

CHEMISTRY

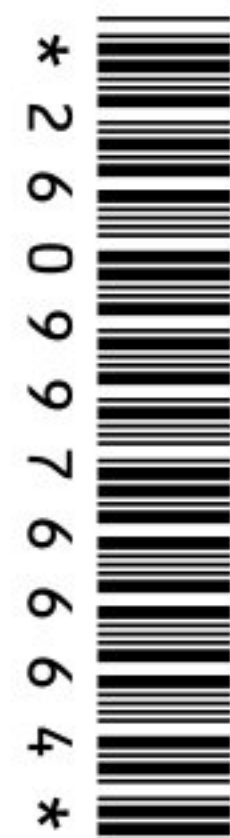
0620/22

Paper 2 Multiple Choice (Extended)

May/June 2018

45 minutes

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



READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, 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.

DO NOT WRITE IN ANY BARCODES.

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.

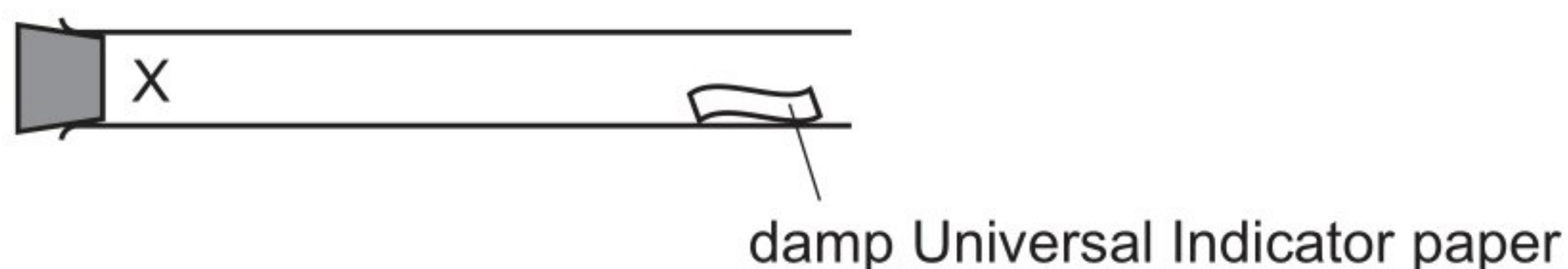
A copy of the Periodic Table is printed on page 16.

Electronic calculators may be used.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **13** printed pages and **3** blank pages.

- 1 A gas is released at point X in the apparatus shown.



Which gas turns the damp Universal Indicator paper red most quickly?

- A ammonia, NH_3
- B chlorine, Cl_2
- C hydrogen chloride, HCl
- D sulfur dioxide, SO_2

Reason:

The lightest molecules diffuse the fastest. In this case NH_3 is the lightest. A bit heavier than NH_3 is HCl . But ammonia is basic and so will not turn the universal indicator paper red. HCl on the other hand is acidic in nature and turns the universal indicator paper red upon reaching. HCl is the lightest compared to NH_3 , Cl_2 and SO_2

Mr of :

$$\text{NH}_3 = 14 + 3(1) = 17$$

$$\text{Mr of HCl} = 1 + 35.5 = 36.5$$

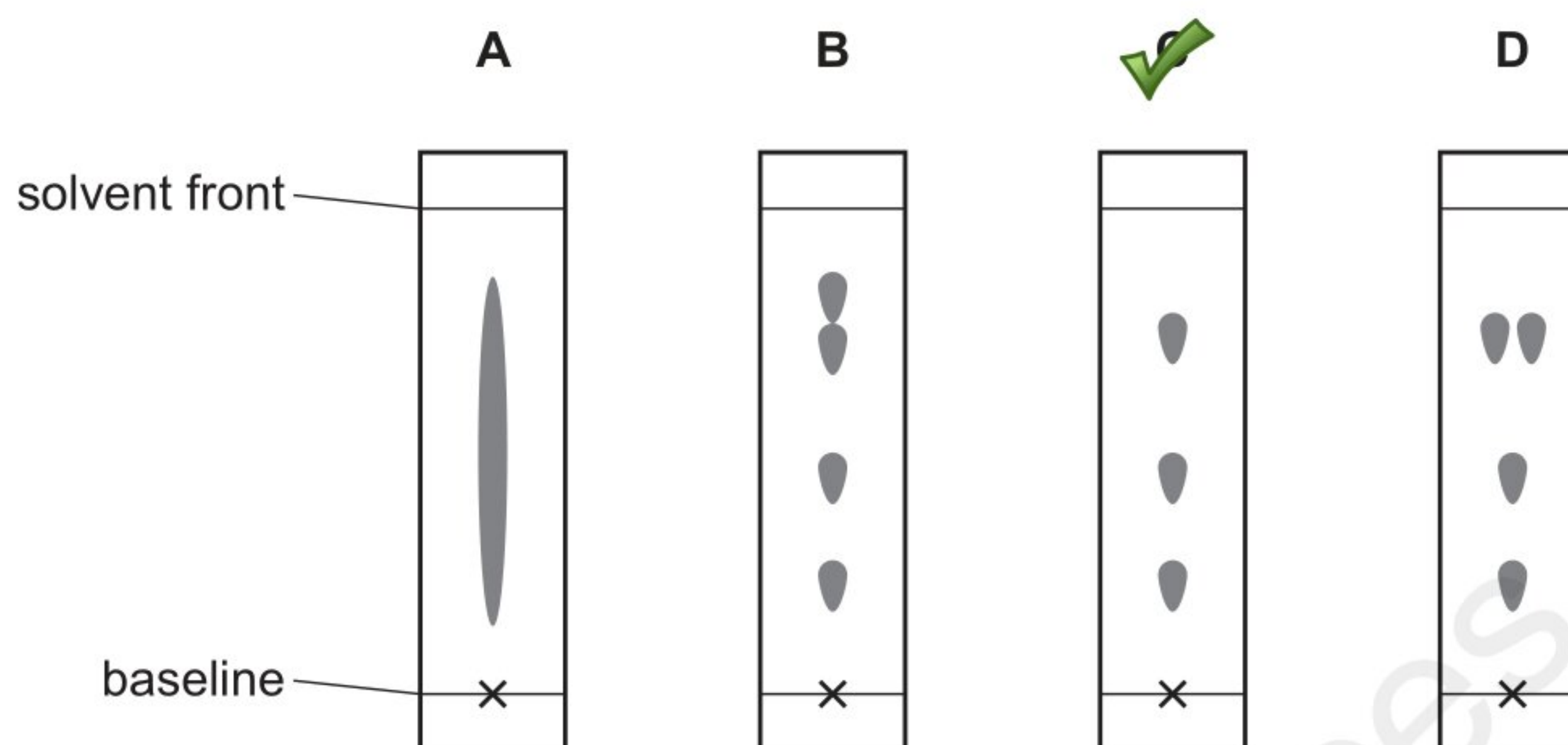
$$\text{Mr of SO}_2 = 32 + 2(16) = 64$$

$$\text{Mr of Cl}_2 = 2(35.5) = 70$$

2 A chromatography experiment was done to separate a mixture of four substances.

The R_f values measured for these substances were 0.3, 0.5, 0.8 and 0.8.

Which diagram shows the chromatogram obtained?



Reason

1) Two substances give the same R_f values at 0.8 and hence the spots must overlap each other at 0.8

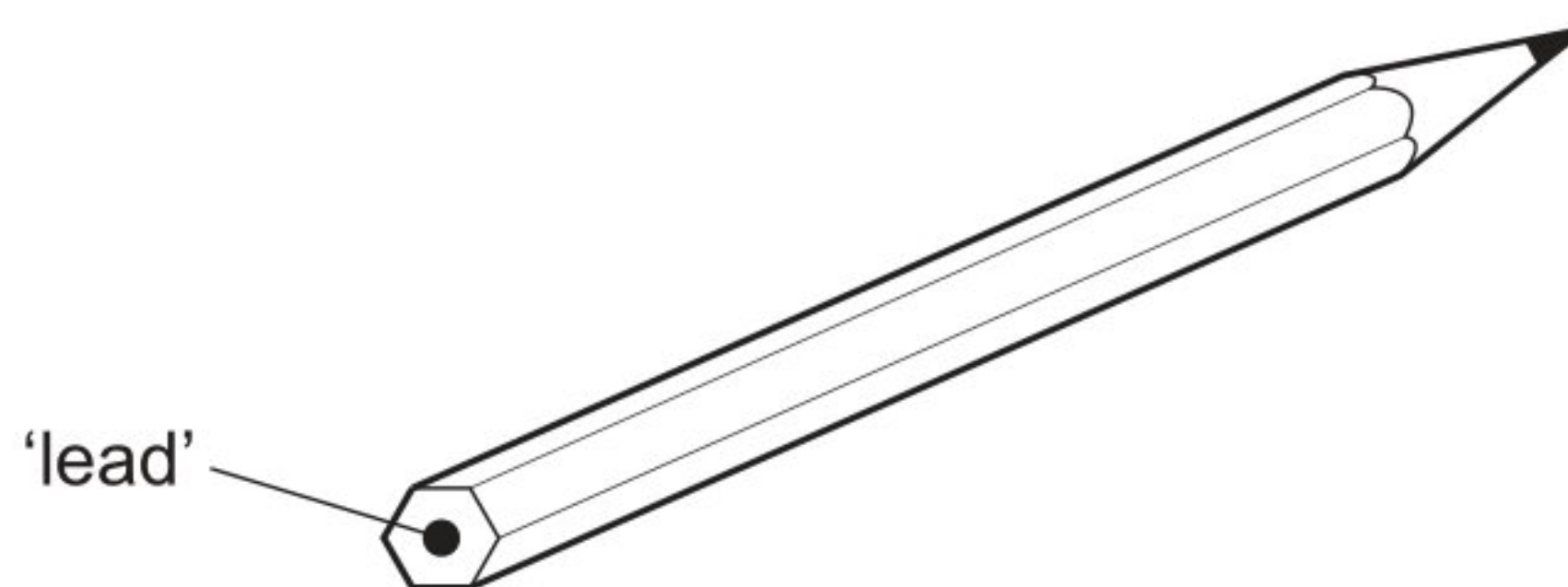
2) Only the third diagram shows three spots while in fact four substances were present.

Hence diagram 3 is the required chromatogram

- 3 Which piece of apparatus **cannot** be used to collect and measure the volume of gas produced in an experiment?
- A burette
 - B gas syringe
 - C measuring cylinder
 - D pipette

Reason: A pipette is used to measure the exact volume of liquid needed in experiments. A pipette is open at both ends and hence cannot be used to collect and hence measure the volume of the gas in experiments.

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



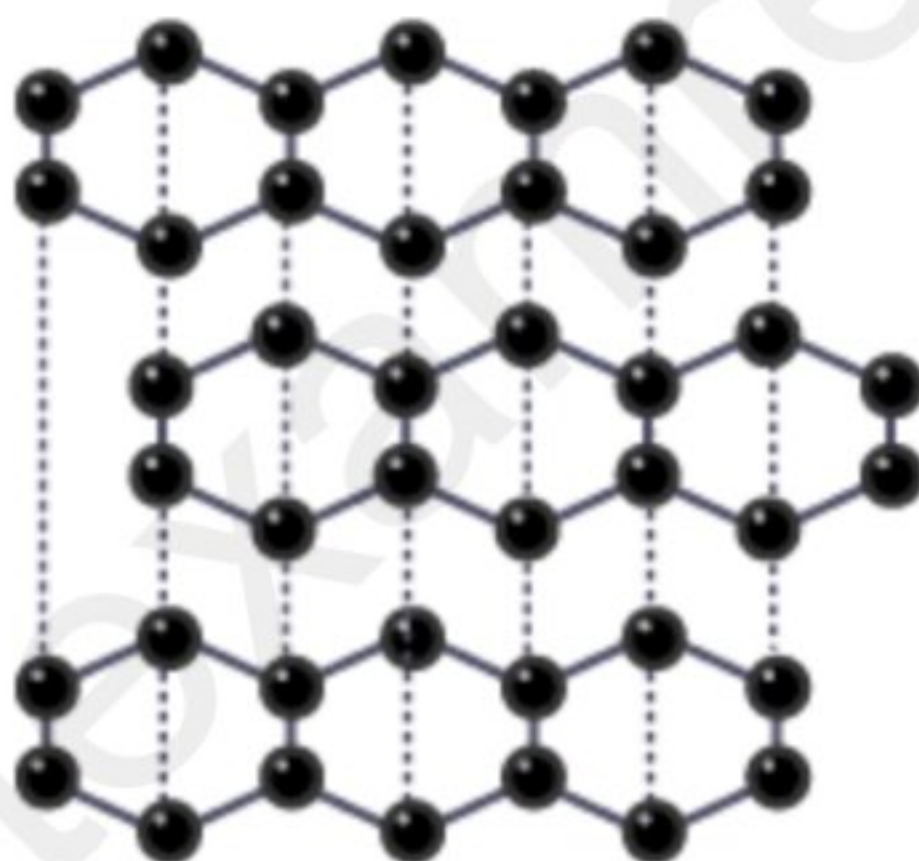
When the percentage of graphite is increased, the pencil slides across the paper more easily.

Which statement explains this observation?

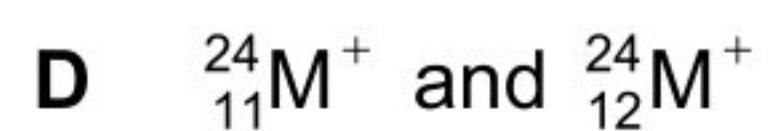
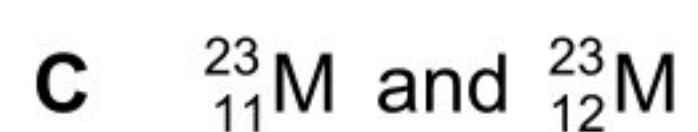
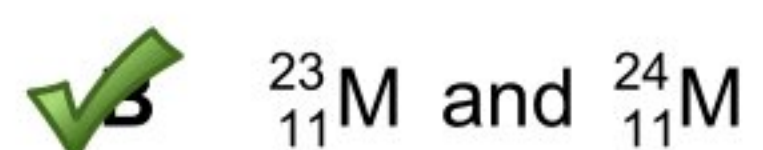
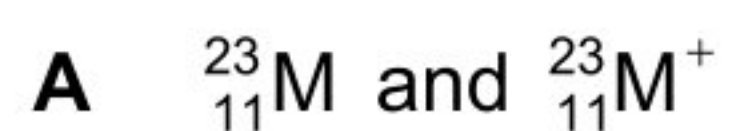
- A Graphite has a high melting point.
- B Graphite is a form of carbon.
- C Graphite is a lubricant.
- D Graphite is a non-metal.

Reason:

The layers in graphite can slide over each other because the forces between them are weak. This makes graphite slippery, so it is useful as a lubricant.



5 Which pair shows particles with the same chemical properties?



Reason: The chemical properties of a substance depend upon the number of valence electrons. In B, the proton number and hence the number of electrons is the same and hence these elements show same chemical properties

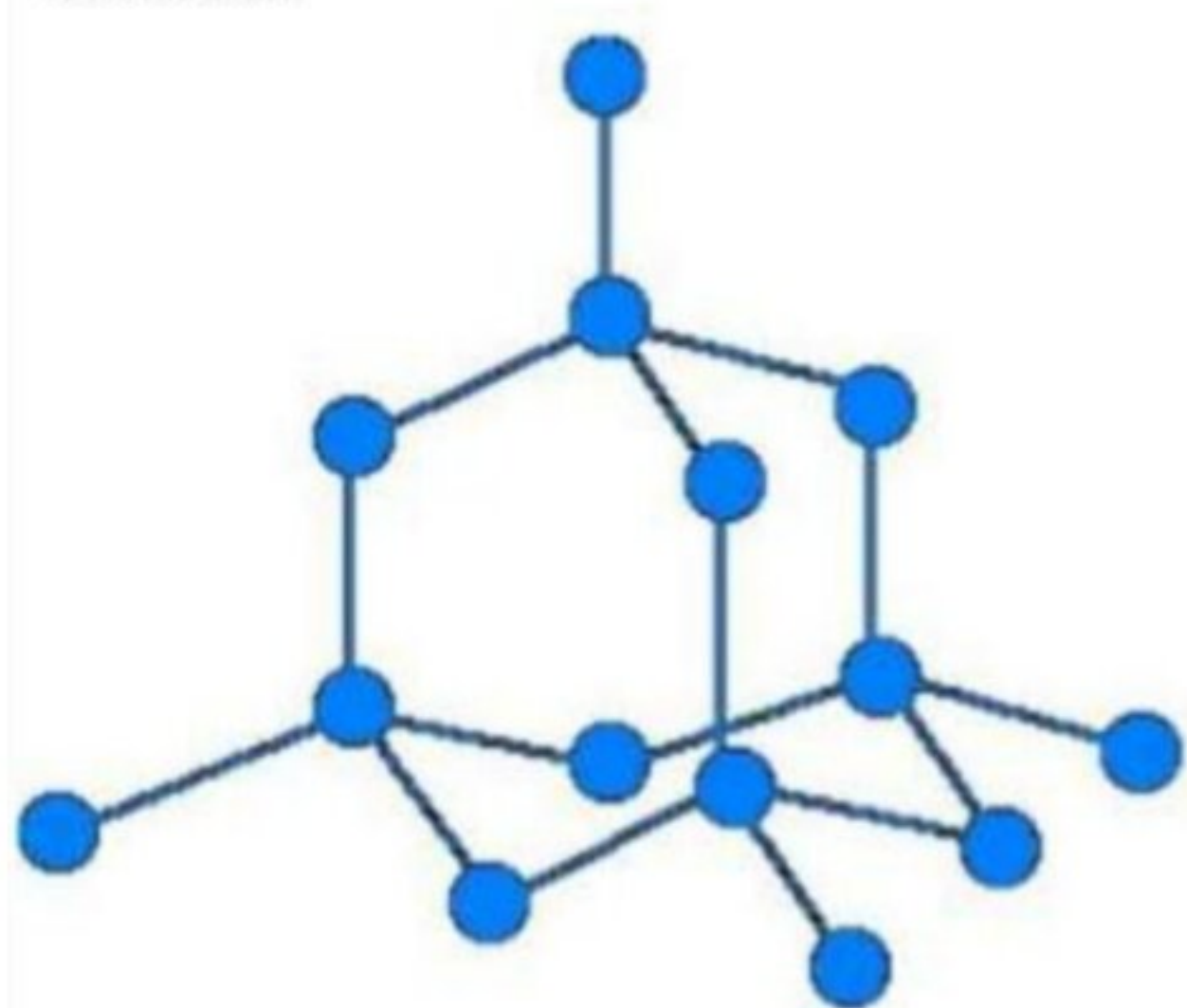
6 Which substances have similar structures?

- A diamond and graphite
- B diamond and silicon(IV) oxide
- C graphite and poly(ethene)
- D graphite and silicon(IV) oxide

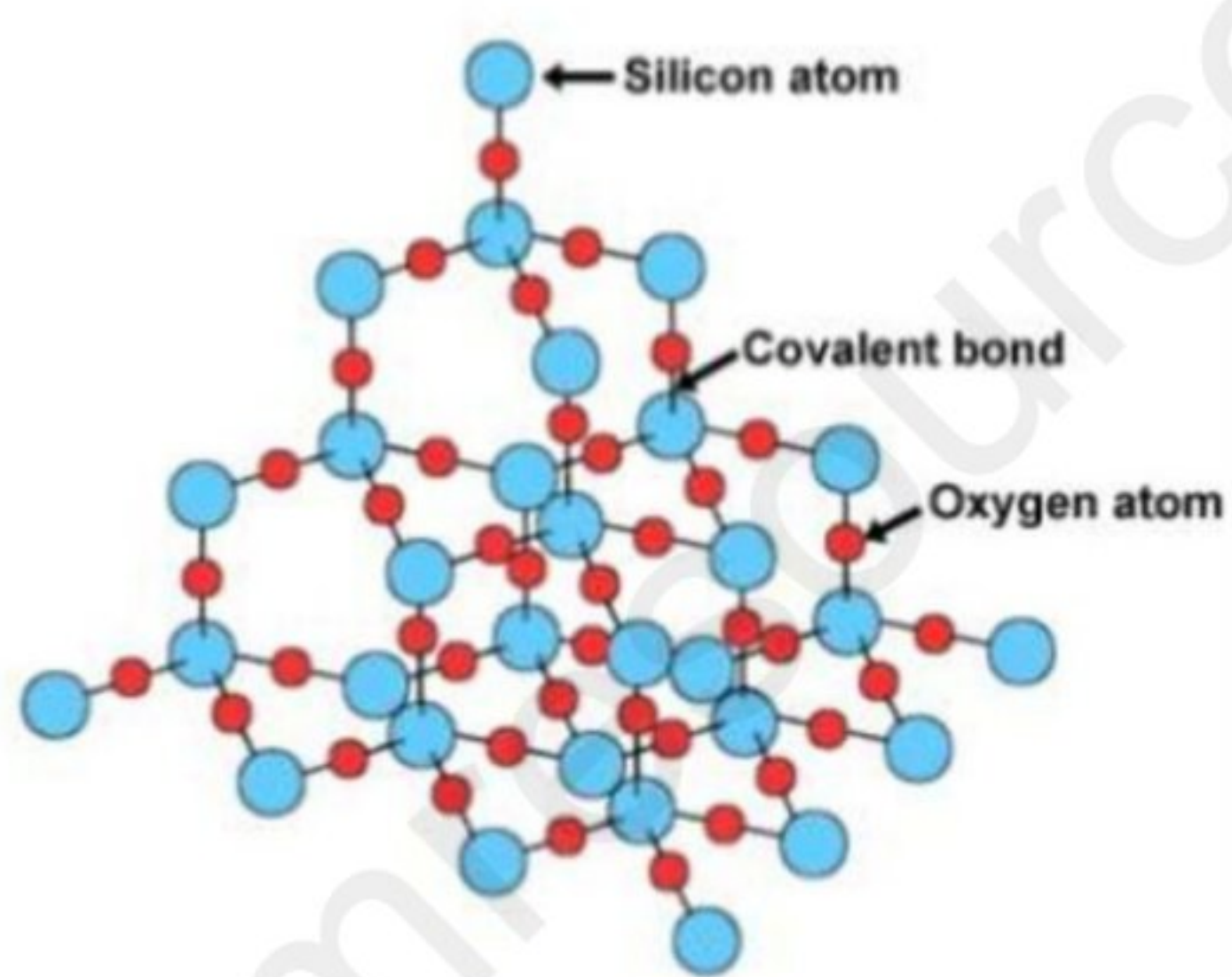
Reason: The following are the structures of diamond and graphite

Pure silicon and silicon dioxide (quartz) have similar structures to diamond.

Silicon



Silicon Dioxide

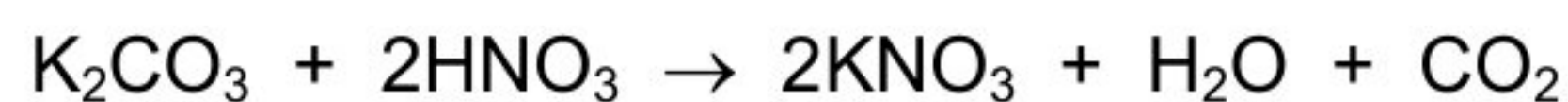


7 Which substance is **not** a macromolecule?

- A diamond
- B graphite
- C silicon(IV) oxide
- D sulfur

Reason: Diamond, graphite and silicon(IV) oxide are macromolecules but sulfur is not a macromolecule. In fact Sulfur atoms form cyclic octatomic molecules with a chemical formula S₈.

- 8 The equation for the reaction between potassium carbonate and nitric acid is shown.



Which volume of carbon dioxide is produced from 69 g of potassium carbonate?

- A 6 dm³ B 12 dm³ C 24 dm³ D 48 dm³

$$\text{Mr of K}_2\text{CO}_3 = 2(39) + 12 + 3(16) = 138\text{g}$$

$$1 \text{ mole of K}_2\text{CO}_3 = 138\text{g}$$

$$x \text{ moles of K}_2\text{CO}_3 = 69 \text{ g}$$

$$\text{Hence } 138x = 69$$

$$x = 69/138 = 0.5 \text{ moles}$$

$$1 \text{ mole of K}_2\text{CO}_3 \text{ produces } 1 \text{ mole of CO}_2 = 24 \text{ dm}^3$$

$$\text{Hence: } 0.5 \text{ moles of K}_2\text{CO}_3 \text{ produces } x \text{ dm}^3 \text{ of CO}_2$$

$$x = 24 \times 0.5 = 12 \text{ dm}^3$$

9 A solution of sodium carbonate, Na_2CO_3 , has a concentration of 0.03 mol/dm^3 .

Which mass of sodium carbonate is dissolved in 1 dm^3 of this solution?

- A 1.06 g B 3.18 g C 10.60 g D 31.80 g

Reason:

Concentration of sodium carbonate =
moles of sodium carbonate / volume of sodium carbonate

Given that the concentration is 0.03 mol/dm^3 . This means that 0.03 moles of Na_2CO_3 are present in 1 dm^3


Moles of Na_2CO_3 are 0.03

Mr of $\text{Na}_2\text{CO}_3 = 2(23) + 12 + 3(16) = 106 \text{ g}$

Mass of $\text{Na}_2\text{CO}_3 = \text{moles} \times \text{Mr} = 0.03 \times 106 = 3.18 \text{ g}$

10 Aqueous copper(II) sulfate is electrolysed using copper electrodes.

Which statement about the electrolysis is **not** correct?

- A An oxidation reaction occurs at the positive electrode.
- B The current is carried through the electrolyte by ions.
- C The negative electrode gains mass.
-  The number of copper(II) ions in the electrolyte decreases.

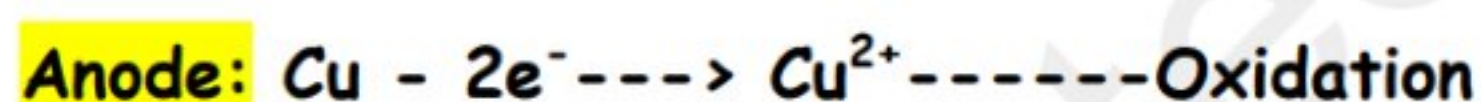
Reason: The number of the copper ions in the electrolyte stays the same as ions lost from solution are replaced by the ions from the anode

List of ions present in the solution: Cu^{2+} , H^+ , OH^- , SO_4^{2-}

Anode:

Electrode is reactive so it will WILL TAKE PART in electrolysis and get reduced to copper ions(Cu^{2+})

Half equation:



Cathode:

Ions attracted to the cathode are Cu^{2+} , H^+

Cu^{2+} ions being lower down in the series are reduced to Cu atoms.

Half equation:



Observation:

Anode: Anode becomes smaller (It loses mass as it gets oxidised)

Cathode: Cathode becomes thicker

Electrolyte: Colour of the solution does not change, it stays blue. This is because copper ions lost from the electrolyte at the cathode are replaced by the copper ions formed at the anode.

11 Dilute sulfuric acid is electrolysed using inert electrodes.

What are the ionic half-equations for the reactions that take place at each electrode?

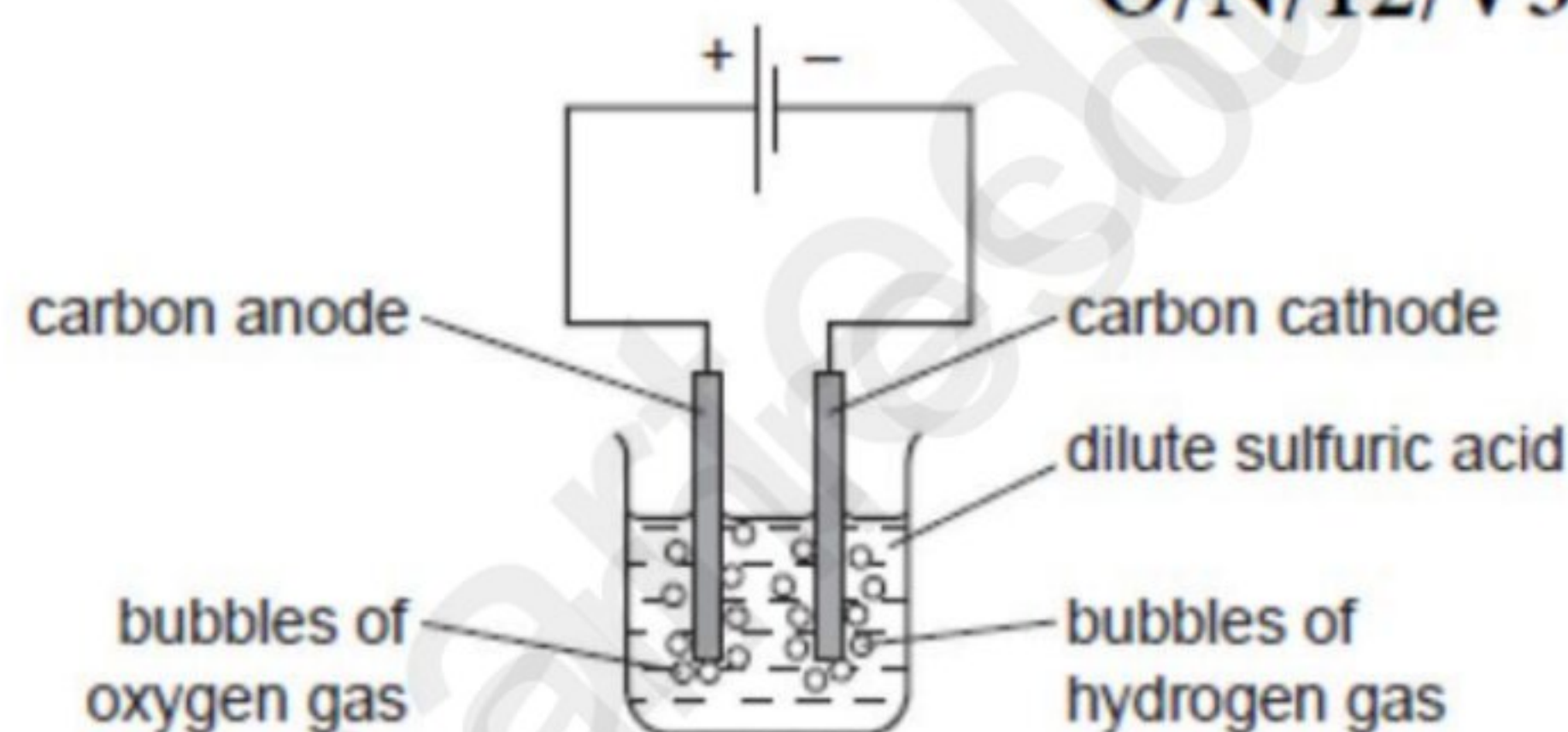
	positive electrode	negative electrode
A	$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$	$4\text{OH}^- \rightarrow 2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^-$
B	$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$	$4\text{OH}^- + 4\text{H}^+ \rightarrow 4\text{H}_2\text{O}$
C ✓	$4\text{OH}^- \rightarrow 2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^-$	$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$
D	$4\text{OH}^- + 4\text{H}^+ \rightarrow 4\text{H}_2\text{O}$	$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$

Reason: As mentioned in the following explanation, the cathode gets reduced and anode gets oxidised.

Electrolysis of dilute sulfuric acid

- (c) The diagram below shows the electrolysis of dilute sulfuric acid. Hydrogen is formed at the negative electrode (cathode) and oxygen at the positive electrode (anode) and the concentration of sulfuric acid increases.

O/N/12/V32-Q6



The ions present in the dilute acid are $\text{H}^+(\text{aq})$, $\text{OH}^-(\text{aq})$ and $\text{SO}_4^{2-}(\text{aq})$.

Anode:

In a dilute solution since the OH^- are in excess so the OH^- are oxidised to O_2 gas.



Cathode:

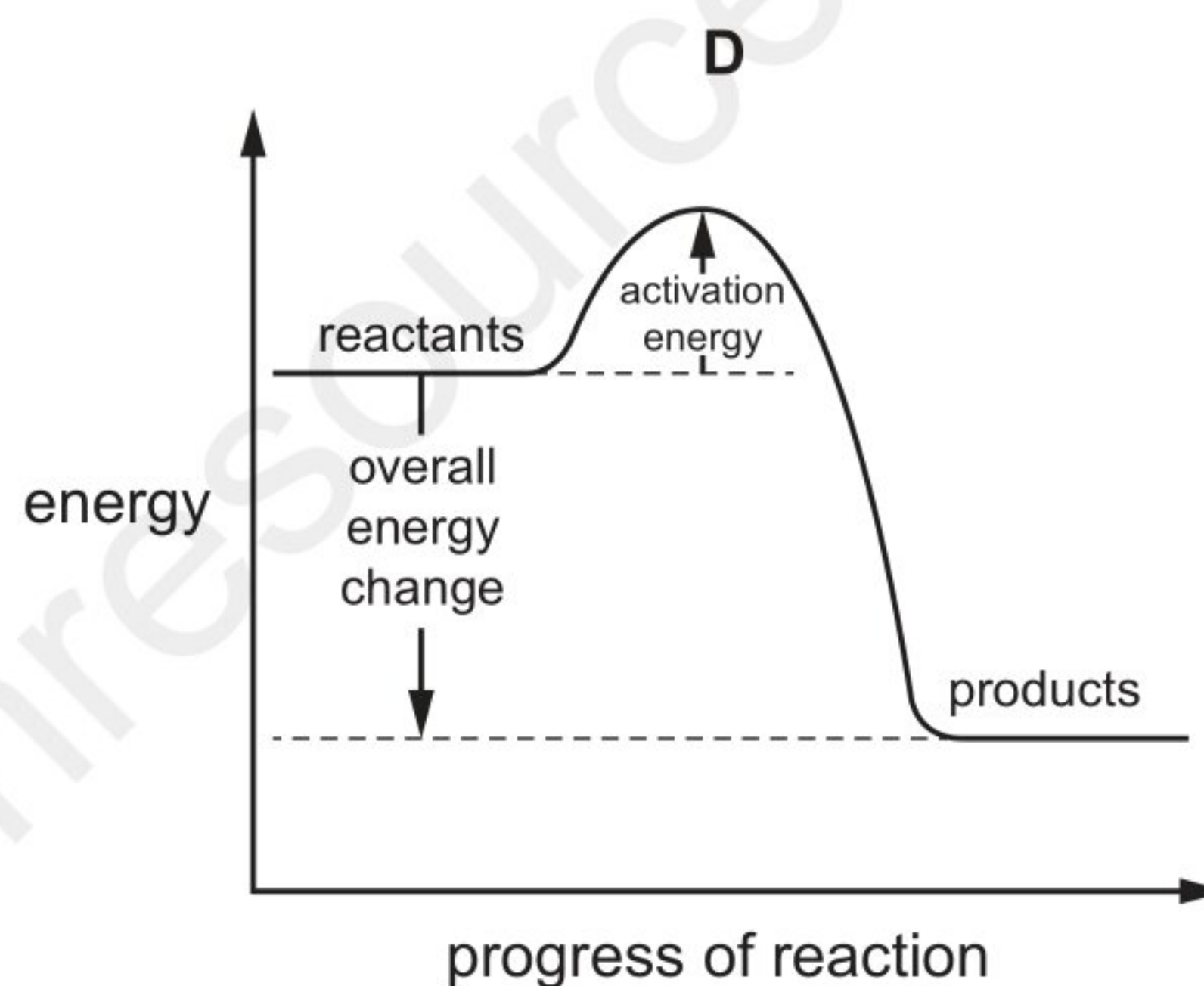
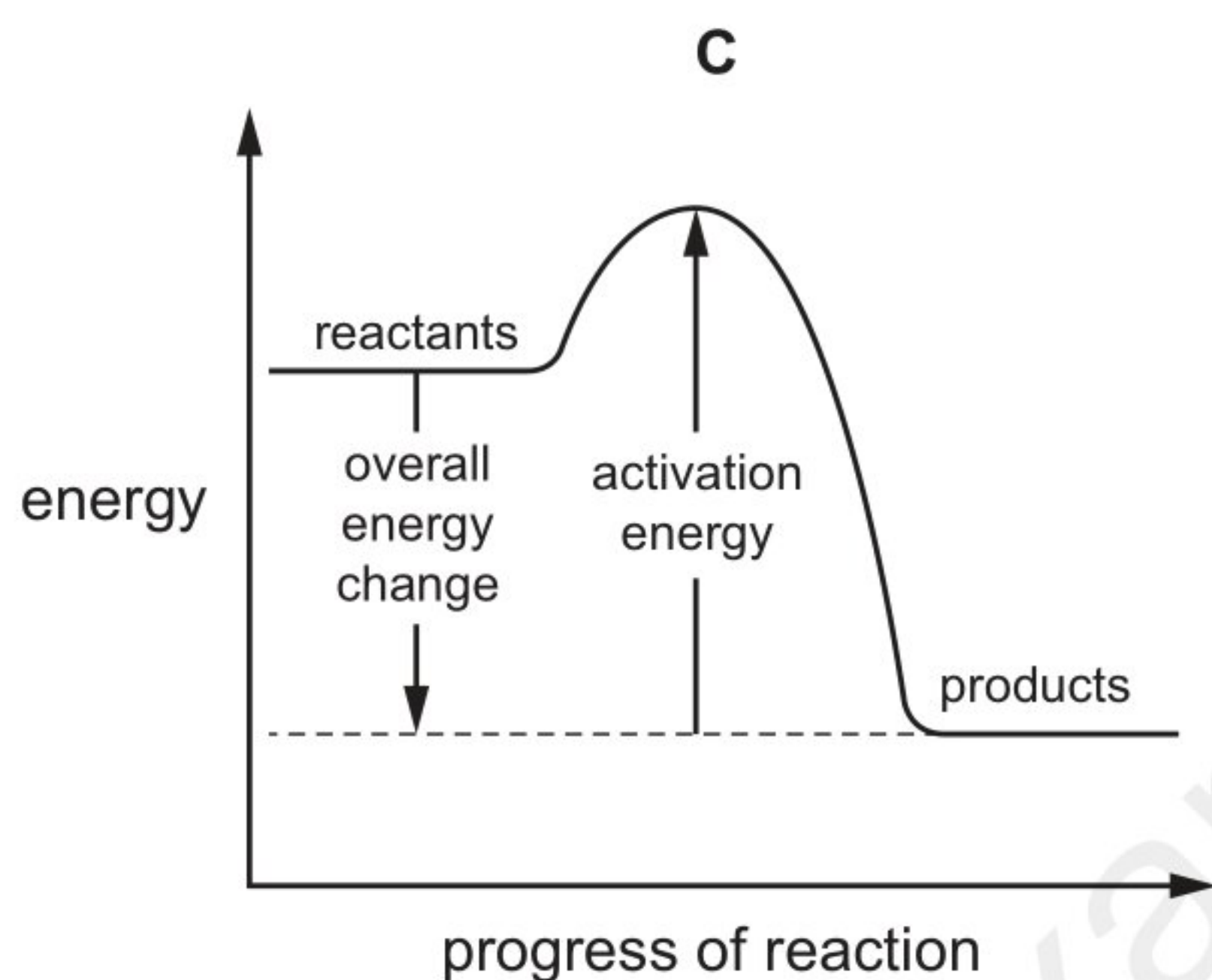
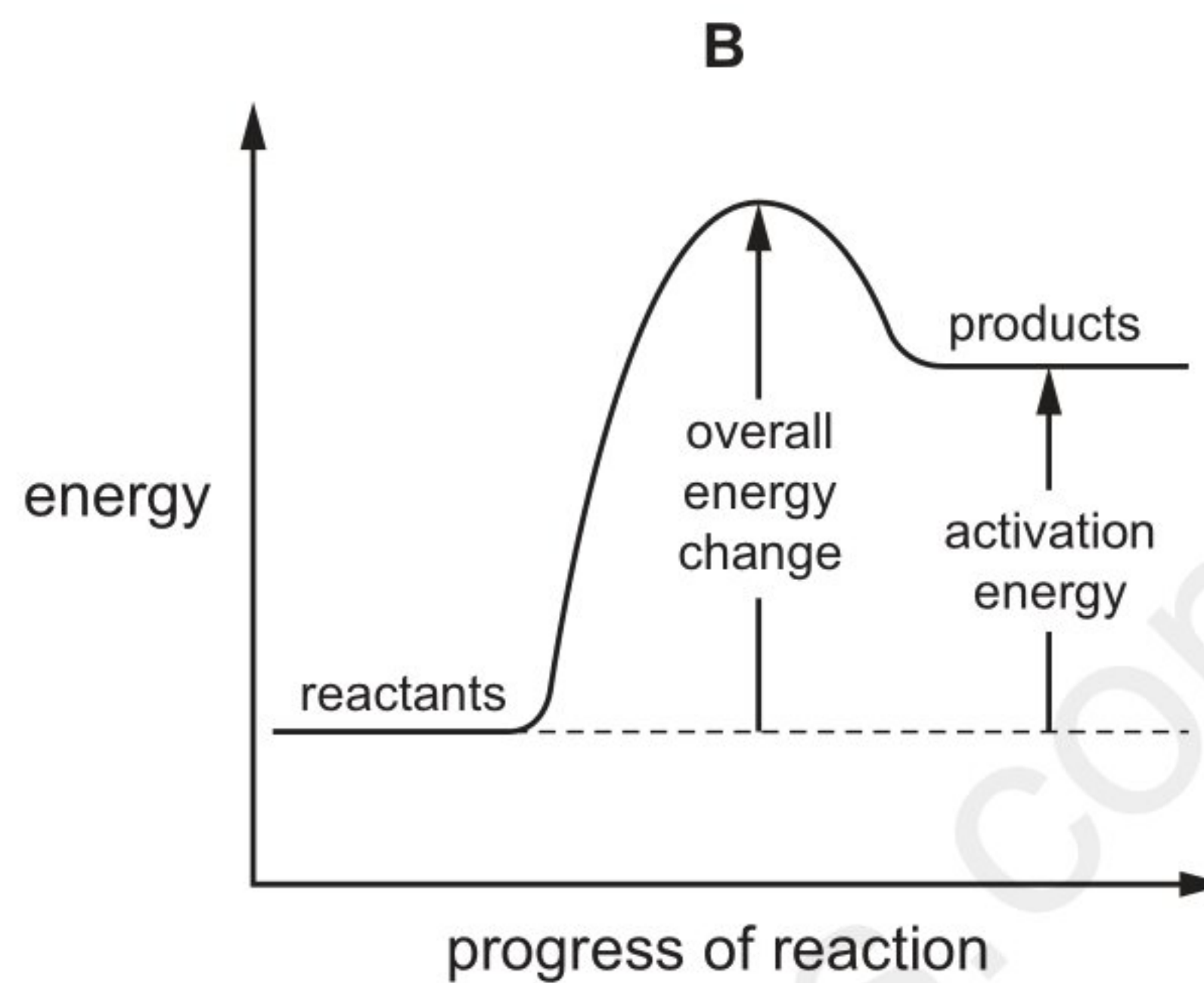
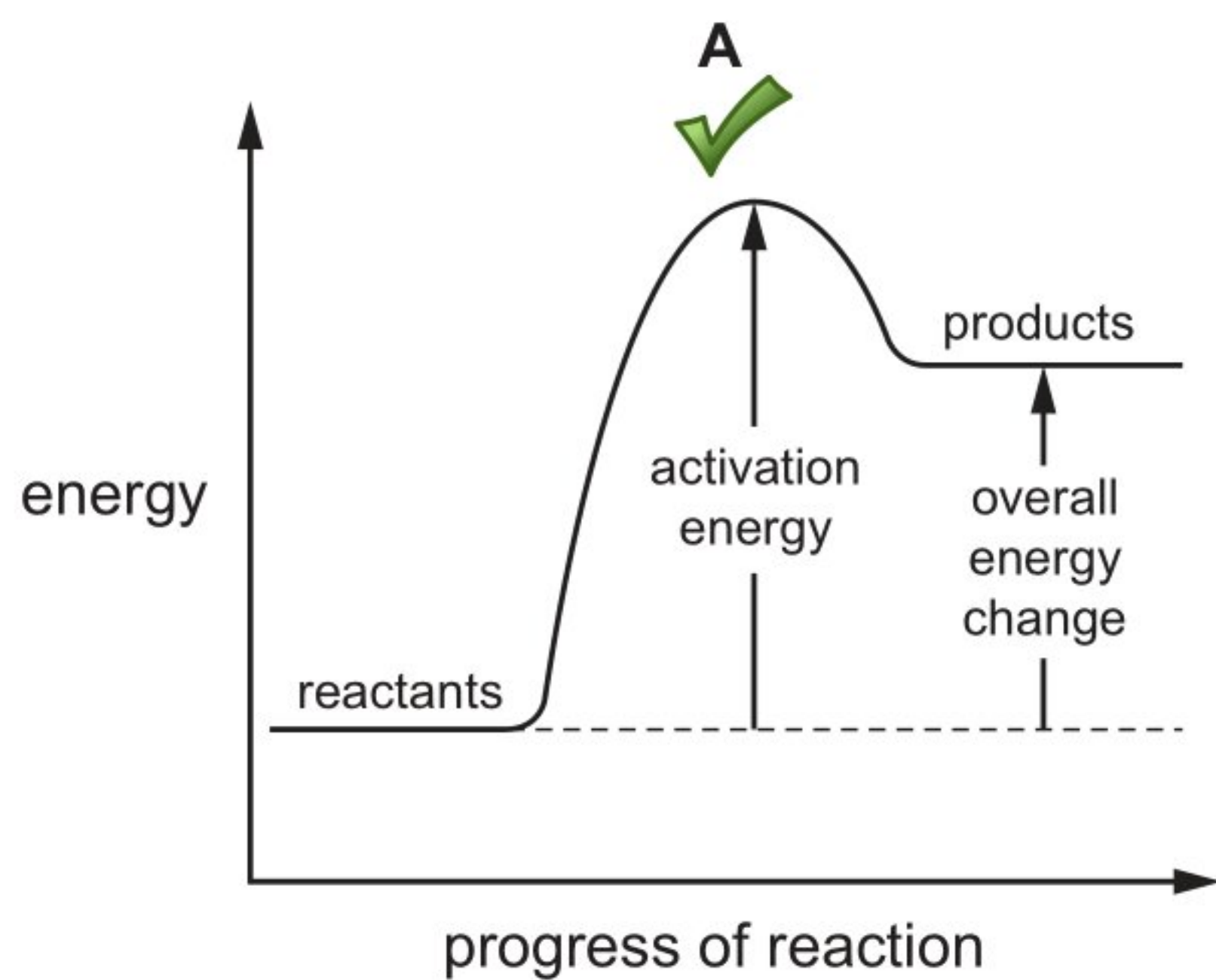
Only H^+ ions are present, so they get reduced to hydrogen gas.



Change to the electrolyte:

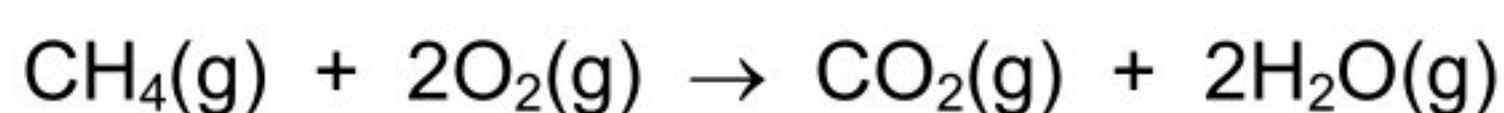
The sulfuric acid becomes more concentrated as the water is used up

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



Reason: In an endothermic reaction, the products are at a higher energy level as compared to the reactants. The reactants get the necessary activation energy required to initiate a reaction. In diagram B, The labelling for the overall energy change and the activation energy is wrong.

13 The equation for the complete combustion of methane is shown.



The bond energies are shown in the table.

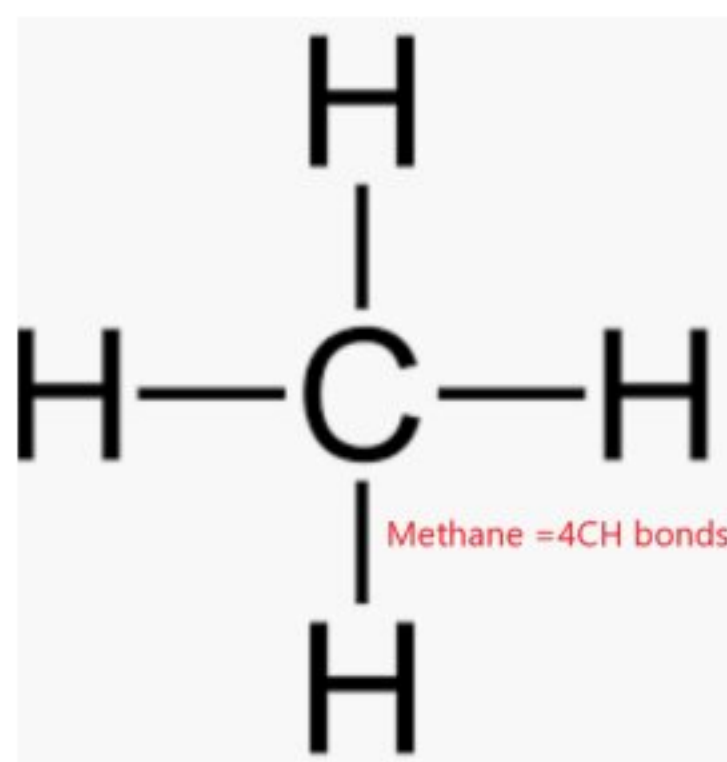
bond	bond energy in kJ/mol
C-H	+410
C=O	+805
O-H	+460
O=O	+496

What is the energy change for the reaction?

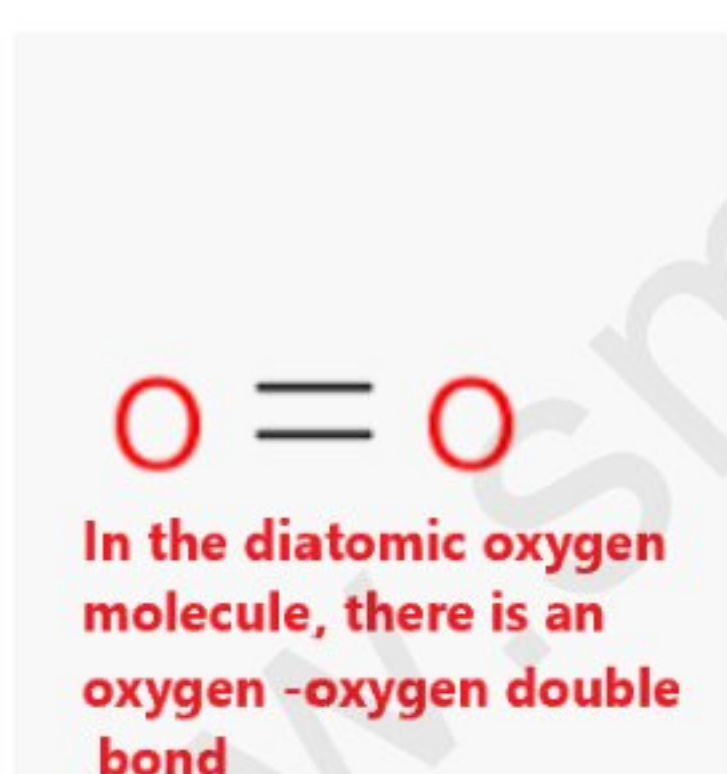
✓ **A** -818 kJ/mol **B** -359 kJ/mol **C** -323 kJ/mol **D** +102 kJ/mol

LHS:- Molecules -Bond energy

Methane: =4(410)=1640kJ /mol



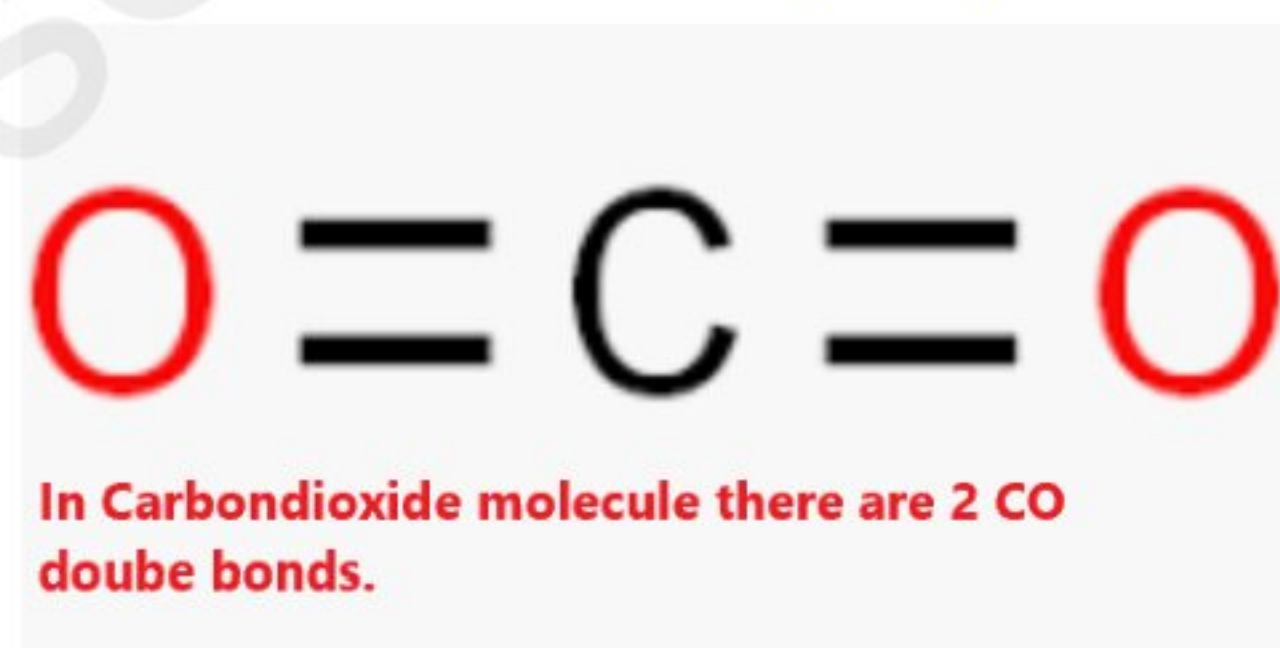
Oxygen =+496kJ / mol
2 oxygen molecules= 496 x 2=+992kJ/mol



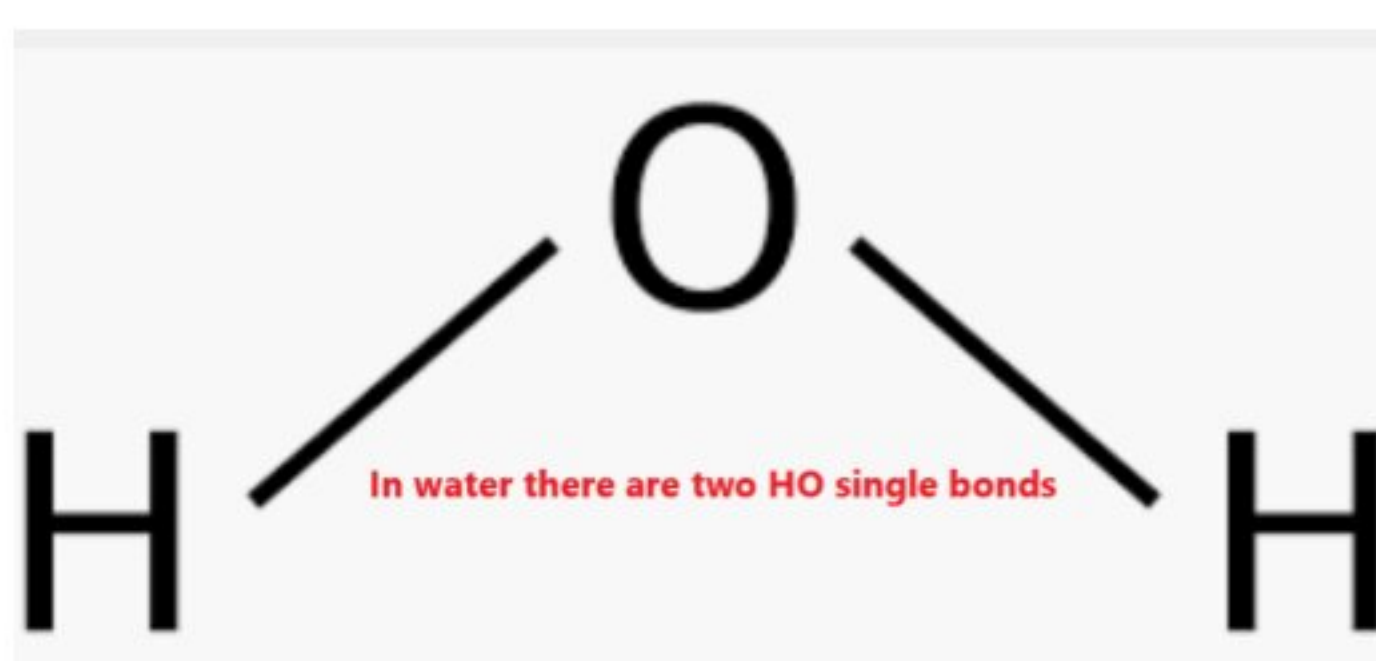
Total bond energy= +1640+992=+2632
Overall energy change for the reaction=+2632-3450=-818kJ/mol

RHS: Molecules -Bond energy

Carbondioxide =2(805)=-1610kJ / mol




1 Water molecule = 2 (460)=-920
2 water molecules= 2 x -920=-1840



Total bond energy= -1610-1840=-3450

- 14 Which row describes the effects of increasing both concentration and temperature on the collisions between reacting particles?

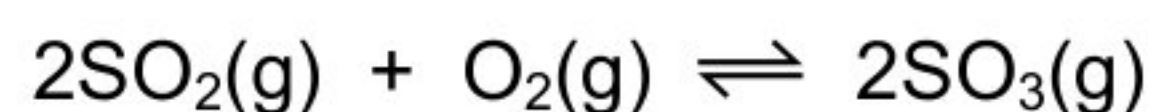
	increasing concentration	increasing temperature
A	more collisions per second only	more collisions per second only
B	more collisions per second and more collisions with sufficient energy to react	more collisions per second only
 C	more collisions per second only	more collisions per second and more collisions with sufficient energy to react
D	more collisions per second and more collisions with sufficient energy to react	more collisions per second and more collisions with sufficient energy to react

Reason:

When the temperature increases, the kinetic energy of the particles also increases and more molecules now have sufficient energy(activation energy) to react. The frequency of collisions and hence the number of collisions per second increase


15 Sulfur dioxide reacts with oxygen at 2 atmospheres pressure. The forward reaction is exothermic.

The equation for the reaction is shown.



The reaction reaches equilibrium. The pressure is then doubled.

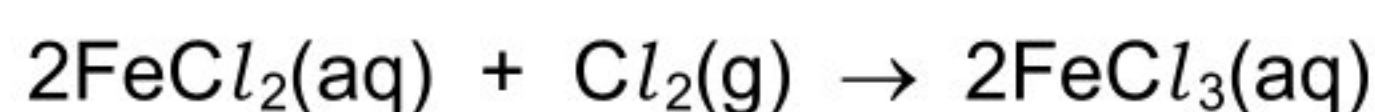
How and why does the amount of sulfur trioxide formed change?

	amount of sulfur trioxide	reason
A	decreases	the forward reaction is exothermic
B	decreases	there are fewer molecules on the right
C	increases	the forward reaction is exothermic
 D	increases	there are fewer molecules on the right

Reason: Increasing the pressure, favours the side with the least number of moles. RHS has the least number of moles .Hence more of sulfur trioxide is formed by reacting more of sulfur dioxide with oxygen.

16 Iron(II) chloride solution reacts with chlorine gas.

The equation is shown.



Which statements about this reaction are correct?

- 1 Fe^{2+} ions are reduced to Fe^{3+} ions.
- 2 Chlorine acts as a reducing agent.
- 3 Fe^{2+} ions each lose an electron.
- 4 Cl_2 molecules are reduced to Cl^- ions.

A 1 and 2

B 2 and 3

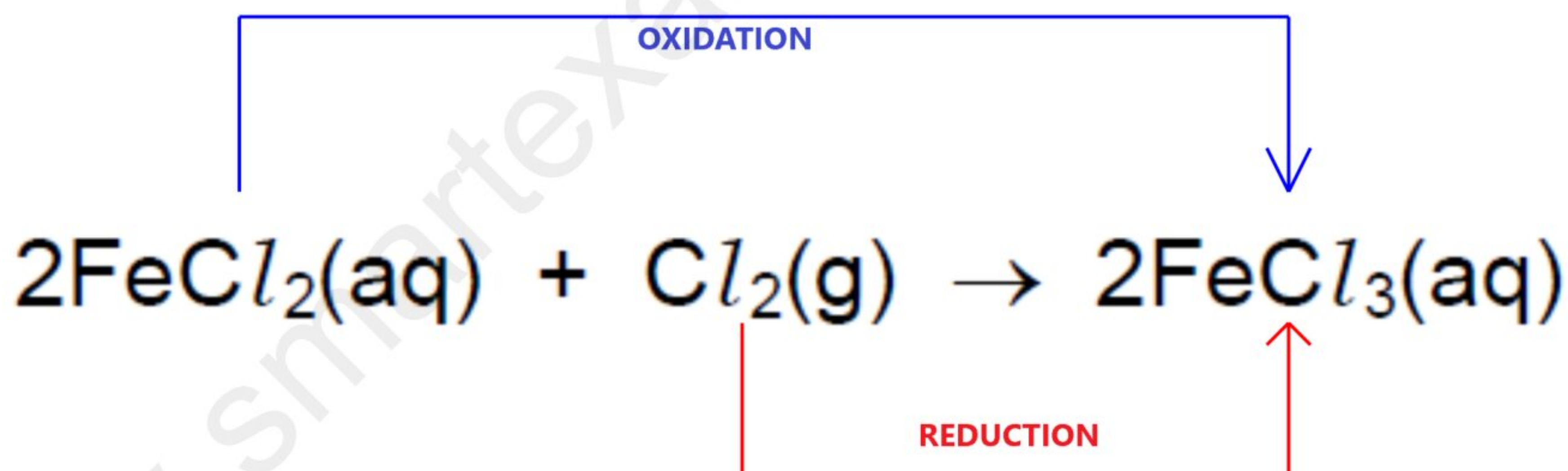
C 2 and 4

3 and 4

Reason:

In the molecule of FeCl_2 , the charge on Fe ion is +2 and when the new product FeCl_3 is formed, its oxidation number increases from +2 to +3. This happens when Iron ion (Fe^{2+}) loses one more electron to form Fe^{3+} ions.

On the other hand, Cl_2 on the reactant side has an oxidation state of 0. When Cl becomes a part of an ionic compound its oxidation state changes from 0 to -1. This indicates that it has accepted an electron.



17 Which statement about oxides is correct?

- A A solution of magnesium oxide has a pH less than pH 7.
- B A solution of sulfur dioxide has a pH greater than pH 7.
- C Magnesium oxide reacts with nitric acid to make a salt.
- D Sulfur dioxide reacts with hydrochloric acid to make a salt.

Reason: Magnesium oxide is a basic oxide and nitric acid is an acid.

As per the general reactions:

Basic oxides react with an acid to form a salt and water.

For the options that are wrong:

1) magnesium oxide is a basic oxide, so it will have a pH greater than 7

2) A solution of sulfur dioxide is acidic and hence will have a pH of less than 7

Sulfur dioxide is acidic in nature. So it does not react with hydrochloric acid which again is an acid

18 Which statement about acids and bases is correct?

- A A base is a donor of hydrogen ions.
- B An acid is an acceptor of protons.
- C A strong acid is fully ionised in aqueous solution.
- D A weak acid cannot be used to neutralise a strong base.

Reason:

A strong acid is one that is completely ionised (dissociates) in an aqueous solution

For the wrong options:

A) A base is an OH^- ion donor or H^+ acceptor

B) An acid is a proton donor

D) Any kind of acids can be used to neutralise bases

19 The solubility of some salts is shown.

	chloride	nitrate	sulfate	carbonate
barium	soluble	soluble	insoluble	insoluble
lead(II)	insoluble	soluble	insoluble	insoluble
potassium	soluble	soluble	soluble	soluble
zinc	soluble	soluble	soluble	insoluble

Which two aqueous solutions produce an insoluble salt when mixed together?

- A barium chloride and zinc nitrate
- B barium nitrate and lead(II) nitrate
- C lead(II) nitrate and potassium carbonate
- D potassium nitrate and zinc sulfate

Reason:

lead nitrate + potassium carbonate \rightarrow lead carbonate + potassium nitrate
soluble soluble insoluble soluble

Note: Potassium can displace lead from its nitrate because it is more reactive than it

For the wrong options:

a) barium chloride + zinc nitrate \rightarrow barium nitrate + Zinc chloride
soluble soluble soluble soluble

b) barium nitrate + Lead (II) nitrate \rightarrow reaction not possible as no new product will be formed

d) potassium nitrate + zinc sulfate \rightarrow potassium sulfate + zinc nitrate
soluble soluble soluble soluble

20 Which methods are suitable for preparing **both** zinc sulfate and copper(II) sulfate?

- 1 reacting the metal oxide with warm dilute aqueous sulfuric acid
- 2 reacting the metal with dilute aqueous sulfuric acid
- 3 reacting the metal carbonate with dilute aqueous sulfuric acid

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

Reason:

General reactions:

Metal Oxide + Acid ---> Salt + Water. hence [1] is correct

Metal carbonate + Acid ----->Salt + Water + Carboindioxide . Hence [3] is corect

For the incorrect option:

Copper will not react with dilute aqueous sulfuric acid as it is highly unreactive

21 Which statement about the Periodic Table is correct?

- A Elements in the same group have the same number of electron shells.
- ✓ B It contains elements arranged in order of increasing proton number.
- C Metals are on the right and non-metals are on the left.
- D The most reactive elements are at the bottom of every group.

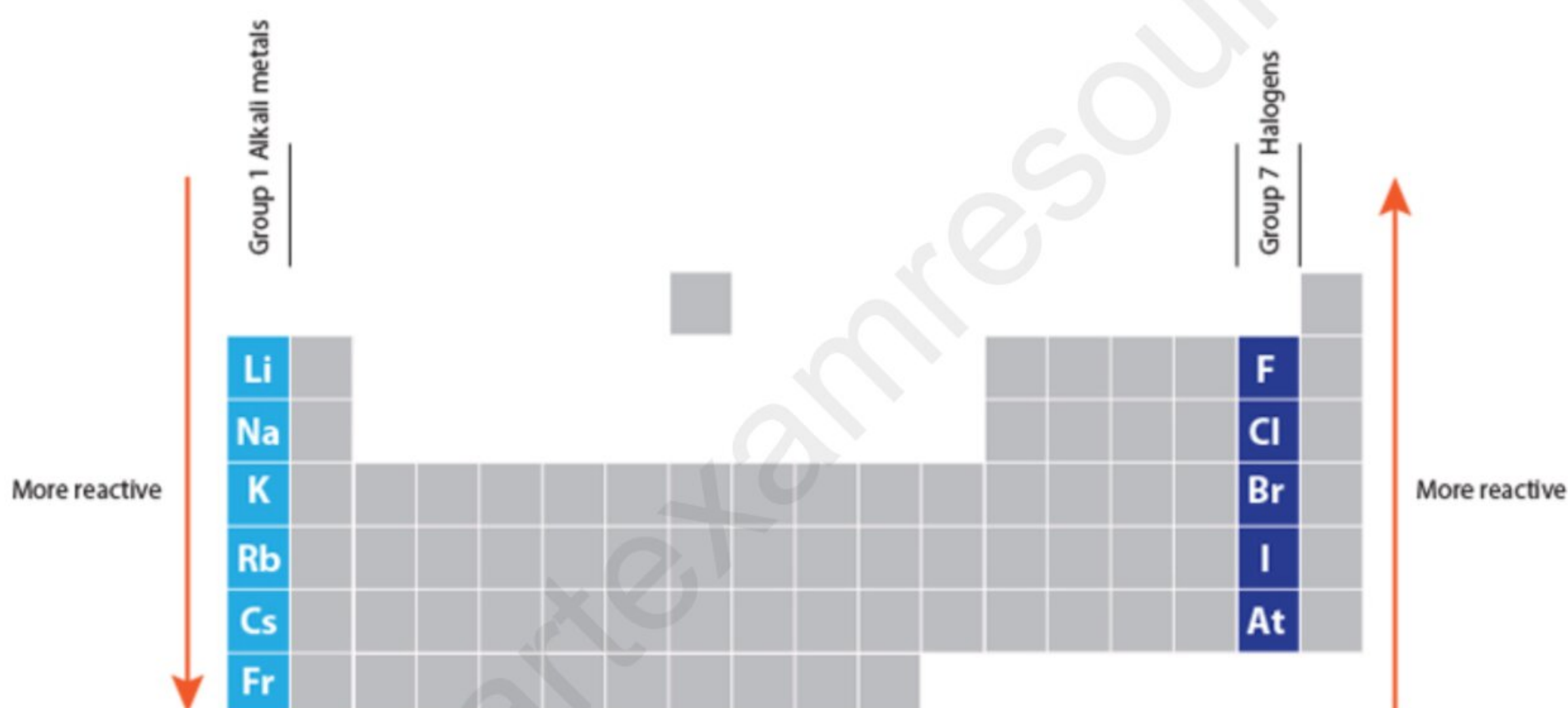
Reason: The elements in the periodic table are arranged in the increasing order of their atomic numbers.

For the wrong options:

A) Elements in the same group have the same number of valence electrons

C) Metals are to the left and non-metals to the right of the periodic table

D) The trends of reactivity vary from group to group. The following image will help you understand the reactivity pattern:

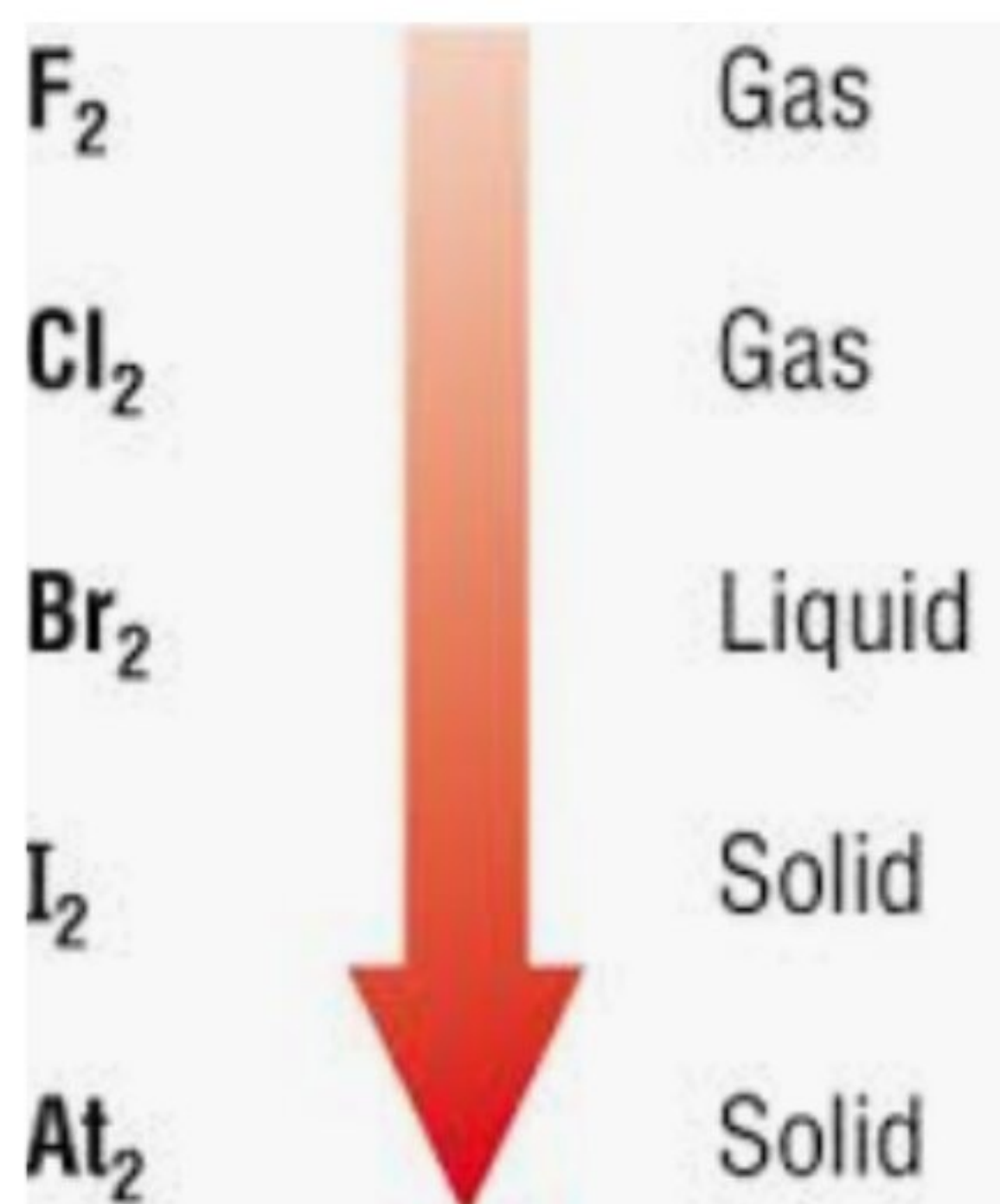


22 Chlorine, bromine and iodine are elements in Group VII of the Periodic Table.

Which statement about these elements is **not** correct?


- A The colour gets darker down the group.
- B The density increases down the group.
- C They are all gases at room temperature and pressure.
- D They are all non-metals.

Reason: The following chart tells you about the physical states of the group (VII) elements



F_2	Gas
Cl_2	Gas
Br_2	Liquid
I_2	Solid
At_2	Solid

23 Which row describes the properties of a transition element?

	property 1	property 2
A	forms colourless compounds	acts as a catalyst
B	forms colourless compounds	low electrical conductivity
 C	high density	acts as a catalyst
D	high density	low electrical conductivity

Reason: The basic properties of transition metal elements are:

- 1) They have high density**
- 2) They form coloured compounds**

24 Stainless steel is an alloy of iron, carbon and other metals.

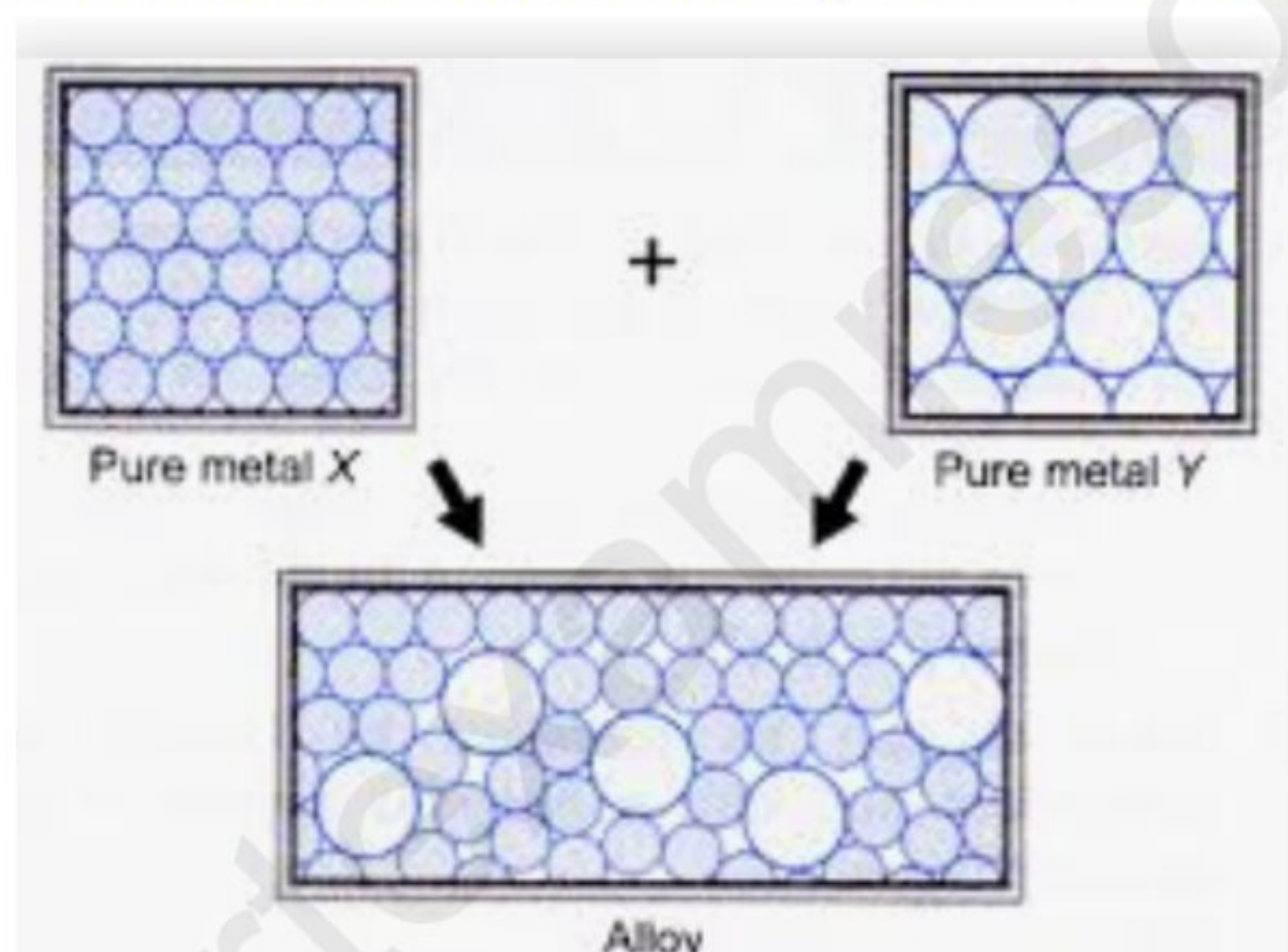
Which row is correct?

	stainless steel is harder than pure iron	stainless steel resists corrosion better than pure iron
<input checked="" type="checkbox"/> A	✓	✓
<input type="checkbox"/> B	✓	✗
<input type="checkbox"/> C	✗	✓
<input type="checkbox"/> D	✗	✗

Reason: Properties of alloys are as follows:

1) Steel is harder than pure iron of what it is made of because the different size of the atoms in the steel alloy prevent the easy sliding of the layers. In pure iron, all atoms are alike and hence they can slide past over each other and this makes the iron relatively soft compared to steel.

2) Stainless steel resists corrosion as they are low carbon steels



25 Metal X is more reactive than metal Y. Metal Y is more reactive than metal Z.

Which statement is correct?

- A When metal X is placed in a solution of Y sulfate, there is no reaction.
- B When metal X is placed in a solution of Z sulfate, a reaction occurs.
- C When metal Y is placed in a solution of Z sulfate, there is no reaction.
- D When metal Z is placed in a solution of X sulfate, a reaction occurs.

Reason: In a displacement reaction, a more reactive metal will displace the less reactive metals from its solution

26 Which statement about the industrial extraction of zinc is correct?

- A Cryolite is added to lower the melting point.
- B Molten zinc oxide is electrolysed.
- C Zinc oxide is heated with coke.
- D Zinc sulfide is heated with coke.

Reason: Coke is used as a reducing agent.

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27 Which row describes the use of an alloy and the property upon which the use depends?

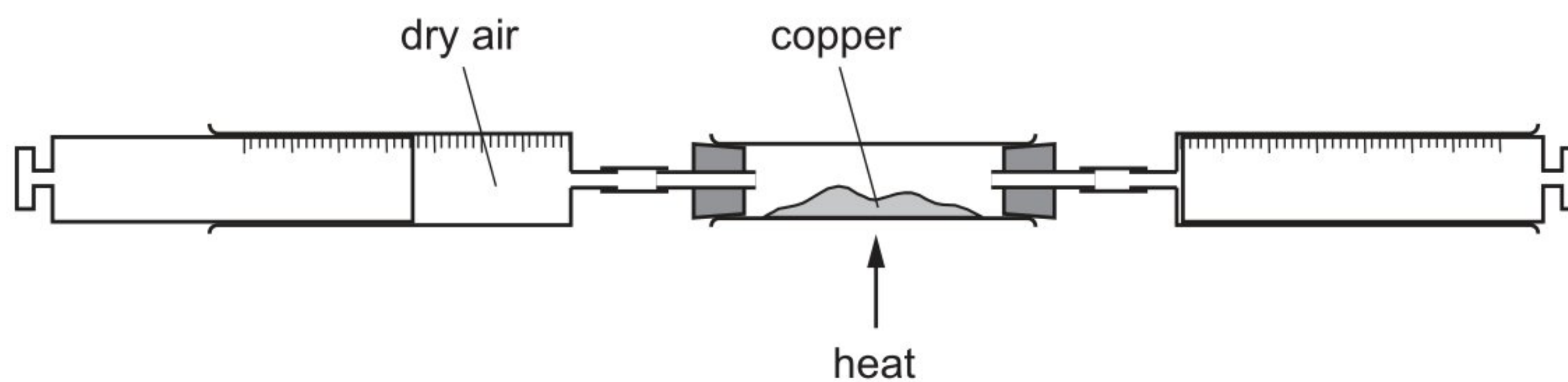
	alloy	use	property
A	mild steel	cutlery	resistant to corrosion
B ✓	mild steel	machinery	strong
C	stainless steel	cutlery	low density
D	stainless steel	machinery	good conductor of electricity

Reason: The above question can be answered if you have studied your concepts well. here is a complete list of alloys , uses and properties:

Alloys and their Uses

Alloy	Properties	Uses
Brass (Copper + Zinc)	Stronger than copper but still malleable	Musical instruments, ornaments
Bronze (Copper+ Tin)	Very hard	Some moving parts of machines, statues, bells
Stainless steel (Nickel + iron+ chromium)	Does not rust like iron	Car parts, cutlery, parts of chemical factories, surgical instruments
Mild steel (Iron+ Carbon)	Soft and malleable steel	Cars, fridges , white goods, construction
Nitinol	Nickel +titanium	Spectacle frames and dental braces

28 Dry air is passed over hot copper until all the oxygen has reacted.



The volume of gas at the end of the reaction is 120 cm^3 .

What is the starting volume of dry air?

- A 132 cm^3 152 cm^3 C 180 cm^3 D 570 cm^3

Knowing that air contains 21% oxygen and 78 % other gases.

Air contains 21 cm^3 oxygen. When all the oxygen has reacted the remaining air = 78 cm^3

Hence x % oxygen is present if the left over gases are 120 cm^3

Hence:

$$78x = 21 \times 120 = 32.30\text{ cm}^3$$

$$\text{So the starting volume of air} = 120\text{ cm}^3 + 32.30\text{ cm}^3 = 152.30\text{ cm}^3 = 150\text{ cm}^3$$

29 A steel bicycle which had been left outdoors for several months was starting to rust.

What would **not** reduce the rate of corrosion?

- A Remove the rust and paint the bicycle.
- B Remove the rust and store the bicycle in a dry shed.
- C Remove the rust and wipe the bicycle with a clean, damp cloth.
- D Remove the rust and wipe the bicycle with an oily cloth.

Reason: Two essential conditions for rusting are: oxygen and moisture. Wiping with a damp cloth and leaving it in open will provide all the essential conditions for rusting

30 Which statements about water are correct?

- 1 Household water contains dissolved salts.
- 2 Water for household use is filtered to remove soluble impurities.
- 3 Water is treated with chlorine to kill bacteria.
- 4 Water is used in industry for cooling.

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

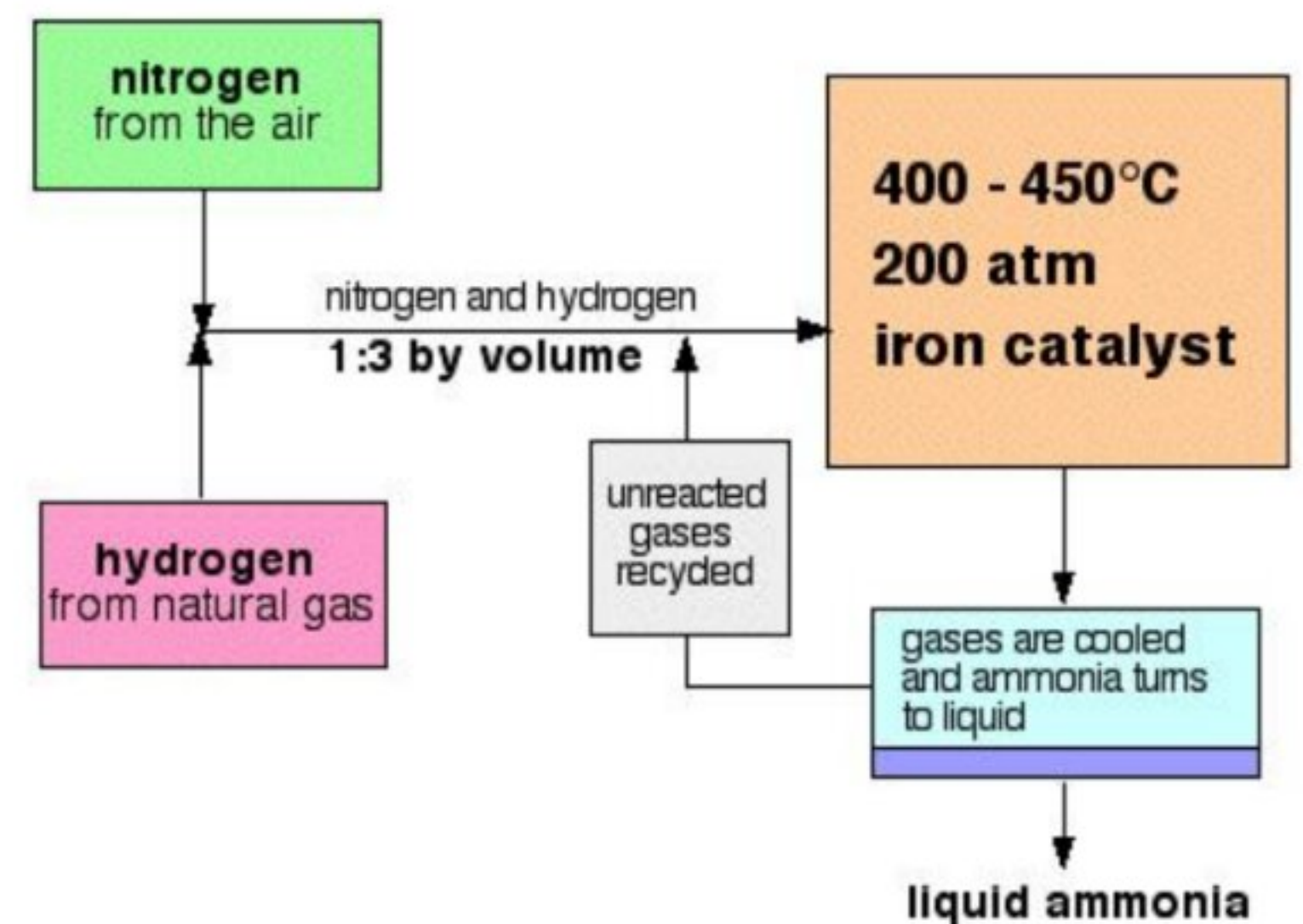
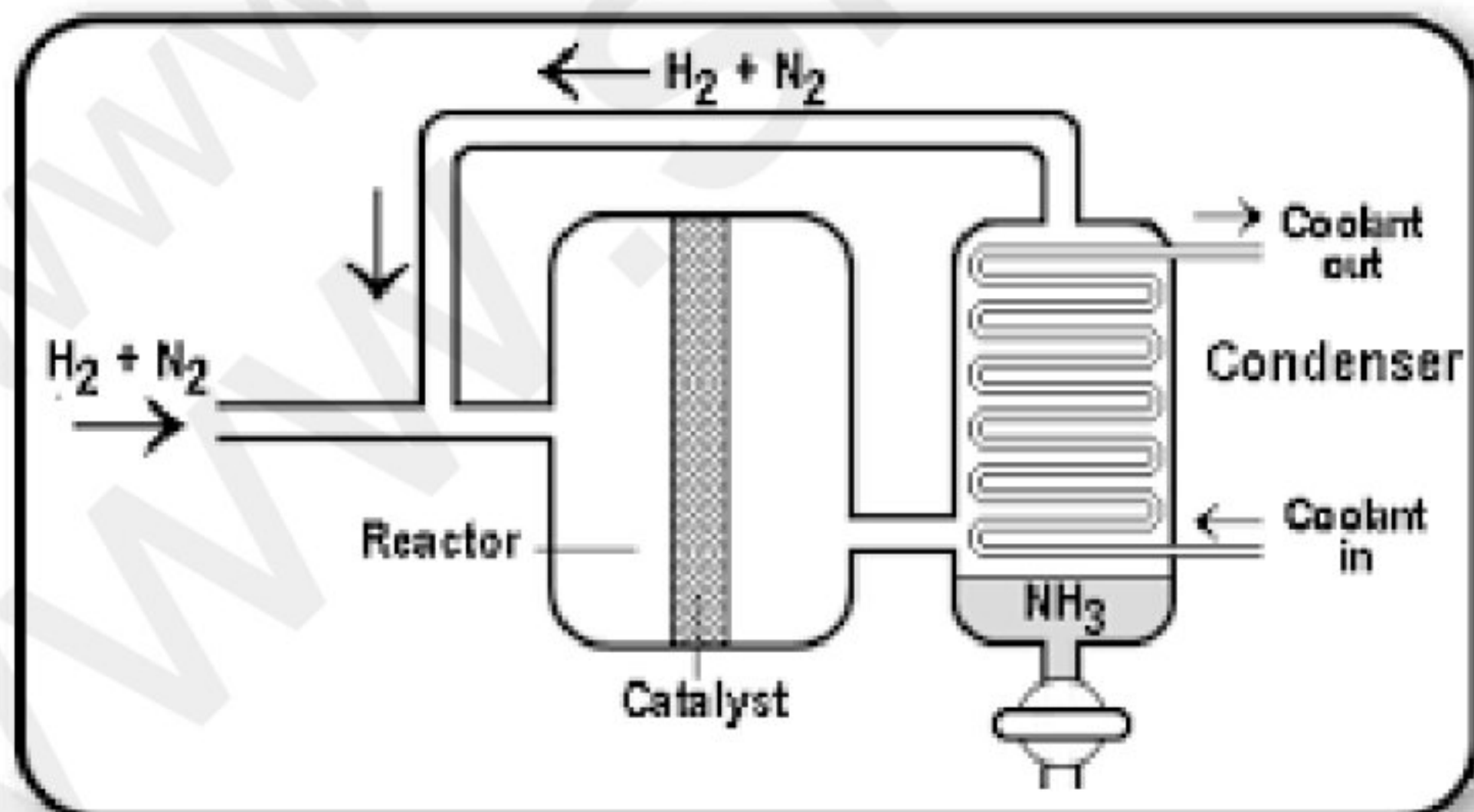
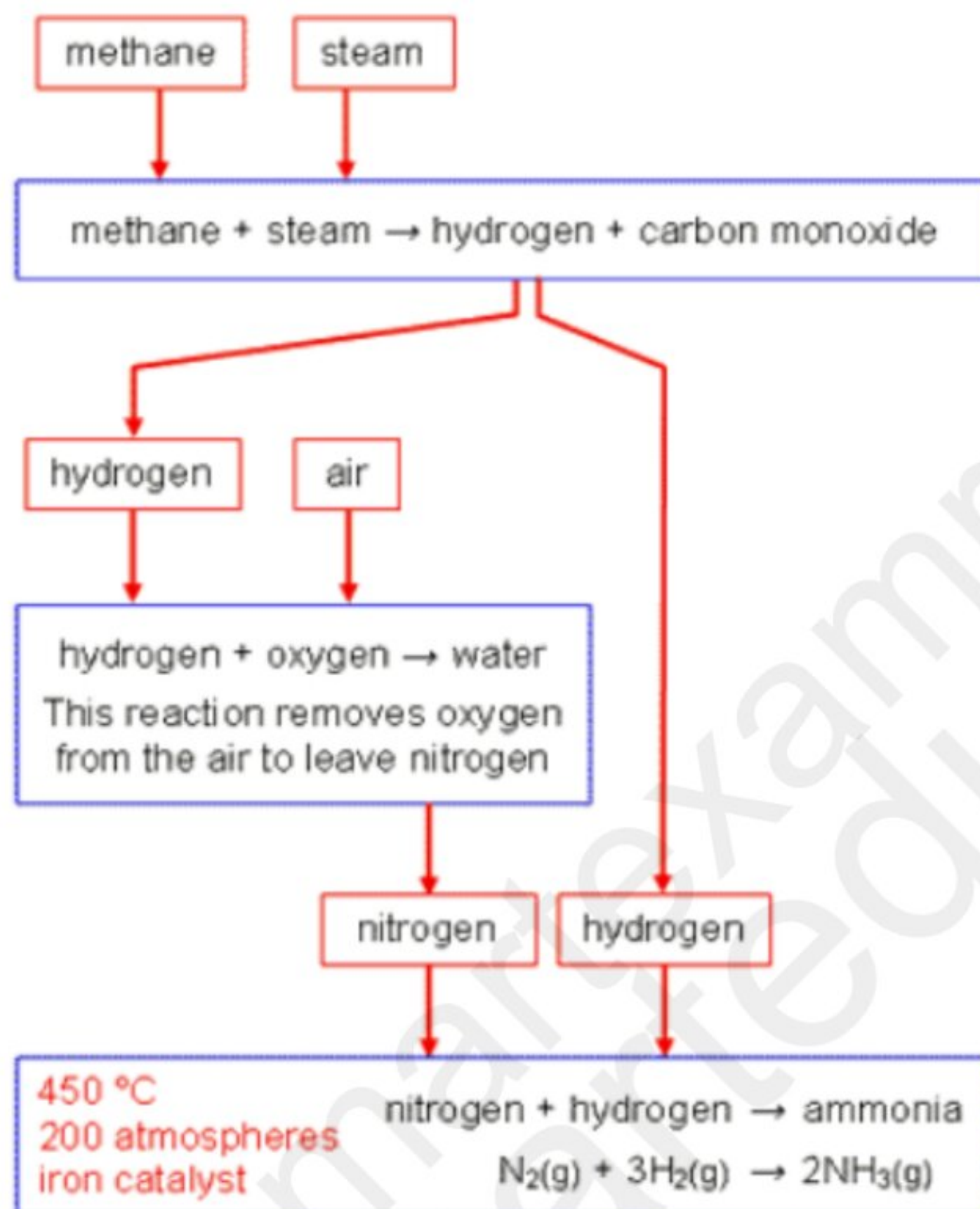
Reason: While all other uses of water are correct, option 2 is incorrect because filtration does not remove soluble impurities, filtration only removes insoluble impurities.

31 Ammonia is manufactured by reacting hydrogen with nitrogen in the Haber process.

Which row describes the sources of hydrogen and nitrogen and the conditions used in the manufacture of ammonia in the Haber process?

	source of hydrogen	source of nitrogen	temperature of reaction / °C	pressure of reaction / atm
A	air	natural gas	250	2
B	air	natural gas	250	200
C	natural gas	air	450	2
D ✓	natural gas	air	450	200

Reason: The following are the conditions used in Haber process.



32 Which statements about the carbon cycle are correct?

- 1 Carbon dioxide is added to the atmosphere by respiration.
- 2 Carbon dioxide is added to the atmosphere by combustion of coal.
- 3 Carbon dioxide is removed from the atmosphere by photosynthesis.

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

Reason: The knowledge of the concept of carbon cycle is essential. Here is an image to summarise the addition and removal of carbondioxide


REMOVAL OF CO₂ FROM THE ATMOSPHERE

- **PHOTOSYNTHESIS**: uses light energy to convert CO₂ into organic compounds in plants.

ADDITION OF CO₂ TO THE ATMOSPHERE

- **RESPIRATION**: converts carbohydrates to CO₂ **with the release of energy.**
- **DEATH AND DECAY**: provide plant and animal material for decomposers – bacteria and fungi.
- **COMBUSTION**: releases CO₂ by the burning of fossil fuels.

33 Which row describes the uses of sulfur and sulfur dioxide?

	sulfur	sulfur dioxide
A	extraction of aluminium	food preservative
B	extraction of aluminium	water treatment
 C	manufacture of sulfuric acid	food preservative
D	manufacture of sulfuric acid	water treatment

Reason: These are the basic uses of sulfur and sulfur dioxide

Sulfur

Sulfur: Yellow- non metallic element

Sources of sulfur:

- volcanoes
- natural gas
- metal sulfides
- petroleum
- Mined in USA, Texas, Louisiana, Japan ,Mexico, Ethiopia, Australia, Sicily and Poland.

Use of sulfur:

- 90 % of sulfur is used in the manufacture of sulfuric acid.
- Remaining is used to make rubber tyres more flexible.

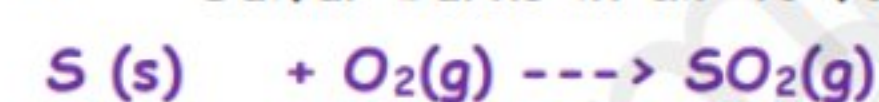
Sulfur dioxide

Sulfur dioxide:

- It is a colourless , poisonous gas.

Sources of Sulfur dioxide:

- Volcanoes
- Burning of fossil fuels
- Sulfur burns in air to form sulfur dioxide



- Roasting the ore galena (ZnS) produces SO_2



Uses of sulfur dioxide :

- It is used in the manufacture of sulfuric acid.
- It is used in the manufacture of paper from wood pulp
- It is used in bleaching materials like silk, wool and straw because chlorine is a strong bleach and destroys the fibres.
- It is used as a food , fruit and wine preservative by killing bacteria(microbes/ fungi).

[SO_2 cannot be directly assed. So compounds like sulfites are added. These sulfites decompose in acidic conditions to form sulfur dioxide.

34 Limestone is used in many industrial processes.

In which process is it **not** used?

- A manufacture of alkenes
- B manufacture of cement
- C manufacture of iron
- D manufacture of lime

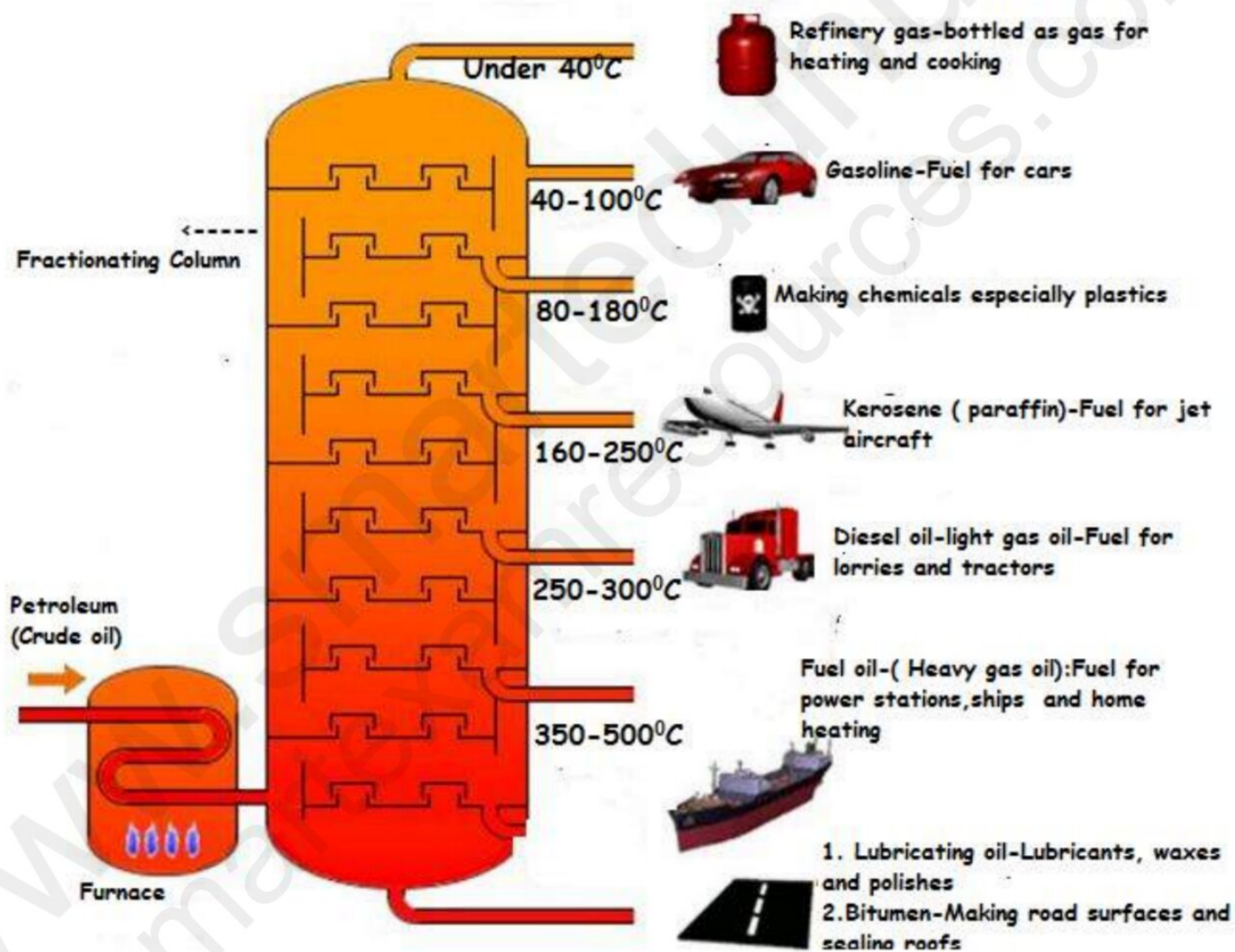
Reason: Alkenes are manufactured by cracking of large chained alkanes

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35 What is **not** the correct use of the fraction named?

	name of fraction	use
✓	fuel oil	making waxes
B	gas oil	fuel in diesel engines
C	kerosene	jet fuel
D	naphtha	making chemicals

Method of fractional distillation:



36 Which statement about alkenes is **not** correct?

- A They decolourise aqueous bromine.
- B They only contain the elements carbon and hydrogen.
- C They react with hydrogen to form alkanes.
-  They react with steam to produce carboxylic acids.

Reason: Alkenes+ steam ---> Alcohol.....Hydration reaction

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37 Which substances can be obtained by cracking hydrocarbons?

- A ethanol and ethene
- B ethanol and hydrogen
- C ethene and hydrogen
- D ethene and poly(ethene)

Reason:

Cracking of hydrocarbons produces small molecules. The most common products are smaller chained alkanes, alkene and hydrogen.

Note that:

poly(ethene) is a macromolecule which is obtained through polymerisation and not cracking.

38 Two processes used for the large-scale production of ethanol are shown.

- process 1 A compound containing carbon, hydrogen and oxygen is used to produce ethanol.
- process 2 A compound containing carbon and hydrogen only is used to produce ethanol.

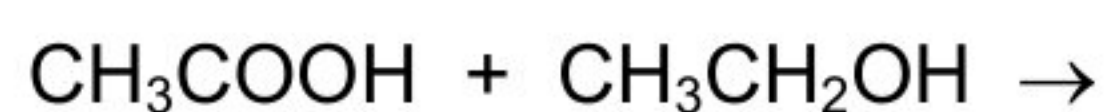
Which statement is correct?

- A Process 1 uses a renewable starting material.
- B Process 1 is done at a very high temperature.
- C Process 2 involves fermentation.
- D Process 2 is done at room temperature.

Reason:

Ethanol is produced on a large scale using sugar cane which is renewable as sugarcane can be re grown.

39 What is the name of the organic product of the reaction shown?



- A ethyl ethanoate
- B ethyl methanoate
- C methyl ethanoate
- D methyl propanoate

Note: Acid + Alcohol -----> Ester

Hence: Ethanoic acid + Ethyl alcohol -----> Ethyl ethanoate + Water

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40 Which two compounds react together to form a condensation polymer?

- A $\text{HOCH}_2\text{CH}_2\text{OH}$ and CH_3COOH
- B $\text{HOCH}_2\text{CH}_2\text{OH}$ and CH_3NH_2
- C $\text{HOCH}_2\text{CH}_2\text{OH}$ and $\text{H}_2\text{NCH}_2\text{CH}_2\text{NH}_2$
- D $\text{HOCH}_2\text{CH}_2\text{OH}$ and $\text{HOOCCH}_2\text{CH}_2\text{COOH}$

Reason: Option D: Acid + Alcohol ----> Ester. When an ester is formed, a water molecule is lost and hence this reaction is termed as a condensation reaction

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The Periodic Table of Elements

		Group																																	
I	II	III	IV	V	VI	VII	VIII						VIII																						
		1 H hydrogen 1											2 He helium 4																						
3 Li lithium 7	4 Be beryllium 9	<table border="1"> <thead> <tr> <th colspan="2">Key</th> </tr> <tr> <th>atomic number</th> <th>atomic symbol name relative atomic mass</th> </tr> </thead> <tbody> <tr> <td>5 B boron 11</td> <td>6 C carbon 12</td> </tr> <tr> <td>13 Al aluminium 27</td> <td>14 Si silicon 28</td> </tr> <tr> <td>31 Ga gallium 70</td> <td>32 Ge germanium 73</td> </tr> <tr> <td>49 In indium 115</td> <td>50 Sn tin 119</td> </tr> <tr> <td>81 Tl thallium 204</td> <td>82 Pb lead 207</td> </tr> <tr> <td>112 Cn copernicium —</td> <td>114 Fl flerovium —</td> </tr> </tbody> </table>											Key		atomic number	atomic symbol name relative atomic mass	5 B boron 11	6 C carbon 12	13 Al aluminium 27	14 Si silicon 28	31 Ga gallium 70	32 Ge germanium 73	49 In indium 115	50 Sn tin 119	81 Tl thallium 204	82 Pb lead 207	112 Cn copernicium —	114 Fl flerovium —	10 Ne neon 20						
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11 Na sodium 23	12 Mg magnesium 24	13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40	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	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	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	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	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	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	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 —	113 Nh nihonium —	114 Fl flerovium —	115 Mc moscovium —	116 Lv livermorium —	117 Ts tennessine —	118 Og oganesson —																		

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.).