Name:		Index Number:		Class:	

CATHOLIC HIGH SCHOOL
Preliminary Examination
Secondary 4 (O-Level Programme)

CHEMISTRY 6092/01

Paper 1 Multiple Choice **18 September 2020**

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, pencil clips, glue or correction fluid.
Write your name, index number and class on the Answer Sheet in the spaces provided.

There are **forty** questions in 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.

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 given on page **18**.
The use of an approved scientific calculator is expected, where appropriate.

For examiner's use only:	**Total**	**/ 40**

This document consists of **18** printed pages.

[Turn over

1 The diagram shows a chromatogram obtained from three sweets, X, Y and Z.

How many different red dyes are present in the sweets?

A 1

B 2

C 3

D 4

2 Acetone is a common organic solvent.

Which is **not** a property of pure acetone?

A It boils at its boiling point exactly.

B It dissolves iodine.

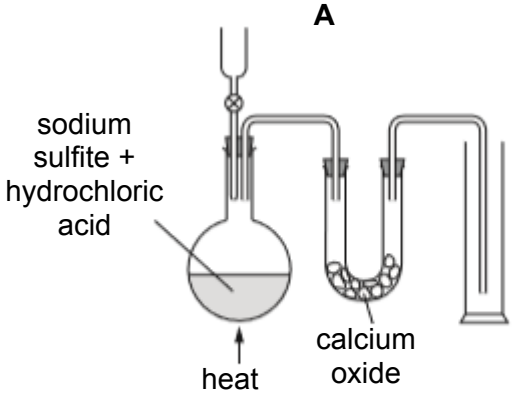
C It is miscible with water.

D It leaves behind no residue when boiled.

3 Sulfur dioxide is a gas that is prepared by heating sodium sulfite with hydrochloric acid.

Which set of apparatus is suitable for preparing and collecting a dry sample of sulfur dioxide?

A



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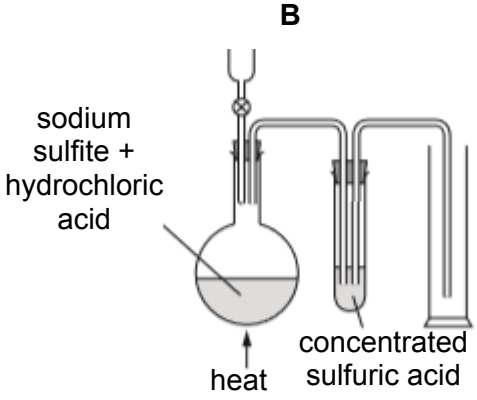

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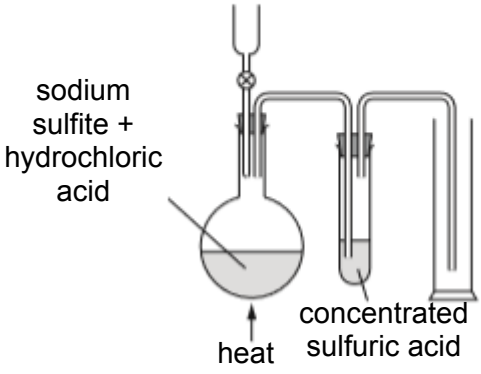
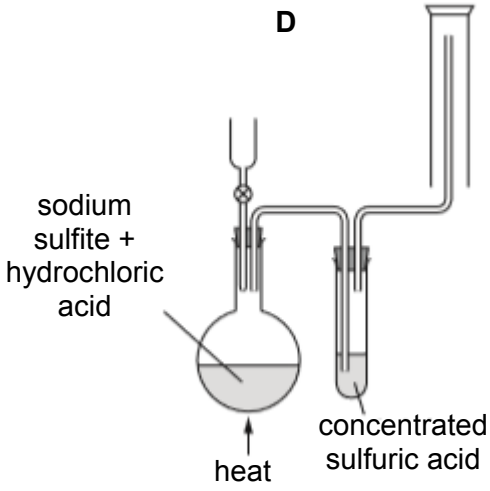


D



4 Which atom has twice as many neutrons as protons?

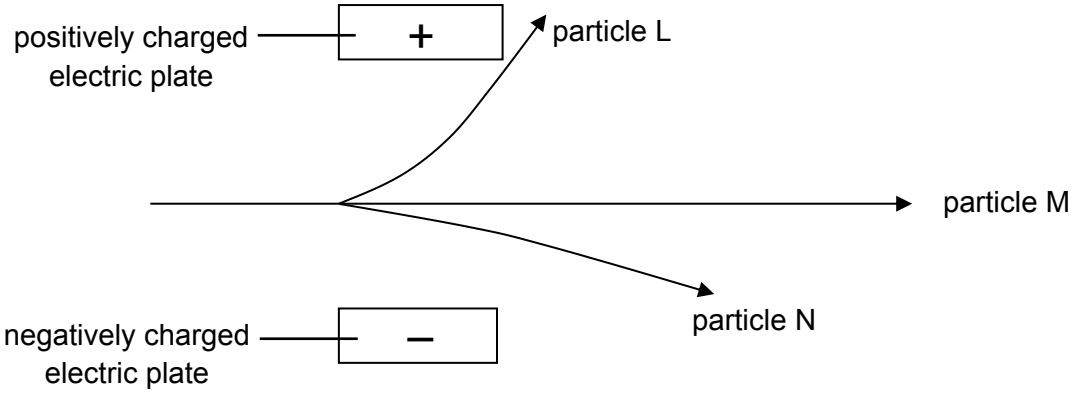
A $^{2}_{1}H$

B $^{3}_{1}H$

C $^{4}_{2}He$

D $^{23}_{11}Na$

5 The diagram below shows the behaviour of three sub-atomic particles as they pass through an electric field.



A student wrote down his conclusions. Which conclusion(s) is/are correct?

1- Particle L is negatively charged.
2- Particle M could be an atom.
3- Particle N has a lighter mass than particle L.

A 1 only

B 3 only

C 1 and 3 only

D 1, 2 and 3

6 What changes when an ion is formed from an atom?

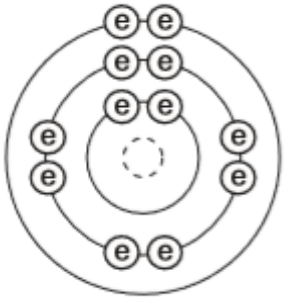
A the number of electrons only

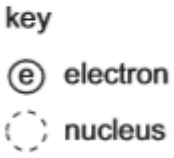
B the number of neutrons only

C the number of protons only

D the number of both protons and electrons

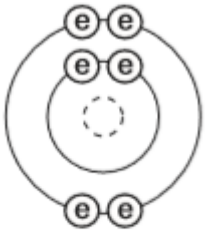
7 The electronic structure of a particle of an element, J is shown. (J is not the actual symbol of the element.)





Which diagram shows the electronic structure of the particle of another element which has similar chemical properties to element J?

A



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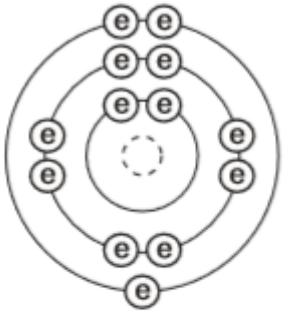

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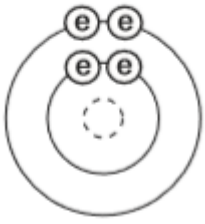

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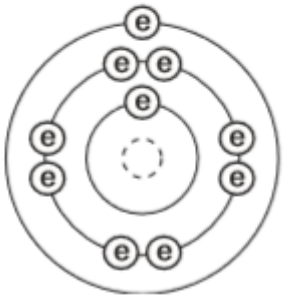


8 The relative atomic mass of oxygen is 16 and that of hydrogen is 1.

This means that …(i)… of oxygen has the same mass as …(ii)… of hydrogen.

Which row correctly complete the gaps?

	(i)	(ii)
A	an atom	8 molecules
B	an atom	32 molecules
C	a molecule	16 atoms
D	a molecule	32 molecules

9 Which sulfide contains the greatest mass of sulfur in a 10 g sample?

	formula	mass of one mole/ g
A	FeS_2	120
B	MoS_2	160
C	NiS	91
D	PbS	239

10 In an experiment, 298 g of uranium reacts with 40 g of oxygen.

What is the formula of uranium oxide?

A UO

B UO_2

C U_2O

D U_2O_3

11 The fertiliser ammonium nitrate is manufactured from ammonia by a two stage process.

stage 1: $NH_3 + 2O_2 \rightarrow HNO_3 + H_2O$

stage 2: $NH_3 + HNO_3 \rightarrow NH_4NO_3$

What is the percentage purity of ammonia if 20 tonnes of impure ammonia yields 40 tonnes of ammonium nitrate? [M_r: NH_3, 17; NH_4NO_3, 80]

A 21%

B 43%

C 50%

D 85%

12 Which statement about hydrogen is **not** true?

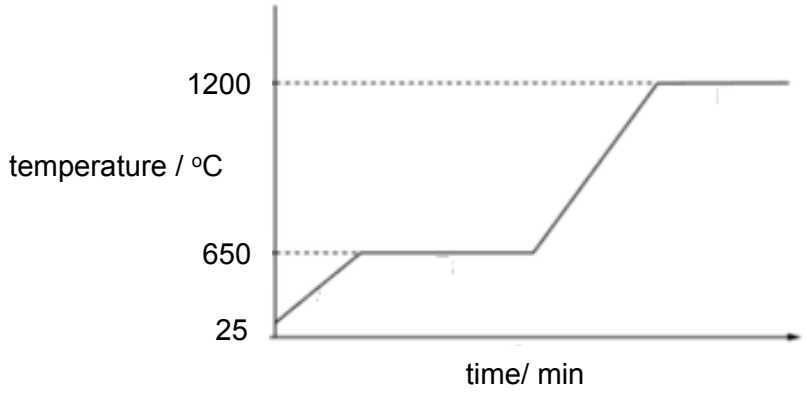
A It can be used as a raw material in a hydrogen-oxygen fuel cell.

B It can exist as oxidation state 0 or +1 only.

C It can form both ionic and covalent compounds.

D Its most abundant isotope contains zero neutrons.

13 The heating curve of an unknown substance H is given below.



What is H likely to be?

A chlorine

B diamond

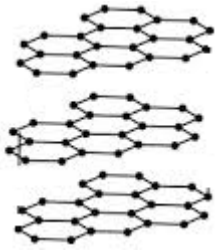
C graphite

D magnesium

14 How many electrons are shared in a molecule of methane, CH_4, and a molecule of water, H_2O?

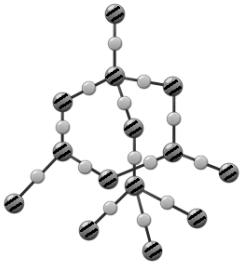
	methane, CH_4	water, H_2O
A	4	2
B	4	4
C	8	4
D	8	8

15 The structures of four substances (W, X, Y and Z) are given.



W

X



Y

Z

Which statement is true?

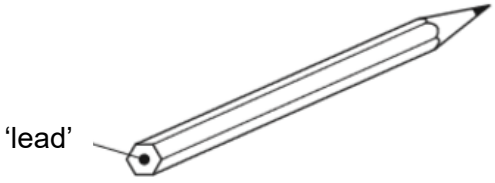
A W contains weak intermolecular forces of attraction between layers.

B X contains only hexagonal rings similar to graphite.

C Y is diamond.

D Z has a simple molecular structure.

16 The 'lead' in a pencil is made up of a mixture of graphite and clay.



Which statement is true?

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

B If the graphite is replaced by diamond, the pencil slides across the paper more easily.

C If the graphite is replaced by diamond, the pencil can conduct electricity.

D The pencil cannot conduct electricity.

17 The oxide Pb_3O_4 reacts with dilute nitric acid to form lead(II) nitrate, lead(IV) oxide and another product.

Which statement about the reaction is true?

A It is not a neutralisation reaction.

B Pb_3O_4 is acting as an amphoteric oxide.

C The chemical equation is $Pb_3O_4 + 2HNO_3 \rightarrow Pb(NO_3)_2 + Pb_2O_3 + H_2O$.

D The ionic equation is $Pb_3O_4(s) + 8H^+(aq) \rightarrow 2Pb^{2+}(aq) + Pb^{4+}(aq) + 4H_2O(g)$.

18 Which row shows the largest increase in acidity and the correct colour of methyl orange at the final pH?

	initial pH	final pH	colour of methyl orange at final pH
A	1	3	yellow
B	2	6	red
C	3	1	yellow
D	6	2	red

19 Which statement proves the presence of hydrogen ions in hydrochloric acid?

A It gives a pale blue solution with aqueous copper(II) sulfate.

B It gives a white precipitate with aqueous silver nitrate.

C It releases carbon dioxide with copper(II) carbonate.

D It releases hydrogen with copper powder.

20 Measurements are made on a sample of pure water.

Sodium chloride is now dissolved in the pure water and the measurements repeated.

Which measured values would change?

	boiling point	freezing point	pH
A	✓	✓	✓
B	✓	✓	✗
C	✗	✗	✓
D	✗	✗	✗

21 An aqueous solution contains either aluminium sulfate or copper(II) sulfate.

Which aqueous reagent can be used to identify the salt present?

A ammonia

B barium chloride

C hydrochloric acid

D silver nitrate

22 In which procedure is a white precipitate produced?

A Excess aqueous sodium chloride is added to aqueous barium nitrate.

B Excess aqueous sodium chloride is added to aqueous lead(II) nitrate.

C Excess aqueous sodium hydroxide is added to aqueous iron(III) sulfate.

D Excess aqueous sodium hydroxide is added to aqueous lead(II) nitrate.

23 Which metal(s) can be obtained by heating their oxides with carbon?

	copper	iron	magnesium
A	✓	✓	✗
B	✓	✗	✗
C	✗	✓	✓
D	✗	✗	✓

24 The table below gives information about the reactivity of three metals P, Q and R.

metal	reaction with air	reaction with steam	reaction with dilute hydrochloric acid
P	burns with spark	forms an oxide	forms hydrogen
Q	slowly forms an oxide	no reaction	no reaction
R	slowly forms an oxide	no reaction	forms hydrogen

What is the order of reactivity of P, Q and R?

	most reactive ⟶		least reactive
A	P	Q	R
B	P	R	Q
C	Q	R	P
D	R	Q	P

25 Which statement correctly compares aluminium and copper metal?

A Aluminium is a better conductor of electricity due to presence of more cations.

B Both conduct electricity due to mobile valence electrons.

C Both have giant ionic lattice structures.

D They are chemically changed when they conduct electricity.

26 A student stated that a highly reactive metal is likely to

- form negative ions
- form thermally stable carbonates
- occur naturally as an element

How many statement(s) is/are true?

A 0

B 1

C 2

D 3

27 A coil of clean zinc wire is suspended in a beaker of aqueous silver nitrate. Crystals of silver are deposited on the zinc wire.

Which statement is **not** correct?

A The ionic equation is $Ag^{+}(aq) + Zn(s) \rightarrow Zn^{2+}(aq) + Ag(s)$.

B The solution stays colourless.

C The total mass of crystals of silver increases gradually.

D The total number of positive ions in the solution decreases.

28 Scrap iron is often recycled.

Which reason for recycling is **not** correct?

A It reduces the amount of pollution produced at the extraction site of its ore.

B It reduces the amount of waste deposited at landfill sites.

C It reduces the need to collect the scrap iron.

D It saves limited natural resources.

29 Hydrogen peroxide, H_2O_2 and acidified potassium manganate(VII), $KMnO_4$ are added together.

Which statement is correct?

A A pungent gas which bleaches litmus paper is liberated.

B Hydrogen peroxide is acting as a catalyst.

C Oxygen in acidified potassium manganate is reduced.

D Purple acidified potassium manganate(VII) decolourises.

30 An inert atmosphere is needed to lengthen the useful life of the metal filament in a lamp.

Why is argon, rather than helium, used for this purpose?

	argon is more abundant in the air	argon is less dense than helium
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

31 A newly discovered element is placed in Group VII of the Periodic Table, below astatine.

Which statement about this element is true?

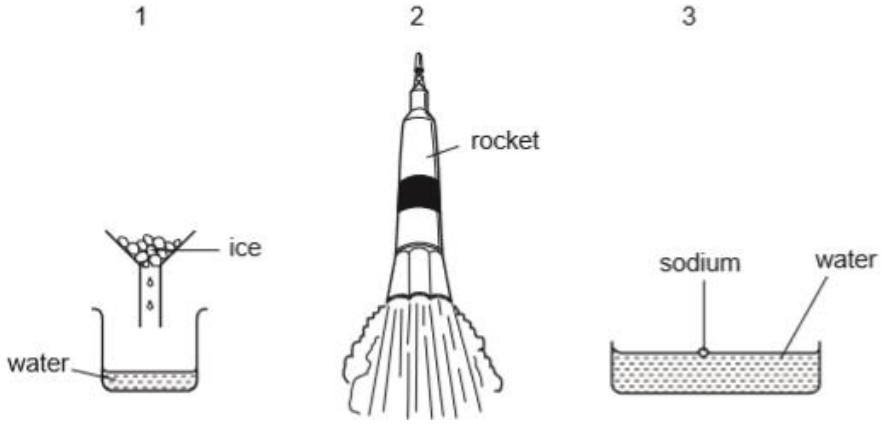
A It has a higher melting point than astatine.

B It has a lower density than astatine.

C The charge of its ion is +1.

D The colour of its ion is black.

32 Which diagrams show that an exothermic change is taking place?



A 1 and 2 only

B 1 and 3 only

C 2 and 3 only

D 1, 2 and 3

33 The table below shows the bond strengths of the substances in the following reaction:

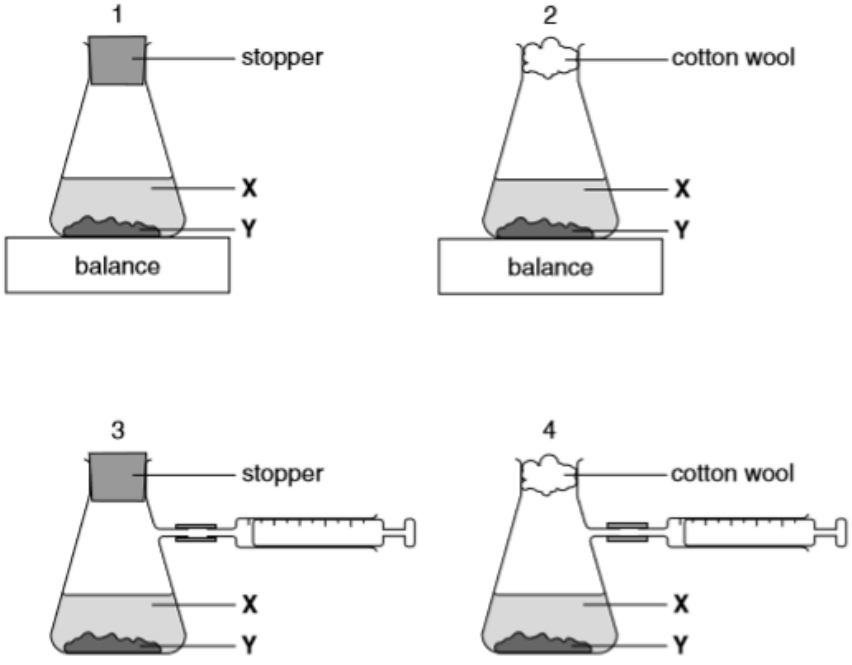
$$X_2 + Y_2 \rightarrow 2XY$$

Which set of bond strengths would result in the most endothermic reaction?

	bonds in X_2	bonds in Y_2	bonds in XY
A	strong	strong	strong
B	strong	strong	weak
C	weak	weak	strong
D	weak	weak	weak

34 A liquid X reacts with solid Y to form a gas.

Which two diagrams show suitable methods for measuring the speed of the reaction?



A 1 and 3

B 1 and 4

C 2 and 3

D 2 and 4

35 In which reaction is the pressure least likely to affect the rate of reaction?

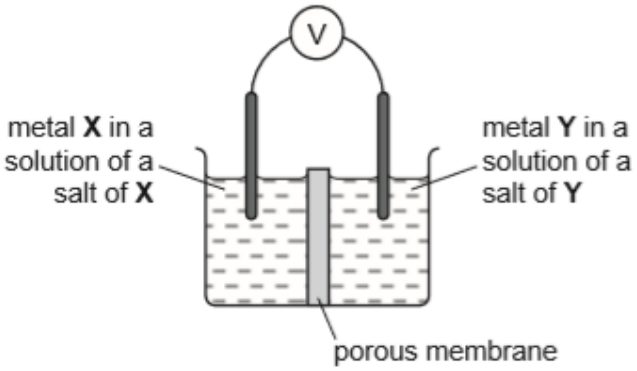
A $C(s) + CO_2(g) \rightarrow 2CO(g)$

B $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$

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

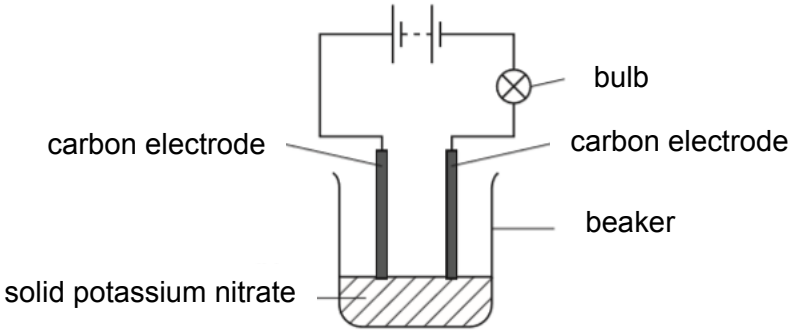
D $OH^-(aq) + H^+(aq) \rightarrow H_2O(l)$

36 Which pair of metals X and Y will produce the highest voltage when used as electrodes in a simple cell?



	metal X	metal Y
A	copper	silver
B	magnesium	silver
C	magnesium	zinc
D	zinc	copper

37 In the circuit shown, the bulb does **not** light up.



Which change would cause the bulb to light up?

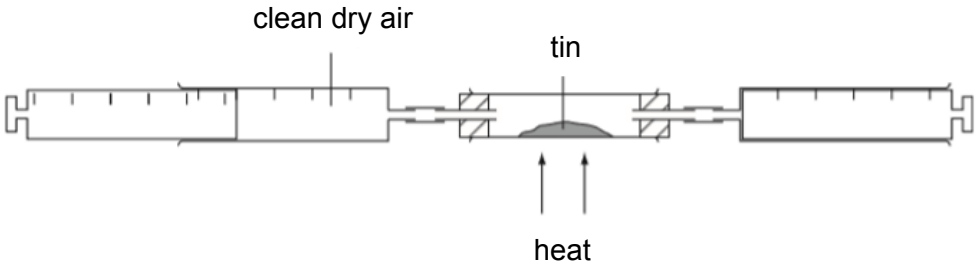
A add more solid potassium nitrate to the beaker

B add water to potassium nitrate

C replace the carbon electrodes with copper electrodes

D reverse the connections to the electrodes

38 A sample of clean, dry air is passed over hot tin until all the oxygen in the air reacts with tin.



The volume of air decreases by 30 cm^3.

What was the original volume of the sample of air?

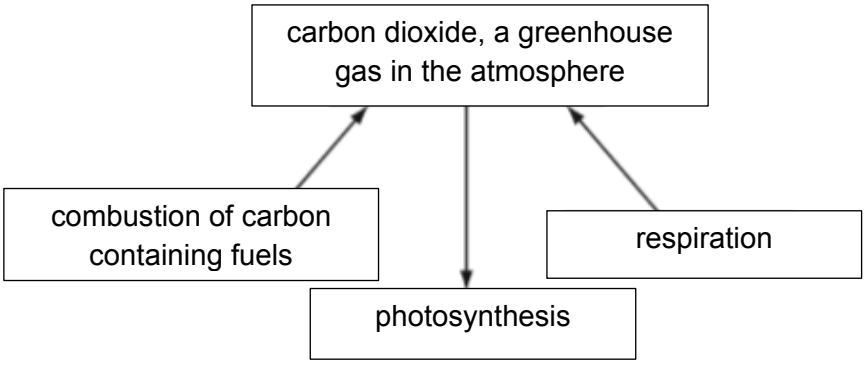
A 60 cm^3

B 100 cm^3

C 150 cm^3

D 300 cm^3

39 A student drew the diagram below to represent the carbon cycle.



Which statement correctly describes how the diagram should be improved?

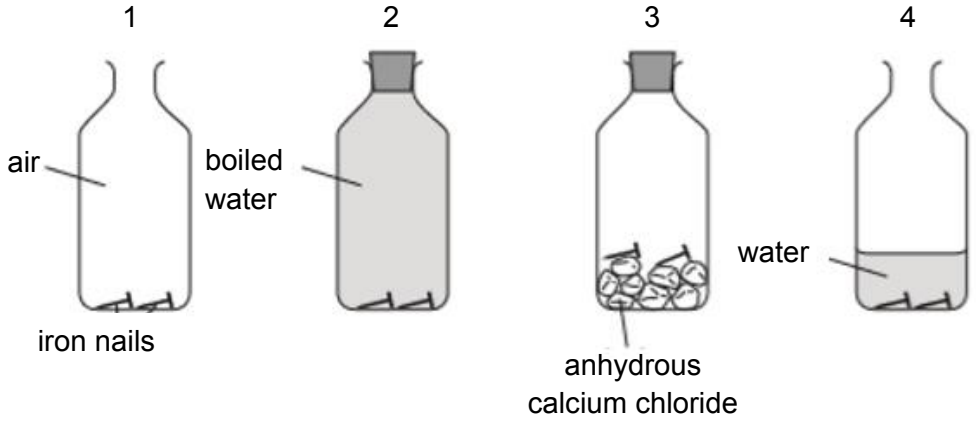
A Change greenhouse gas to pollutant.

B Change the direction of arrow for photosynthesis.

C Include the contribution of carbon dioxide into the atmosphere by combustion of hydrogen.

D Include the contribution of carbon dioxide into the atmosphere by decay and bacterial decomposition.

40 Some iron nails were placed in bottles under different conditions.



Which bottles prove the conditions required for rusting to occur?

A 1 and 2

B 2 and 3

C 1, 3 and 4

D 2, 3 and 4

–End–

The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	0
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9		Key proton (atomic) number atomic symbol name relative atomic mass									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 –		

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.).