Cambridge Assessment International Education

Cambridge O Level

CHEMISTRY **5070/12**

Paper 1 Multiple Choice **May/June 2020**

1 hour

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

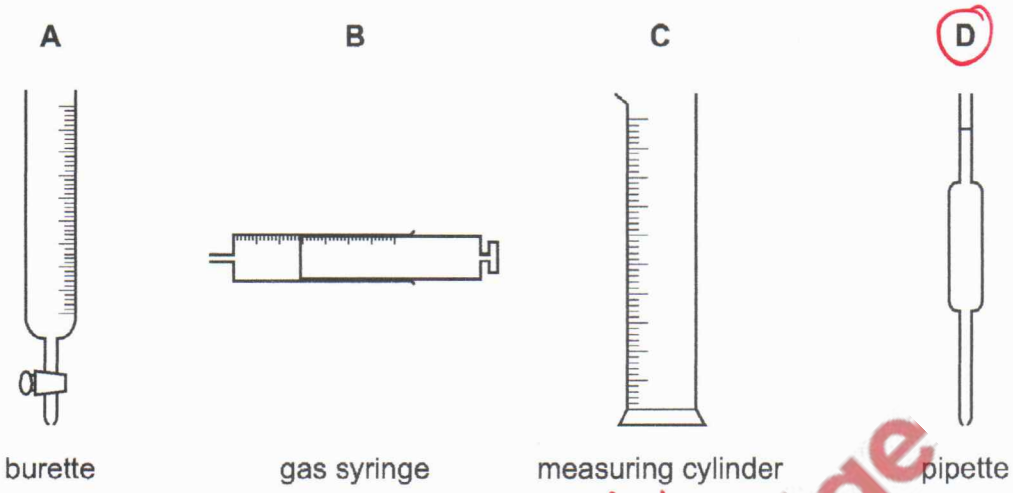
INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **20** pages. Blank pages are indicated.

1 The diagram shows four pieces of apparatus that are used to measure the volume of a gas or liquid.

Which piece of apparatus should always be filled to the same level?



- Burette does not have fixed / exact range but measures accurate volume.
- ✓ Pipette measures fixed volume 20cm³ or 25cm³.
- ✓ Burette, gas syringe and measuring cylinder have callibrations.
- ✓ |

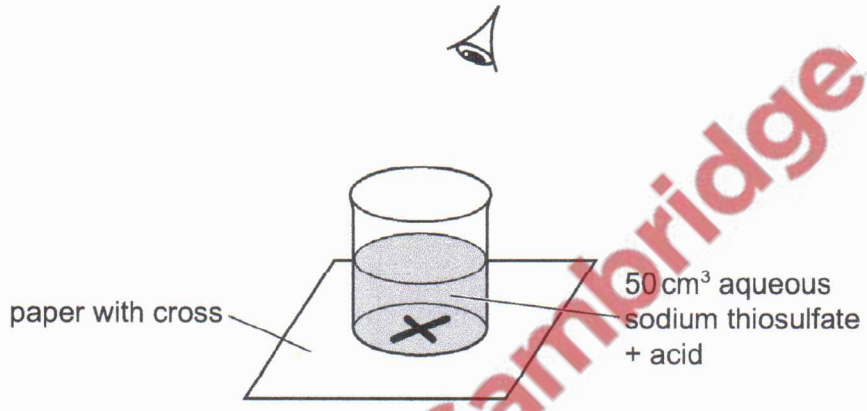
2 Aqueous sodium thiosulfate reacts with acid to make a precipitate of sulfur.

$$Na_2S_2O_3(aq) + 2HCl(aq) \rightarrow 2NaCl(aq) + H_2O(l) + SO_2(g) + S(s)$$

A student investigates the effect of temperature on the rate of this reaction.

The student:

- places a piece of paper with a cross on it below the reaction mixture as shown in the diagram
- measures the time taken for the cross to no longer be seen
- repeats the reaction at different temperatures.



Which apparatus is needed for this investigation?

A balance, pipette, stop-clock

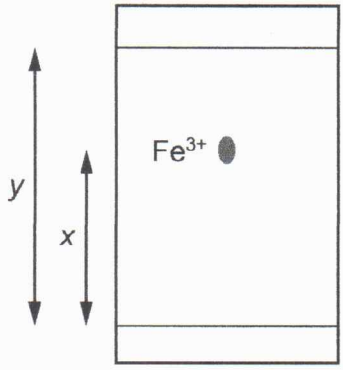
B balance, stop-clock, thermometer

C burette, gas syringe, thermometer

D measuring cylinder, stop-clock, thermometer

Pipette can be used for 20 or 25 cm^3 and the volume given is 50 cm^3.
- Thermometer is used to measure temperature.
- Measuring cylinder can measure 50 cm^3.
- Stop-clock is used to measure the time.

3 A paper chromatography experiment is carried out to find an R_f value for $Fe^{3+}(aq)$. The result is shown.



R_f = distance travelled by spot / distance travelled by the solvent front.

= x/y

To make the spot containing $Fe^{3+}(aq)$ more visible, the paper is sprayed with aqueous sodium hydroxide so that a precipitate of iron(III) hydroxide forms.

Under the conditions of the experiment, the R_f of $Fe^{3+}(aq)$ is given by .....1..... and the colour of the precipitate is .....2..... .

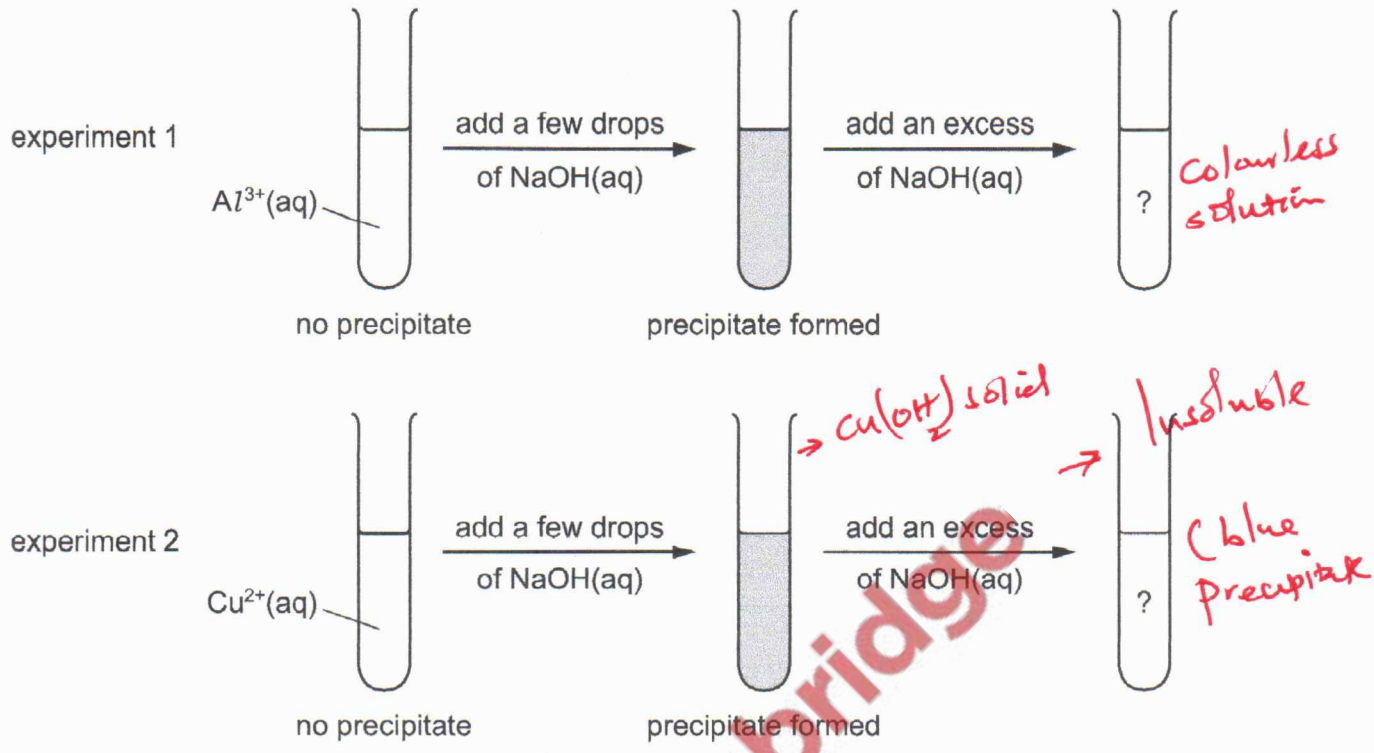
Which row correctly completes gaps 1 and 2?

	gap 1	gap 2
A	$\frac{x}{y}$	red-brown
B	$\frac{x}{y}$	green
C	$\frac{y}{x}$	red-brown
D	$\frac{y}{x}$	green

Fe^{3+} (aq) – red brown precipitate

Fe^{2+} – Green precipitate

4 The diagram shows two experiments.



What are the results of adding an excess of NaOH(aq) in each experiment?

	experiment 1	experiment 2
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key
✓ = precipitate remains
✗ = precipitate dissolves

5 Which methods of separation require a change of state from liquid to gas?

1 paper chromatography
2 crystallisation
3 distillation
4 filtration

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

6 Hydrogen sulfide, H_2S, and hydrogen chloride, HCl, are both gases at temperatures above –50 °C.

Which gas will diffuse most rapidly at the temperature given?

A hydrogen chloride at –40 °C

B hydrogen chloride at –20 °C

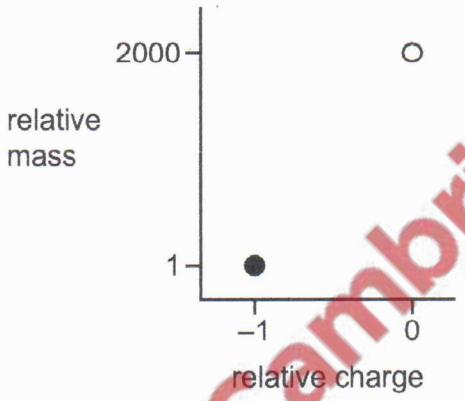
C hydrogen sulfide at –40 °C

D hydrogen sulfide at –20 °C

High temperate high kinetic energy hence more rate of diffusion.

Diffusion depends on the Molecular Mass of gas and temperature.
- Higher the Molecular mass the slow the rate of diffusion.
- lower the Molecular mass the faster the diffusion.

7 The diagram shows the relative mass and the relative charge of two particles, O and ●, present in atoms and ions.



$^1H = 0$

$^1H^+ = +1$

Which of these particles are present in a hydrogen atom and in a hydrogen ion?

	H	H^+
A	both O and ●	both O and ●
B	both O and ●	O but not ●
C	● but not O	neither O nor ●
D	O but not ●	● but not O

8 Which ion has the most shells that contain electrons?

A Al^{3+} 13 $13-3=10$ 2.8

B Be^{2+} 4 $4-2=2$

C N^{3-} $7+3=10$ 7 2.8

D S^{2-} $16+2$ 16 2.8.8

9 Which substance conducts electricity both when solid and when molten?

A an alloy

B a hydrocarbon

C a metal oxide

D a salt

✓ Alloy is made of Metals and Metals are good conductors of heat and electricity.

→ Bad conductors in solid and Molten form.

→ Bad conductor, since Ionic bond is present and Metal has lost its electrons to the oxygen atom.

10 When they react together, which pair of elements form an ionic compound?

A carbon and hydrogen Covalent Compound

B hydrogen and chlorine Covalent Compound

C lithium and oxygen

D sulfur and oxygen Covalent Compound

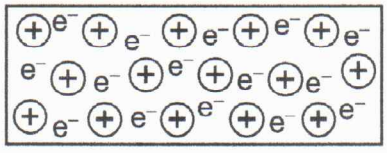
ionic bond is between Metal and Non-metals.

11 How many shared electrons are in one carbon dioxide molecule?

CO_2

A 2 **B** 4 **C** 8 **D** 12

12 Element X has a lattice of positive ions and a 'sea of electrons'.



Which property will X have?

A It conducts electricity by the movement of ions and electrons.

B It has a high melting point.

C It is decomposed by an electric current.

D It is not malleable.

Movement of free electrons (delocalised) conducts electricity

It cannot decompose electric Current

Metals are Malleable → can be converted to sheets.

13 Which row shows the correct state symbols for the reaction between calcium carbonate and dilute hydrochloric acid? (The conditions are room temperature and pressure.)

	$CaCO_3$ +	$2HCl$ →	$CaCl_2$ +	H_2O +	CO_2
A	s	aq	aq	aq	g
B	s	l	aq	l	g
C	s	l	l	aq	g
D	s	aq	aq	l	g

14 The expression shown for the value of A_r for fluorine is incomplete.

$$A_r \text{ (fluorine)} = \frac{\text{average mass of one .....1..... of fluorine}}{\text{.....2..... of the mass of one atom of } {}^{12}_{6}C}$$

How should the gaps in the expression be correctly completed?

	gap 1	gap 2
A	atom	$\frac{1}{6}$
B	atom	$\frac{1}{12}$
C	molecule	$\frac{1}{6}$
D	molecule	$\frac{1}{12}$

Relative atomic mass is average mass of atom compared to $\frac{1}{12}$ of Carbon 12.

15 A mixture of 5 cm^3 of CH_4 and 100 cm^3 of air is exploded. Assume air is 80% N_2 by volume and 20% O_2 by volume. The resulting mixture is cooled. All volumes are measured at room temperature and pressure.

$$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$$

What is the composition of the resulting gas?

	5 cm^3 of CO_2	10 cm^3 of O_2	80 cm^3 of N_2	10 cm^3 of steam
A	✓	✓	✓	✓
B	✓	✓	✓	✗
C	✓	✗	✓	✓
D	✓	✗	✓	✗

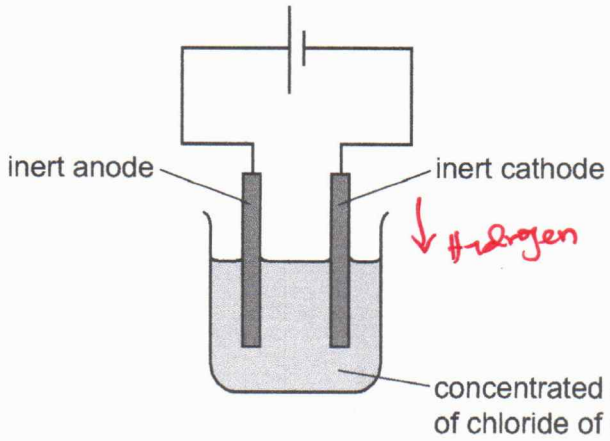
16 Which arrangement is used to electroplate copper onto a steel key?

	electrolyte	anode (positive electrode)	cathode (negative electrode)
A	aqueous copper(II) sulfate	piece of pure copper	steel key
B	aqueous copper(II) sulfate	steel key	piece of pure copper
C	dilute sulfuric acid	piece of pure copper	steel key
D	dilute sulfuric acid	steel key	piece of pure copper

- ✓ Anode dissolves
- ✓ The solution must be similar to that of anode. $Cu^{2+} + SO_4^{2-}$
- ✓ The substances that need to be electroplated must be made of the cathode.

17 The chloride of metal X is dissolved in water.

A concentrated solution of this chloride is electrolysed using inert electrodes.



X is above sodium in the reactivity series.

In addition to chlorine, which gas is liberated and at which electrode?

	gas	liberated at electrode
A	hydrogen	anode
B	hydrogen	cathode
C	oxygen	anode
D	oxygen	cathode

18 Which change in conditions, for the reaction between zinc and dilute sulfuric acid, increases the rate of reaction by lowering the activation energy?

A adding a catalyst

B increasing the concentration of the acid

C increasing the surface area of the zinc

D increasing the temperature

19 Many reactions can be classified as redox reactions.

Which equations show redox reactions?

1 $Mg + 2HCl \rightarrow MgCl_2 + H_2$

2 $2FeCl_2 + Cl_2 \rightarrow 2FeCl_3$

3 $2Na + Br_2 \rightarrow 2NaBr$

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

20 Which row correctly shows whether the hydrogen ion concentration and the pH of ethanoic acid are higher or lower than those of hydrochloric acid of the same concentration?

	hydrogen ion concentration	pH
A	higher	higher
B	higher	lower
C	lower	higher
D	lower	lower

$HCl \longrightarrow H^+ + Cl^-$

$CH_3COOH \rightleftharpoons CH_3COO^- + H^+$ lower.

lowering the hydrogen ion concentration, the higher the pH so in ethanoic acid hydrogen concentration will be lower and pH - higher.

21 Which aqueous reagent liberates ammonia from ammonium nitrate on warming?

A calcium nitrate (salt)

B potassium hydroxide (alkali)

C sodium chloride (salt)

D sulfuric acid

Ammonium salt + alkali → ammonia gas.

22 Two fertilisers are made by mixing chemical compounds.

Fertiliser X contains 500 g of NH_4NO_3 and 500 g of $(NH_4)_2SO_4$ per kilogram.

Fertiliser Y contains 700 g of NH_4NO_3 and 300 g of $CaSO_4$ per kilogram.

Which fertiliser contains the higher percentage of nitrogen by mass and which contains the higher percentage of sulfur by mass?

[M_r: NH_4NO_3, 80; $(NH_4)_2SO_4$, 132; $CaSO_4$, 136]

	fertiliser with higher percentage N	fertiliser with higher percentage S
A	X	X
B	X	Y
C	Y	X
D	Y	Y

Mass of N = $\frac{\text{Atomic Mass g N} \times \text{Given Mass}}{\text{Mr g Compound}}$ g Compound.

NH_4NO_3 : $(NH_4)_2SO_4$

$\frac{28}{80} \times 500$: $\frac{28}{132} \times 500$

= 175 g : 106 g

175 + 106 = 281 g

X contains 281 g g N

Y contains 245 g.

Y

NH_4NO_3 : $CaSO_4$

$\frac{28}{80} \times 700$: No Nitrogen atom

= 245 g Y

23 Which processes occur in the manufacture of sulfuric acid?

1 burning sulfur in air
2 dissolving sulfur dioxide in sulfuric acid
3 dissolving sulfur dioxide in water
4 reacting sulfur dioxide with air

$S + O_2 \rightarrow SO_{2(g)}$

$SO_{2(g)} + O_{2(g)} \rightarrow SO_3$

$SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$ (oleum)

$H_2S_2O_7 + H_2O \rightarrow H_2SO_4$

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

24 A lump of element X can be cut by a knife.

During its reaction with water, X floats and melts.

What is X?

A calcium
B copper
C magnesium
D potassium

Li, Na, K – less dense than water. The reactions are exothermic.
– Group 1 elements are ease to cut since it is soft and floats on the surface of water since it is less dense.

25 Chlorine is passed into separate samples of aqueous potassium iodide and aqueous potassium bromide.

In which solutions is there a colour change?

	KI(aq)	KBr(aq)
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key
✓ = yes
✗ = no

F_2
Cl_2
Br_2
I_2

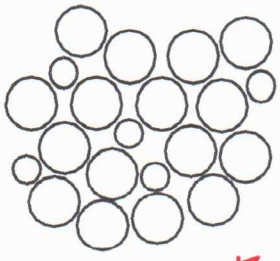
$Cl_2 + KI \rightarrow KCl + I_2$ (purple)

Cl_2 – pale green.

More reactive chlorine displaces the least reactive iodine.

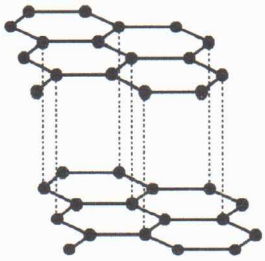
26 Which diagram shows the structure of an alloy? An alloy is a mixture of metals.

A



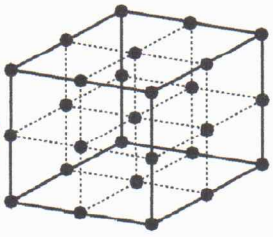
different elements combined together.

B



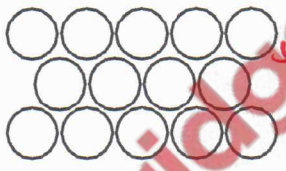
Graphite

C



Structure of ionic compound.

D



Structure of a pure element which is made up of one type of atoms.

27 Which element can only be extracted from its ore using electrolysis?

A calcium

B copper

C lead

D silver

K
Na
Ca
Mg
Al
C

More reactive than Carbon. → used for metals that are highly reactive and whose oxygen cannot be reduced.

28 Which equation shows a thermal decomposition that occurs in the blast furnace?

A $C + O_2 \rightarrow CO_2$ → strongly exothermic. Coke is impure Carbon.

B $CO_2 + C \rightarrow 2CO$ → At high temperatures CO_2 reacts with coke to form Carbon Monoxide. Carbon Monoxide → reducing agent.

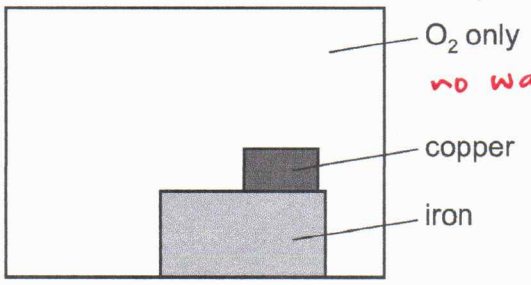
C $CaCO_3 \rightarrow CaO + CO_2$

D $CaO + SiO_2 \rightarrow CaSiO_3$

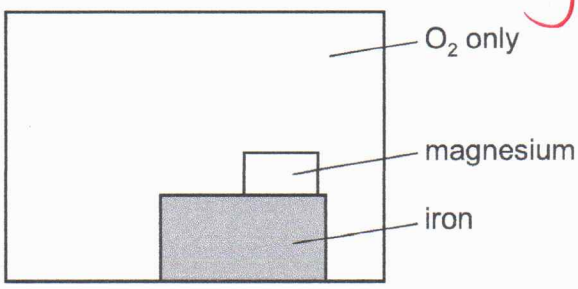
Impurity is Silicon dioxide → used to form a slag. (Calcium silicate)

29 Which diagram correctly shows the conditions necessary for the rusting of iron and also the metal that can be used to prevent rusting by sacrificial protection?

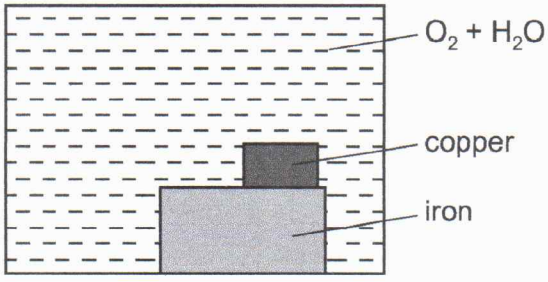
A



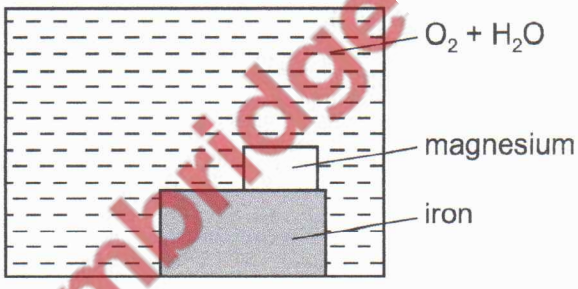
B



C



D



30 Aluminium is produced by the electrolysis of pure aluminium oxide. One of the electrodes in the process has to be replaced often.

Which statement is correct?

A The product at the anode reacts with the anode.

B The product at the anode reacts with the cathode.

C The product at the cathode reacts with the anode.

D The product at the cathode reacts with the cathode.

31 Which row correctly compares carbon dioxide and methane?

	both contain carbon	both are described as a greenhouse gas	both lower the pH of water when they dissolve in it
A	✓	✗	✓
B	✓	✓	✗
C	✗	✓	✓
D	✗	✓	✗

32 Sea water has to be purified in order to obtain drinking water from it.

Which processes are used to purify the sea water?

	fractional distillation	desalination
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key
✓ = used
✗ = not used

Desalination – removal of salts.
Fractional distillation separates substances with different boiling points eg. Water and Ethanol.

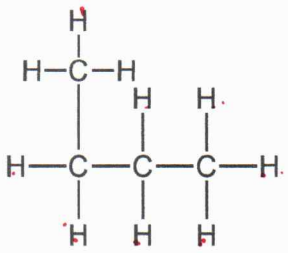
33 Which structure represents an isomer of butane?

Alkanes → C_nH_{2n+2}

C H
4 10

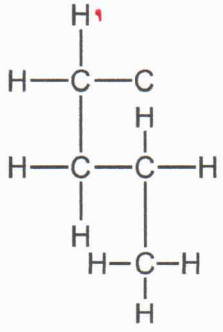
Isomers have same Molecular formula but different structural formula

A



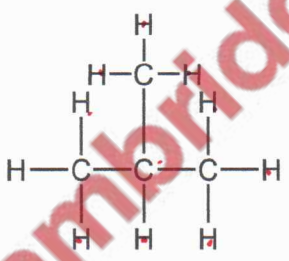
C H
4 10

B



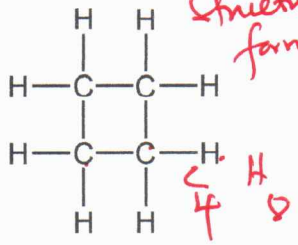
C H
4 9

C



C H
4 10

D



C H
4 8

Methane Ethene Ethane Propane

34 Which statement about the organic compounds CH_4, C_2H_4, C_2H_6 and C_3H_8 is correct?

A Only C_2H_4 and C_2H_6 decolourise bromine water.

B They are all saturated compounds. → alkanes

C They are all unsaturated compounds. → alkenes

D They are all hydrocarbons.

Only alkenes decolorise bromine water. They are Unsaturated Hydrocarbons.

Hydrocarbon are Made up of Carbon and Hydrogen atoms only.

35 The alkenes are a homologous series.

Which statement about alkenes is correct?

General Formula Alkenes → C_nH_{2n}

A An alkene molecule contains four fewer hydrogen atoms than an alkane molecule with the same number of carbon atoms.

B If a food is described as *polyunsaturated* it means that it contains polymers.

C Propene reacts with steam to form propanol.

D The general formula for the alkenes is C_nH_{2n+2}. (alkanes)

36 Which organic compound is used as a solvent, a renewable fuel and in the production of vinegar?

A ethanoic acid → It is Carboxylic acid hence can be used as a solvent. / Not renewable / Cannot be used in Vinegar production.

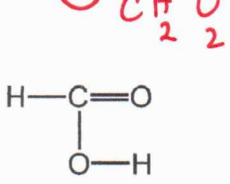
B ethanol

C propanoic acid → Solvent, not fuel, / Vinegar.

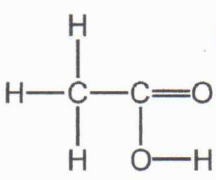
D propanol ✓ Solvent, fuel, not used in Vinegar.

37 Which structure shows the carboxylic acid with the lowest relative molecular mass?

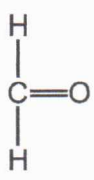
A CH_2O_2



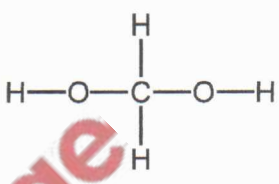
B C_2OH_2



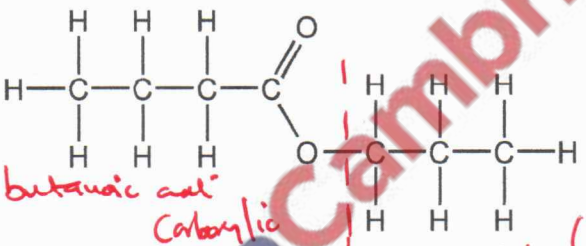
C C_2OH_4



D



38 What is the name of the ester shown?



butanoic acid

Carboxylic acid

alcohol. (propanol)

The ester is Made from Carboxylic acid and alcohol.

Butanoic acid + propanol

→ Propyl butanoate.

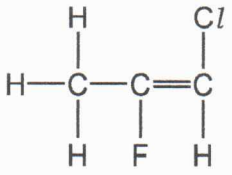
A butyl propanoate

B propyl butanoate

C propyl ethanoate

D propyl propanoate

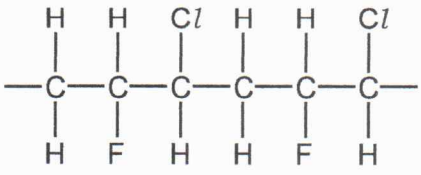
39 The diagram shows the structure of a monomer.



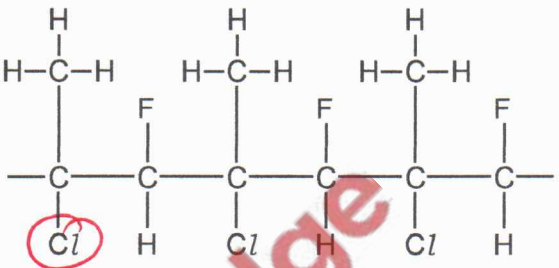
Which diagram shows the partial structure of its polymer?

"Double bond is converted to single bonds in addition polymerisation.

A

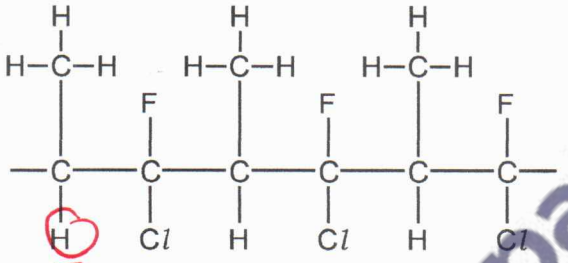


B



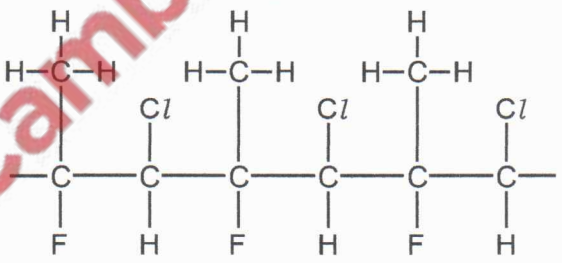
F

C



F

D

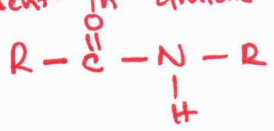


40 Which statement about polymers is correct?

A Nylon and *Terylene* are produced by addition polymerisation. (condensation)

B Nylon and *Terylene* both contain amide linkages.

Nylon is present in amide linkages



C Simple sugars are produced by hydrolysing proteins. (amino acids)

D Starch contains the elements carbon, hydrogen and oxygen.

$(C_6H_{10}O_5)_n$ → Contains elements C, H, O, They are Carbohydrates.