloride

- 24** The element vanadium, V, forms several oxides.

In which change is oxidation taking place?

- A** $\text{VO}_2 \rightarrow \text{V}_2\text{O}_3$
- B** $\text{V}_2\text{O}_5 \rightarrow \text{VO}_2$
- C** $\text{V}_2\text{O}_3 \rightarrow \text{VO}$
- D** $\text{V}_2\text{O}_3 \rightarrow \text{V}_2\text{O}_5$

[Turn over

- 25** In the Periodic Table, how does the metallic character of the elements vary from left to right across a period?
- A** It decreases.
- B** It increases.
- C** It increases then decreases.
- D** It stays the same.

- 26** The elements in a Group of the Periodic Table show the following trends.
- 1 The element with the lowest proton number has the lowest reactivity.
 - 2 All the elements in the group form basic oxides.
 - 3 The density of the elements increases down the group.
 - 4 The melting point of the elements decreases down the group.

What is this Group?

- A** I **B** IV **C** VI **D** VII
- 27** Element X is a solid at room temperature and pressure. It needs to lose one electron per atom to attain the electronic structure of argon.

What is element X?

- A** bromine
- B** chlorine
- C** potassium
- D** sodium
- 28** When aqueous iodine is added to a solution of vanadium ions, V^{2+} , the V^{2+} ions each lose one electron.

Which property of transition elements is shown by this reaction?

- A** Transition elements are oxidising agent.
- B** Transition elements form a stable ion with a charge of 1+.
- C** Transition elements have variable oxidation states.
- D** Transition elements can act as catalyst.

- 29** Which row shows the correct indication of halogen which will react with potassium bromide to form bromine?

	chlorine	iodine
A	✓	✓
B	✓	×
C	×	✓
D	×	×

✓ = will react

× = will not react

Questions **30** and **31** concern the extraction of titanium.

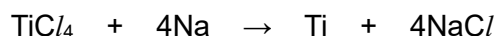
Titanium (Ti) is extracted from the ore called rutile. Rutile is mainly made up of titanium oxide (TiO_2). Titanium is not very reactive so it should be possible to displace titanium from its oxide with carbon. However carbon reacts with titanium, making it very brittle.

Therefore, titanium is extracted by reacting titanium chloride (TiCl_4) with sodium. The sodium used for the reaction is obtained by electrolysis.

- 30** Which row in the table is the correct order of reactivity for carbon, sodium and titanium?

	most reactive $\longrightarrow$ least reactive		
A	sodium	carbon	titanium
B	carbon	titanium	sodium
C	titanium	carbon	sodium
D	sodium	titanium	carbon

- 31** The equation for the reaction of titanium chloride with sodium is shown below.



When 190 g of titanium chloride reacted with sodium, 48 g of titanium and 234 g of sodium chloride were produced.

How much sodium is required to produce 48 g of titanium?

- A** 23 g **B** 92 g **C** 190 g **D** 234 g

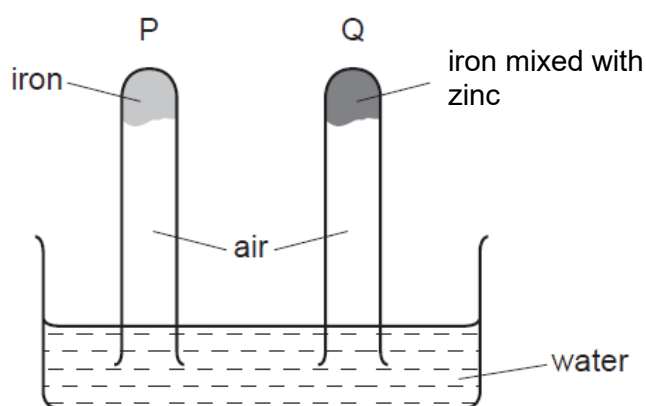
[Turn over

- 32** As extraction of aluminium by electrolysis is expensive, an increasing amount of aluminium is being recycled.

Another important reason to recycle aluminium is that

- A** it saves limited aluminium oxide reserves.
- B** the recycled aluminium is purer.
- C** aluminium scrap does not corrode easily.
- D** recycling aluminium does not use energy.

- 33** The diagram shows an experiment to investigate the rusting of iron.



What happens to the iron and water level in tube P and Q?

	P		Q	
	iron	water level	iron	water level
A	rusts	falls	rusts	no change
B	rusts	raises	does not rust	raises
C	rusts	no change	does not rust	falls
D	does not rust	raises	does not rust	no change

- 34** During the manufacture of iron by the blast furnace, which equation shows the reaction of an acidic substance with a basic substance?

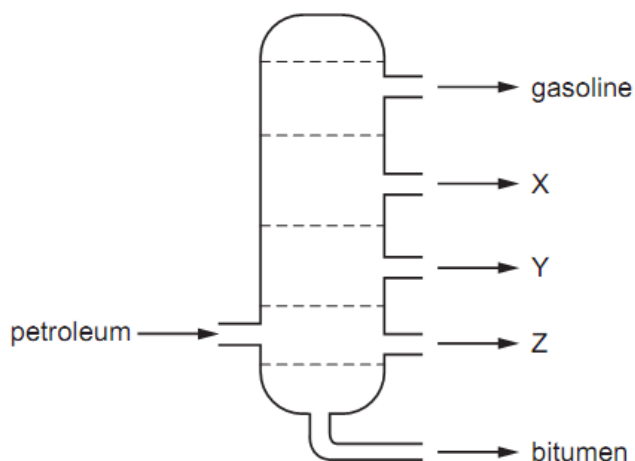
- A** $C + O_2 \rightarrow CO_2$
- B** $CO_2 + C \rightarrow 2CO$
- C** $CaO + SiO_2 \rightarrow CaSiO_3$
- D** $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

- 35** Pure air contains nitrogen, oxygen, and small amounts of other gases. The noble gases have been left out of the table.

Which row shows the composition of dry, unpolluted air?

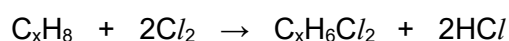
	nitrogen / %	oxygen / %	other gases
A	21	78	small amount of carbon dioxide
B	21	78	small amount of carbon monoxide
C	78	21	small amount of carbon dioxide
D	78	21	small amount of carbon monoxide

- 36** The diagram shows the separation of petroleum into fractions.



Which statement about fraction X, Y and Z is correct?

- A** Fraction Y has the higher range of boiling points than Z.
- B** Fraction Y is less viscous than X.
- C** Fraction Z is less flammable than Y.
- D** Incomplete combustion of Z produces carbon dioxide and water.
- 37** The equation between a hydrocarbon, C_xH_8 , and chlorine is shown.

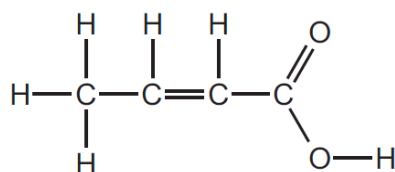


Which statement is correct?

- A** The reaction is an addition reaction.
- B** UV light is required for the reaction to take place.
- C** High temperature and pressure is required for the reaction to take place.
- D** The molecular formula of the hydrocarbon is C_4H_8 .

[Turn over

38 The structure of a compound is shown.



Which row shows the observation when the compound reacts with aqueous bromine, acidified potassium manganate(VII) and a piece of magnesium?

	aqueous bromine	warm with acidified potassium manganate(VII)	magnesium
A	colourless to brown	purple to colourless	no effervescence
B	brown to colourless	purple to colourless	effervescence
C	colourless to brown	remain purple	no effervescence
D	brown to colourless	remain purple	effervescence

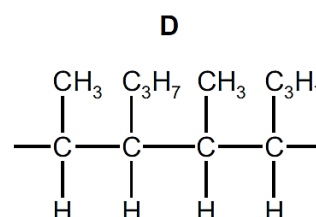
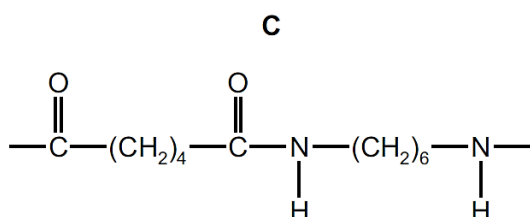
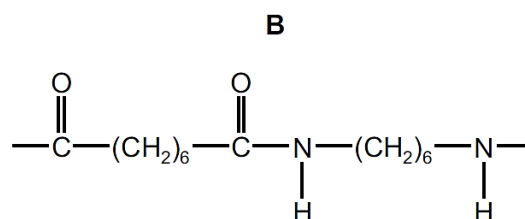
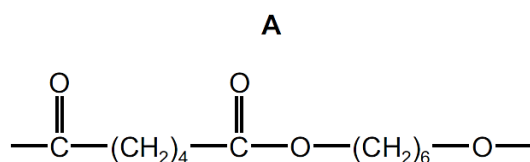
39 What are formed when glucose is fermented?

- A** ethene and carbon dioxide
- B** ethene and oxygen
- C** ethanol and carbon dioxide
- D** ethanol and oxygen

40 Polymer Z

- has six carbon atoms in each of the monomers from which it is formed.
- is formed using condensation polymerisation.
- contains amide linkage.

Which is polymer Z?



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The Periodic Table of Elements

Group																			
I	II	1 H hydrogen 1										III	IV	V	VI	VII	0		
		Key proton (atomic) number atomic symbol name relative atomic mass																	
3 Li lithium 7	4 Be beryllium 9																		
11 Na sodium 23	12 Mg magnesium 24																		
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65						35 Br bromine 80	36 Kr krypton 84	
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium -	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112						53 I iodine 127	54 Xe xenon 131	
55 Cs caesium 133	56 Ba barium 137	57 – 71 lanthanoids		72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201						85 At astatine -	86 Rn radon -
87 Fr francium	88 Ra radium	89 – 103 actinoids		104 Rf Rutherfordium	105 Db dubnium	106 Sg seaborgium	107 Bh bohrium	108 Hs hassium	109 Mt meitnerium	110 Ds darmstadtium	111 Rg roentgenium	112 Cn copernicium	114 Fl flerovium	116 Lv livermorium	-	-			
lanthanoids																			
57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium -	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175					
actinoids																			
89 Ac actinium	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium	94 Pu plutonium	95 Am americium	96 Cm curium	97 Bk berkelium	98 Cf californium	99 Es einsteinium	100 Fm fermium	101 Md mendelevium	102 No nobelium	103 Lr lawrencium					

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).