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CHEMISTRY

PAPER 1 3051/1

Tuesday **22 MAY 2008** 12.30 – 1.45 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.

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 cm³ and at standard temperature and pressure (s.t.p.) is 22 400 cm³.

This question paper consists of 13 printed pages and 3 blank pages.

hydrogen 1 H 1.0079												helium 2 He 4.0026						
lithium 3 Li 6.941	beryllium 4 Be 9.0122											boron 5 B 10.811	carbon 6 C 12.011	nitrogen 7 N 14.007	oxygen 8 O 15.999	fluorine 9 F 18.998	neon 10 Ne 20.180	
sodium 11 Na 22.990	magnesium 12 Mg 24.305											aluminium 13 Al 26.982	silicon 14 Si 28.086	phosphorus 15 P 30.974	sulfur 16 S 32.065	chlorine 17 Cl 35.453	argon 18 Ar 39.948	
potassium 19 K 39.098	calcium 20 Ca 40.078		scandium 21 Sc 44.956	titanium 22 Ti 47.867	vanadium 23 V 50.942	chromium 24 Cr 51.996	manganese 25 Mn 54.938	iron 26 Fe 55.845	cobalt 27 Co 58.933	nickel 28 Ni 58.693	copper 29 Cu 63.546	zinc 30 Zn 65.39	gallium 31 Ga 69.723	germanium 32 Ge 72.61	arsenic 33 As 74.922	selenium 34 Se 78.96	bromine 35 Br 79.904	krypton 36 Kr 83.80
rubidium 37 Rb 85.468	strontium 38 Sr 87.62		yttrium 39 Y 88.906	zirconium 40 Zr 91.224	niobium 41 Nb 92.906	molybdenum 42 Mo 95.94	technetium 43 Tc [98]	ruthenium 44 Ru 101.07	rhodium 45 Rh 102.91	palladium 46 Pd 106.42	silver 47 Ag 107.87	cadmium 48 Cd 112.41	indium 49 In 114.82	tin 50 Sn 118.71	antimony 51 Sb 121.76	tellurium 52 Te 127.60	iodine 53 I 126.90	xenon 54 Xe 131.29
caesium 55 Cs 132.91	barium 56 Ba 137.33	57-70 ★	lutetium 71 Lu 174.97	hafnium 72 Hf 178.49	tantalum 73 Ta 180.95	tungsten 74 W 183.84	rhenium 75 Re 186.21	osmium 76 Os 190.23	iridium 77 Ir 192.22	platinum 78 Pt 195.08	gold 79 Au 196.97	mercury 80 Hg 200.59	thallium 81 Tl 204.38	lead 82 Pb 207.2	bismuth 83 Bi 208.98	polonium 84 Po [209]	astatine 85 At [210]	radon 86 Rn [222]
francium 87 Fr [223]	radium 88 Ra [226]	89-102 ★ ★	lawrencium 103 Lr [262]	rutherfordium 104 Rf [261]	dubnium 105 Db [262]	seaborgium 106 Sg [266]	bohrium 107 Bh [264]	hassium 108 Hs [269]	meitnerium 109 Mt [268]	ununnium 110 Uun [271]	ununium 111 Uuu [272]	unubium 112 Uub [277]		ununquadium 114 Uuq [289]				

✱Lanthanide series

✱✱Actinide series

lanthanum 57 La 138.91	cerium 58 Ce 140.12	praseodymium 59 Pr 140.91	neodymium 60 Nd 144.24	promethium 61 Pm [145]	samarium 62 Sm 150.36	europium 63 Eu 151.96	gadolinium 64 Gd 157.25	terbium 65 Tb 158.93	dysprosium 66 Dy 162.50	holmium 67 Ho 164.93	erbium 68 Er 167.26	thulium 69 Tm 168.93	ytterbium 70 Yb 173.04
actinium 89 Ac [227]	thorium 90 Th 232.04	protactinium 91 Pa 231.04	uranium 92 U 238.03	neptunium 93 Np [237]	plutonium 94 Pu [244]	americium 95 Am [243]	curium 96 Cm [247]	berkelium 97 Bk [247]	californium 98 Cf [251]	einsteinium 99 Es [252]	fermium 100 Fm [257]	mendelevium 101 Md [258]	nobelium 102 No [259]

1. In which state of matter, under the same conditions of temperature and pressure, will particles have the most energy?

- A molecules in a solid
- B molecules in a liquid
- C dissolved ions in a liquid
- D molecules in a gas

2. Which are pure substances?

- A elements and mixtures
- B compounds and mixtures
- C elements and compounds
- D elements, compounds and mixtures

3. Which element is the most powerful oxidizing agent?

- A bromine
- B chlorine
- C iodine
- D sodium

4. Which of these oxides is acidic?

- A Al_2O_3
- B K_2O
- C MgO
- D SO_2

5. What is formed when sulfur dioxide dissolves in water?

- A sulfurous acid
- B sulfur trioxide
- C hydrogen sulfide
- D sulfuric acid

6. The table shows the pH of the solutions of four salts dissolved in water. Which of the solutions is acidic?

		pH of its solution in water
A	ammonium chloride	5
B	potassium chloride	7
C	potassium nitrate	7
D	sodium carbonate	9

7. Which statement about both graphite and diamond is true?

- A They have the same crystal lattice structure.
- B They have the same degree of hardness.
- C They have the same electrical conductivity.
- D They can undergo the same chemical reactions.

8. What is the formula for magnesium hydroxide?

- A MgOH
- B $\text{Mg}(\text{OH})_2$
- C Mg_2OH
- D $\text{Mg}_2(\text{OH})_3$

9. Which atom has the greatest number of electrons that can form bonds with other atoms?

- A Al
- B P
- C S
- D Si

10. Which compound has the functional group $\text{—C}\begin{matrix} \text{=O} \\ \text{—O—} \end{matrix}$ in its molecule?

- A carboxylic acid
- B aldehyde
- C ester
- D ether

11. Which compounds are isomers?

- A 1-propanol and 2-propanol
- B ethane and ethanol
- C methanoic acid and ethanoic acid
- D methanol and ethanol

12. Which substance, in combination with an organic acid, forms an ester?

- A an alcohol
- B an alkane
- C an ether
- D a ketone

13. Which formula represents an organic ester?

- A $\text{CH}_3\text{CH}_2\text{OH}$
- B CH_3OCH_3
- C HCOOH
- D $\text{CH}_3\text{COOCH}_3$

Shown are four methods of separation, labelled A, B, C and D.

- A chromatography
- B distillation
- C evaporation
- D filtration

Which method of separation can be used to

14. obtain crystals of fertilizer from a mixture of nitric acid and ammonia;

A B C D

15. obtain pure water from seawater;

A B C D

16. analyse ink from a forged cheque?

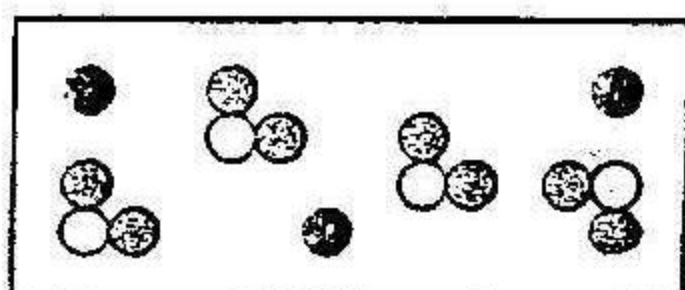
A B C D

17. When copper is heated in a Bunsen flame it forms a black solid.

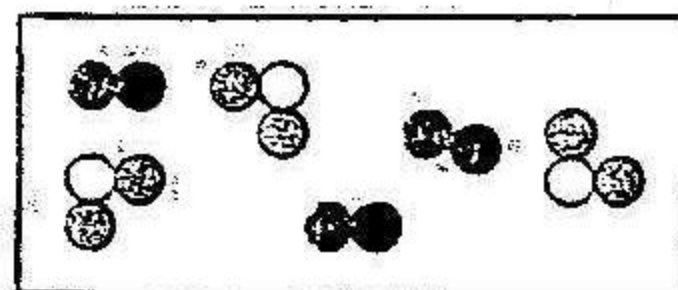
What is the name of this solid?

- A copper oxide
- B copper carbide
- C copper hydroxide
- D copper nitride

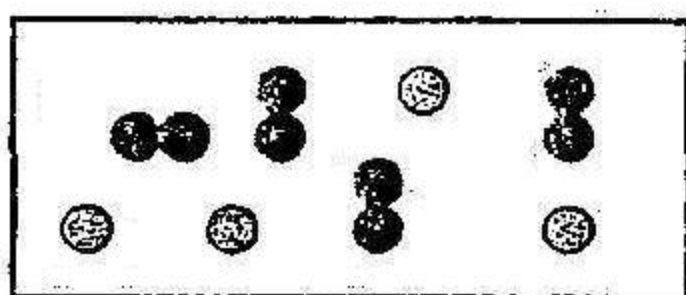
18. Which diagram represents a mixture of the molecules of an element and the molecules of a compound?



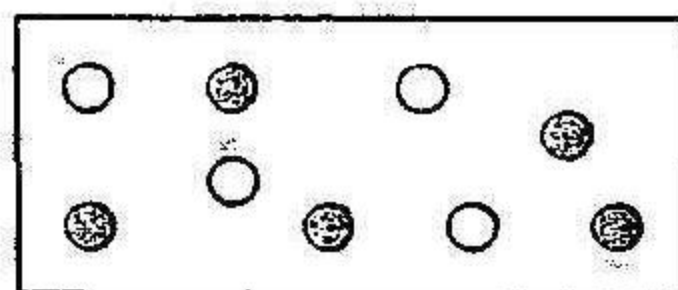
A



B



C



D

19. A student tests several solutions with Universal Indicator to see whether they were acidic, alkaline or neutral. The results are shown in the table.

solution	colour
solution W	greenish-blue
solution X	blue-purple
solution Y	pinkish-red
solution Z	yellow-orange

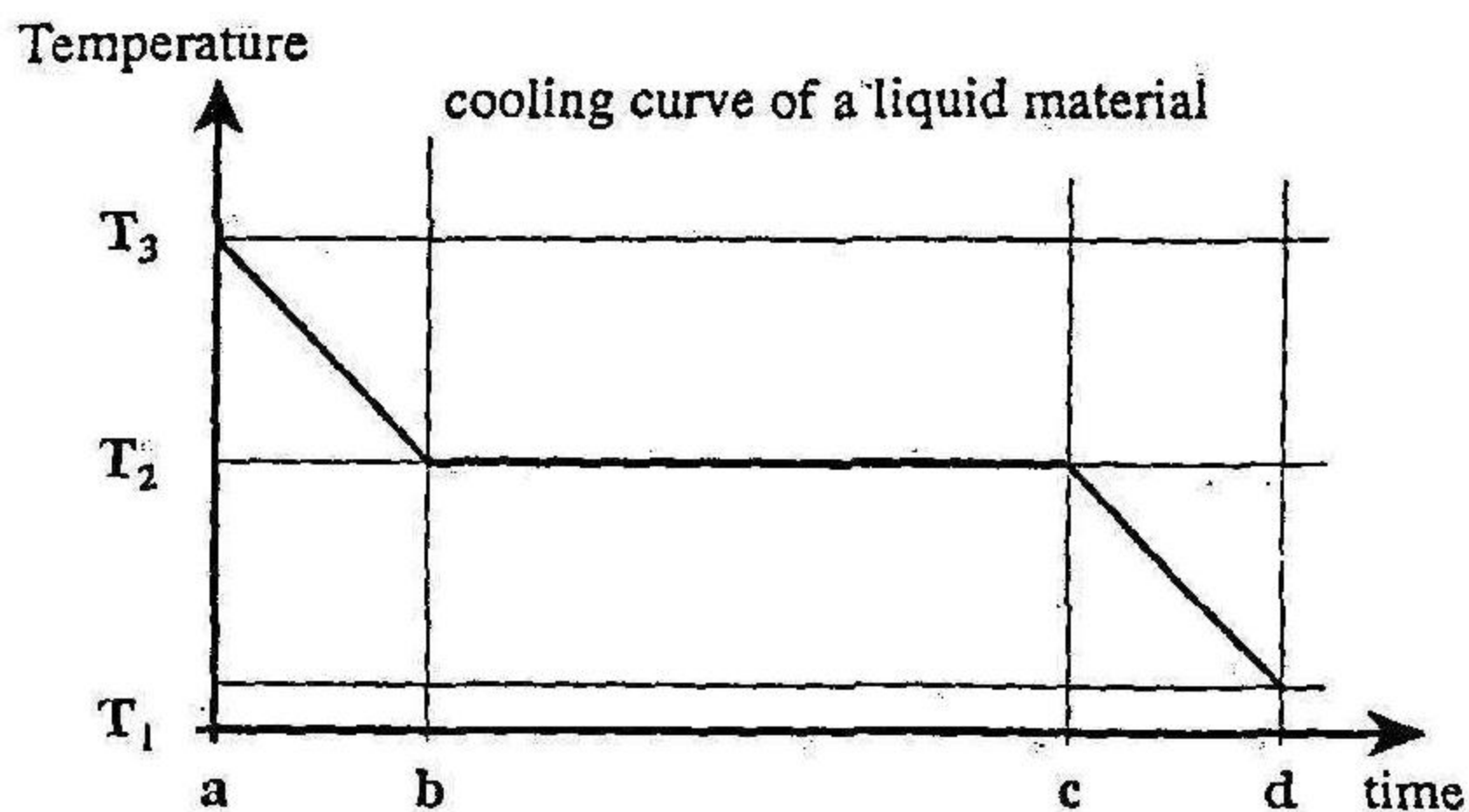
Which solution is nearest to neutral?

- A Y
- B W
- C X
- D Z

20. Which one of these descriptions is a physical change and not a chemical change?

- A cast iron solidifying from a blast furnace
- B burning petrol to form liquid water and carbon dioxide gas
- C shiny steel changing to a brown rust powder
- D zinc dissolving in hydrochloric acid

21. The graph shows the results of observing hot, liquid, pure wax, as it slowly cools to room temperature.



What can be deduced from these results?

- A a to b, the wax is starting to freeze
- B b to c, the wax is changing state from liquid to solid
- C c to d, some wax is still liquid
- D the freezing point of the wax is T_1

22. Which statement best describes what happens to water particles when the water freezes?

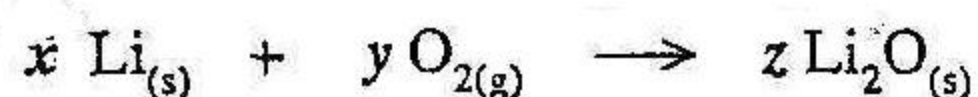
- A they lose energy and escape into the atmosphere
- B they lose energy and lose freedom to move about
- C they gain energy and break up into atoms of hydrogen and oxygen
- D they gain energy and gain freedom to move about

23. Which of these is an alkali in solution?
- A salt solution
 - B battery acid
 - C oven cleaner
 - D lime juice
24. Which statement best explains why the gas pressure in a metal cylinder containing oxygen gas increases when it is heated?
- A the higher temperature makes some of the molecules split up
 - B the molecules expand when they are heated and so take up more space
 - C the higher temperature makes the molecules collide more violently with the walls
 - D the higher temperature makes the molecules attract each other
25. When solid *P* reacts with an acid, a colourless gas, *Q*, is given off. When gas *Q* is bubbled into limewater, a white precipitate is formed.

What is solid *P* most likely to be?

- A a metal carbonate
- B a metal sulphate
- C a metal chloride
- D carbon

26. The equation is not balanced.



Which numbers for *x*, *y* and *z* balance the equation?

	<i>x</i>	<i>y</i>	<i>z</i>
A	4	2	1
B	2	2	1
C	2	1	2
D	4	1	2

27. Carbon dioxide is formed in the complete combustion of a fuel.
Carbon monoxide is formed in the incomplete combustion of a fuel.

Which statement is true for both of these gases?

- A both gases are toxic to animals
 - B carbon monoxide is an element and carbon dioxide is a compound
 - C neither compound will burn in air
 - D carbon dioxide gives a milky precipitate when bubbled into limewater, but carbon monoxide does not
28. Ethanol may be used as a fuel because it
- A has a high heat of combustion.
 - B is easily converted to carbon.
 - C is easily converted to ethane.
 - D has a low heat of formation.
29. Which statement is generally true about metallic and non-metallic elements?
- A solid, non-metallic elements are dull looking
 - B non-metallic elements are good conductors of electricity
 - C metallic elements are poor conductors of heat
 - D metallic elements have low melting points
30. The cathode, used in the extraction of aluminium from bauxite, is made of
- A copper
 - B mercury
 - C iron
 - D carbon
31. Which period of the Periodic Table contains tin?
- A Period 1
 - B Period 3
 - C Period 4
 - D Period 5

32. The elements in which Group of the Periodic Table can all have a valency of -1?
- A Group I
 - B Group II
 - C Group VII
 - D Group VIII
33. Which metal element may have a valency of +2 or +3?
- A aluminium
 - B copper
 - C iron
 - D mercury
34. When a mixture of substances reacts chemically, what does an increase in temperature indicate?
- A bonds in the reactants are broken
 - B the reactants contain less energy than the products
 - C the products contain less energy than the reactants
 - D heat energy is being absorbed during the reaction
35. Which pure substance will turn anhydrous copper sulfate from the colour white to the colour blue?
- A alcohol
 - B bromine
 - C ether
 - D water
36. Which substance may be responsible for the overgrowth of plant life in ponds and rivers?
- A carbonates
 - B chlorides
 - C phosphates
 - D sulfates

37. Which statement about the volume occupied by 1 mole of any gas at s.t.p., is correct?
- A volume varies with the density of the gas
 - B volume always contains the same number of molecules
 - C volume is inversely proportional to the relative molecular mass of the gas
 - D the volume of any gas will always take the same time to diffuse through a given hole under the same conditions
38. Which condition exists when a reversible reaction has reached equilibrium?
- A the two reactants are present in equal amounts
 - B the amount of reactants and products are equal
 - C the forward and backward reaction rates are equal
 - D both the forward and backward reactions have stopped
39. The mineral aragonite is mined in The Bahamas.
- Which element is contained in this mineral?
- A calcium
 - B magnesium
 - C potassium
 - D sodium
40. Which ion contains four oxygen atoms?
- A sulfide
 - B sulfite
 - C sulfate
 - D thiosulfate
41. What happens to the reactivity of the alkaline earth metals Be, Mg, Ca, with water; as the atomic number increases?
- A decreases
 - B increases then decreases
 - C increases
 - D remains the same

42. What name is given to different forms of the same element that results from different molecular structures?
- A allotrope
 - B amphoteric
 - C isotope
 - D isomer
43. Which process involves coating iron with zinc?
- A anodizing
 - B galvanizing
 - C oxidizing
 - D vulcanizing
44. Which particle has the same electronic configuration as the neon atom?
- A a fluorine atom
 - B an oxygen ion
 - C a potassium ion
 - D a sodium atom
45. What is the M_r of $\text{Ca}(\text{NO}_3)_2$?
- A 3
 - B 9
 - C 102
 - D 164

The table gives some data about the relative amounts of gases in the atmosphere. Use this information to answer questions 46 and 47.

	gases	amount in parts per million
A	carbon dioxide	4 000
B	carbon monoxide	350
C	ozone	120
D	sulfur dioxide	1 200

46. Which substance is mainly responsible for global warming? A B C D
47. Which substance is responsible for acid rain? A B C D
48. Which of these ions causes hardness of water?
- A K^+ and Na^+
 B Ca^{2+} and Mg^{2+}
 C Fe^{2+} and Al^{3+}
 D Cl^- and O^{2-}
49. In a tourism-based country like The Bahamas, which substances are the more serious air pollutants?
- A carbon dioxide and carbon monoxide
 B methane and polymers
 C nitrates and sulfur dioxide
 D oxides of nitrogen and other automobile exhaust gases
50. What is the percentage amount of phosphorus in a 20-10-8 fertilizer?
- A 8%
 B 10%
 C 20%
 D 62%

School Number	Candidate Number
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CHEMISTRY

PAPER 2 3051/2

Thursday **22 MAY 2008** 1.50 – 3.20 P.M.

No additional materials required

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

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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 asked 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 [].

A copy of the Periodic Table is printed on page 2.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

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

hydrogen 1 H 1.0079												helium 2 He 4.0026						
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caesium 55 Cs 132.91	barium 56 Ba 137.33	57-70 ★	lutetium 71 Lu 174.97	hafnium 72 Hf 178.49	tantalum 73 Ta 180.95	tungsten 74 W 183.84	rhenium 75 Re 186.21	osmium 76 Os 190.23	iridium 77 Ir 192.22	platinum 78 Pt 195.08	gold 79 Au 196.97	mercury 80 Hg 200.59	thallium 81 Tl 204.38	lead 82 Pb 207.2	bismuth 83 Bi 208.98	polonium 84 Po [209]	astatine 85 At [210]	radon 86 Rn [222]
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✱ Lanthanide series

✱ ✱ Actinide series

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actinium 89 Ac [227]	thorium 90 Th 232.04	protactinium 91 Pa 231.04	uranium 92 U 238.03	neptunium 93 Np [237]	plutonium 94 Pu [244]	americium 95 Am [243]	curium 96 Cm [247]	berkelium 97 Bk [247]	californium 98 Cf [251]	einsteinium 99 Es [252]	fermium 100 Fm [257]	mendelevium 101 Md [258]	nobelium 102 No [259]

1. This question is about the elements found in the Periodic Table.

- (a) Name the element located at Period 4, Group II. _____ [1]
- (b) Name the element with the symbol Os. _____ [1]
- (c) State the number of alkaline earth metals. _____ [1]
- (d) Write the symbol for the most reactive halogen. _____ [1]
- (e) Name a metal found in Period 3 that forms an amphoteric oxide. _____ [1]
- (f) State the number of neutrons in a titanium-48 atom. _____ [1]
- (g) Name the atom with electronic configuration: 2,8,6. _____ [1]
- (h) Name the transition element with the lowest atomic number. _____ [1]
- (i) Draw a diagram to show how the carbon dioxide molecule is bonded together. (Use the outer electrons only.) [2]

Total marks [10]

- 2 Magnesium ions can be precipitated from sea water as magnesium hydroxide, $\text{Mg}(\text{OH})_2$. The magnesium hydroxide is converted to magnesium chloride by reaction with hydrochloric acid. Magnesium metal is then obtained by electrolysis of molten magnesium chloride.

- (a) (i) Balance the equation for the conversion of magnesium hydroxide to magnesium chloride.



Equations A and B show reactions taking place when magnesium and chlorine are formed by electrolysis.



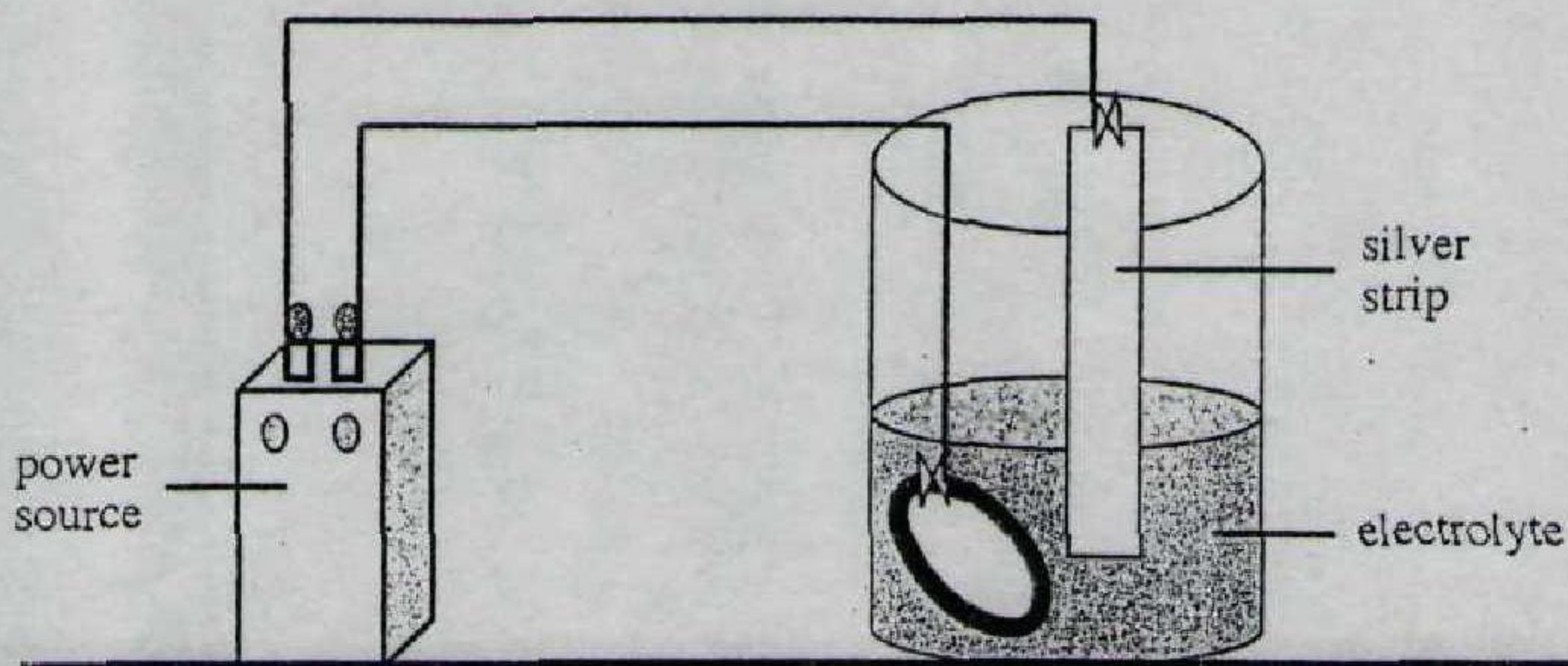
- (ii) Identify which of the reactions A or B is a reduction reaction.

_____ [1]

- (iii) Name the product formed at the negative terminal (cathode).

_____ [1]

- (b) The drawing shows the process of electroplating a steel bracelet with silver.



- (i) Give the name and sign (+ or -) of the electrode that is the steel bracelet.

_____ [1]

- (ii) Give the name and sign (+ or -) of the electrode that is the silver strip.
_____ [1]
- (iii) On the diagram, draw arrows to show the pathway of electrons. [1]
- (iv) Name the particles in the solution which carry the electric current.
_____ [1]
- (v) Suggest the name of a chemical that can be used as the electrolyte.
_____ [1]
- (vi) State how the rate of corrosion of the steel will be affected by electroplating it with silver.
_____ [1]

Total marks [10]

3. Plastics are made from petroleum. They are chemically and biologically inert. Old bottles can be recycled and used to make a variety of products such as plastic boxes, trash cans etc.

- (a) Using the information given above, explain why plastic recycling is important to the environment.

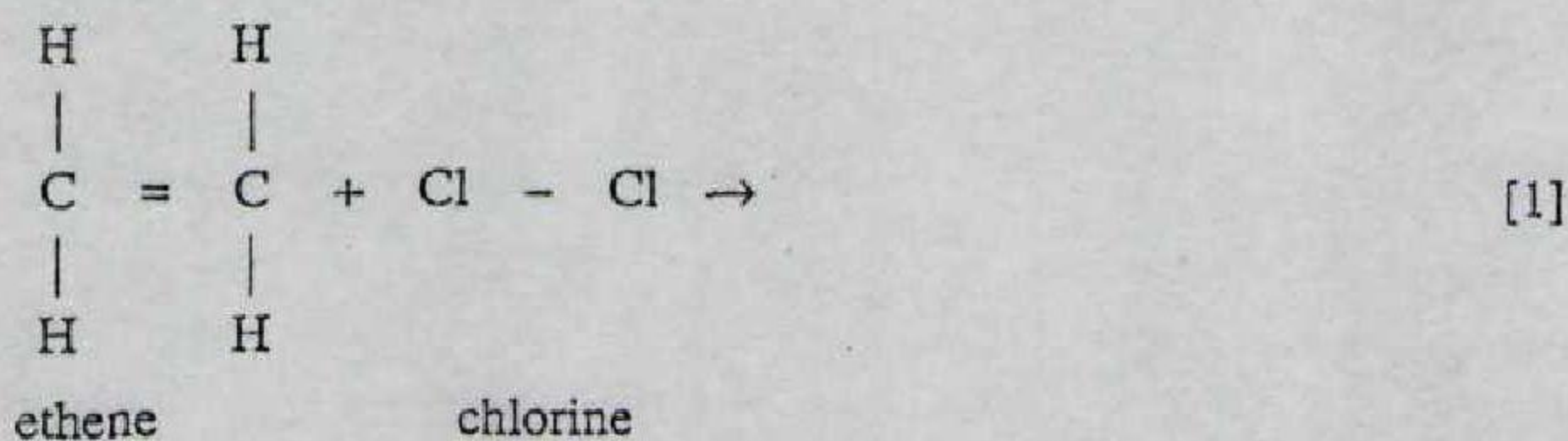
_____ [2]

- (b) Ethene, made from petroleum, can be used as a monomer in making plastic.

- (i) Name one polymer made from ethene.

_____ [1]

- (ii) Ethene will react with chlorine. Complete the equation by drawing the structural formula of the product.



- (iii) Explain how electrons hold the two carbon atoms together in the ethene molecule.

_____ [1]

- (iv) Classify the type of reaction between ethene and chlorine.

_____ [1]

- (v) Name the type of organic molecules that will undergo this type of reaction.

_____ [1]

- (c) Esters are common in plants and are responsible for some distinctive fragrances in fruits. The scent and flavour of an ester varies depending upon the alcohol and the organic acid that are reacted to form it.

Fill in the blanks to complete the table.

alcohol	organic acid	ester	fragrance
	butanoic acid	ethylbutanoate	pineapple
pentanol		pentylethanoate	banana
methanol	butanoic acid		apple

[3]

Total marks [10]

4. A list of oxides is shown.

aluminum oxide
calcium oxide

carbon monoxide
carbon dioxide

sulphur dioxide
water

Answer the questions using the oxides from the list.

- (a) Name two acidic oxides.

1 _____

2 _____ [2]

- (b) Name the oxide that is produced when methane burns in a limited supply of oxygen.

_____ [1]

- (c) Name the oxide which reacts with water in the atmosphere to form acid rain.

_____ [1]

- (d) The formula for aluminum oxide is Al_2O_3 .

Calculate the relative molecular mass for aluminum oxide.

[3]

- (e) Calcium oxide reacts with water to produce calcium hydroxide.

Name the products of the reaction between calcium hydroxide and hydrochloric acid.

_____ [2]

- (f) Name the type of reaction which occurs between calcium hydroxide and hydrochloric acid.

_____ [1]

Total marks [10]

5. A gardener purchased a bag of inorganic fertilizer, with the marking 30-15-20, on the bag.

(a) (i) Briefly explain what the numbers 30-15-20 represent.

_____ [1]

(ii) State what the letters of the elements in the fertilizer stand for.

_____ [1]

(b) Name one natural organic fertilizer used in The Bahamas.

_____ [1]

(c) Write a word equation for the reaction between nitric acid and ammonia.

[2]

(d) Ammonium sulphate, $(\text{NH}_4)_2\text{SO}_4$, is another fertilizer.

Calculate the percentage of nitrogen present in ammonium sulphate.

[2]

(e) Name the process by which ammonia is produced from nitrogen and hydrogen.

_____ [1]

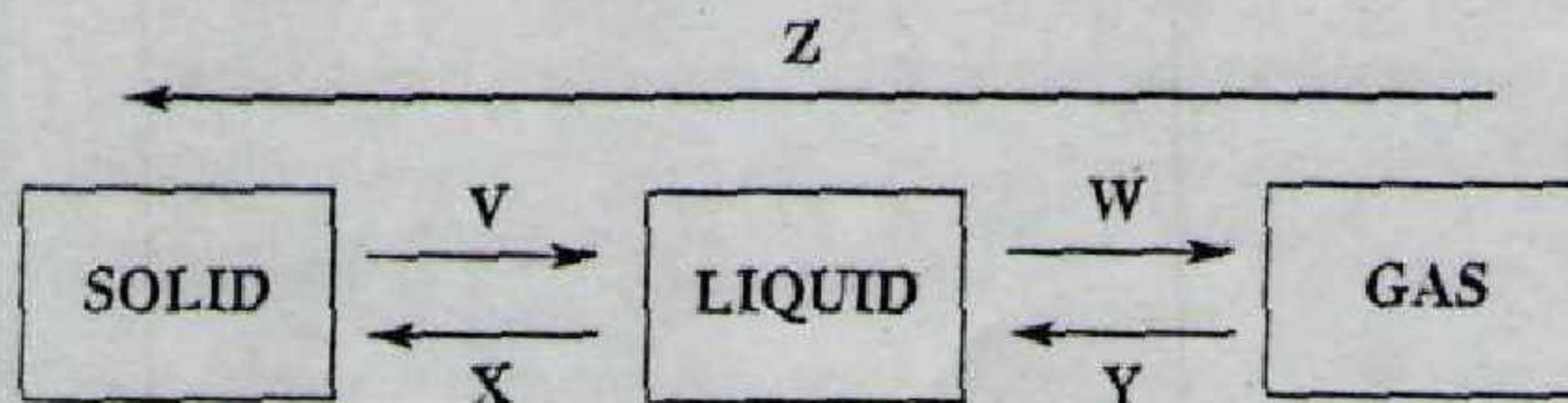
(f) The garden is located next to a large pond.

Explain the environmental problem that can be created if fertilizer is washed into the pond.

_____ [2]

Total marks [10]

6. The diagram shows three phases of matter.



Where $\rightarrow$ represents heat added and $\leftarrow$ represents heat removed.

- (a) Name the physical changes occurring at

V _____ X _____

W _____ Y _____

Z _____

[5]

- (b) Name a substance that changes directly from a solid to a gas on heating.

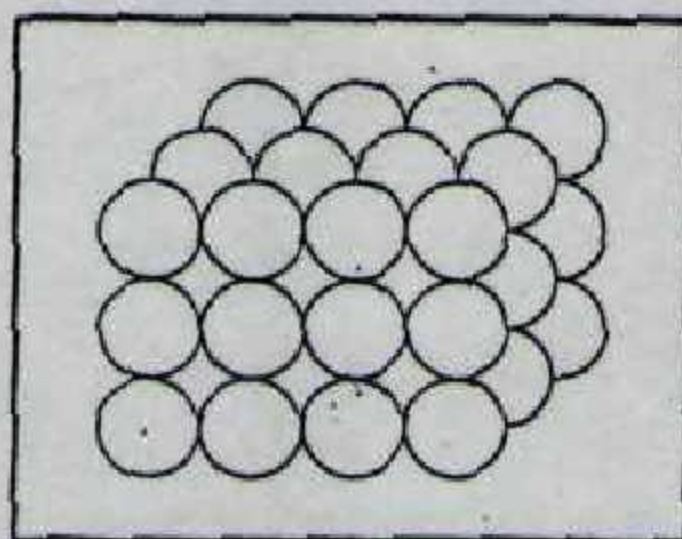
_____ [1]

- (c) A process like the conversion of a liquid to a gas absorbs heat energy.

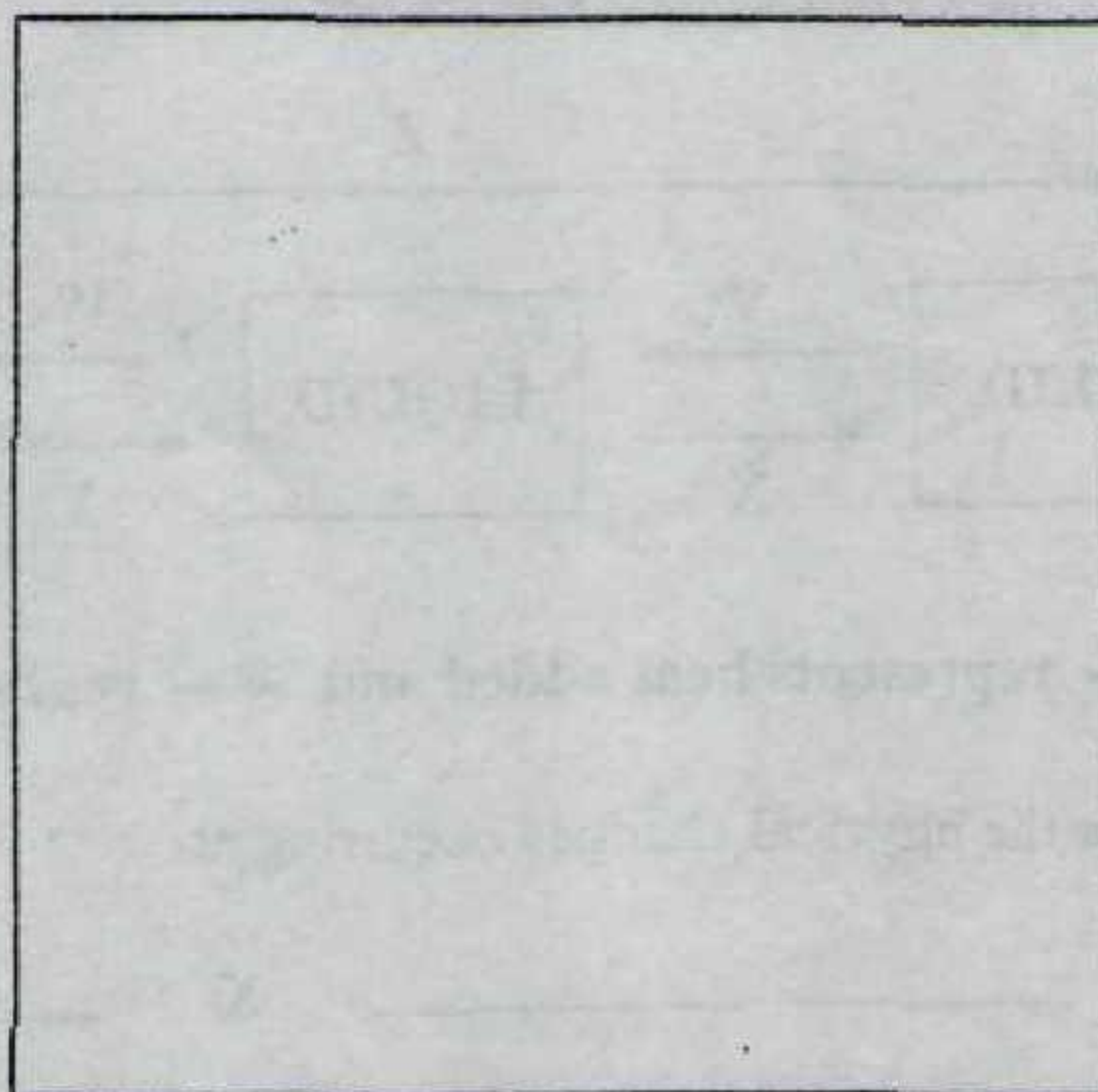
Name this type of energy change.

_____ [1]

- (d) The particles in a solid are packed tightly together. The particles are too strongly held together to allow movement from place to place but the particles vibrate about their position in the structure.



- (i) Draw in the box the arrangement of particles in a gas.



[2]

- (ii) Describe the speed at which these particles will move in the container.

_____ [1]

Total marks [10]



7. Chlorine is a halogen.

- (a) (i) Name the naturally occurring crystalline salt crystal that is used as a source of chlorine.

_____ [1]

- (ii) State the colour of chlorine gas

_____ [1]

- (iii) Name the type of bond formed when a chlorine molecule is made.

_____ [1]

- (iv) The electrolysis of brine also produces chlorine and one important alkali. Name the alkali produced.

_____ [1]

- (v) Balance the equation



- (vi) Name the type of reaction that has occurred to the chlorine in (v).

_____ [1]

- (b) (i) State the molar mass of sodium hydroxide, NaOH.

_____ [1]

- (ii) State the number of moles contained in 10 g of NaOH.

_____ [1]

- (iii) To make a molar solution, the 10 g of sodium hydroxide is dissolved in 250 cm³ of water. Convert this volume to dm³.

_____ [1]

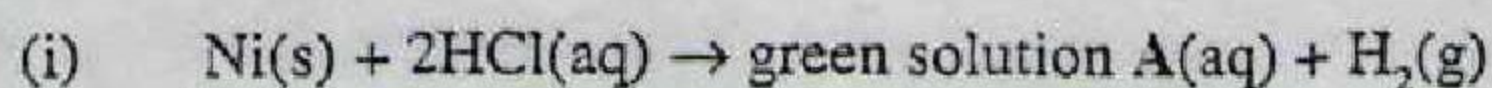
Total marks [10]

3. (a) A laboratory technician carries out a series of tests on nickel, copper and two unknown substances, compound E and compound G.

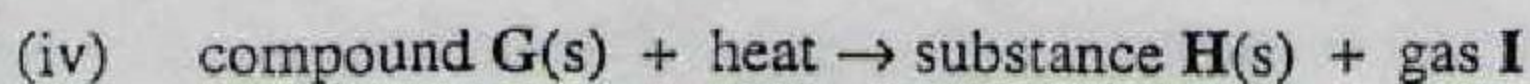
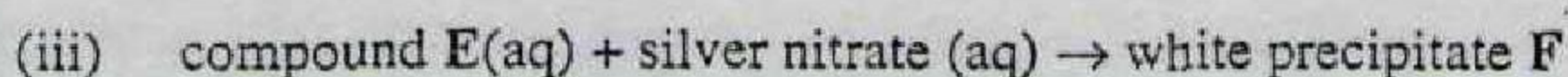
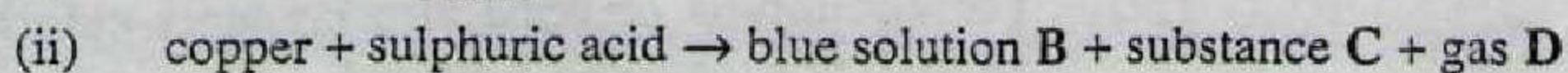
THE FACTS

- transition metals form coloured compounds.
- compound E comes in great quantities from the Island of Inagua.
- compound G is found in the shell of the Bahamian conch.
- gas I turns lime water milky.
- gas D has four atoms.

Study the reactions and identify the substances A to I.



conc.



A _____ F _____

B _____ G _____

C _____ H _____

D _____ I _____

E _____ [9]

- (b) Name the acid formed when gas D is bubbled through water.

_____ [1]

Total marks [10]

School Number	Candidate Number
— — — —	— — — —
Surname and Initials	

CHEMISTRY

PAPER 3 3051/3

Tuesday **3 JUNE 2008** 12.30 – 2.00 P.M.

Additional materials:

Lined paper

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 in the spaces provided at the top of this page as well as at the top of all lined paper submitted.

Answer **ALL** the questions in **Section A** (1–4) in the spaces provided on the question paper and any **TWO** questions from **Section B** on the lined paper provided.

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 printed on page 2.

ADDITIONAL INFORMATION

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

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

FOR EXAMINER'S USE	
Section A	
1	
2	
3	
4	
Section B	
5	
6	
7	
TOTAL	

This question paper consists of 12 printed pages and 4 blank pages.

hydrogen 1 H 1.0079												helium 2 He 4.0026						
lithium 3 Li 6.941	beryllium 4 Be 9.0122											boron 5 B 10.811	carbon 6 C 12.011	nitrogen 7 N 14.007	oxygen 8 O 15.999	fluorine 9 F 18.998	neon 10 Ne 20.180	
sodium 11 Na 22.990	magnesium 12 Mg 24.305											aluminium 13 Al 26.982	silicon 14 Si 28.086	phosphorus 15 P 30.974	sulfur 16 S 32.065	chlorine 17 Cl 35.453	argon 18 Ar 39.948	
potassium 19 K 39.098	calcium 20 Ca 40.078		scandium 21 Sc 44.956	titanium 22 Ti 47.867	vanadium 23 V 50.942	chromium 24 Cr 51.996	manganese 25 Mn 54.938	iron 26 Fe 55.845	cobalt 27 Co 58.933	nickel 28 Ni 58.693	copper 29 Cu 63.546	zinc 30 Zn 65.39	gallium 31 Ga 69.723	germanium 32 Ge 72.61	arsenic 33 As 74.922	selenium 34 Se 78.96	bromine 35 Br 79.904	krypton 36 Kr 83.80
rubidium 37 Rb 85.468	strontium 38 Sr 87.62		yttrium 39 Y 88.906	zirconium 40 Zr 91.224	niobium 41 Nb 92.906	molybdenum 42 Mo 95.94	technetium 43 Tc [98]	ruthenium 44 Ru 101.07	rhodium 45 Rh 102.91	palladium 46 Pd 106.42	silver 47 Ag 107.87	cadmium 48 Cd 112.41	indium 49 In 114.82	tin 50 Sn 118.71	antimony 51 Sb 121.76	tellurium 52 Te 127.60	iodine 53 I 126.90	xenon 54 Xe 131.29
caesium 55 Cs 132.91	barium 56 Ba 137.33	57-70 ★	lutetium 71 Lu 174.97	hafnium 72 Hf 178.49	tantalum 73 Ta 180.95	tungsten 74 W 183.84	rhenium 75 Re 186.21	osmium 76 Os 190.23	iridium 77 Ir 192.22	platinum 78 Pt 195.08	gold 79 Au 196.97	mercury 80 Hg 200.59	thallium 81 Tl 204.38	lead 82 Pb 207.2	bismuth 83 Bi 208.98	polonium 84 Po [209]	astatine 85 At [210]	radon 86 Rn [222]
francium 87 Fr [223]	radium 88 Ra [226]	89-102 ★ ★	lawrencium 103 Lr [262]	rutherfordium 104 Rf [261]	dubnium 105 Db [262]	seaborgium 106 Sg [266]	bohrium 107 Bh [264]	hassium 108 Hs [269]	meitnerium 109 Mt [268]	ununnium 110 Uun [271]	ununium 111 Uuu [272]	unubium 112 Uub [277]		ununquadium 114 Uuq [289]				

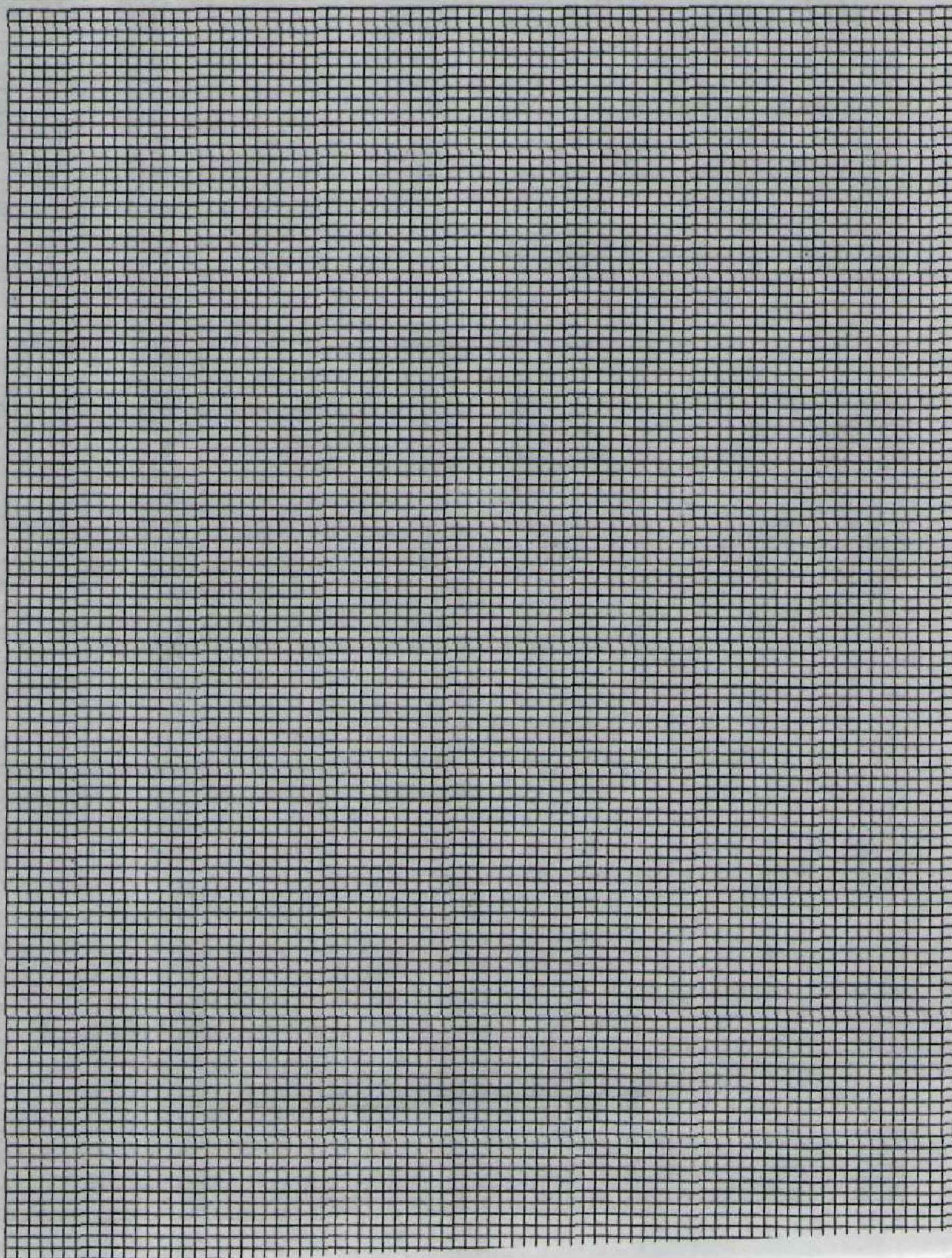
✱Lanthanide series

✱✱Actinide series

lanthanum 57 La 138.91	cerium 58 Ce 140.12	praseodymium 59 Pr 140.91	neodymium 60 Nd 144.24	promethium 61 Pm [145]	samarium 62 Sm 150.36	europium 63 Eu 151.96	gadolinium 64 Gd 157.25	terbium 65 Tb 158.93	dysprosium 66 Dy 162.50	holmium 67 Ho 164.93	erbium 68 Er 167.26	thulium 69 Tm 168.93	ytterbium 70 Yb 173.04
actinium 89 Ac [227]	thorium 90 Th 232.04	protactinium 91 Pa 231.04	uranium 92 U 238.03	neptunium 93 Np [237]	plutonium 94 Pu [244]	americium 95 Am [243]	curium 96 Cm [247]	berkelium 97 Bk [247]	californium 98 Cf [251]	einsteinium 99 Es [252]	fermium 100 Fm [257]	mendelevium 101 Md [258]	nobelium 102 No [259]

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:	Ques. No.	



Section A

Candidates are to answer all four questions in Section A.

1. (a) A student knows that a compound was potassium sulphate.

Write a procedure; include testing methods and their positive results; that would conclusively demonstrate that the salt is potassium sulphate.

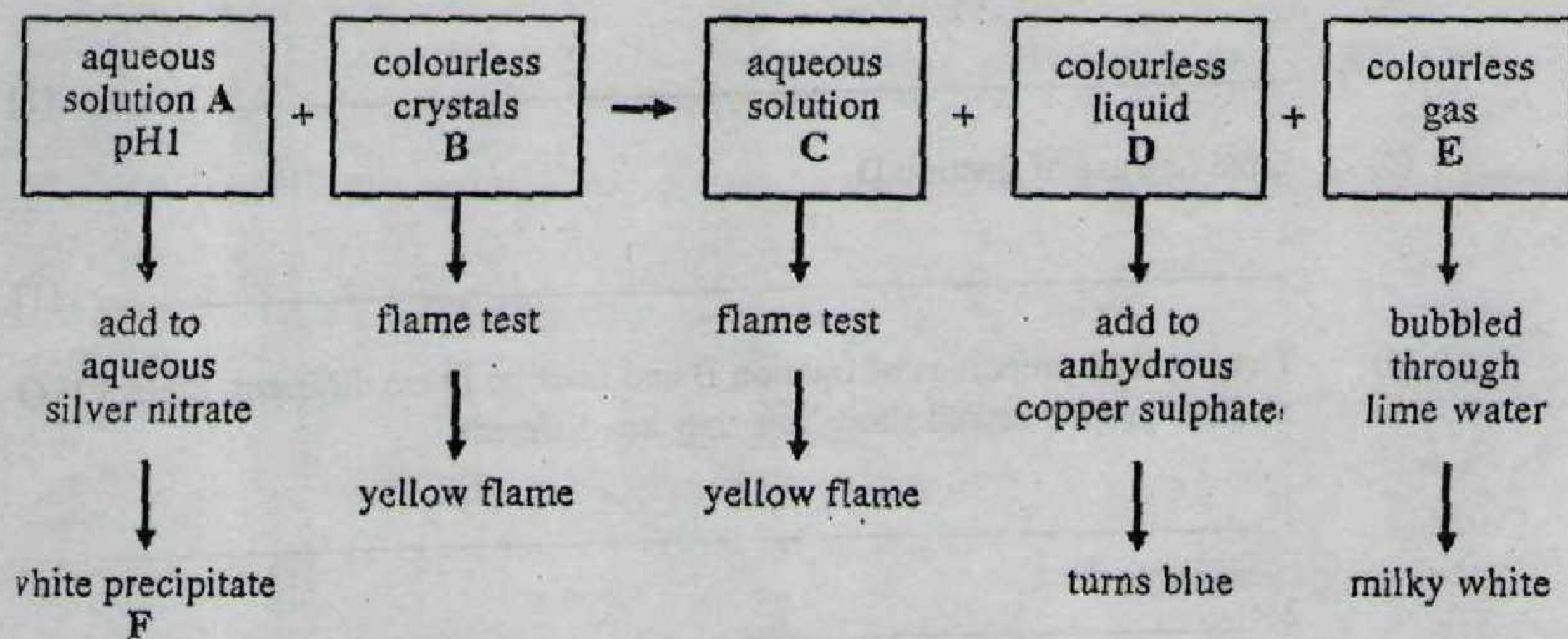
procedure for potassium

 _____ [2]

procedure for sulphate

 _____ [2]

- (b) A series of steps produces the data in the schematic reaction.



Use the data to identify the substances A through F.

A _____ D _____

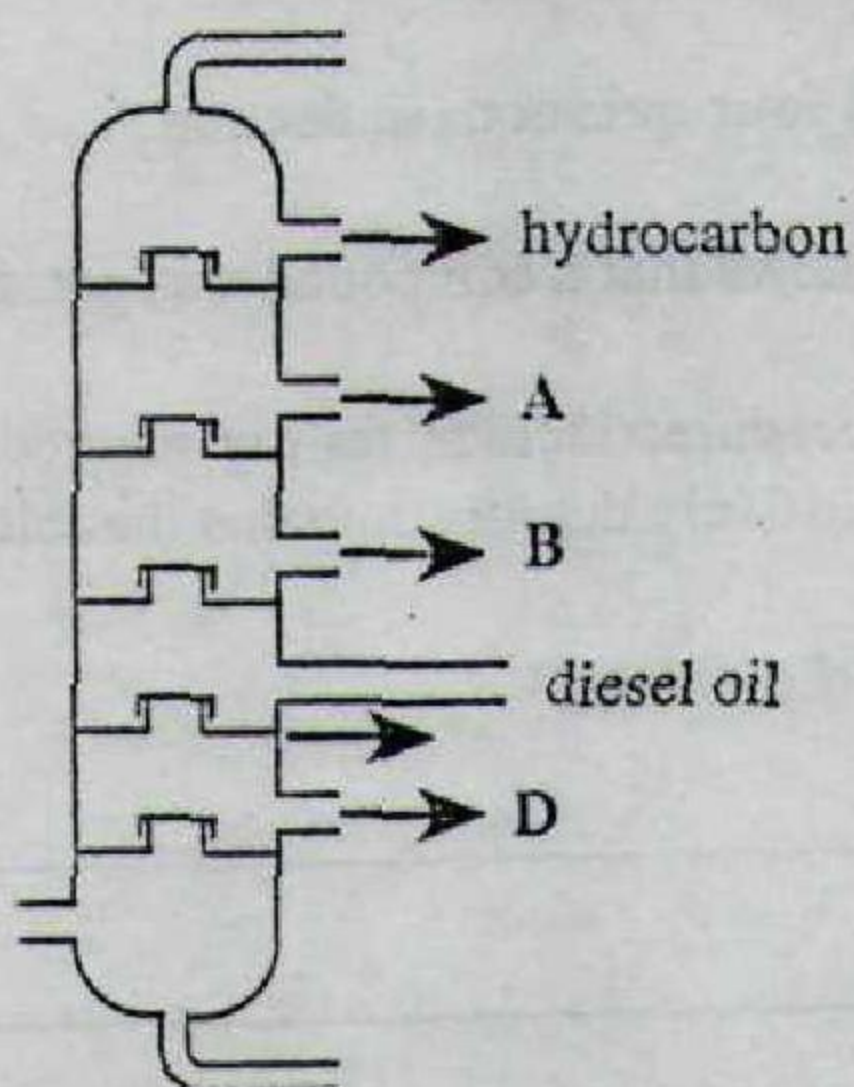
B _____ E _____

C _____ F _____

[6]

Total marks [10]

2. Crude oil is a mixture of many hydrocarbon molecules. The industrial fractional distillation of crude oil is shown in the diagram.



- (a) Identify fractions A and B.

A _____

B _____ [2]

- (b) Give one use of fraction B.

_____ [1]

- (c) Give one use of fraction D.

_____ [1]

- (d) The physical properties of fraction B and fraction D are different. State TWO of these properties and show how they are different.

1 _____

2 _____

_____ [2]

(e) The oil industry uses the process called cracking to obtain sufficient quantities of short-chained hydrocarbons.

(i) Name **TWO** hydrocarbons formed when pentane is cracked.

1 _____

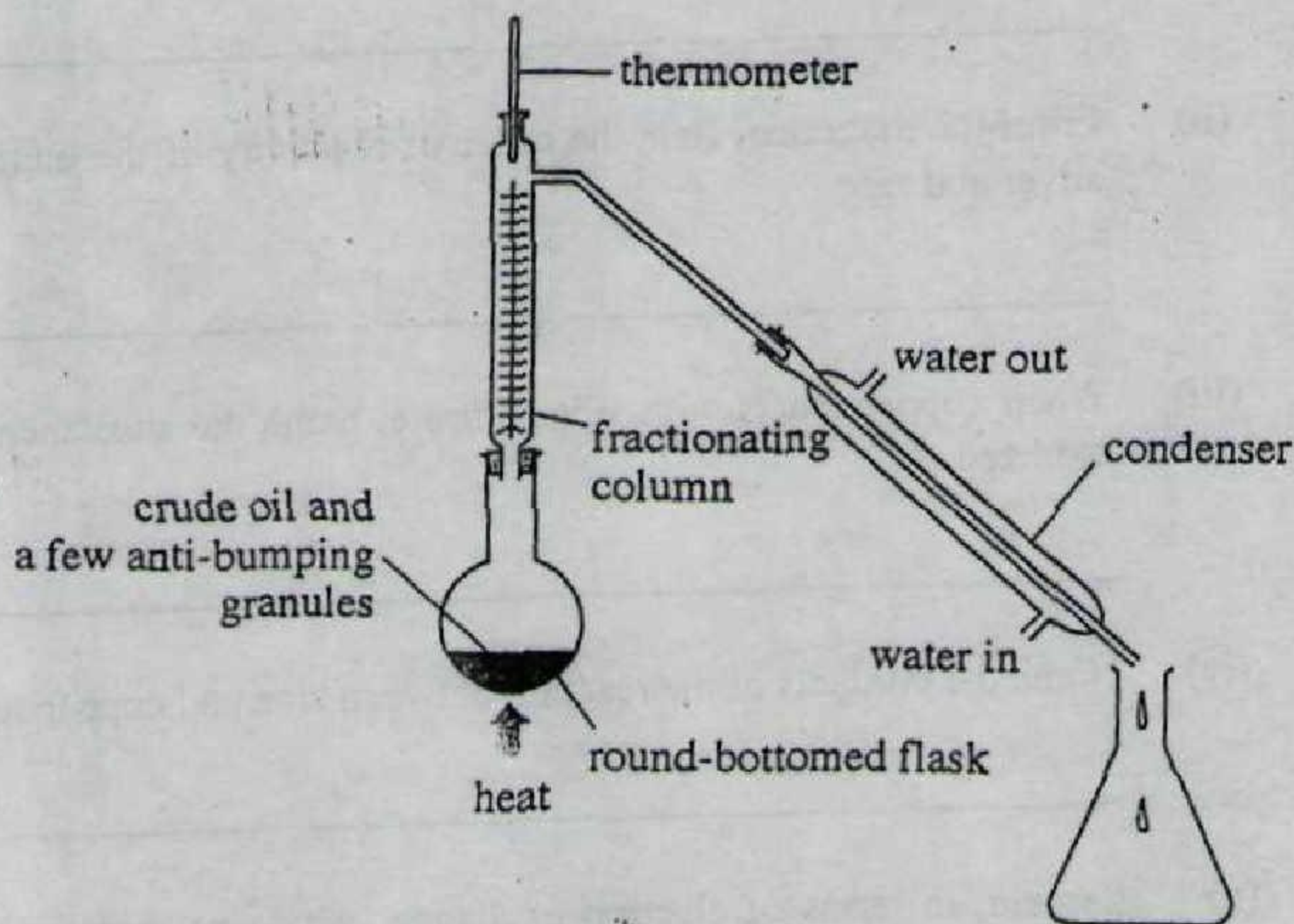
2 _____ [2]

(ii) Before the petroleum industry used the cracking method, long-chain hydrocarbons were discarded.

State the environmental problem which resulted from this waste.

_____ [1]

In an experiment to demonstrate the fractional distillation of crude oil in a lab, crude oil was placed in a round-bottomed flask and warmed with an electric heater as shown in the diagram.



(f) State **ONE** reason why this process, carried out in a laboratory, would not be as efficient as the process used in the industrial fractional distillation of crude oil.

_____ [1]

Total marks [10]

3. Diagrams A and B show simple experiments that can be conducted in the laboratory.

(a) These diagrams show redox reactions.

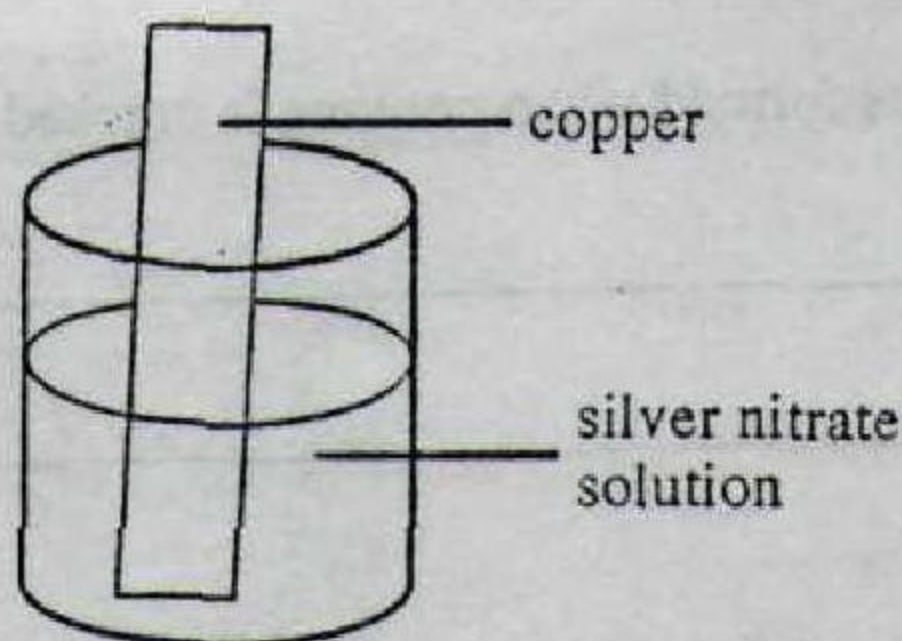


Diagram A

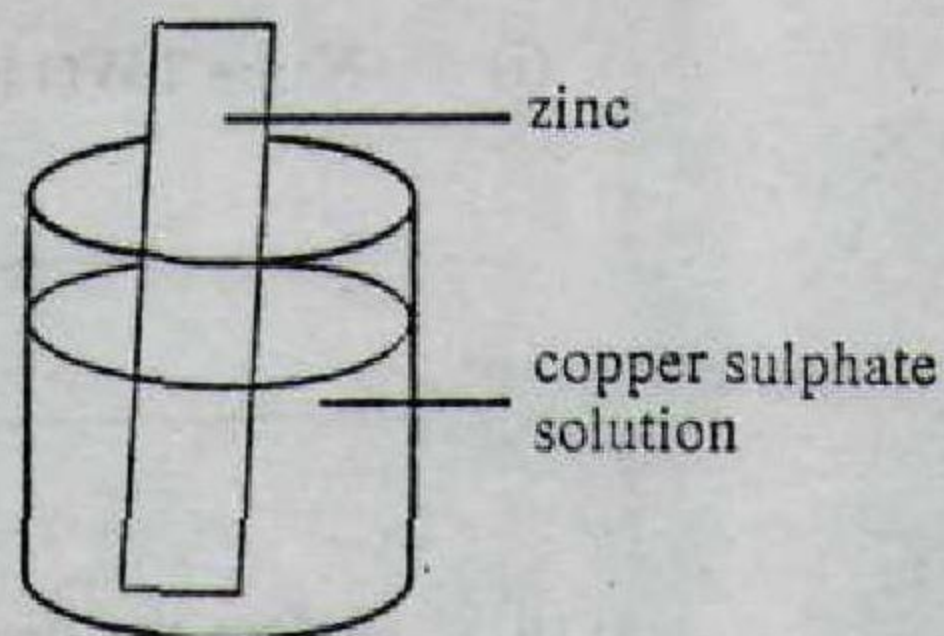


Diagram B

In **diagram A**, when copper is placed in a solution of silver nitrate, silver deposits on the copper strip.

In **diagram B** blue copper(II) sulphate gradually becomes colourless if a strip of zinc metal is placed in it.

(i) State why the solution in **diagram A** turns blue.

_____ [1]

(ii) From the diagrams, state the order of reactivity of the metals copper, silver and zinc.

_____ [1]

(iii) When copper reacts with silver nitrate, name the substance which is oxidized.

_____ [1]

(iv) Name the products of the reaction between zinc and copper sulphate.

_____ [1]

(v) Explain, in terms of electron exchange, why zinc metal reacts with copper sulphate.

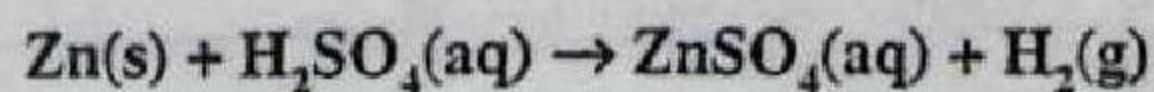
_____ [2]

- (b) The oxidation number of chromium can vary from compound to compound, resulting in chromium compounds with strikingly different colours.

State the oxidation number of chromium in the blue solution of CrCl_2 .

_____ [1]

Zinc reacts with sulphuric acid producing hydrogen gas.



- (c) (i) Calculate the mass of zinc that must be dissolved to produce $4\,800\text{ cm}^3$ of hydrogen, at r.t.p.

[2]

- (ii) Identify the reducing agent.

_____ [1]

Total marks [10]

4. The solubility of a salt is usually quoted in the grams of solute which will saturate 100 g of the solvent at a particular temperature.

- (a) (i) State why it is necessary to use the phrase "at a particular temperature".

 _____ [1]

- (ii) Name the solute in brine. _____ [1]

(b) In an experiment to determine the solubility of potassium chloride, it was found that 27.40 g of the saturated solution at 30 °C contained 7.40 g.

- (i) Calculate the mass of water in 27.40 g of the saturated solution at 30 °C of the salt.

[1]

- (ii) Calculate the solubility of potassium chloride at 30 °C (mass of potassium chloride per 100 g of water).

[2]

The solubility of potassium chloride at 60 °C is 45.50 g in 100 g of water.

(c) In an experiment, 45.50 g of potassium chloride is added to 100 g of water at 60 °C.

- (i) State the total mass of potassium chloride and water used.

_____ [1]

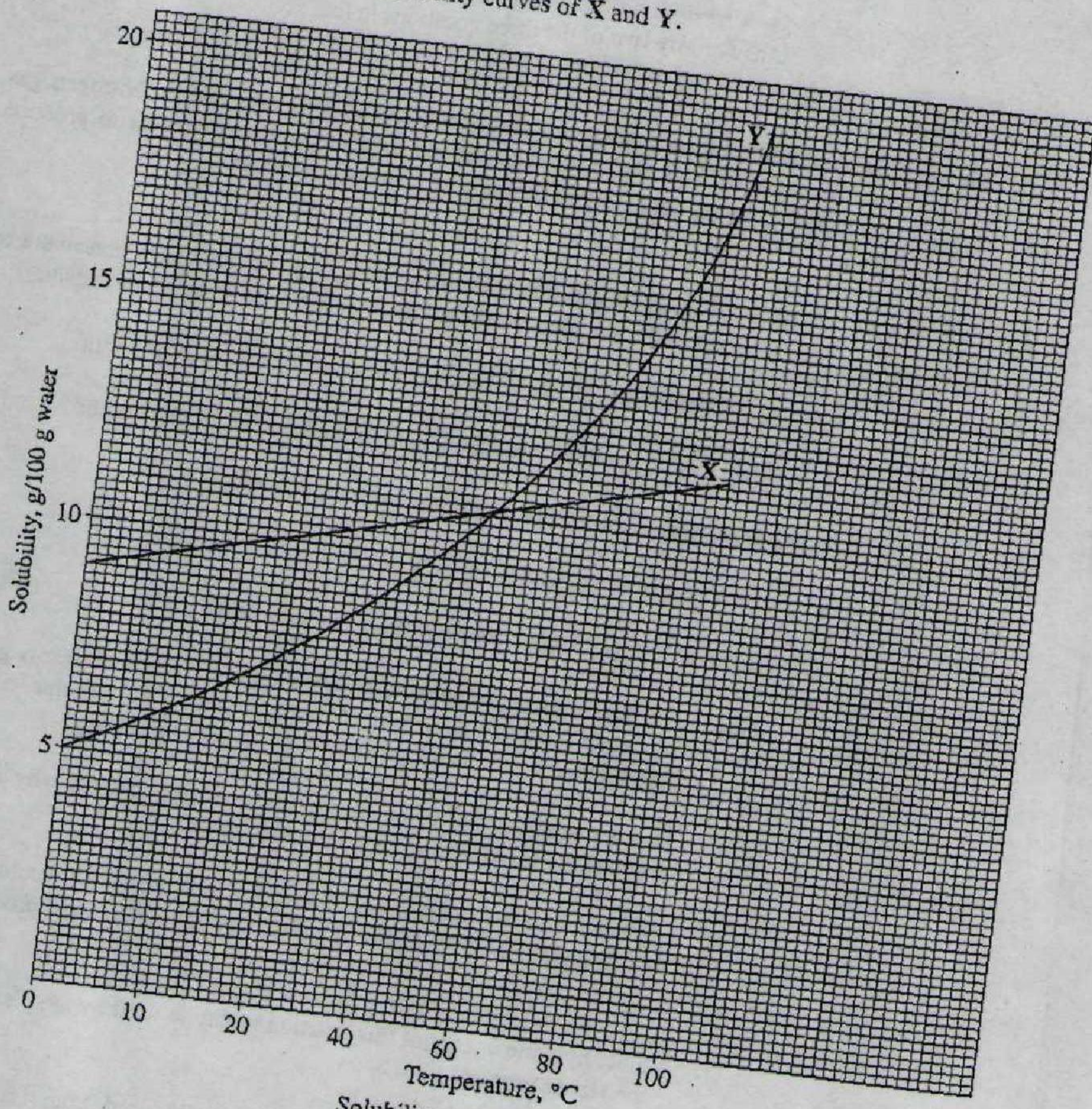
- (ii) Use your answer to (b)(ii) to calculate the mass of potassium chloride that will precipitate from this solution when it is cooled to 30 °C.

[1]

- (iii) State the mass of potassium chloride which will be contained in 100 g of the saturated solution at 60 °C.

_____ [1]

The graph shows solubility curves of X and Y.



Solubility curves of X and Y

- (d) Use the graph to determine which of the two substances, X or Y, has a greater solubility at 10 °C and the difference in their solubility.

[2]

Total marks [10]

Section B

Answer any two of the three questions in this section.

5. Air contains many gaseous pollutants containing sulphur and carbon. Nitrogen gas can be liquefied from the mixture of air and used in the Haber process to produce ammonia. The ammonia in turn can be converted into fertilizer.

- (a) (i) Name two gaseous molecules containing sulphur which contribute to air pollution. Only one of your answers can be an oxide of sulphur.
- (ii) Name the pollutant oxide that does not contribute to acid rain.
- (iii) Name the third most abundant gas found in the mixture of air. [4]

The Haber process involves an exothermic, reversible reaction.

- (b) (i) Write a balanced equation to show the Haber process. [3]
- (ii) Write a suitable statement of Le Chatelier's Principle. [2]
- (iii) The synthesis of ammonia is an exothermic process and heat is given out when the gases hydrogen and nitrogen react. Despite this, a high temperature is used in the process. Explain why this is so. [1]
- (iv) Use the equation that you have written in part (i) to show why a high pressure is maintained in the reaction chamber. [2]
- (v) Define a *catalyst* and state, with a reason, how a catalyst would affect the composition of the equilibrium mixture of reactants and products. [2]
- (vi) State how the energy of this reaction might be used by the plant using the Haber process. [1]
- (vii) Find the maximum volume of ammonia produced from 150 dm³ of nitrogen, all volumes measured at r.t.p. [2]
- (c) Name a fertilizer that contains nitrogen and write an equation to show how it can be made from ammonia. [3]

Total marks [20]

6. An average person drinks 2 L of water each day, yet eliminates about 2.5 L of water. The extra water is produced when food is metabolized in the body. In one series of metabolic reactions glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) is burned to produce carbon dioxide and water.

(a) According to the chemical equation



- (i) State the mass of water produced from 90 g of glucose. [3]
- (ii) Assuming that 1 g of water is 1 mL of water; calculate the volume of water produced from 90 g of glucose and the mass of carbon dioxide which would be produced at the same time. [1]

(b) The empirical formula of glucose is CH_2O . Ethanoic acid, lactic acid, ribose and share the same empirical formula as glucose.

- (i) Write the molecular formula of lactic acid if it is three times the empirical formula.
- (ii) Write the molecular formula of ribose, which has a molecular mass of 150.
- (iii) Name a household substance that contains ethanoic acid. [5]

(c) Succinic, an organic acid, present in fungi and lichens, is extracted to make perfumes and dyes. The percentage composition of this acid is 40.68% carbon, 5.08% hydrogen and 54.24% oxygen.

Determine its empirical formula. [3]

(d) Methane and candle wax (paraffin wax) belong to the same homologous series of organic compounds.

- (i) Name the homologous series to which they belong. [1]
- (ii) Use the equation to calculate the volume of carbon dioxide produced by burning 7.04 g of candle wax ($\text{C}_{25}\text{H}_{52}$) in oxygen at r.p.t.



- (iii) Draw the structural formula of methane. [1]
- (iv) Write a balanced chemical equation for the complete combustion of methane. [3]

Total marks [20]

7. A certain mass of a Group II metal was added to excess hydrochloric acid and the volume of hydrogen gas recorded at r.t.p. at regular intervals. The data collected is shown in the table.

time/s	0	20	40	60	80	100	120	140	160	180
H ₂ /cm ³	0	50	85	115	140	160	177.5	190	200	200

- (a) Describe a test for hydrogen and state the results you would expect. [2]
- (b) (i) Plot a suitable graph of the data. [6]

Use your graph to

- (ii) find the volume of gas produced in 90 s; [1]
- (iii) find the time it takes to 74.0 cm³ of H₂ (g); [1]
- (iv) draw and label a curve for the same reaction if it were catalysed; [1]
- (v) draw and label a curve that used only half the amount of metal. [1]
- (c) (i) State the final volume of gas produced in dm³. [1]
- (ii) Write a balanced equation for the reaction using magnesium as the metal. [2]
- (iii) Calculate (to two decimal places) the mass of magnesium required to produce this volume of gas at r.t.p. [2]
- (d) (i) Study the equation you have written in part (c)(ii). Which substance has been oxidized during the reaction? [1]
- (ii) Write a half-reaction for the oxidation reaction. [2]

Total marks [20]