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CHEMISTRY

PAPER 1 3051/1

Wednesday **22 MAY 2013** 12:00 noon–1:15 P.M.

No additional materials required

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS AND INFORMATION TO CANDIDATES

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

Write your school number, candidate number, surname and initials in the spaces provided above.

Answer **ALL** the questions on this paper.

For each question in this paper, **four** suggested answers A, B, C and D are given.

Circle the letter of the response which you consider to be correct.

Attempt **ALL** the questions. Marks will **NOT** be deducted for wrong answers. Your total score on this test will be the number of correct answers given.

Relative atomic masses are given in the Periodic Table of elements provided.

The volume of one mole of gas at room temperature and pressure (r.t.p.) is $24\,000\text{ cm}^3$ and at standard temperature and pressure (s.t.p.) is $22\,400\text{ cm}^3$.



This question paper consists of 14 printed pages and 2 blank pages.

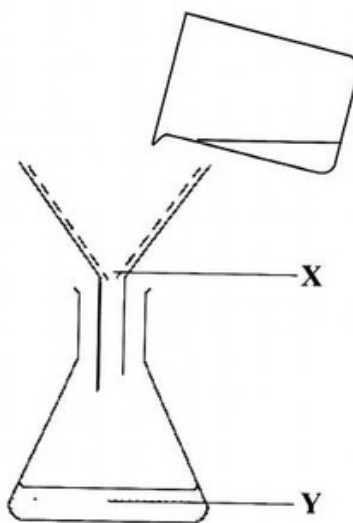
The Periodic Table of the Elements

[illegible]

1. Which of the following mixtures can be separated into pure substances by sublimation?

A sand and iodine crystals
B graphite and aragonite
C ammonium chloride and sugar
D hematite and sodium bicarbonate

2. Identify the parts labelled **X** and **Y** in the apparatus shown.

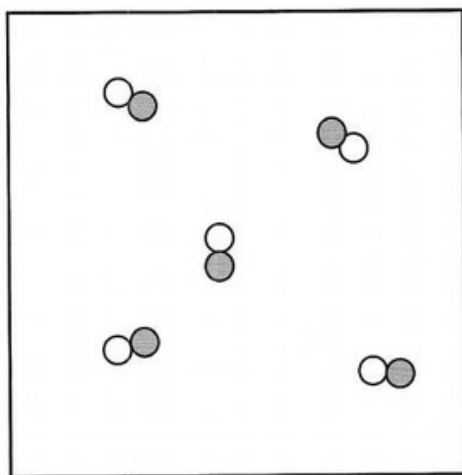


A **X** is the mixture and **Y** is the distillate
B **X** is the residue and **Y** is the filtrate
C **Y** is the pure liquid and **X** is the precipitate
D **Y** is the solid particles and **X** is the solution

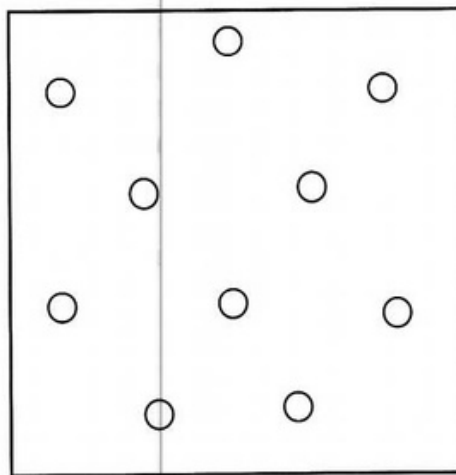
3. Which unit is used when stating the volume of a sample of mercury at 0°C?

A grams
B metres
C seconds
D centimetre cubed

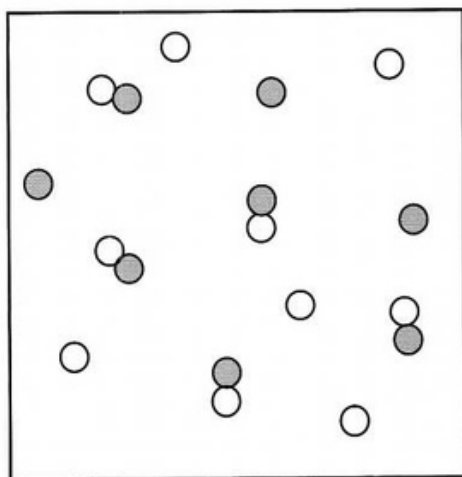
4. Which diagram shows a mixture of elements and compounds?



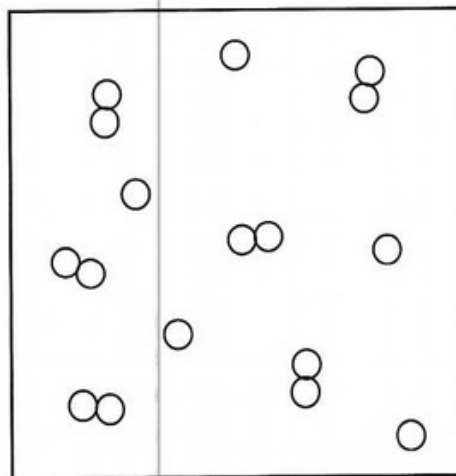
A



B



C



D

5. Nitrogen is an element found in all commercial fertilisers. Which fertiliser contains the largest percentage of nitrogen by mass?

- A ammonium nitrate, NH_4NO_3
- B ammonium sulfate, $(\text{NH}_4)_2\text{SO}_4$
- C ammonium phosphate, $(\text{NH}_4)_3\text{PO}_4$
- D calcium nitrite $\text{Ca}(\text{NO}_2)_2$

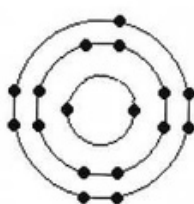
6. Which subatomic particles have the same mass?

- A neutron and electron
- B proton and electron
- C neutron and proton
- D electron and hydrogen ion

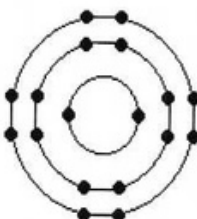
7. What is the number of neutrons in an atom that has an atomic number of 40 and a nucleon (mass) number of 91?

- A 40
- B 51
- C 91
- D 131

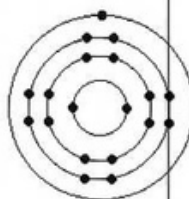
8. Which diagram represents the calcium ion?



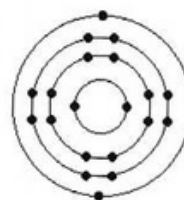
A



B



C

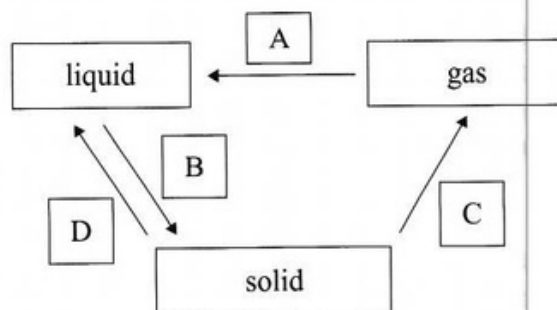


D

9. Chlorine exists as two different isotopes. The isotopes have different

- A atomic numbers
- B chemical properties
- C numbers of neutrons
- D numbers of electron.

10. Which arrow shows condensation occurring?



- A arrow A
B arrow B
C arrow C
D arrow D
11. The relative atomic mass of nitrogen is 14. Which statement is **INCORRECT**?
- One mole of nitrogen gas at s.t.p.
- A contains 6.02×10^{23} particles.
B contains 14 molecules.
C occupies 22.4 dm^3 .
D has a mass of 28 g
12. Which gas will diffuse at the fastest rate?
- A carbon dioxide
B methane
C ammonia
D carbon monoxide

13. Name the type of bonding found in the diagram.



- A covalent bonding
B dative bonding
C ionic bonding
D metallic bonding
14. Which statement describes the oxidation of a metal?

- A loses protons
B gains hydrogen
C gains electrons
D gains oxygen

Refer to the list of contributors to the development of the Atomic Theory to answer questions 15–17.

- A Amedeo Avogadro
B John Dalton
C Antoine Lavoisier
D Joseph Louis Proust

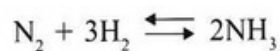
Which contributor developed the

- | | | | | | |
|-----|------------------------------|---|---|---|---|
| 15. | Law of Conservation of Mass | A | B | C | D |
| 16. | Law of Multiple Proportions | A | B | C | D |
| 17. | Law of Definite Proportions? | A | B | C | D |

18. What is the mass of one mole of carbon dioxide?

- A 28
- B 28 g
- C 44
- D 44 g

19. How many moles of N_2 are required to produce 18 moles of NH_3 in this reaction?



- A 9
- B 18
- C 27
- D 36

20. In the equation summarising photosynthesis in plants, what is the mole ratio of carbon dioxide to glucose?



- A 1:1
- B 1:6
- C 3:4
- D 6:1

21. Which alkaline gas turns moist red litmus paper blue?

- A sulfur dioxide
- B ammonia
- C nitrogen dioxide
- D hydrogen

22. What is the colour of Universal Indicator in sodium hydroxide?

- A blue
- B green
- C red
- D pink

23. Which of the following is **true** about sulfuric acid?
- A is a poor conductor of electricity
 - B has a pH less than 7
 - C will react with copper to produce hydrogen gas
 - D has no reaction with zinc carbonate
24. What is the basicity of hydrochloric acid, $\text{HCl}_{(\text{aq})}$?
- A 1
 - B 2
 - C 3
 - D 4
25. Which solution, of concentration 1 mol/dm^3 , has the highest concentration of hydrogen ions?
- A ethanoic acid
 - B hydrochloric acid
 - C sodium hydroxide
 - D sulfur trioxide
26. Which gas is produced when hot, concentrated sulfuric acid reacts with copper?
- A hydrogen
 - B carbon dioxide
 - C sulfur dioxide
 - D sulfur trioxide
27. Which metal ion produces an apple-green flame in the flame test?
- A Cu^{+2}
 - B Na^{+}
 - C Ba^{+2}
 - D Ca^{+2}

28. A solution of silver nitrate, acidified with dilute nitric acid is used to test for
- A chlorides
 - B carbonates
 - C nitrates
 - D sulfates
29. What is the valency of copper in Cu_2O ?
- A +1
 - B -1
 - C +2
 - D -2
30. Which is made at the anode during electrolysis of molten lead bromide?
- A H_2
 - B Pb
 - C Br_2
 - D O_2
31. Which compound forms a coloured aqueous solution?
- A CaCl_2
 - B CrCl_3
 - C NaOH
 - D KBr
32. What happens to the atoms of a metal and a non-metal when they react to form a compound?
- A the metal atoms gain electrons and the non-metal lose electrons
 - B the metal atoms lose electrons and the non-metal increase in size
 - C the metal atoms gain electrons and the non-metal decrease in size
 - D the non-metal atoms share electrons with the metal atoms.

33. How is a pain killer, such as Tylenol or Panadol, used to relieve headaches classified?
- A analgesics
 - B antibiotics
 - C antidepressants
 - D hallucinogens
34. What is the general relationship between boiling point and molecular size for hydrocarbons in a series?
- A there is no relationship
 - B the smaller the molecule, the lower the boiling point
 - C the boiling point is constant
 - D the larger the molecule the lower the boiling point
35. What is responsible for the atoms of elements in a Group on the Periodic Table having similar chemical properties?
- A the number of paired electrons
 - B the number of valence electrons
 - C the atomic numbers
 - D the atomic masses
36. Which metal is obtained commercially by the electrolysis of common salt?
- A Zn
 - B Na
 - C Fe
 - D Ag
37. Which element can be found in nature in the free (uncombined) state?
- A Ca
 - B Ba
 - C Au
 - D Al

38. Which symbols represent atoms that are isotopes?

- A C - 14 and N - 14
- B O - 16 and O - 18
- C I - 131 and I - 131
- D Rn - 222 and Ra - 222

Use the list of gases to answer questions 39 to 42. The choices may be used once, more than once or not at all.

- A carbon dioxide
- B hydrogen
- C oxygen
- D nitrogen

39. How many of the listed gases are diatomic?

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

Which gas

40. could be made by decomposing peroxide; A B C D

41. is a triatomic; A B C D

42. is used in the **Contact Process**? A B C D

43. Which element, for reasons of safety, should never be added to acid?

- A sodium
- B magnesium
- C iron
- D gold

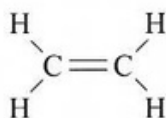
44. Which industrial process produces pig iron?

- A Blast Furnace
- B Contact Process
- C Electrolysis
- D Fractional Distillation

45. How many electrons are in the outer ring of each carbon atom in the molecule C_2H_6 ?

- A 2
- B 4
- C 6
- D 8

Use the diagram to answer questions 46–47



46. What is the name of the series to which the diagramed organic compound belongs?

- A Alkanoic acids
- B Alkanols
- C Alkenes
- D Alkanes

47. What type of chemical reaction takes place when the compound reacts with chlorine gas?

- A Addition reaction
- B Substitution reaction
- C Combustion reaction
- D Hydration reaction

48. In a laboratory experiment some yeast was added to grape juice and left in the lab for two days. Which row in the table correctly matches the chemical reaction that is occurring and a product that is being formed?

	chemical reaction	product
A	Addition	ethanol
B	Fermentation	ethanol
C	Polymerisation	poly(ethene)
D	Substitution	methanol

49. What is the oxidation number of iron in iron oxide, Fe_2O_3 ?

- A + I
- B + II
- C + III
- D + IV

50. From which ore is aluminum extracted?

- A Aragonite
- B Bauxite
- C Hematite
- D Ferric oxide

3051/2

BGCSE

School Number	Candidate Number
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CHEMISTRY

PAPER 2 3051/2

Wednesday **22 MAY 2013** 1:30–3:30 P.M.

No additional materials required

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS AND INFORMATION TO CANDIDATES

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

Write your school number, candidate number, surname and initials in the spaces provided above.

Answer **ALL** the questions on this paper.

Read each question carefully and make sure you know what you have been before starting your answer.

The instruction **NAME** . . . requires an answer in words not chemical symbols.

Show **ALL** your working when answering numerical questions. Lines are provided on the question paper for your answers. You should write your answers on these lines only.

The mark for each part question is given in brackets [].

This question paper consists of 16 printed pages and 4 blank pages.

[illegible]

*58-71 Lanthanoid series
†90-103 Actinoid series

Key

a	X
---	---

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

1. (i) Use the Periodic Table to answer this question.

- (a) State the total number of elements that are in Period 3 of the Periodic Table. _____
- (b) Name an element that is a liquid at r.t.p. _____
- (c) Name the element that is the least dense gas at r.t.p. _____
- (d) Name the element that is the most reactive non-metal. _____
- (e) Give the atomic mass of the element with the symbol Ir. _____
- (f) Name the element that has stable atoms containing 12 neutrons. _____
- (g) Clean, dry air contains several **elements**. Name the group to which the third most abundant of these elements belongs. _____
- (h) Name one of the elements in the compound known as Aragonite. _____ [8]

(ii) Draw dot and cross (Lewis) diagrams showing the ions or molecules in the substances named below. [2]

sodium fluoride, NaF	fluoride gas, F ₂

TOTAL MARKS [10]

2. Compounds are substances that are made up of two or more different elements. Compounds can exist as salts or molecular compounds.

(a) (i) Give the chemical name for **common salt**.

_____ [2]

(ii) Name the type of bonding that is found in salts.

_____ [1]

(iii) Complete the word equation by inserting one word into each blank.

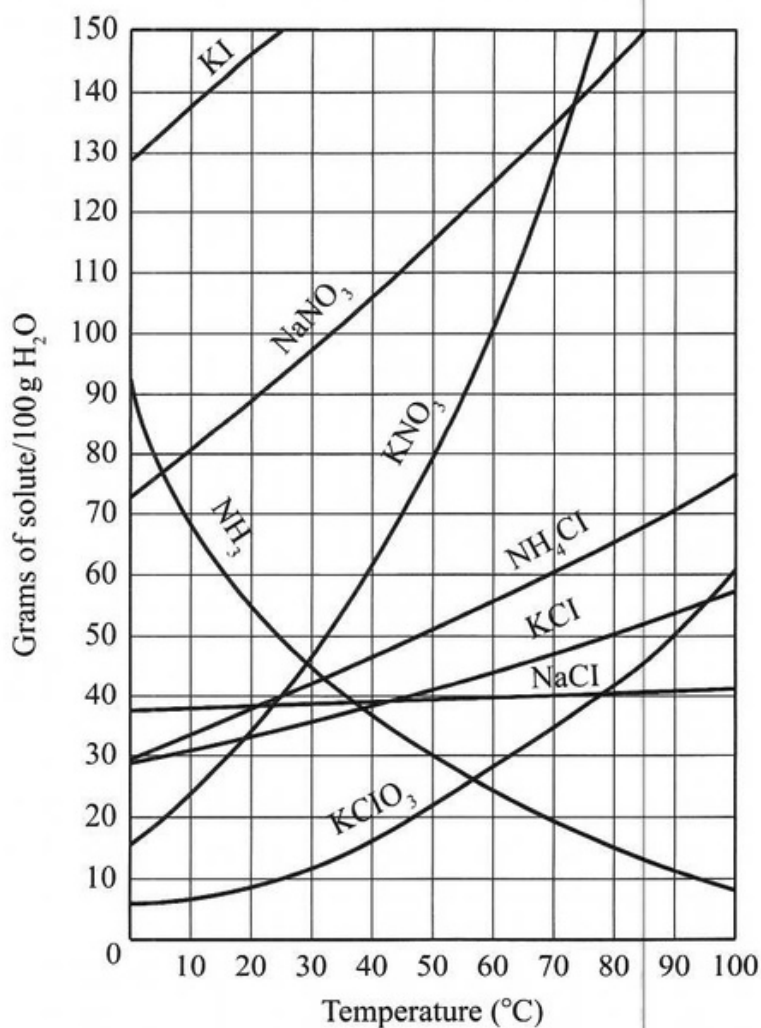
acid + → salt + [2]

(b) This question is about covalent and ionic compounds. Use the words printed in bold to fill in the blanks.

physical property	type of compound	
	covalent	ionic
The melting point of the compound is usually high or low		
A compound that is a solid at room temperature can be dissolved in water yes or no (exclude ALL sugars)		
The compound will conduct electricity when it is in the form of a liquid yes or no		

[3]

- (c) The graph shows the solubility curves for different substances.



Use the graph to determine solubility.

- (i) Which is the most soluble substance at 10°C, potassium chlorate, potassium nitrate or sodium nitrate?

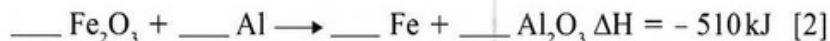
- (ii) State the solubility of ammonium chloride (NH₄Cl) at 80°C.

[2]

TOTAL MARKS [10]

3. At high temperatures iron(III) oxide reacts with aluminium metal according to the chemical equation.

(a) (i) Balance the chemical equation.



(ii) Name the substance that is reduced in the reaction.

_____ [1]

(iii) State the purpose of Al in the reaction.

_____ [1]

(iv) Explain what the symbol $\Delta H = -510 \text{ kJ}$ means.

_____ [1]

(v) Find the mass of iron which will be produced if 2.50 kg of iron(III) oxide is reacted.

[2]

(b) An alloy is a mixture of metals. Iron is used to make various kinds of steel. One form of steel contains carbon.

(i) Name one metal that can be added to iron to make steel.

_____ [1]

(ii) Give a benefit of adding other metals to iron to make the alloy steel.

_____ [1]

(iii) A common non-steel alloy is bronze. Name the metal which is added to copper to make bronze.

_____ [1]

TOTAL MARKS [10]

BLANK PAGE

4. (a) The table shows observations made of various solutions. Classify each solution as either an acid or a base.

Complete the table by placing a tick (✓) in the column of the answer you select to indicate whether the observations indicate an **acid** or a **base**.

observations	acid	base
taste sour and turns blue litmus red		
displaces ammonia from its salt		
reacts with iron giving hydrogen		

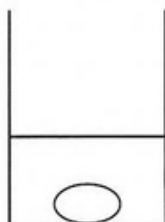
[3]

- (b) Hydrochloric acid and ethanoic acid are both monobasic acids. When tested, hydrochloric acid solution had a pH of 1, ethanoic acid had a pH of 4, even though both were of the same concentration. Explain these results.

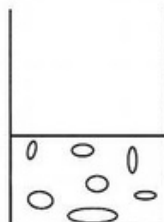
_____ [1]

- (c) The diagram shows the making of a soluble salt.

copper(II) carbonate is
added to hydrochloric acid



fizzing is seen
as a gas is given



excess copper(II)
carbonate remains

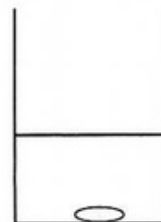


Figure 4.9

- (i) State the colour of Universal Indicator in hydrochloric acid before the copper(II) carbonate is added in Fig. 4.9.

_____ [1]

- (ii) Name the gas causing the fizz in the reaction in **Fig. 4.9**.

_____ [1]

- (iii) Explain why, at the end of the chemical reaction, some copper(II) carbonate remains in the beaker in **Fig. 4.9**.

_____ [1]

- (iv) State how the excess copper(II) carbonate is removed from the mixture.

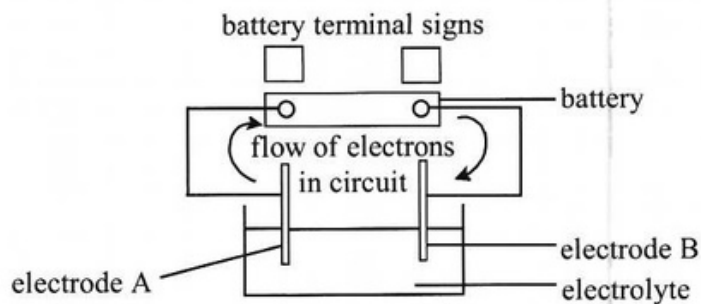
_____ [1]

- (v) Describe how crystals of the salt can be obtained from the solution after the excess copper carbonate has been removed.

_____ [2]

TOTAL MARKS [10]

5. The diagram shows the electrolysis of molten sodium chloride.



- (a) (i) Copper was chosen because it is an excellent conductor of electricity. State another reason why copper is chosen as the conductor.
- _____ [1]
- (ii) **On the diagram**, write the battery terminal signs (+ and -) in the two boxes.
- _____ [1]
- (iii) Use your knowledge about the flow of electrons in an electrolysis circuit to give the name of electrode A.
- _____ [1]
- (iv) The current in the wires is caused by the movement of electrons. State the cause of the current in the electrolyte.
- _____ [1]
- (b) A student wants to electroplate a piece of copper with silver metal.
- (i) Suggest a suitable electrolyte for electroplating copper.
- _____ [1]
- (ii) Explain where, in the diagram, the piece of copper to be electroplated should be placed.
- _____ [1]

- (c) **Situation I** and **situation II** are examples of oxidation and reduction reactions.

SITUATION I

Cathodic protection is the method most often employed to protect steel from rusting in buried fuel tanks and pipelines. A magnesium rod is connected by a wire to the tank or pipeline. Magnesium supplies electrons to the iron. This prevents the iron from rusting.

- (i) Magnesium is oxidised in the process instead of steel or iron. In terms of electrons, explain the meaning of oxidation.

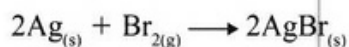
_____ [1]

- (ii) Name another metal that can be used instead of magnesium in this reaction.

_____ [1]

SITUATION II

Silver bromide, a salt used in making light-sensitive photographic film, is made as shown in the equation.



Identify the

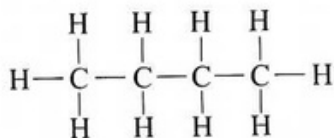
- (iii) element which is reduced;

- (iv) substance which acts as the reducing agent.

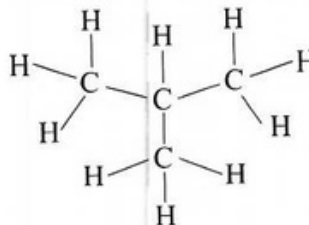
_____ [2]

TOTAL MARKS [10]

6. The diagrams show the structural formulae of two organic compounds.



Compound A



Compound B

- (a) (i) State the chemical name for **Compound A**.
_____ [1]
- (ii) Write the molecular formula for both compounds.
_____ [1]
- (iii) Calculate the r.m.m. of these compounds.
_____ [1]
- (iv) Two different compounds are formed when **Compound A** undergoes a substitution reaction with bromine. Draw the molecular structure of one of these compounds.
_____ [1]
- (b) (i) State the term used in organic chemistry to describe the relationship between **Compound A** and **Compound B**.
_____ [1]

- (ii) Give the name and general formula of the homologous series to which both of these compounds belong.

Name: _____

general formula: _____ [2]

- (c) Name the carbon compound formed that forms the largest component of natural gas.

_____ [1]

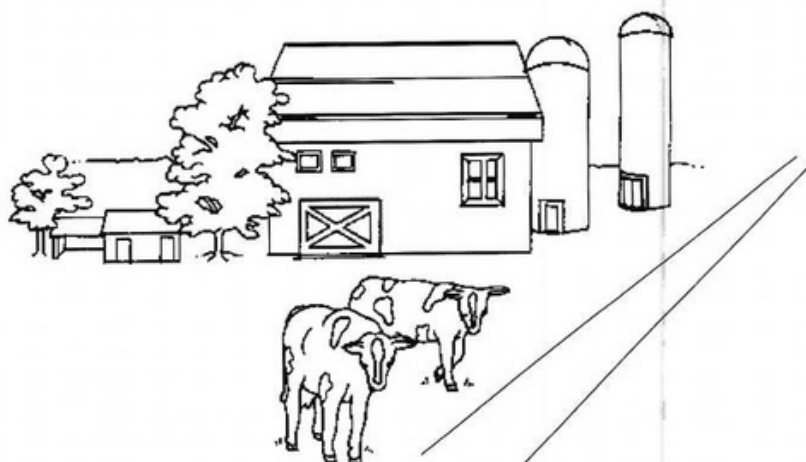
- (d) Name the first member of the **alkene** and **alcohol** series.

alkene series _____

alcohol series _____ [2]

TOTAL MARKS [10]

7. The diagram shows a farm next to a water supply.



Over a period of time, the farmer notices that the water, in the river next to his farm, changes colour and he sees dead fish floating in it. He thinks that pollution has caused these changes.

- (a) (i) Define the term **pollution**.

_____ [2]

- (ii) Name a possible **source** of the pollution seen in the river.

_____ [1]

- (iii) Name **ONE** pollutant from the source mentioned in (a) (ii) that contributes to the pollution seen in the river.

_____ [1]

- (iii) Explain the term **eutrophication**.

_____ [2]

(b) A catalytic converter is a device that is attached to an automobile's exhaust system. A catalytic converter changes harmful pollutants in an automobile's fuel into less harmful substances by oxidation and reduction.

(i) Name a poisonous pollutant made by the combustion of fuel that is oxidised by the catalytic converter.

_____ [1]

(ii) Name the gas that results from the action of the catalytic converter on the pollutant named in (i).

_____ [1]

(iii) Name the metal that can be used as a catalyst in the catalytic converter.

_____ [1]

(iv) Name the environmental problem that the catalytic converter has little or no effect in reducing.

_____ [1]

TOTAL MARKS [10]

8. While doing an inventory of chemicals with students, a chemistry instructor comes across an old container of potassium metal. The students had heard of this metal and were very curious about what it could do. The instructor agrees to demonstrate some of its chemistry if the students could tell him what they already knew about it. Before any investigations the students agree to follow all instructions and safety precautions.

The students knew:

Potassium is stored in oil, is a soft, shiny grey, very reactive metal that they had heard can burn in water (were eager to see if this was true) and its compounds are soluble in water.

The instructor opens the container and shows the students that **the oil had drained away** and the **material** in the container is a **dull grey**. Using forceps the instructor removes a small cylinder of the grey material and scrapes off some of the grey surface matter with an ordinary table knife to reveal a shiny substance underneath. He easily cuts a small disk of the material from the cylinder shaped material.

- (a) State what caused the shiny metal to corrode.
_____ [1]
- (b) Name the dull grey substance. _____ [1]
- (c) The instructor tests the grey material, state the colour of the
- (i) flame test, _____ [1]
- (ii) litmus in its aqueous solution. _____ [1]
- (d) The shiny material is held together by a metallic bond. Describe how the metallic bond works. You may draw a diagram to help in your description.

_____ [2]

- (e) When small pieces of the shiny metal were added to water a lilac-coloured flame was seen and the students heard a popping sound. The metal disappeared into the water.

Suggest the name of the **final product** that was formed by the reaction, in the water.

_____ [1]

- (f) The instructor agrees to show the curious students what would happen if a small piece of the shiny potassium was added to hydrochloric acid. For safety reasons the instructor uses dilute acid and a small sample of the metal. During the violent reaction between metal and acid, a new compound is formed.

- (i) Name this new compound.

_____ [1]

- (ii) Give the name of the reagent used to identify the anion.

_____ [1]

- (g) Using the Periodic Table identify an element that could displace the cation in the compound made in (f).

_____ [1]

TOTAL MARKS [10]

3051/3

BGCSE

School Number	Candidate Number
Surname and Initials	

CHEMISTRY

PAPER 3 3051/3

Monday **3 JUNE 2013** 12:00 noon–1:30 P.M.

Additional materials:
Graph paper

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS AND INFORMATION TO CANDIDATES

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

Write your school number, candidate number, surname and initials at the top of this page as well as at the top of all lined paper submitted.

Answer **ALL** the questions in **Section A** in the spaces provided on this question booklet and any **TWO** questions from **Section B** on the lined paper provided at the back of this question booklet.

Equations and diagrams should be given wherever they are helpful.

Essential working must be shown.

The intended marks for each question or part question are given in brackets [].

Relative atomic masses are given in the Periodic Table of elements provided.

ADDITIONAL INFORMATION

s.t.p. ($t = 0^{\circ}\text{C}$, $p = 760\text{ mmHg}$)

The volume of one mole of gas at room temperature and pressure (r.p.t.) is $24\,000\text{ cm}^3$.

This question paper consists of 14 printed pages, 6 lined pages and 4 blank pages.

[Turn over

The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
1 H Hydrogen 1																	
7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35 5 Cl Chlorine 17	40 Ar Argon 18
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	101 Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Cesium 55	137 Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
Fr Francium 87	Ra Radium 88	Ac Actinium 89															
*58-71 Lanthanoid series †90-103 Actinoid series																	
140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	146 Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71				
232 Th Thorium 90	238 Pa Protactinium 91	238 U Uranium 92	238 Np Neptunium 93	244 Pu Plutonium 94	244 Am Americium 95	244 Cm Curium 96	244 Bk Berkelium 97	244 Cf Californium 98	251 Es Einsteinium 99	252 Fm Fermium 100	257 Md Mendelevium 101	259 No Nobelium 102	259 Lr Lawrencium 103				

a

X

b

Key

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

Key

a	X	b
---	---	---

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

EXAMINATION

School No.	Candidate No.	Level:	For Examiner's Use
Subject Number & Title:		Paper:	
Surname & Initials:		Section:	
Signature:	Date:	Qu. No.	

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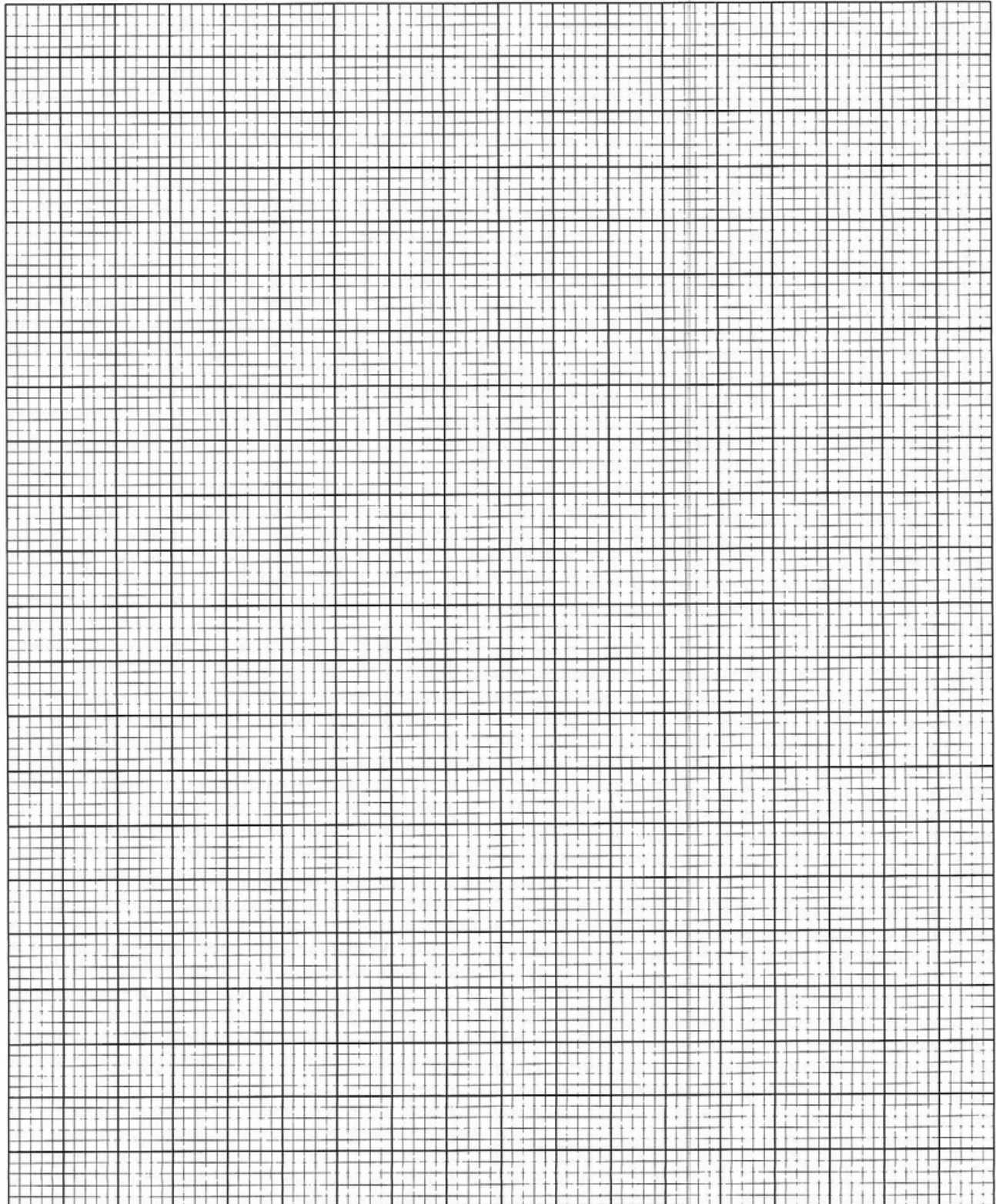
SCIENCE GRAPH PAPER

MINISTRY OF EDUCATION

AB7

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

School No.	Candidate No.	Level:	For Examiner's Use
Subject Number & Title:		Paper:	
Surname & Initials:		Section:	
Signature:	Date:	Qu. No.	

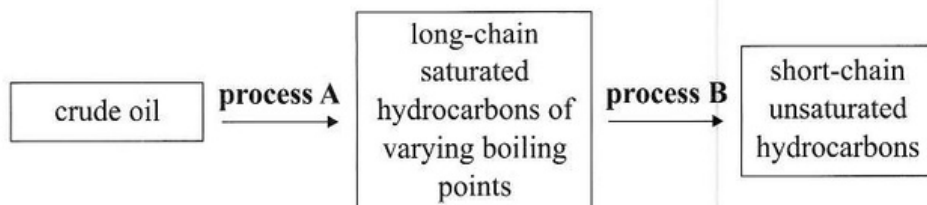


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Section A

This section consists of 4 questions containing several parts. Candidates are to answer all the parts of each of the 4 questions.

1. (a) Study the schematic and use it to answer the following questions.



- (i) Name the homologous series to which long-chain saturated hydrocarbons belong.

_____ [1]

- (ii) State the names of the **processes A** and **B**.

A _____

B _____ [2]

- (iii) **Process B** requires the use of a catalyst.

Explain what effect a catalyst has on the rate of a chemical reaction.

_____ [1]

- (iv) During **process B**, long-chain saturated hydrocarbon molecules such as $C_{16}H_{34}$ are split up to give short-chain unsaturated molecules such as C_2H_4 . Suggest a chemical equation for this reaction that produces only **ONE** of these unsaturated molecules.

[1]

- (v) Explain why the product C_2H_4 is an important material for the production of plastics.

_____ [2]

- (b) The unsaturated C_2H_4 may be used in the following reaction.



What type of reaction is

- (i) **reaction C?** _____
(ii) **reaction D?** _____ [2]
(iii) Suggest the name of a reagent that can be used in the laboratory for **reaction D**, changing C_2H_5OH to CH_3CO_2H .

_____ [1]

TOTAL MARKS [10]

2. This question is about the generation of electricity. Electricity is produced in many countries using coal-fired power stations or nuclear reactors. The heat from these reactions is used to run steam-powered generators.

(a) (i) Here is a word equation for the burning of coal.

Complete the equation by using symbols that show that heat is being given out during the reaction.

coal + air $\longrightarrow$ ash + **product X** (g) + **product Y** (l) + _____ [1]

(ii) Write one word to describe a reaction which gives out heat.

_____ [1]

(iii) One of the products of the reaction in (a)(i) increases global warming. State whether **X** or **Y** causes global warming and name the product you have chosen.

_____ [1]

(iv) Coal also contains sulfur. Name a pollutant that is produced from sulfur during the burning of coal.

_____ [1]

(v) Write an equation to show the chemical change that occurs when the substance you have named in (iv) is released into the atmosphere.

_____ [2]

(vi) State an effect the product of this reaction will have on Bahamian rock.

_____ [1]

- (b) Nuclear power is produced using radioactive isotopes. The element uranium exists as the isotope U^{235} and U^{238} . One of these isotopes is very radioactive.

(i) Explain what is meant by the term **radioactive**.

_____ [1]

(ii) Name a metal that can be used in the construction of the power plant to prevent radiation from leaking into the air.

_____ [1]

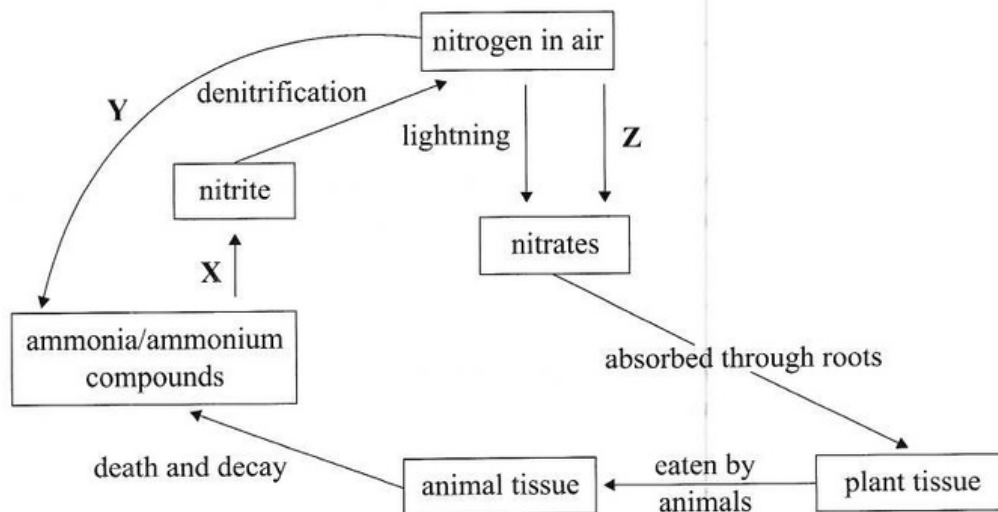
- (c) State how electricity can be produced in The Bahamas using a renewable energy source.

_____ [1]

TOTAL MARKS [10]

3. Nitrogen is an important element needed by organisms for the growth and repair of tissue. The nitrogen cycle explains how nitrogen is recycled in the air and soil.

The diagram represents the Nitrogen Cycle



- (a) Name the processes that are occurring at **X**, **Y** and **Z**.

(i) **X** _____

(ii) **Y** _____

(iii) **Z** _____ [3]

- (b) (i) Balance the equation to show the reaction that occurs in process **X**.



- (ii) Calculate the volume of oxygen needed to react with 240 dm³ of ammonia at s.t.p.

[2]

- (c) Nitrogen gas is used to make ammonia and nitric acid on an industrial scale for the manufacture of fertilisers.

Explain how pure nitrogen gas is prepared industrially from air.

[2]

TOTAL MARKS [10]

4. The preparation of copper metal involves roasting of the ore Cu_2S (Chalcocite) with oxygen to convert the metal sulfides to metallic oxides. The equation for the reaction is



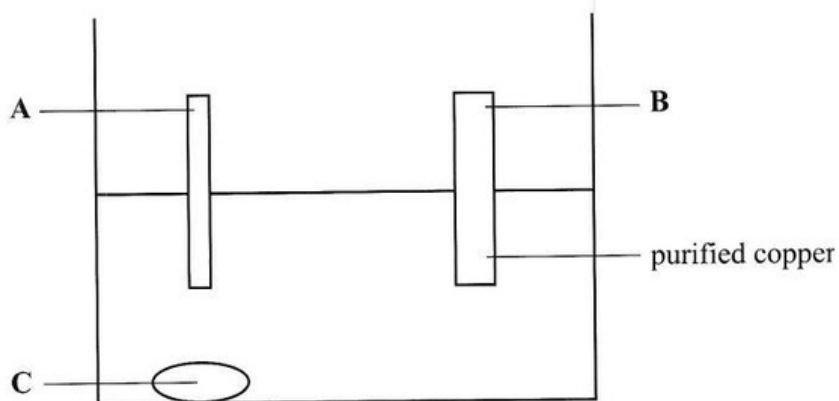
- (a) (i) Calculate the mass of copper that could theoretically be obtained from 8 kg of Copper sulfide.

[2]

- (ii) Calculate the volume of oxygen needed to convert 8 kg of Cu_2S at r.t.p.

[3]

- (b) The copper(I) oxide is then smelted by mixing and heating with SiO_2 , CaCO_3 and air to produce blister copper (impure copper). The impure copper can be purified by electrolysis to 99.95% purity. The diagram represents electrolysis showing the parts of the electrolytic cell.



- (i) State which electrode, **A** or **B**, is connected to the positive terminal of the direct current.

_____ [1]

- (ii) Suggest what substance **C** is most likely to be.

_____ [1]

- (iii) Write the symbol equations for the anode and cathode half-reactions.

Anode reaction

Cathode reaction [2]

- (iv) Name a suitable electrolyte that could be used in the purification of impure copper.

_____ [1]

TOTAL MARKS [10]

Section B

This section consists of 3 questions. Candidates are to select any two of the questions numbered 5, 6 and 7.

5. A student carried out two experiments **A** and **B** to investigate rates of reaction using equal masses of zinc and equal excess dilute hydrochloric acid. The total volume of hydrogen given off was measured at r.t.p., every 30 seconds.

The results for the two experiments were recorded in a table.

time/s		0	30	60	90	120	150	180	210
volume of hydrogen/cm ³	Expt. A	0	200	320	420	500	560	590	600
	Expt. B	0	265	400	490	560	600	600	600

- (a) (i) Draw graphs of the volume of hydrogen against time. Use the same axes for both **experiment A** and **experiment B**. [7]
- (ii) Draw a diagram to show the apparatus used to produce and collect the gas. [2]
- (b) (i) Use your graph to find the volumes of gas produced in 100 s in **both** experiments.
- (ii) Suggest a reason why one reaction is able to proceed faster.
- (iii) Explain why the slopes of the graphs become less steep as the reactions proceed. [4]
- (c) (i) Write a chemically balanced equation for the reaction between zinc and hydrochloric acid.
- (ii) Calculate the total number of moles of hydrogen produced by the two experiments.
- (iii) Using the equation calculate the mass of zinc reacted in each experiment. [6]
- (d) In past years, hydrogen was used in passenger-carrying airships. State why it is no longer used in this way. [1]

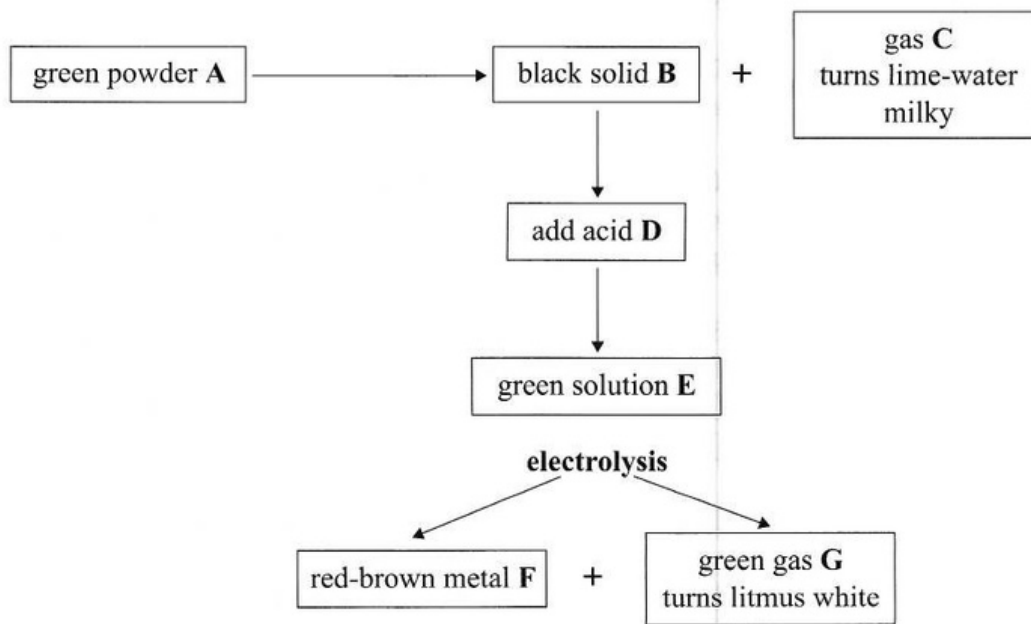
TOTAL MARKS [20]

6. Fermentation of sucrose is a process used in industry to make a useful chemical.
- (a) (i) Name a useful product of fermentation. [1]
- (ii) Write a balanced symbol equation for the fermentation of sucrose $C_{12}H_{22}O_{11}$. [2]
- (iii) Other than as a drink, suggest a use for the product you have named in (a)(i). [1]
- (b) Sucrose, $C_{12}H_{22}O_{11}$ is a disaccharide that can be split into two monosaccharide sugars. One of these 6-carbon sugars is used by the human body as a fuel to produce quick energy.
- (i) Sucrose is often purchased in grocery stores in 5 lb bags. If one pound is equal to 454 grams, calculate the number of moles of sucrose (to two decimal places) contained in one 5 lb bag of pure sucrose. [Show all working] [2]
- (ii) Determine the percentage composition, by mass, of sucrose. [1]
- (iii) Write the name and chemical formula of the 6-carbon sugar used by the body to produce quick energy. [1]
- (iv) Write the empirical formulae of the 6-carbon sugar named in part (ii). [1]
- (c) Human respiration produces the energy needed to power our biological processes.
- (i) Write the formula for oxidation of glucose during respiration. [2]
- (ii) Explain a chemical test to positively identify **ONE** of the products of this reaction. [2]
- (d) Sulfuric acid is one of the most important industrially produced chemicals.
- (i) Sulfur dioxide reacts with oxygen in the presence of a catalyst. Name this reaction. [1]
- (ii) Write the equation for this reaction. [2]
- (iii) Name a catalyst that is used for this reaction. [1]
- (iv) State **ONE** industrial use for sulfuric acid. [1]

TOTAL MARKS [20]

7. An unlabelled bottle containing a dull-green **powder A** was found in a lab. The dull-green powder is analysed and the scheme of the process and results are recorded in the chart.

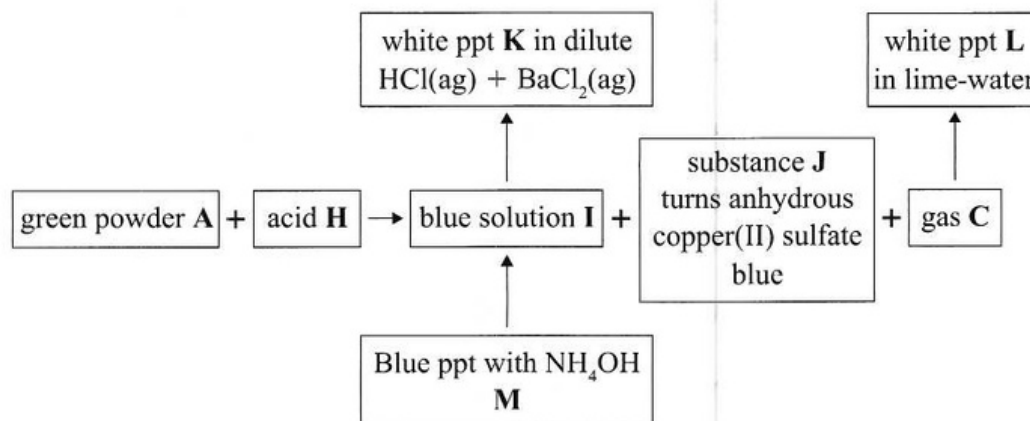
Reaction Scheme 1



Use the information given in the schematic to answer the questions.

- (a) (i) Identify the substances lettered from **A** to **G** in the reaction scheme.
- (ii) Write a symbol equation for the reaction that occurs when the green powder is heated. [10]

Reaction Scheme 2

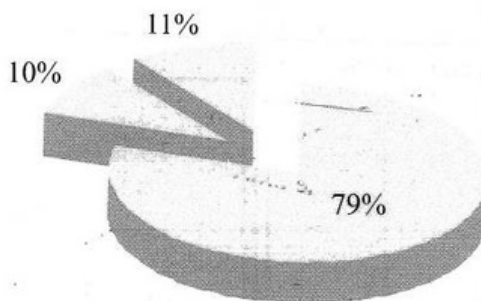


- (iii) Identify the substances lettered **H** to **M** in the reaction scheme. [5]

(b) Magnesium metal occurs as a mixture of three isotopes.

(i) Define the term **isotopes**. [1]

(ii) Use the Periodic Table to answer the question. State how many neutrons are present in one atom of each of the isotopes Mg-25 and Mg-26. [1]



The percentages of the three isotopes are

79% of Mg-24

10% of Mg-25

11% of Mg-26

(iii) Taking into account the different percentages of the three isotopes, Calculate the relative atomic mass of magnesium. [3]

TOTAL MARKS [20]

Question
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[illegible]

Question
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[illegible]

Question
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[illegible]

Question
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[illegible]

Question
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[illegible]

Question
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