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Candidate Name	Class	Register Number
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CHANGKAT CHANGI SECONDARY SCHOOL

Preliminary Examination 2019

Subject : Science (Chemistry)
Paper No : 5078/01
 5076/01
Level : Secondary 4 Express/
 Secondary 5 Normal Academic
Date : 04 September 2019
Duration : 1 hour
Setter : Ms Marie Lee

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your name, class and register number in the spaces at the top of this page.

MULTIPLE CHOICE QUESTIONS [40 MARKS]

Answer all questions. For each question, there are four possible answers A, B, C and D. Choose **one** correct answer and shade the correct answer in soft pencil on the OTAS provided.

A copy of the Periodic Table can be found on page 9.

For Examiners' Use	Marks
Paper 1	/ 40
Personal Target	Actual Grade
Parent's / Guardian's signature	

[Turn over

This Question Paper consists of **9** printed pages.

MULTIPLE CHOICE QUESTIONS (40 marks)

- 1 A student measures 2.0 g of calcium carbonate and adds it to 20 cm³ of dilute hydrochloric acid at different temperatures. He measures the time taken for the reaction to stop.

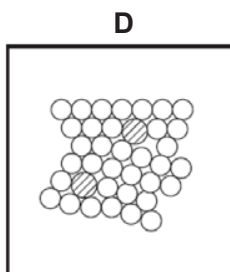
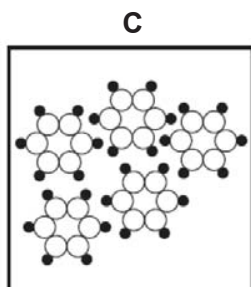
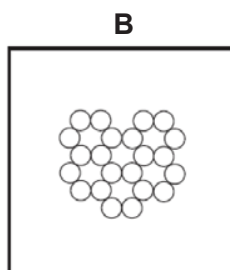
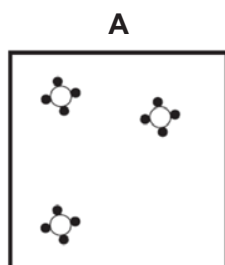
Which of the following apparatus is needed for the experiment?

	electronic balance	stopwatch	filter funnel	measuring cylinder	thermometer
A	√	√	√	√	×
B	√	√	×	√	√
C	√	×	√	√	√
D	×	√	√	×	√

- 2 Which changes occur when a liquid at 50°C becomes a gas at 120°C?

	attractive forces between particles	separation of particles	energy of particles
A	decrease	decreases	increases
B	decreases	increases	increases
C	increases	decreases	decreases
D	increases	increases	decreases

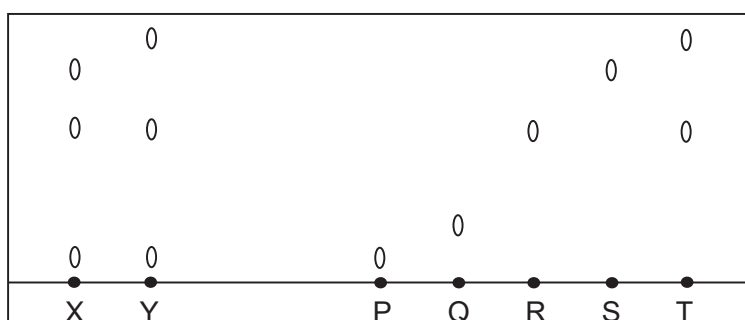
- 3 Which diagram represents the arrangement of particles in a gas?



- 4 A beaker contains a mixture of ethanol and water. Which method could be used to separate the mixture of ethanol and water and the corresponding purity check for the separated ethanol?

	method of separation	purity check
A	filtration	observe the colour and scent
B	fractional distillation	observe the colour and scent
C	fractional distillation	measure the boiling point
D	simple distillation	measure the boiling point

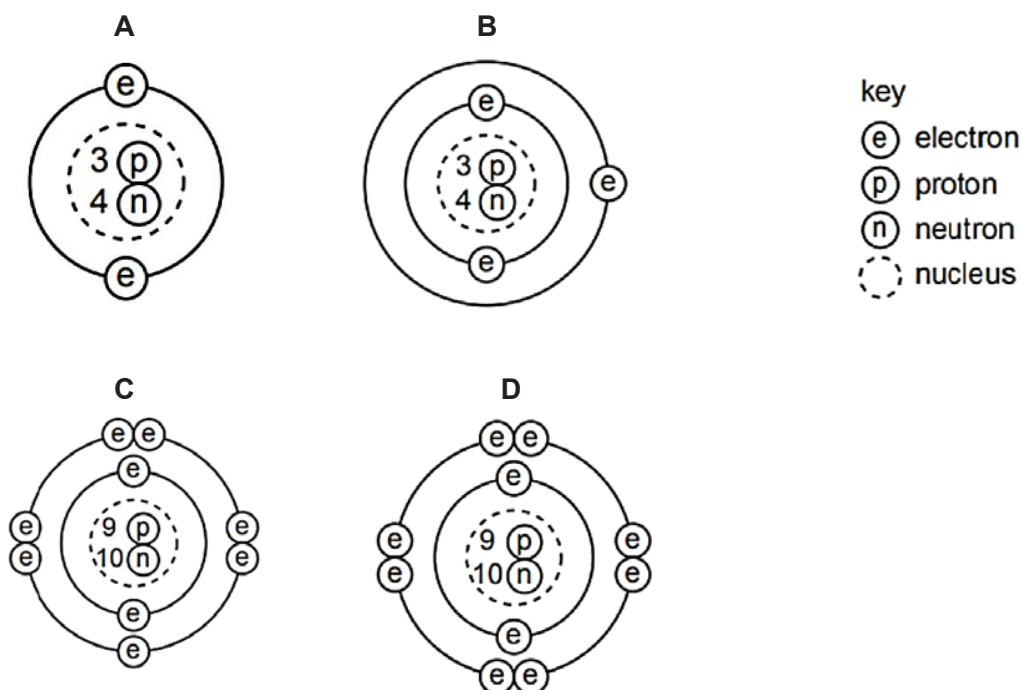
- 5 The diagram shows the result of a chromatogram obtained from two mixtures, X and Y.



Which of the substance(s) is/are present in mixture X but not in mixture Y?

- A Q and S only
 B R and T only
 C S only
 D T only
- 6 Which statement(s) about isotopes of the same element is/are correct?
- I They are atoms which have the same chemical properties because they have the same number of electrons in their outer shell.
 II They are atoms which have the same number of electrons and neutrons but different number of protons.
 III They are atoms which have the same number of electrons and protons but different number of neutrons.
- A I and II
 B I and III
 C II only
 D III only

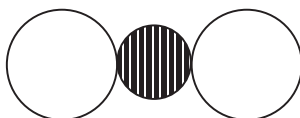
7 Which diagram shows a positively-charged ion?



8 When substance X and substance Y are heated together, substance Z is produced.
The chemical equation of the reaction is as follows:



A molecule of Z has the following structure:



Which of the following statements is true about X, Y and Z?

- A X can be either an element or compound.
- B Z is a mixture of X and Y.
- C Z is an ionic compound with chemical formula X_2Y_2 .
- D Z has similar chemical properties as compared to X and Y.

9 When sodium is added to water, a gas is produced.
Which of the following is true when potassium is added to water instead?

- A No gas is produced.
- B The reaction is slower.
- C More energy is given out.
- D A smaller volume of gas is produced compared to gas produced for sodium.

- 10 When copper (II) nitrate is heated, it decomposes to form copper (II) oxide, nitrogen dioxide gas and oxygen gas. The chemical equation of the decomposition of copper (II) nitrate is as follows:



What is the mass of copper (II) nitrate that has decomposed if 4.0g of copper (II) oxide is produced?

- A 12.6 g
 - B 9.4 g
 - C 18.8 g
 - D 6.3 g
- 11 Many countries have taken measures to ensure that the amount of sulfur in unleaded petrol and diesel fuels are kept low.
- Which of the following could be the reason for such measures?
- A To reduce the amount of fuel used in motor vehicles.
 - B To increase the acidity of the rain.
 - C To reduce incomplete combustion.
 - D To prevent the pH of soil from decreasing.
- 12 Fresh distilled water has a pH value of 7.0. However after it was left standing in the open for a short time, the pH was observed to drop below 7.0.

Which of the following ions caused the drop in pH value?

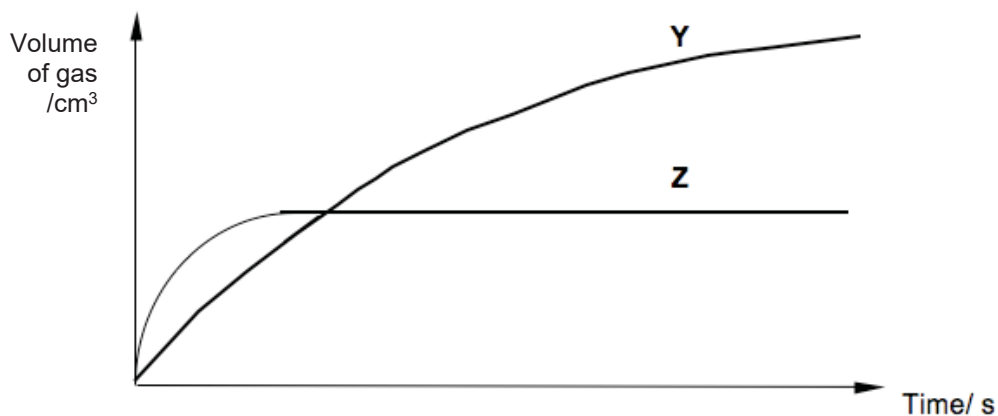
- A ammonium ion, NH_4^+
- B chloride ion, Cl^-
- C hydrogen ion, H^+
- D hydroxide ion, OH^-

13 Lead (II) carbonate reacts with both nitric acid and sulfuric acid. In what ways are the two reactions the same?

- I Water is formed.
- II A gas is produced.
- III A white precipitate is obtained.

- A II only
- B II and III
- C I and II
- D I, II and III

14 Excess calcium carbonate was added into 100 cm^3 of 1.0 mol/dm^3 of hydrochloric acid. The curve Y represents the results obtained when the volume of gas collected was plotted against time.



The experiment was repeated using different volumes and concentrations of hydrochloric acid. Which change could produce curve Z?

- A 50 cm^3 of 1.0 mol/dm^3 hydrochloric acid
- B 25 cm^3 of 1.0 mol/dm^3 hydrochloric acid
- C 50 cm^3 of 2.0 mol/dm^3 hydrochloric acid
- D 25 cm^3 of 2.0 mol/dm^3 hydrochloric acid

15

Experiment	X	Y	Z
Does the metal liberate hydrogen from dilute hydrochloric acid?	yes	no	yes
Is the metal oxide reduced by heating with carbon?	yes	yes	no

	most reactive	→	least reactive
A	X	Z	Y
B	Y	X	Z
C	Z	X	Y
D	Z	Y	X

16 The chart below shows four iron plates under different conditions.

plate 1
Exposed to moisture only, wrapped with a copper foil

plate 2
Exposed to air and moisture, kept in a beaker with a drying agent.

plate 3
Exposed to air and moisture beside a solution of sodium chloride.

plate 4
Exposed to moisture, kept in an air-tight jar.

Which of these plates will corrode the fastest?

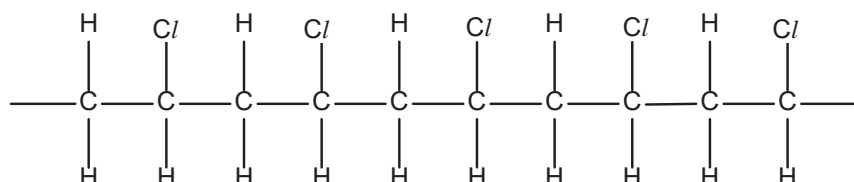
- A** plate 1
- B** plate 2
- C** plate 3
- D** plate 4

- 17 The table below shows information about the exhaust fumes produced from car engines that run on petrol and diesel respectively.

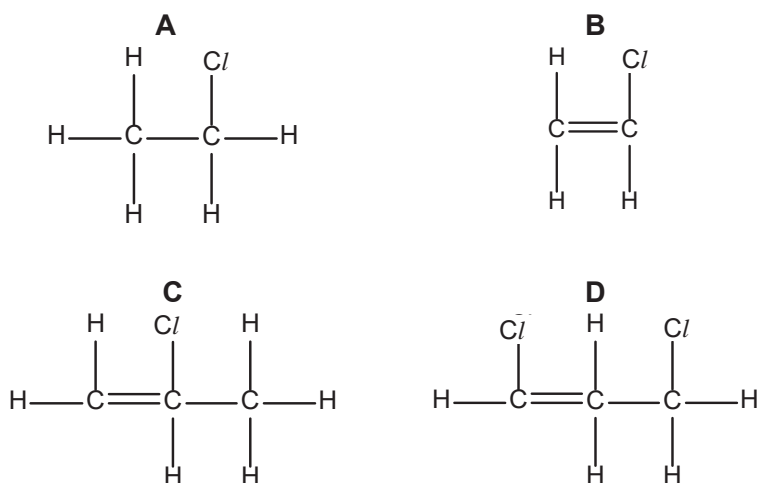
Type of engine	Concentration of carbon monoxide present	Concentration of nitrogen oxides present	Concentration of sulfur dioxide present
petrol engine	high	low	low
diesel engine	low	high	high

Which statement can be inferred using the data in the table?

- A Burning petrol contributes less towards the formation of acid rain.
 B Burning petrol generates more heat in the combustion engine.
 C Cars running on diesel produce fumes that are less sooty.
 D Cars running on diesel do not contribute to air pollution.
- 18 Which of the processes is different from the others in terms of energy changes?
- A forming of bonds
 B combustion
 C neutralisation
 D photosynthesis
- 19 The diagram shows the structure of a polymer.



Which monomer is used to manufacture the polymer?



- 20 Which of the following is true of the oxidation of ethanol?
- A Carbon dioxide is produced.
 - B It can also be used in the detection of alcohol content in drivers.
 - C There is a decrease in the oxidation states of the elements in ethanol.
 - D The product has the functional group -C=O .

--End of Paper--

The Periodic Table of Elements

		Group																														
I	II	III	IV	V	VI	VII	0					0																				
3 Li lithium 7	4 Be beryllium 9	11 Na sodium 23	12 Mg magnesium 24	19 K potassium 39	20 Ca calcium 40	37 Rb rubidium 85	38 Sr strontium 88	55 Cs caesium 133	87 Fr francium -	57-71 lanthanoids	88-103 actinoids	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	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	84 Po polonium -	85 At astatine -	86 Rn radon -
1 H hydrogen 1											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20	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	36 Kr krypton 84									

Key
proton (atomic) number
atomic symbol
name
relative atomic mass

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
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 mendeleevium -	102 No nobelium -	103 Lr lawrencium -

lanthanoids

actinoids

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

Candidate Name	Class	Register Number
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CHANGKAT CHANGI SECONDARY SCHOOL

Preliminary Examination 2019

Subject	: Science (Chemistry)
Paper No	: 5076/03, 5078/03
Level	: Secondary 4 Express/ 5 Normal Academic
Date	: 30 August 2019
Duration	: 1 hour 15 mins
Setter	: Ms Marie Lee

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your name, class and register number in the spaces at the top of this page.

Section A [45 MARKS]

Answer **all** questions. Write your answers in the spaces provided on the question paper.

Section B [20 MARKS]

Answer any **two** questions. Write your answers in the spaces provided on the question paper.

A copy of the Periodic Table can be found on page 12.

For Examiners' Use	Marks
Section A	/ 45
Section B	
	/ 10
	/ 10
Total	/ 65
Personal Target	Actual Grade
Parent's / Guardian's signature	

This Question Paper consists of **12** printed pages.

Section A [45 marks]

Answer all the questions in this section in the spaces provided.

- 1 **Table 1.1** shows some information about six particles.

Table 1.1

Particle	Number of protons in particle	Number of neutrons in particle	Number of electrons in particle
A	37	48	37
B	53	74	54
C	92	143	92
D	92	143	89
E	92	146	92
F	94	150	92

- (a) What is the nucleon number for particle A?

..... [1]

- (b) Explain why particle B is a negative ion.

.....
 [1]

- (c) Which two atoms are isotopes of the same element?

..... [1]

- 2 Magnesium reacts with sulfur to form the compound, magnesium sulfide.

- (a) Suggest two physical properties of magnesium sulfide.

.....
 [2]

- (b) Explain, in terms of electrons, how a magnesium atom reacts with a sulfur atom to make a magnesium ion and a sulfide ion.

.....

 [2]

3 When solutions are mixed, precipitates are sometimes formed.

- (a) Barium carbonate is an insoluble compound. It is formed as a precipitate when solutions of barium chloride and sodium carbonate are mixed.

When solutions of potassium chloride and sodium sulfate are mixed, no precipitate is formed.

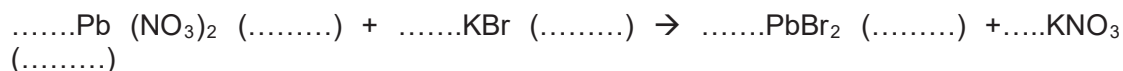
Complete **Table 3.1** to show the colour and name of the precipitates formed from mixing solutions of some compounds, if any.

	sodium carbonate solution	sodium sulfate solution
Barium chloride solution	white precipitate of barium carbonate	
Calcium chloride solution		white precipitate of calcium sulfate
Potassium chloride solution		no precipitate

[3]

- (b) When solutions of lead (II) nitrate and potassium bromide are mixed, a precipitate of lead(II) bromide and a solution of potassium nitrate are produced.

The equation for the reaction is



[2]

Complete the equation with the correct numbers and state symbols.

- (c) In order to prepare a pure, dry sample of lead (II) bromide, a student carried out the following steps:

Steps:

- The mixture was filtered,
- The residue was washed with distilled water, and
- The solid was left in a warm place for several hours.

- (i) Explain why the student filtered the mixture.

.....

[1]

- (ii) Explain why the student washed the residue.

.....

[1]

- 4 A sample of 25.0 cm³ of 0.500 mol/dm³ of aqueous ammonium nitrite, NH₄NO₂, is heated and nitrogen gas is produced as shown below.



- (a) Describe how you could show that aqueous ammonium nitrite contains ammonium ions.

.....

[2]

- (b) (i) Calculate the number of moles of ammonium nitrite in 25.0 cm³ of 0.500 mol/ dm³ in its aqueous solution.

..... moles [1]

- (ii) A sample of 25.0 cm³ of 0.500 mol/dm³ aqueous ammonium nitrite is heated and nitrogen gas is produced accordingly to the chemical equation given above. Calculate the volume of nitrogen gas formed, measured at room temperature and pressure.

volume of nitrogen gas = [2]

- (iii) Calculate the relative molecular mass of ammonium nitrite and hence calculate the concentration of 0.500 mol/ dm^3 ammonium nitrite solution in g/ dm^3 .

Relative molecular mass of ammonium nitrite is [1]

Concentration of ammonium nitrite is g/ dm^3 [1]

- (c) (i) State two chemicals that can be used to produce aqueous ammonium nitrite.

.....
 [1]

- (ii) State the preparation method that can be used to produce ammonium nitrite salt.

..... [1]

- (d) (i) Ammonium nitrate, NH_4NO_3 , decomposes when heated, in a similar way to ammonium nitrite, with water as one of the two products. Write a balanced chemical equation for this reaction.

..... [1]

- (ii) Describe a chemical test for nitrate ion and state the results with ammonium nitrate.

chemical test

.....
 [1]

results with ammonium nitrate

.....
 [1]

5 Fluorine, chlorine, bromine and iodine are halogens in Group VII of the Periodic Table.

(a) With reference to the atomic structure, explain why fluorine, chlorine, bromine and iodine are in Group VII of the Periodic Table.

.....

[1]

(b) With reference to the atomic structure, describe and explain the trend in the reactivity of the elements in Group VII as it goes down the group.

.....

[3]

6 Fig 6.1 shows a sequence of reactions involving elements from Group VII.

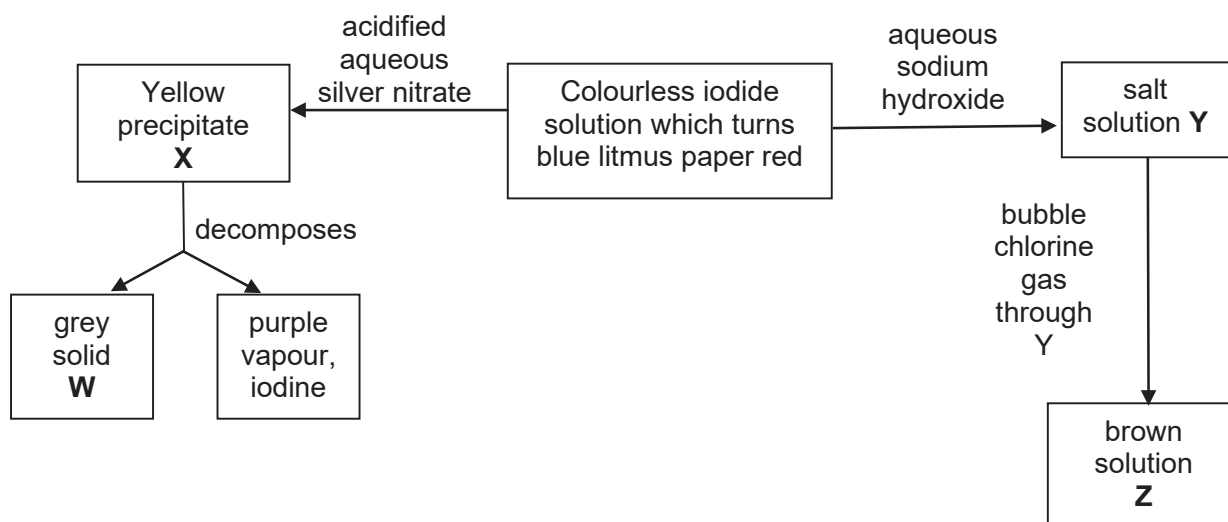


Fig 6.1

(a) Identify the following:

W

X

Y

Z

[4]

- (b) Write a chemical equation, including state symbols, for the reaction between salt solution Y and chlorine gas.

..... [2]

- 7 Haematite, a common ore used for the extraction of iron, contains the compound, iron(III) oxide. Iron is produced in the blast furnace by heating a mixture of iron(III) oxide, coke and limestone with air. **Fig. 7.1** gives the outline of a blast furnace in which iron is extracted from its ore.

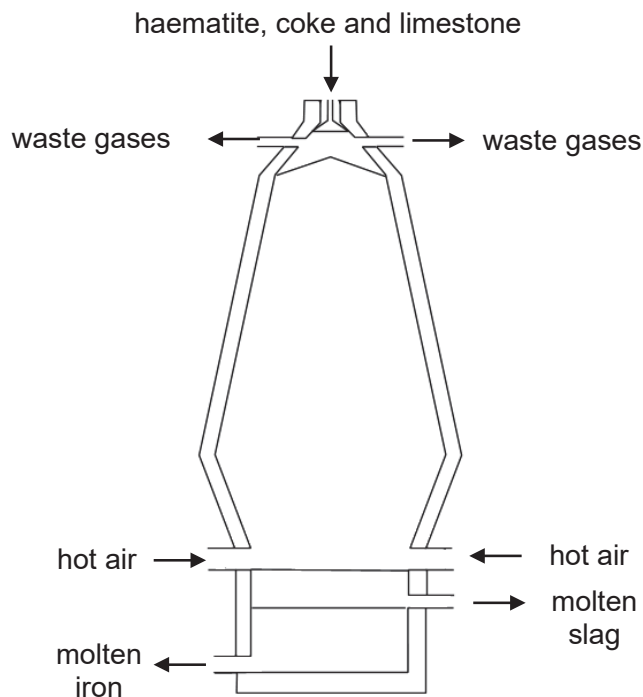
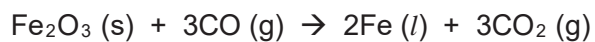


Fig 7.1

- (a) Describe how carbon dioxide is produced under high heat in the blast furnace.

..... [2]

- (b) The chemical equation for the production of iron in the blast furnace is shown.



- (i) State the oxidation state of iron in Fe_2O_3 .

..... [1]

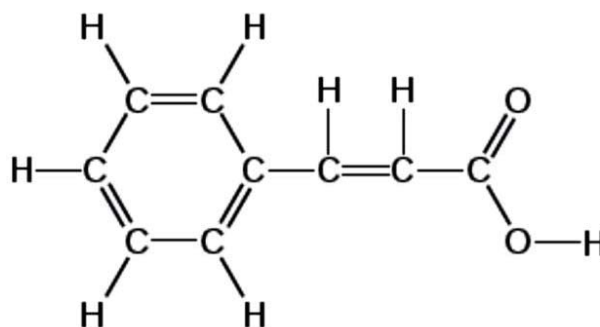
(ii) Explain, in terms of oxidation state, whether iron (III) oxide is oxidised or reduced.

.....
 [2]

(c) State a reason for the presence of nitrogen gas in the blast furnace.

.....
 [1]

8 Cinnamic acid is found in plants called balsams.
 The structure of cinnamic acid is shown below.



(a) Cinnamic acid is an unsaturated compound.

What is meant by the term “unsaturated”?

.....
 [1]

(b) Describe a chemical test to show that cinnamic acid is unsaturated.

chemical test

.....
 [1]

result with cinnamic acid

.....
 [1]

Section B [20 marks]Answer any **two** questions in this section.

Write your answers in the spaces provided.

- 9 (a)** Aqueous iron (II) sulfate can react with magnesium metal but not copper.
- (i)** Explain why copper is unable to react with aqueous iron (II) sulfate.
-
-
- [2]
- (ii)** Write the ionic equation for the reaction between aqueous iron (II) sulfate and magnesium.
- [1]
- (iii)** Explain two observations that can be made when magnesium reacts with aqueous iron (II) sulfate.
-
-
- [2]
- (b)** When acidified potassium manganate (VII) was added to aqueous iron (II) sulfate, aqueous iron (III) sulfate was formed.
- State the observation for this reaction.
- [1]
- (c)** Describe how a student can confirm the presence of iron (II) and sulfate ions in the solution.
- iron (II) ion:
-
- sulfate ion:
- [2]
- (d)** Comment on the electrical conductivity of aqueous iron (II) sulfate, giving a reason for your answer.
-
- [2]

[Turn over

10 (a) Air is a mixture of gases which consists of nitrogen, oxygen, carbon dioxide and a small percentage of argon, water vapour and other gases.

(i) Classify the gases in air by writing the chemical formula of any two elements and two compounds in Table 10.1 below.

Table 10.1

chemical formulae of two elements found in air	chemical formulae of two compounds found in air

(ii) Describe two differences between elements and compounds. [2]

.....

.....

..... [2]

(iii) In another similar experiment, the total volume of air in the apparatus before heating is 150 cm³. At the end of the experiment, the volume of gas remaining is 125 cm³.

Use this information to calculate the percentage of oxygen in this sample of air.

(b) Other than clear air, the atmosphere also contains a large number of pollutants including sulfur dioxide, oxides of nitrogen, methane and chlorofluorocarbons (CFCs). Carbon dioxide, methane and CFCs are greenhouse gases.

(i) Explain one effect of an increase in the atmospheric concentration of carbon monoxide. [2]

.....

..... [2]

(ii) Other than the production of carbon monoxide gas in the blast furnace, state one source of this gas and explain why it is produced. [2]

.....

..... [2]

11 Alcohols form a homologous series.

(a) State two general properties of a homologous series.

.....

 [2]

(b) X is an alcohol containing two carbon atoms in its molecule.

(i) Complete **Table 11.1** by naming, drawing the full structural formula and stating the chemical formula of X.

Table 11.1

Name of X	Structural formula of X	Chemical formula of X

[3]

(ii) State the chemical equation for the reaction between X and atmospheric oxygen.

..... [1]

(iii) A solution of X can be made by fermentation of glucose. Describe how this process is completed in the laboratory, using appropriate apparatus.

.....

 [3]

(iv) X is commonly used in Brazil as a fuel for vehicles. Suggest a reason why X can be used for this purpose.

.....
 [1]

