Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/21**

Paper 2 Multiple Choice (Extended) **May/June 2017**

45 minutes

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

* 8 8 8 9 8 4 4 0

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.

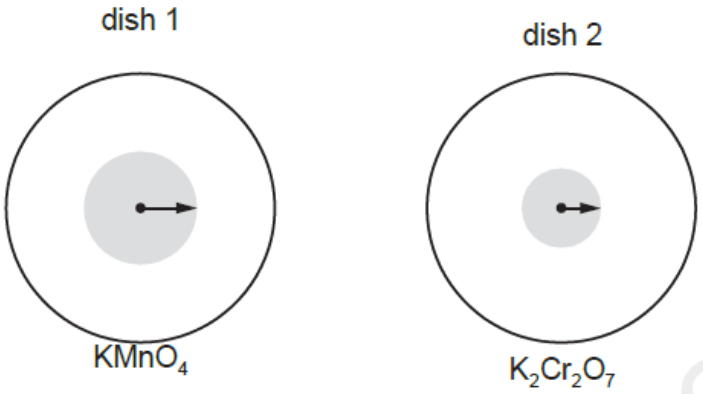
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
A copy of the Periodic Table is printed on page 16.
Electronic calculators may be used.

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 **16** printed pages.

1 Small crystals of purple $KMnO_4$ (M_r = 158) and orange $K_2Cr_2O_7$ (M_r = 294) were placed at the centres of separate petri dishes filled with agar jelly. They were left to stand under the same physical conditions.

After some time, the colour of each substance had spread out as shown.



The lengths of the arrows indicate the relative distances travelled by particles of each substance.

Which statement is correct?

A Diffusion is faster in dish 1 because the mass of the particles is greater.

B Diffusion is faster in dish 2 because the mass of the particles is greater.

C Diffusion is slower in dish 1 because the mass of the particles is smaller.

D Diffusion is slower in dish 2 because the mass of the particles is greater.

Reason:
The rate of diffusion depends upon the mass of the particles. Heavier particles diffuse slower compared to lighter particles.

2 Pure water has a boiling point of 100 °C and a freezing point of 0 °C.

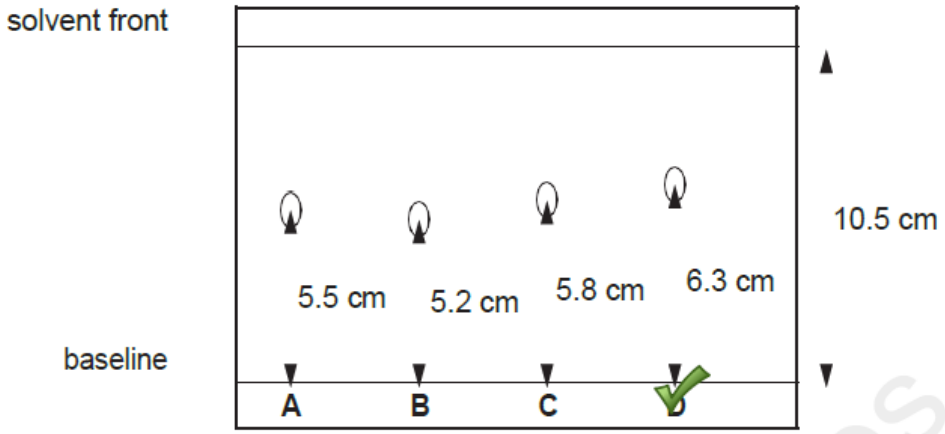
What is the boiling point and freezing point of a sample of aqueous sodium chloride?

	boiling point / °C	freezing point / °C
A	98	–2
B	98	2
C ✓	102	–2
D	102	2

Reason:
Aqueous soldium chloride is impure water , where sodium chloride is the impurity. Pure substances show a sharp melting and a boiling point. Addition of impurities lowers the melting point (or the freezing point) and raises the boiling water. Hence the freezing point of water gors from 0^0C to -2^0C and the boiling point increases from 100^0C to 102^0C

3 A chromatogram obtained from the chromatography of four substances is shown.

Which substance has an R_f value of 0.6?



R_f value = (Distance travelled by the solute) / (Distance betwen base line and the solvent front)
Calculating R_f value using the ablove formula we get the R_f value for D as 6.3/10.5= 0.6

4 Sodium reacts with chlorine to form sodium chloride.

Which statements describe what happens to the sodium atoms in this reaction?

1 Sodium atoms form positive ions.

2 Sodium atoms form negative ions.

3 Sodium atoms gain electrons.

4 Sodium atoms lose electrons.

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

Sodium chloride is an ionic compound. Sodium atom loses one electron and the chlorine atom accepts one electron. Hence sodium atom becomes an anion and chlorine atom becomes a negatively charged chloride ion (a cation)

5 Diamond is extremely hard and does not conduct electricity.

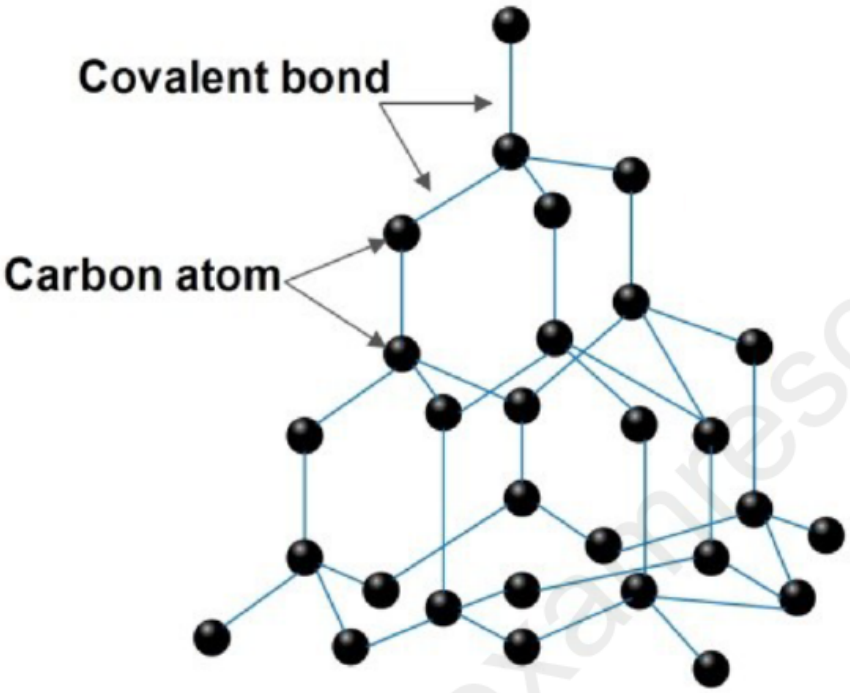
Which statement explains these properties?

A It has a lattice of positive carbon ions in a 'sea of electrons'.

B It has delocalised electrons and each carbon atom forms three covalent bonds with other carbon atoms.

✔ **C** It has no delocalised electrons and each carbon atom forms four covalent bonds with other carbon atoms.

D It has strong ionic bonds between each carbon atom.



In carbon, each carbon is bonded to 4 other carbon atom and no electrons are set free. Hence there are no delocalised electrons and as a result diamond does not conduct electricity

6 Which statement about metals is **not** correct?

A Metals are malleable because the metal ions can slide over one another.

B Metals conduct electricity because electrons can move through the lattice.

C Metals consist of a giant lattice of metal ions in a 'sea of electrons'.

✔ **D** Metals have high melting points because of the strong attraction between the metal ions.

Metallic bonding exists between the positive metal cations and the negatively charged anions. This electrostatic force of attraction is very strong and hence the ionic compounds have a high melting point

7 Aluminium reacts with fluorine.

$$x\mathit{Al}\,(s) + y\,F_2(g) \rightarrow z\mathit{Al}\,F_3(s)$$

Which values of *x*, *y* and *z* balance the equation?

	x	*y*	*z*
A	1	2	1
B	2	3	2
C	3	2	3
D	4	3	4

This requires the knowledge of balancing equation. An effort to explain the balancing will further complicate matters....so i suggest watching a video is a better alternative

8 Carbon monoxide burns in oxygen to produce carbon dioxide.

$$2CO(g) + O_2(g) \rightarrow 2CO_2(g)$$

Which mass of carbon dioxide is produced from 14 g of carbon monoxide?

A 22 g **B** 28 g **C** 44 g **D** 88 g

2 moles of CO produces 1 mole of carbon dioxide

This means (12+ 16=28g) of CO produces (12+ 2(16)=44 g CO_2 ideally

so:

	CO		**CO_2**
Ideally	**28**	**:**	**44**
Experimentally	**14**	**:**	**x**

Hence

$$28x = 14(44)$$

$$x = \frac{14(44)}{28}$$

x= 22

9 Which statement about electrolysis is correct?

A Electrons move through the electrolyte from the cathode to the anode.

B Electrons move towards the cathode in the external circuit.

C Negative ions move towards the anode in the external circuit.

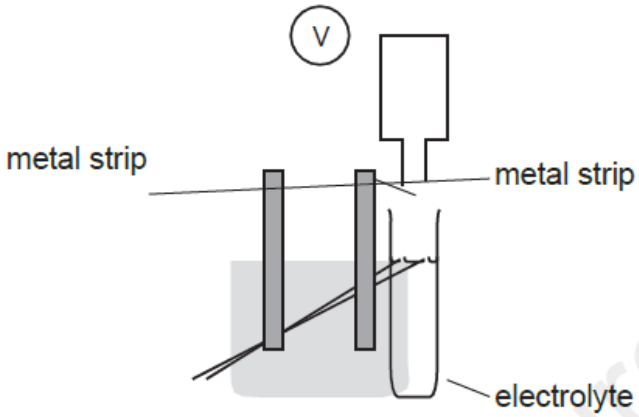
D Positive ions move through the electrolyte towards the anode during electrolysis.

Reason: It is a fact that electrons move in the external circuit from the anode to the cathode and the ions move in the elctrolyte.

10 The reactivity series for a number of different metals is shown.

most reactive →					least reactive
magnesium	zinc	iron	copper	silver	platinum

The diagram shows different metal strips dipped into an electrolyte.



Which pair of metals produces the highest voltage?

A copper and magnesium

B magnesium and platinum

C magnesium and zinc

D silver and platinum

Magnesium and platinum are the furthest apart in the reactivity series. Hence as a rule they will create the highest voltage.
Thus the further apart the metals electrodes are in the reactivity series, the greater will be the voltage produced by them.

11 Some properties of four fuels are shown in the table.

Which fuel is a gas at room temperature and makes two products when it burns in a plentiful supply of air?

	fuel	formula	melting point / °C	boiling point / °C
A	hydrogen	H_2	–259	–253
B	methane	CH_4	–182	–164
C	octane	C_8H_{18}	–57	126
D	wax	$C_{31}H_{64}$	60	400

Reason:
Although hydrogen is also a gas, it only produces one product an dthat is water along with the release of heat energy

Also Only the hydrocarbons that have upto 4 carbon atoms are gases at room temperature. Hence Octane and Wax are not gases at room temperature.

Thus methane is the only obvious choice

12 Which statements about exothermic and endothermic reactions are correct?

1 During an exothermic reaction, heat is given out.

2 The temperature of an endothermic reaction goes up because heat is taken in.

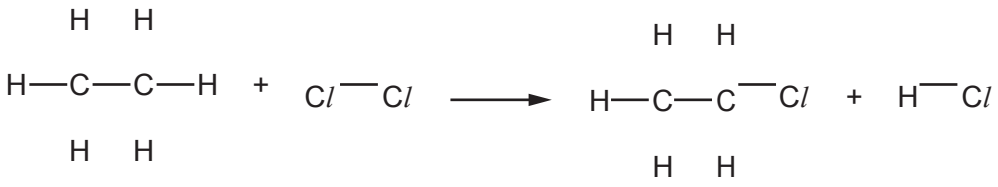
3 Burning methane in the air is an exothermic reaction.

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

Reason:
1. An exothermic reaction releases heat to the surroundings. Hence option 1 is correct.
3. Methane is a fuel and thus is burnt to release heat energy. So this reaction is also an exothermic reaction

2 is wrong because when endothermic reactions take in the heat energy from the surroundings, the temperature decreases

13 Chlorine reacts with ethane to produce chloroethane and hydrogen chloride.



The reaction is exothermic.

The bond energies are shown in the table.

bond	bond energy in kJ / mol
C–C*l*	+340
C–C	+350
C–H	+410
C*l* –C*l*	+240
H–C*l*	+430

What is the energy change for the reaction?

A –1420 kJ / mol

B –120 kJ /mol ✔

C +120 kJ / mol

D +1420 kJ / mol

Note: Endothermic =+ve
Exothermic = -ve

Energy Input:
1) 1 C-C bond = +350
2) 1 Cl-Cl Bond = +240
3) 6 C-H bonds = +(410) x 6= + 2460
ToTal energy input: +3050

Energy Output:
1) 1 C-C bond = -350
2) 1 Cl-Cl Bond = -0
3) 5 C-H bons = +(410) x 5= -2050
4) 1 C-Cl bond = -340
5) 1 H-Cl bond = -430
ToTal energy input: -3170

Hence energy difference = +3050-3170=-120 kJ/mol

14 When sulfur is heated it undergoes a .....1.....change as it melts.

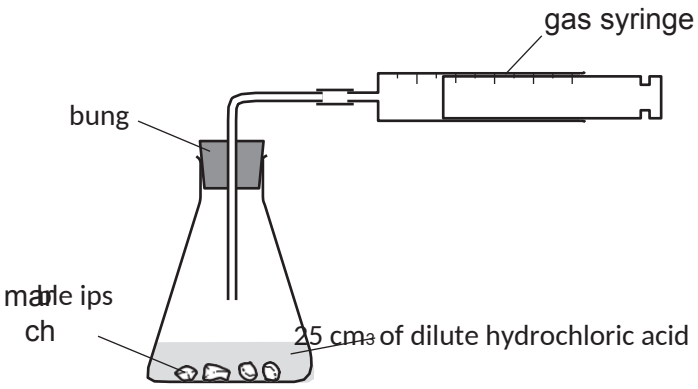
Further heating causes the sulfur to undergo a .....2.....change and form sulfur dioxide.

Which words complete gaps 1 and 2?

	1	2
A	chemical	chemical
B	chemical	physical
✔	physical	chemical
D	physical	physical

Reason:
When sulfur melts, only a state change is involved, without any change in the chemical nature of the substance.
But when sulfur changes to sulfurdioxide, a completely new substance is formed .The chemical properties of sulfurdioxide are different from those of sulfur. Thus it is an example of a chemcial change

15 A student was investigating the reaction between marble chips and dilute hydrochloric acid.



Which changes slow down the rate of reaction?

	temperature of acid	concentration of acid	surface area of marble chips
✓ A	decrease	decrease	decrease
B	decrease	decrease	increase
C	increase	decrease	decrease
D	increase	increase	increase

Reason:
Low temperature means: Less collision amongst reactants and hence less chances of cuccessful collision. Hence the rate of reaction slows down.
[Note: Not all collisions of the reactants lead to the formation of a product. SO when we use the word successful collision,all we mean to say is that the collision resulted in the formation of a product]

Decrease in the concentration of acid:
When acid concentration decreases, it means the concentration of hydeogen ions also decreases. Hence less hydrogen ions are available for a successful collision to take place.Hence the rate of reaction slows down.

Decrease in the surface area of the marble chips:
When the surface area decreases, less particles of the marble chips are available for collision. Hence the rate of reaction slows down.

16 Nitrogen, hydrogen and ammonia gases are placed inside a container. The container is then sealed. After some time, an equilibrium forms.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

Which statement describes the equilibrium in this container?

A The amount of ammonia remains constant from the moment the container is sealed.

B The amounts of ammonia, nitrogen and hydrogen in the container are always equal.

C The rate of formation of ammonia is equal to the rate of decomposition of ammonia.

D The rate of formation of ammonia is faster than the rate of decomposition of ammonia.

Equiliberium is reached when:
The rate of the forward reaction = the rate of the backward reaction
So the breaking down of ammonia = backward reaction and the formation of ammonia is a forward reaction

17 An example of a redox reaction is shown.

$$Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$$

Which statement about the reaction is correct?

A Zn is the oxidising agent and it oxidises Cu^{2+}.

B Zn is the oxidising agent and it reduces Cu^{2+}.

C Zn is the reducing agent and it oxidises Cu^{2+}.

✔ **D** Zn is the reducing agent and it reduces Cu^{2+}.

Reason:
Zinc gets oxidised as its oxidation number has increased from 0 to +2. Always when a substance gets oxidised, it reduces another compound and so the compound that gets oxidised acys as a reducing agent and vice-versa.
Copper has got reduced because iots oxidation number has reduced from being +2 to 0

Note: All uncombined elements have an oxidation state of "ZERO"

Note: Cu^{2+} means copper is a positive ion with a chanrge of +2 and is a part of some compound. This means we know the positive ion is Cu^{2+} but have noclues anout the negative ion. Similar holds good for zinc.

18 Zinc oxide is amphoteric.

Which row describes the reactions of zinc oxide?

	reaction with hydrochloric acid	reaction with aqueous sodium hydroxide
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = reaction occurs

✗ = reaction does not occur

Reason: Definition of an amphoteric oxide is an oxide that reacts with both; an acid as well a base

19 Which row shows how the hydrogen ion concentration and pH of ethanoic acid compare to those of hydrochloric acid of the same concentration?

	ethanoic acid compared to hydrochloric acid	
	hydrogen ion concentration	pH
A	higher	higher
B	higher	lower
C ✓	lower	higher
D	lower	lower

Reason:
The hydrogen ion concentration is a measure of the pH of the acid. So an acid with less concentration of hydrogen ions will have a high pH and will be a dilute acid.

Note:

Strong acids=Acids that completely ionise in water
Weak acids= Acids that partially ionise in water
Dilute acid= Acids having low concentration of hydrogen ions
Concentrated acids=Acids having high concentration of hydrogen ions

20 A pure sample of the insoluble salt barium carbonate can be made using the method given.

step 1 Dissolve barium chloride in water.

step 2 Separately dissolve sodium carbonate in water.

step 3 Mix the two solutions together.

step 4 Filter the mixture.

step 5

step 6 Dry the residue between two sheets of filter paper.

Which instruction is missing from step 5?

A Heat the residue to dryness.

B Heat the residue to the point of crystallisation.

C Place the filtrate in an evaporating basin.

✔ **D** Wash the residue with water.

Reason:
You have been asked to make a pure sample of insoluble barium carbonate.
So, to make the salt; which is insoluble barium carbonate completely pure, the residue(insoluble barium carbonate) can be washed quickly with water, as the inpurities will dissolve in water leaving the salt in the pure form.

21 Substance X reacts with warm dilute hydrochloric acid to produce a gas which decolourises acidified aqueous potassium manganate(VII).

Substance X gives a yellow flame in a flame test.

What is X?

A potassium chloride

B potassium sulfite

C sodium chloride

✔ **D** sodium sulfite

Reason:
Flame test indicates the the presence of a metal cation. A yellow colour of the flame test indicates presence of sodium metal

How do we know its the sulfite ion and not chloride ion?

Well look at the following instructions which are infact the steps for identifying the presence of sulfite ions

- Add dilute hydrochloric acid.
- Test the gas given off for sulphur dioxide by passing through pink acidified potassium manganate solution which turns colourless.

In our question, we have been clearly told that the gas given off decolourises acidified potassium manganate(VII). This means the gas given off was SO_2 and this proves the presence of sulfite ions

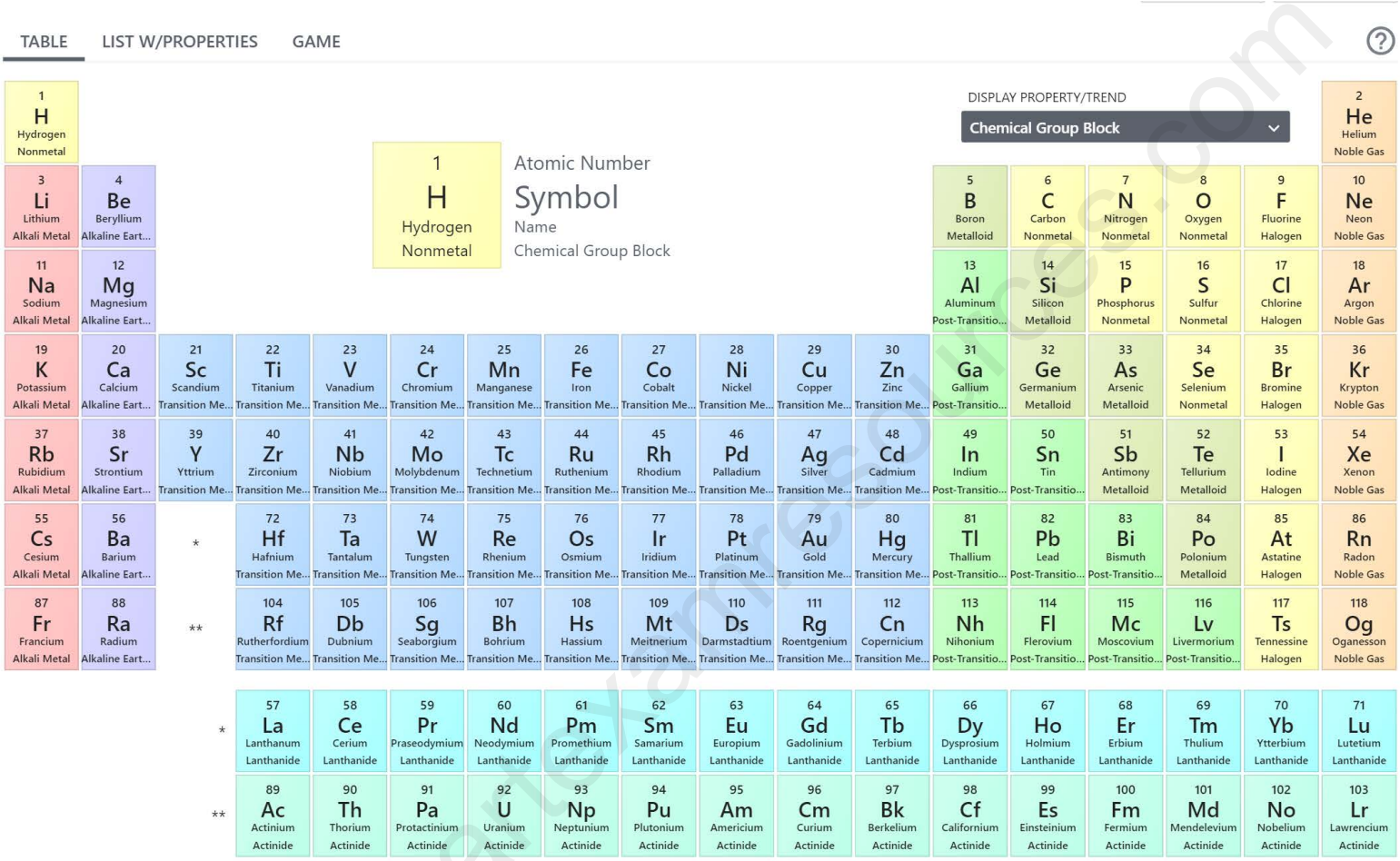
22 Which element is less reactive than the other members of its group in the Periodic Table?

A astatine

B caesium

C fluorine

D rubidium



Reason:

1)Rubidium and Cesium are in group 1 of the periodic table. The reactivity of group 1 elements increases down the group. So of Rb and Cs, Rb is less reactive, but yet these two are highly reactive compared to other elements otheir group.
Outside the laboratory, Francium is very rare to be found. In trace amounts, it is found in uranium and thorium ores as Fr-223, which continually forms and decays

2)Fluorine is at the top of the periodic table and it is highly reactivity as compared to other elements of its own group.

3) Astatine is in the group 5 of the periodic table . Group 5 is also called the Nitrogen family of elements. The reactivity of the elements decreases down the group. Hence As has very less reactivity.

23 The elements in Group IV of the Periodic Table are shown.

carbon

silicon

germanium

tin

lead

flerovium

What does **not** occur in Group IV as it is descended?

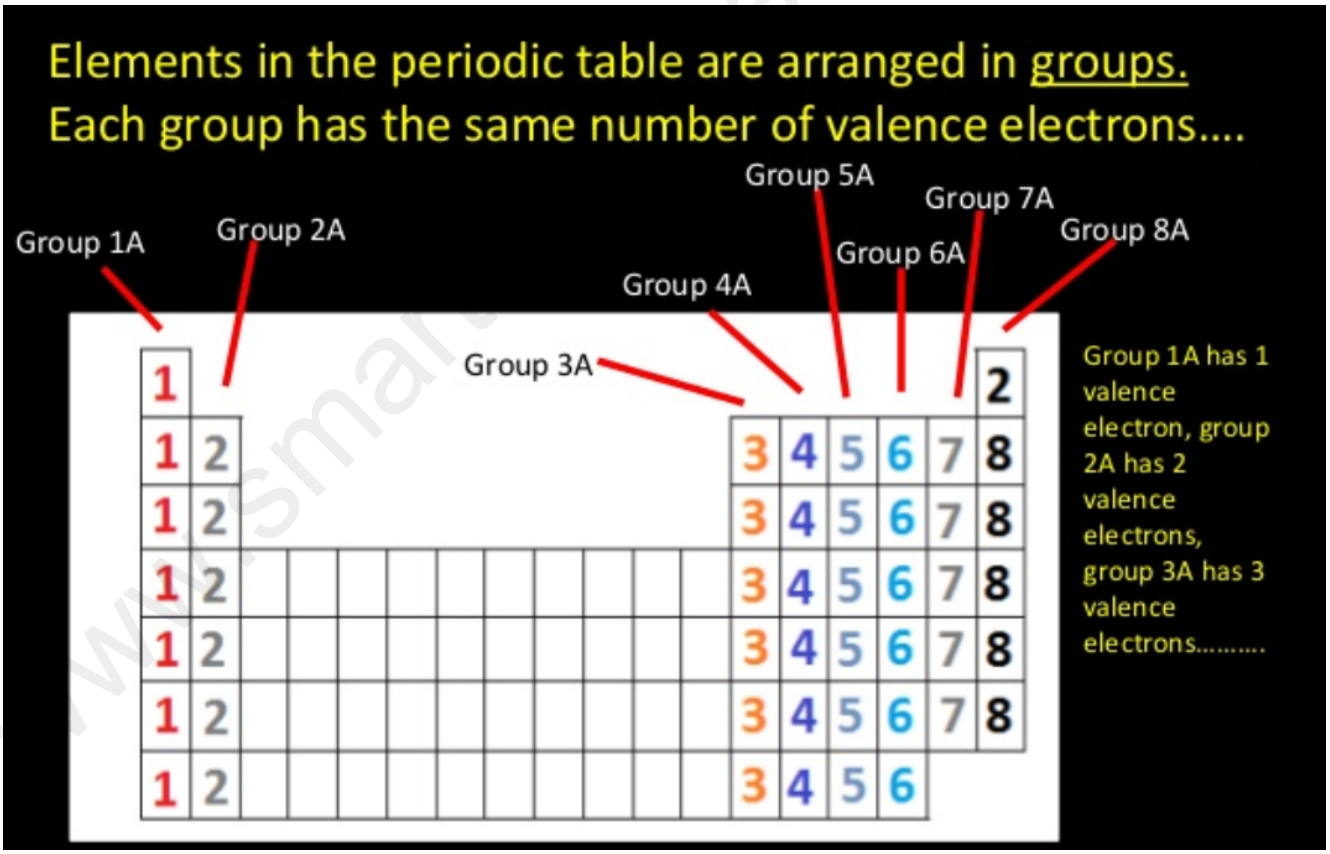
A The proton number of the elements increases.

B The elements become more metallic.

C The elements have more electrons in their outer shells.

D The elements have more electron shells.

Electronic configuration of elements in the periodic table



All group 4 elements ahve only 4 electrons in their outermost shell. Rather it is not true for any of the groups of the periodic table shown in the diagram!

24 Why are weather balloons sometimes filled with helium rather than hydrogen?

A Helium is found in air.

B Helium is less dense than hydrogen.

C Helium is more dense than hydrogen.

✔ Helium is unreactive.

Hydrogen	Helium
LIGHT in mass	LIGHT in mass
DANGER (may lead explosion)	SAFE (chemically stable)
NOT recommended to use	USE : to fill airship or balloons

Reason: As shown above since helium gas is chemically stable and is an inert gas and does not catch fire when in contact with fire as again hydrogen that can lead to an explosion and is hence not considered safe to be used in ablloons.

25 Metal X is added to a colourless aqueous solution of the sulfate of metal Y.

A coloured solution is formed and metal Y is deposited at the bottom of the beaker.

Which row describes elements X and Y and their relative reactivity?

	type of element	relative reactivity
✓	X is a transition element	X is more reactive than Y
B	X is a transition element	Y is more reactive than X
C	Y is a transition element	X is more reactive than Y
D	Y is a transition element	Y is more reactive than X

Reason:
X + YSulfate -----> Y + XSulfate..... This is X is morea reactive than Y

X is considered to be a transition element because it forms a coloured solution when it reacts with the salt solution of metal Y. It is the basic property of transition metal elements to form coloured compounds

26 Element E:

- forms an alloy
- has a basic oxide
- is below hydrogen in the reactivity series.

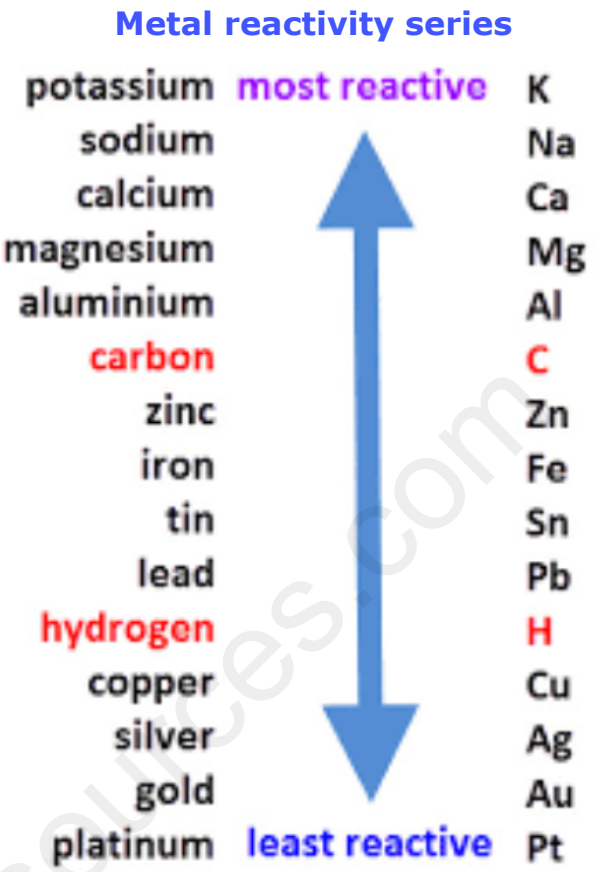
What is E?

A carbon

B copper

C sulfur

D zinc



Reason:

Copper forms an alloy. Example:

Alloy	Composition	Properties	Uses
Bronze	• 90% copper • 10% tin	• Hard and strong • Doesn't corrode easily • Has shiny surface	• To build statues and monuments. • In the making of medals, swords and artistic materials.
Brass	• 70% copper • 30% zinc	• Harder than copper	• In the making of musical instruments and kitchenware.
Steel	• 99% iron • 1% carbon	• Hard and strong	• In the construction of building and bridges. • In the building of the body of cars and railway tracks.
Stainless steel	• 74% iron • 8% carbon • 18% chromium	• Shiny • Strong • Doesn't rust	• To make cutlery and surgical instruments.
Duralumin	• 93% aluminum • 3% copper • 3% magnesium • 1% manganese	• Light • Strong	• To make the body of aeroplanes and bullet trains.
Pewter	• 96% tin • 3% copper • 1% antimony	• Luster • Shiny • Strong	• In the making of souvenirs.

Copper is a metal. Metallic oxides are basic in nature. Hence CuO is a basic oxide.

27 Zinc metal is extracted from its ore zinc blende in a similar method to that used to extract iron from hematite.

In which way is zinc extraction different from iron extraction?

A Carbon and carbon monoxide are the main reducing agents.

B Hot air at the base of the furnace reacts with coke to keep the furnace hot.

✔ **C** The metal is removed as a vapour at the top of the furnace.

D The metal oxide is added into the top of the furnace.

Reason:

Zinc is removed as a vapour at the top os the furnace because the temperature in the furname is 1673K. This is way above the boiling point of zinc which is 1180K.Hence zinc immediately vapourises and move to the upper parts of the furnace where it is condensed and removed.

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

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

A cutlery

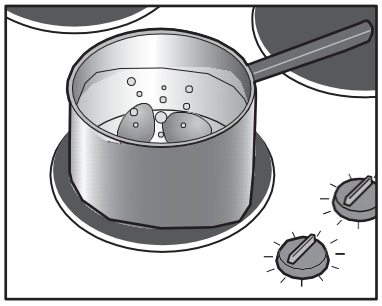
B pipes in a chemical factory

C railway lines

D saucepans

Reason; The above question can be answered if you have learnt by heart the uses of stainless steel.

29 The diagram shows some uses of water in the home.



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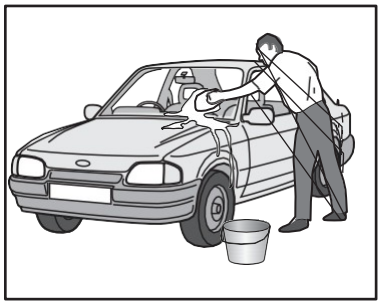

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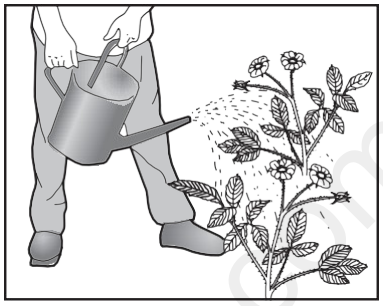

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For which uses is it important for the water to have been treated?

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

Reason:
In diagram 1, the water is used for consumption by humans. Hence it must be treated before use. The diagram 2 and 3 shows water for car washing and watering plants which need not be treated.

30 Oxides of nitrogen are found in polluted air.

Which statement about oxides of nitrogen is correct?

A Oxides of nitrogen are formed by the reaction of nitrogen with oxygen during the fractional distillation of liquid air.

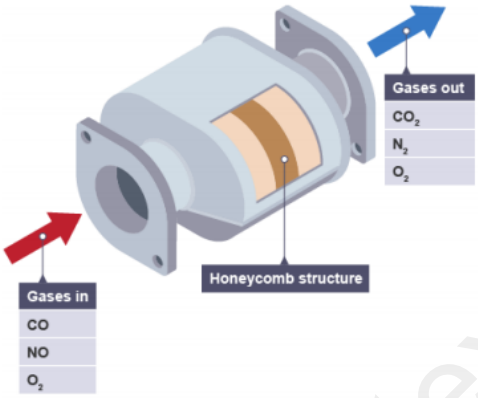
B Oxides of nitrogen are formed in a car engine by the reaction of petrol with nitrogen from the air.

C Oxides of nitrogen are removed from exhaust gases by reaction with carbon dioxide in a catalytic converter.

D Oxides of nitrogen are removed from exhaust gases by reduction in a catalytic converter.

This is a conceptual question, where you need to know the working of catalytic convertors in a car engione.

Catalytic removal of oxides of nitrogen by Catalytic convertors



In the car engines, oxides of nitrogen and carbon monoxide are formed.

A catalytic convertor is used to remove these poisonous gases.

Catalytic converters use a transition metal cataylst like platinum , palladium or rhodium catalyst with a high surface area. This increases the rate of reaction.

Most catalytic convertors have 2 compartments. In the first compartment, the metals mainly catalyse the conversion of nitrogen oxides to nitrogen.

Compartment (A):-Reduction

$2NO(g) \longrightarrow N_2(g) + O_2(g)$

$2NO_2(g) \longrightarrow N_2(g) + 2O_2(g)$

The nitrogen and oxygen from this reaction then flow into compartment B

Compartment (B):-Oxidation

$2CO(g) + O_2(g) \longrightarrow 2CO_2(g)$

The reactions in the catalytic convertors are redox reactions. The following reactions might also occur.

$2NO(g) + 2CO(g) \longrightarrow N_2(g) + 2CO_2(g)$

$2NO_2(g) + 4CO(g) \longrightarrow N_2(g) + 4CO_2(g)$

The gases leaving the car exhaust are non poisonous but CO_2 contributes to global warming.

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31 Photosynthesis and respiration are important natural processes.

Which statement is correct?

A Carbon dioxide is formed by the reaction of glucose with water during photosynthesis.

B Carbon dioxide is removed from the air by respiration.

C Glucose reacts with water to form oxygen during respiration.

✔ **D** Photosynthesis produces glucose and oxygen.

Reason: The following equations will make the concept of photosynthesis and respiration clearer.

Photosynthesis chemical equation:

$$6CO_2 + 6H_2O + \text{light} \longrightarrow C_6H_{12}O_6 + 6O_2$$

carbon dioxide + water + energy ⟶ glucose + oxygen

Respiration chemical equation:

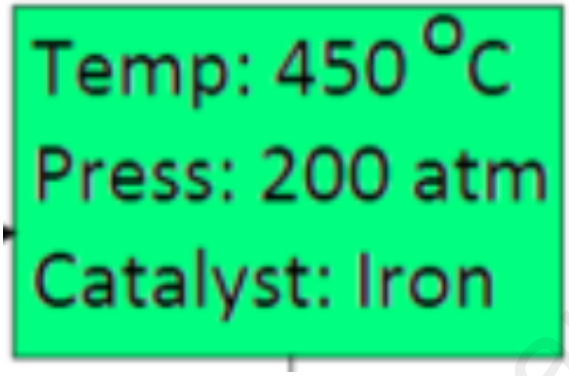
$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + ATP$$

glucose + oxygen ⟶ carbon dioxide + water + energy

32 Which row gives the conditions for the Haber process?

	temperature / ℃	pressure / atm	catalyst
A	200	2	V_2O_5
B	200	450	Fe
C ✓	450	200	Fe
D	500	250	V_2O_5

Reason: These are the standard conditions to make ammonia via the Haber's process



33 Which statement about sulfuric acid is correct?

A It is made by the Haber process.

B It is made in the atmosphere by the action of lightning.

✔ It reacts with ammonia to produce a fertiliser.

D It reacts with copper metal to produce hydrogen gas.

Reason:
You need to know the reaction of sulfuric acid awith ammonia

$$2NH_3(g) + H_2SO_4(aq) \longrightarrow (NH_4)_2SO_4(aq)$$

34 Which statement is **not** correct?

A Converting limestone into lime is a thermal decomposition reaction.

B Flue gas desulfurisation is a neutralisation reaction.

C In the extraction of iron, calcium carbonate is converted into calcium oxide.

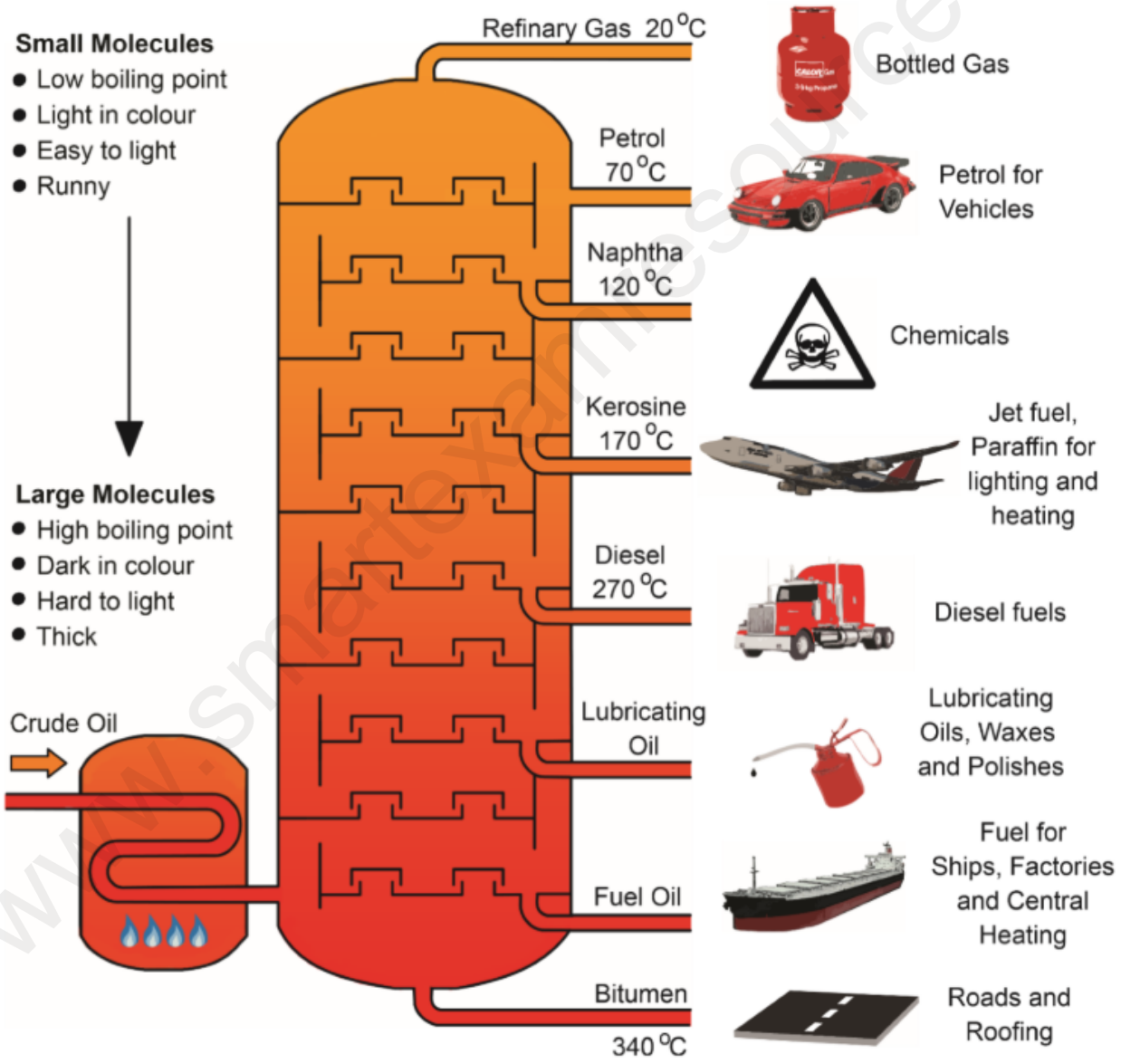
D Slaked lime is added to soil as a fertiliser.

Reason: Slaked lime (Calcium hydroxide) is added to the soil to reduce soil acidity

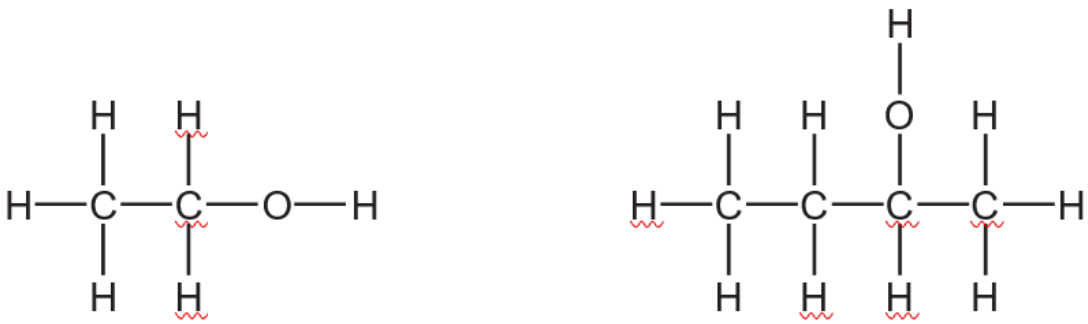
35 Which fraction of petroleum is **not** matched to its correct use?

	fraction	use
A	bitumen	making roads
B	gasoline	fuel for cars
✔ **C**	kerosene	fuel for ships
D	naphtha	chemical industry

Reason: You must know the different uses of all the fractions of petroleum



36 The diagram shows the structures of two organic molecules.



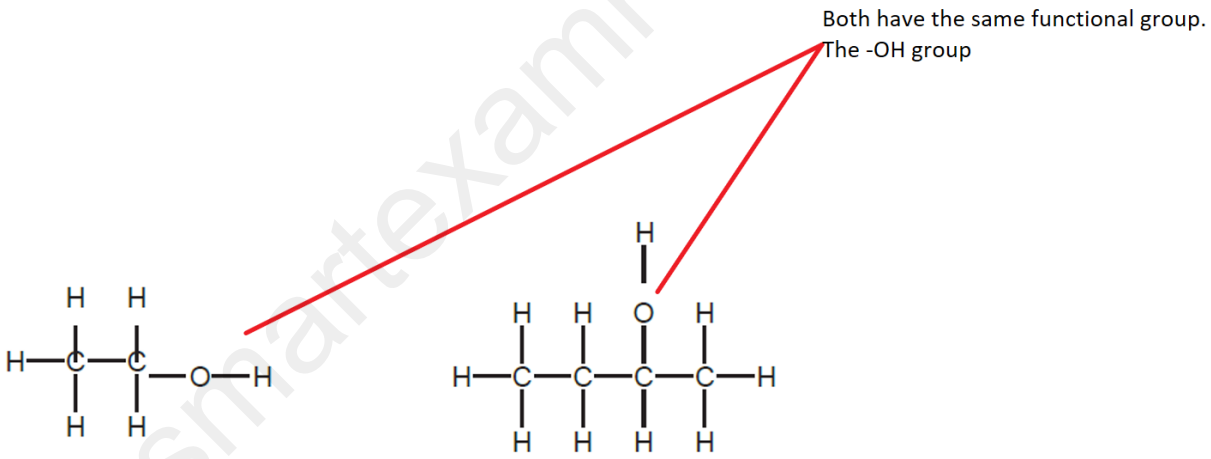
Which statement about these molecules is **not** correct?

A They are both alcohols.

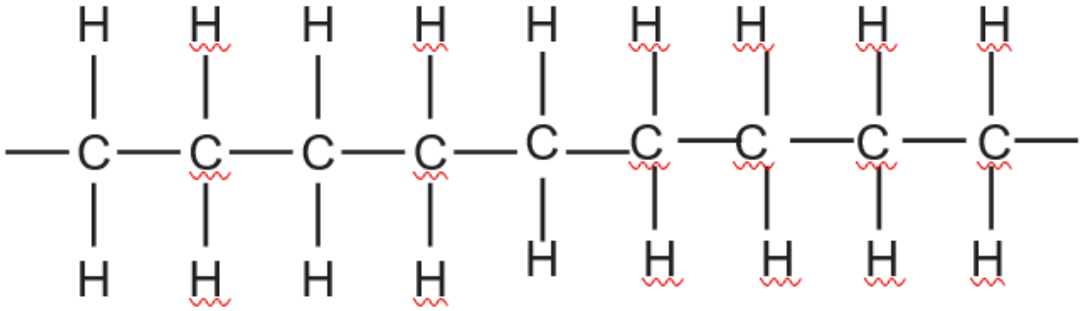
B They both produce carbon dioxide and water when they burn in oxygen.

C They contain different functional groups.

D They have the same general formula.

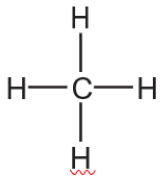


37 The diagram shows part of the molecule of a polymer.

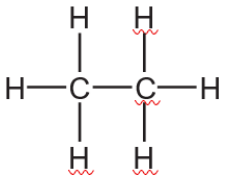


Which diagram shows the monomer from which this polymer could be manufactured?

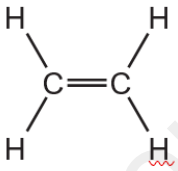
A



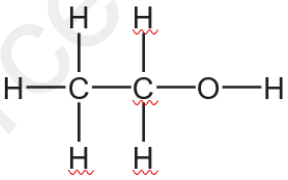
B



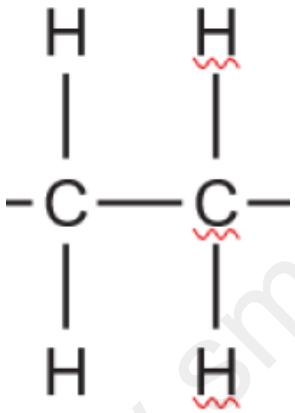
C ✔



D



Reason:A close observation reveals that the following structure keeps repeating on both sides.



Hence we draw the structure of the monomer by replacing the single bond between C-C by a double bond and by removing the continuation bonds on either side.

38 Ethanol is manufactured by fermentation or by the catalytic addition of steam to ethene.
Which statement is correct?

A Fermentation uses a higher temperature than the catalytic addition of steam to ethene.

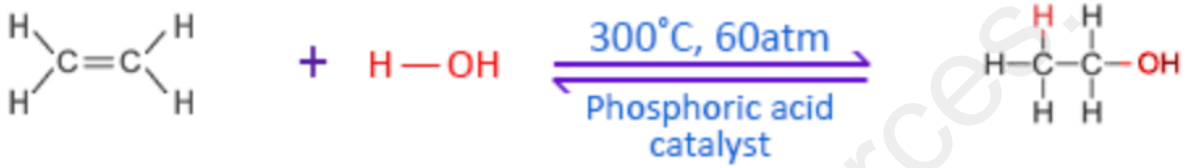
B Fermentation uses a non-renewable resource.

C ✔ The catalytic addition of steam to ethene produces purer ethanol than fermentation.

D The catalytic addition of steam to ethene uses a biological catalyst.

Reason: This is a very famous reaction between ethene and water for the manufacture of ethanol, where ethanol ois the only by-product

$C_2H_4(g)$ $H_2O(g)$ $C_2H_5OH(g)$

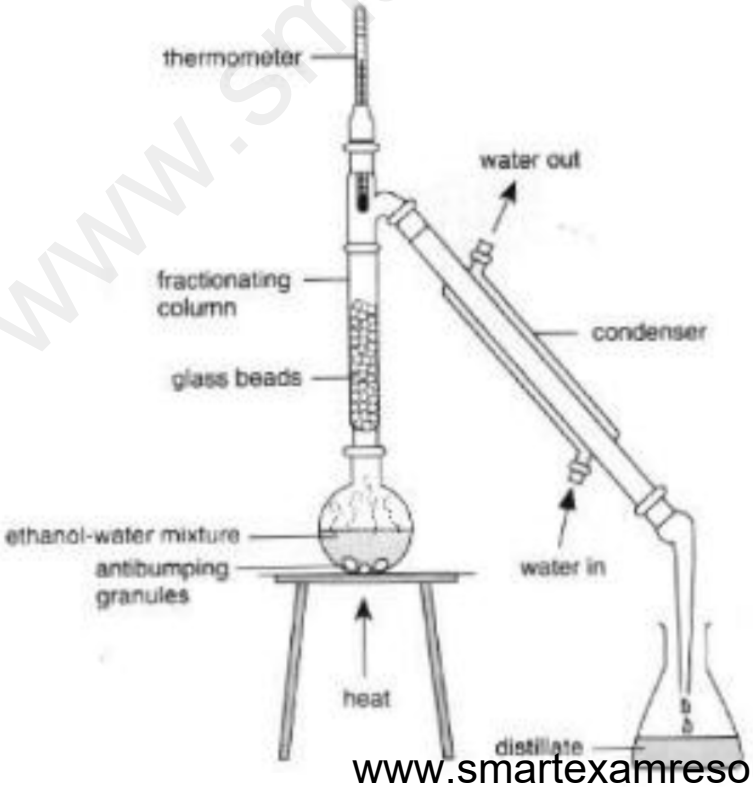


Ethene Water Ethanol

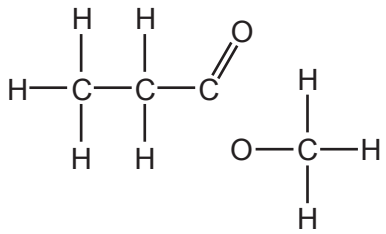
Fermentation produces impure ethanol.This is beacuse during fermentation , the impurities such as water and yeast are also present. Hence ethanol formed in this way needs purification via distillation techniques

glucose $\xrightarrow{yeast}$ ethanol + carbon dioxide

$C_6H_{12}O_{6(aq)} \xrightarrow{yeast} 2C_2H_5OH_{(aq)} + 2CO_{2(aq)}$

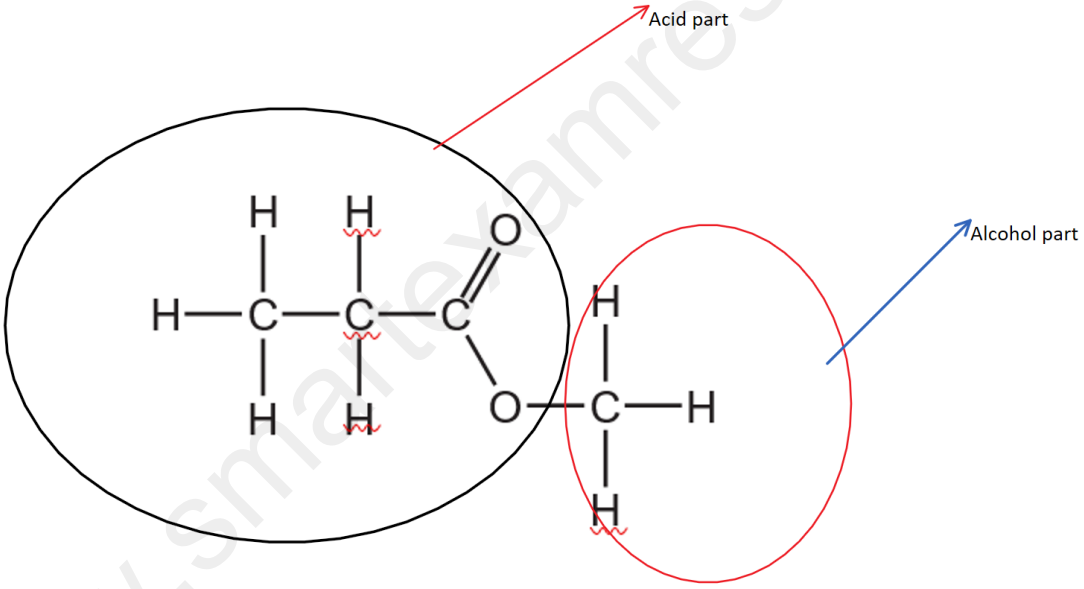


39 The structure of an ester is shown.



Which row is correct?

	name of ester	names of the carboxylic acid and the alcohol used to form the ester
A	methyl propanoate	methanoic acid and propanol
B ✓	methyl propanoate	methanol and propanoic acid
C	propyl methanoate	methanoic acid and propanol
D	propyl methanoate	methanol and propanoic acid



While naming an ester, the alcohol comes first follwed by name of the acid.

So, the above ester is named as: methly propanoate

40 Keratin is a protein that is found in human hair.

Keratin is chemically broken down to produce amino acids.

What is the name of this chemical process?

A catalysis

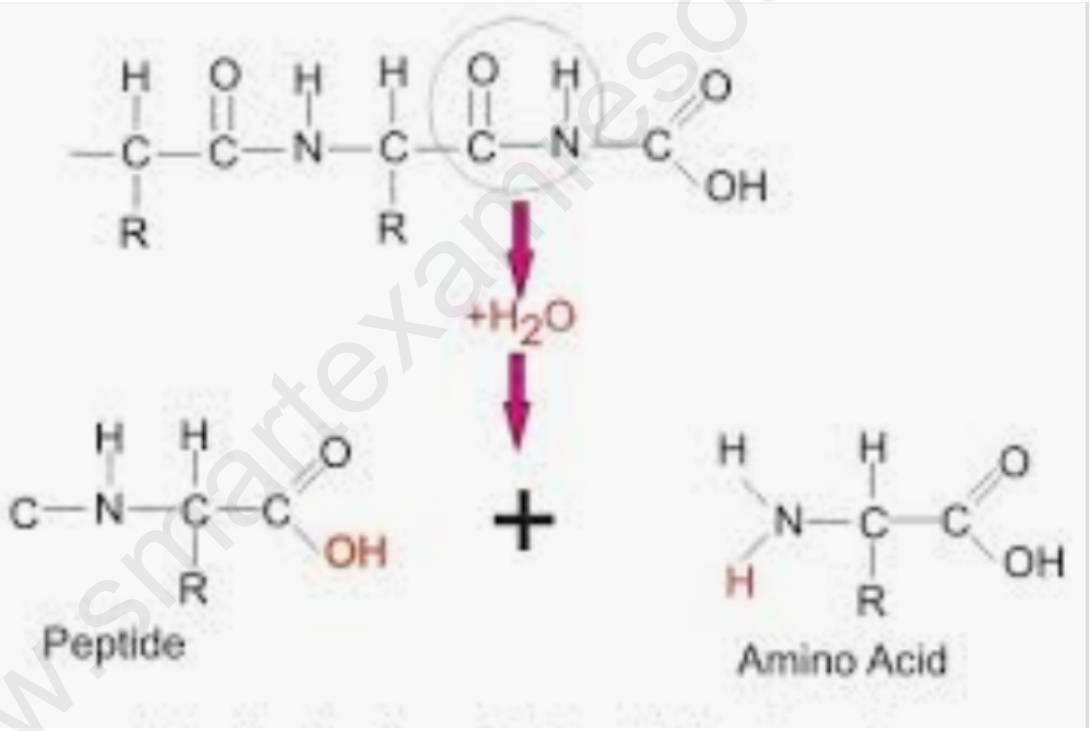
B hydration

✔ **C** hydrolysis

D polymerisation

Reason: Larger molecules (Macromolecules) are broken down by hydrolysis reactions into their smaller subunits called a s monomers.

Proteins are made of amino acids. Since keratin is a protein, it will be broken down to amino acids



The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
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 –		114 Fl flerovium –		116 Lv livermorium –		

Key

atomic number
atomic symbol
name
relative atomic mass

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 dm^3 at room temperature and pressure (r.t.p.).