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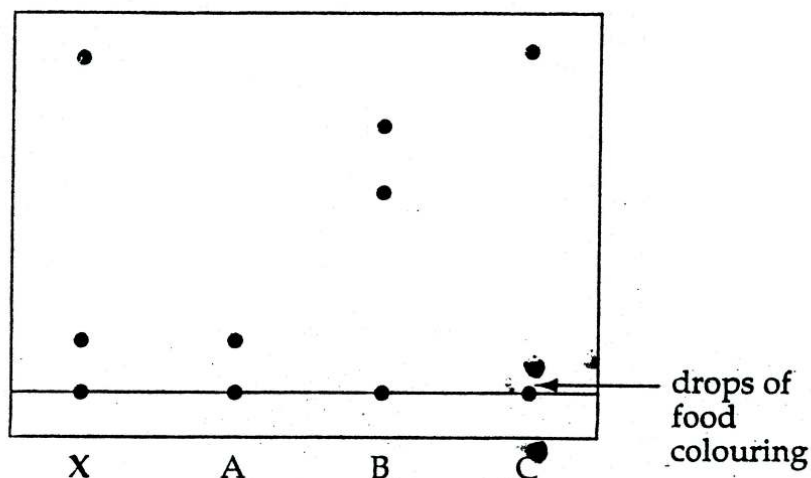
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CHEMISTRY

PAPER 1

29 MAY 1998

- 1 The chromatogram obtained to identify the food colourings in substance X is shown below.



Which food colourings are present in substance X?

- A A and B
 - B A and C
 - C B and C
 - D A, B and C
- 2 Methylated spirits, a solvent, is often used to remove grass stains because the stains are
- A inorganic and insoluble in this solvent.
 - B inorganic and soluble in this solvent.
 - C organic and insoluble in this solvent.
 - D organic and soluble in this solvent.
- 3 What is the name given to solid left in the filter paper after filtration?
- A filtrate
 - B residue
 - C solute
 - D solvent

- 4 Which process is the most suitable method to use to separate alcohol from water?
- A chromatography
 - B centrifugation
 - C fractional distillation
 - D solvent extraction

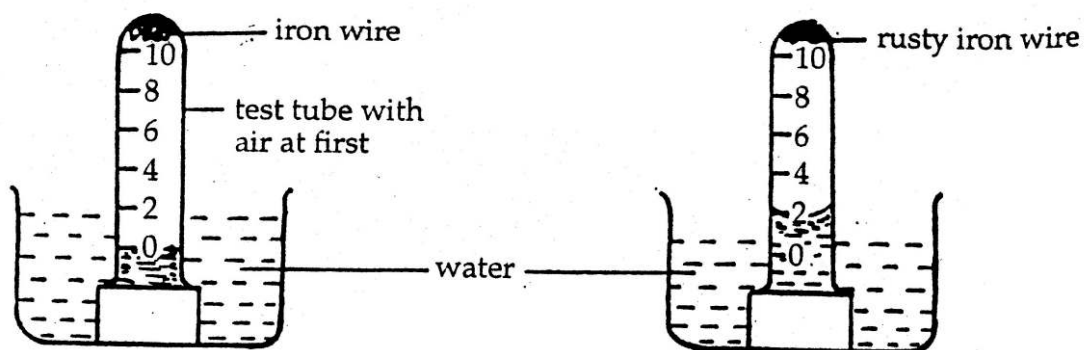
Questions 5 – 7 are based on the information given in the table.

The table shows the melting points, boiling points and densities of four substances A, B, C and D.

substance	m.p. /°C	b.p. /°C	density g/cm ³
A	1009	2506	8.9
B	44	97	1.5
C	-10	63	0.9
D	-256	-248	0.08

- 5 Which substance will be a liquid at -250 °C?
- 6 Which substance is most likely to be a metal?
- 7 Which substance will change state when cooled from room temperature to -25 °C?

- 8 The diagrams below show the apparatus used to determine the amount of oxygen that is used up during the rusting of iron wire.



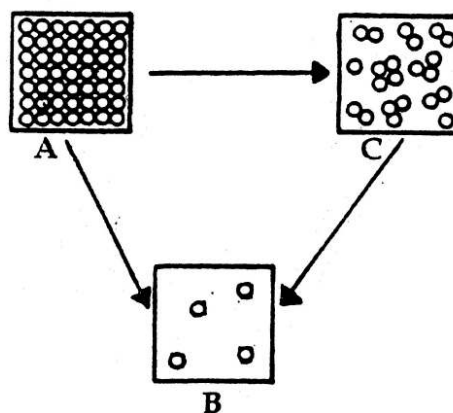
What volume of oxygen was used up for the rusting of iron wire?

- A 2.0 cm³
- B 3.0 cm³
- C 4.0 cm³
- D 5.0 cm³

9 Which process does NOT involve a change of state?

- A boiling
- B rusting
- C melting
- D sublimation

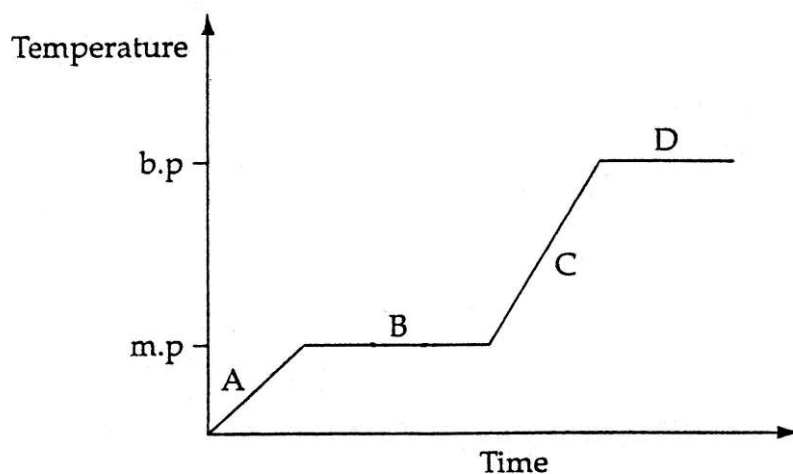
10 The diagrams labelled A, B and C represent particles in the three states of matter.



What name is given to the process by which state A changes directly to state B?

- A boiling
- B freezing
- C melting
- D sublimation

- 11 A solid is steadily warmed. The graph shows how its temperature changed.



in which zone would the substance be present in both the liquid and solid states?

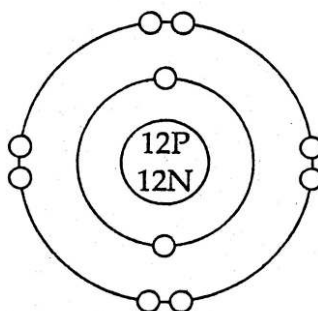
- 12 "The volume of a given mass of gas is directly proportional to its Kelvin temperature, provided that the pressure is kept constant." This is a statement of

A Boyle's Law.
B Charles' Law.
C Dalton's Law.
D Gay-Lussac's Law.

- 13 The atomic number of an element is

A the total number of particles in the nucleus of the atom.
B the number of charged particles in the neutral atom.
C the number of protons in the nucleus of the atom.
D the number of neutrons in the nucleus of the atom.

- 14 What name is given to atoms with the same atomic number but with different mass (nucleon) numbers?
- A isotopes
 - B isomers
 - C homologous
 - D allotropes
- 15 Using the Periodic Table, what is the number of neutrons in the atom with the chemical symbol Cr?
- A 24
 - B 28
 - C 52
 - D 76
- 16 What type of particle is represented by this diagram?



- A An atom of a metal.
- B An atom of a non-metal.
- C An ion of a non-metal.
- D An ion of a metal.

17 A sulphur atom can be changed to a sulphide ion. How can this change be brought about?

- A The atom gains two protons.
- B The atom loses two electrons.
- C The atom gains two electrons.
- D The atom loses two protons.

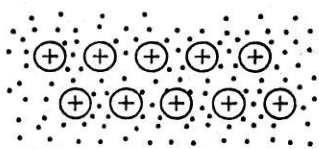
18 An ionic bond is formed between reacting atoms of two elements when

- A the combining atoms both need to lose electrons in order to attain a noble gas structure.
- B the combining atoms both need to gain electrons in order to attain a noble gas structure.
- C a metallic element combines with a non-metallic element.
- D two non-metallic elements react together.

19 What type of bonding exists in a sodium chloride crystal?

- A metallic
- B ionic
- C co-ordinate
- D covalent

20 The diagram shows a type of bonding exhibited by certain elements. To which group does this element belong?

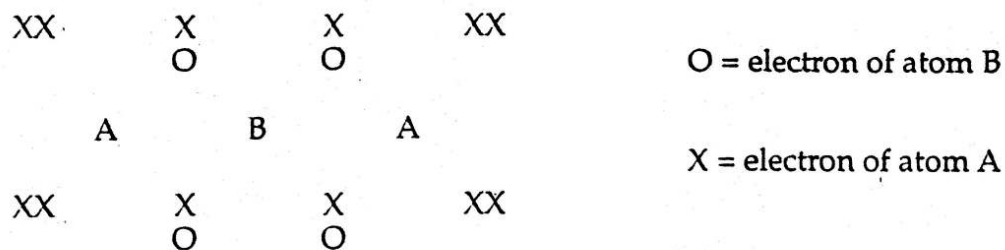


• = an electron

⊕ = positive ion

- A an element in group 1
- B an element in group 6
- C an element in group 7
- D an element in group 0

21. The diagram represents the elements and bonding of a compound.



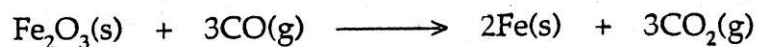
Which set of information applies to this compound?

	bonding type	chemical formula
A	covalent	BA_2
B	covalent	B_2A
C	ionic	BA_2
D	ionic	B_2A

Questions 22 to 25. Refer to the information below.

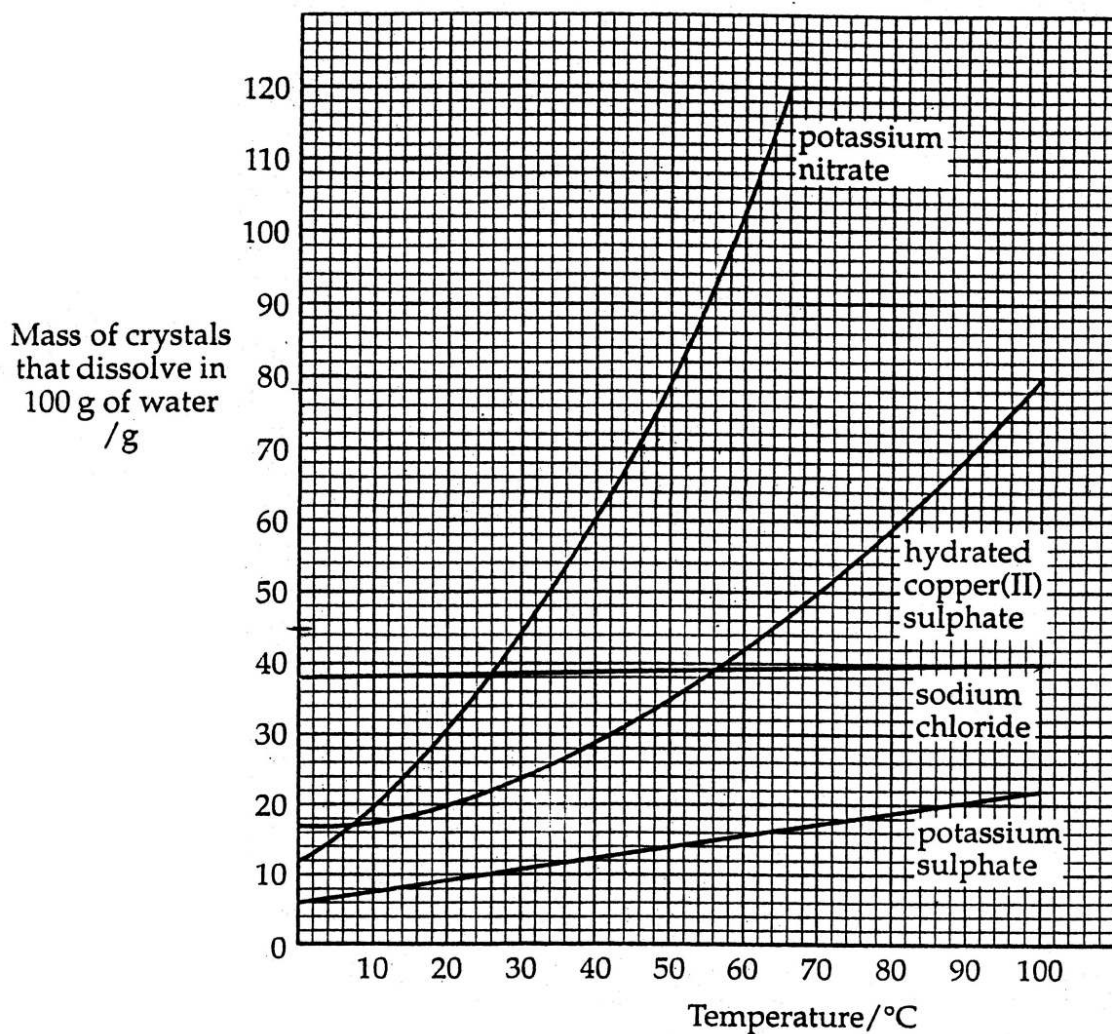
Iron is manufactured by reducing iron ore in a blast furnace.

The equation for the reaction is



- 22 What is the molecular (formula) mass or M_r of $\text{Fe}_2\text{O}_3(\text{s})$?
- A 48
B 56
C 72
D 160
- 23 What is the TOTAL number of moles of reactants shown in the equation?
- A 2
B 3
C 4
D 5
- 24 How many moles of $\text{Fe}(\text{s})$ are produced when one mole of $\text{Fe}_2\text{O}_3(\text{s})$ is reduced?
- A 1
B 2
C 3
D 5
25. What volume of carbon dioxide would be produced at r.t.p. when one mole of $\text{Fe}_2\text{O}_3(\text{s})$ is reduced?
- A 24.0
B 44.8
C 67.2
D 72.0

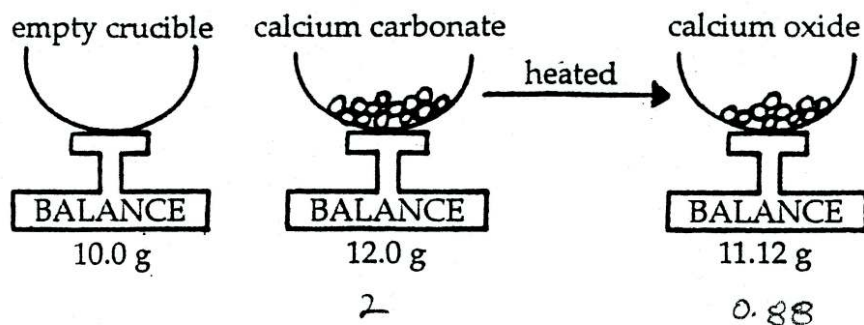
26. The solubility curves for four salts are shown on the graph.



What is the solubility of potassium nitrate at 50 °C?

- A 15 g/100 g
 B 34 g/100 g
 C 38 g/100 g
 D 80 g/100 g
27. 45 g of sodium chloride was added to 100 g of water at 100 °C. Using the graph given for question 26, what mass of sodium chloride remained undissolved?
- A 23 g
 B 5 g
 C 2 g
 D 0 g

The diagrams show the results of an experiment in which calcium carbonate is heated to give off carbon dioxide.



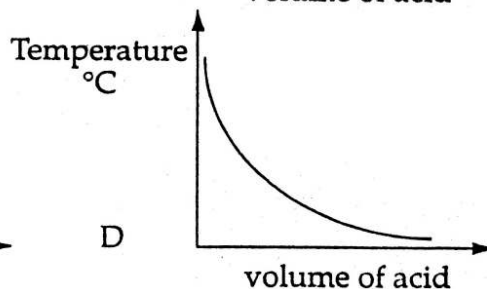
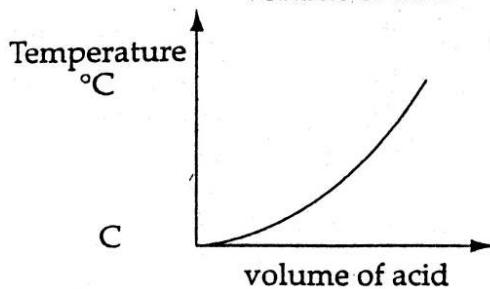
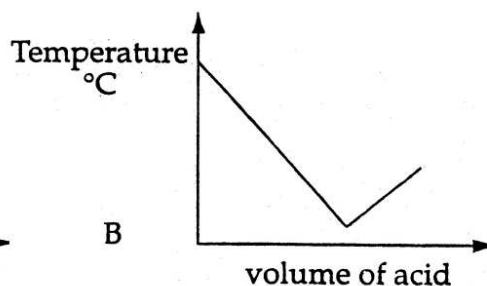
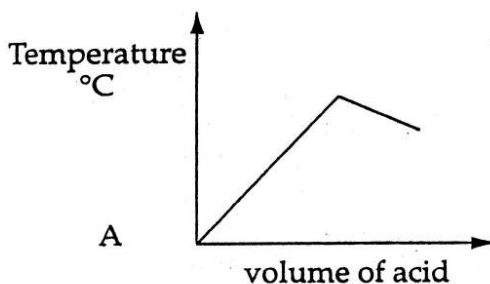
28. What mass of carbon dioxide was produced in this experiment?
- A 0.88 g
 - B 1.12 g
 - C 21.12 g
 - D 23.12 g
29. What is the most likely pH value of a strong acid such as hydrochloric acid?
- A 2
 - B 7
 - C 10
 - D 14

Questions 30 – 32 refer to the following list of salts and chemicals.

- A calcium carbonate
- B sodium sulphate
- C sulphuric acid
- D zinc

A substance may be used once, more than once or not at all.

- 30. Which substance would react with hydrochloric acid to produce carbon dioxide?
- 31. Which substance reacts with hydrochloric acid to produce hydrogen gas?
- 32. Which substance could be used to prepare a sample of magnesium sulphate from magnesium metal?
- 33. Which graph shows how the temperature of an alkali solution would change when acid is added until it is in excess?



34. An insoluble salt has been precipitated by mixing two aqueous solutions. Which series of steps shows the correct order of processes used to obtain the salt?

- A filter, wash, dry
- B evaporate, filter, dry
- C dissolve, crystallise, dry
- D evaporate, crystallise, dry

35. What colour will copper ions impart to a flame?

- A brick-red
- B blue-green
- C lilac/purple
- D yellow

36. When substance X is heated in a Bunsen flame, the flame changes to a lilac/purple colour. Which ion is present in substance X?

- A K^+
- B Na^+
- C Ca^{2+}
- D Cu^{2+}

37. Aqueous silver nitrate is added to an unknown solution. A white precipitate, insoluble in excess acid, is formed.

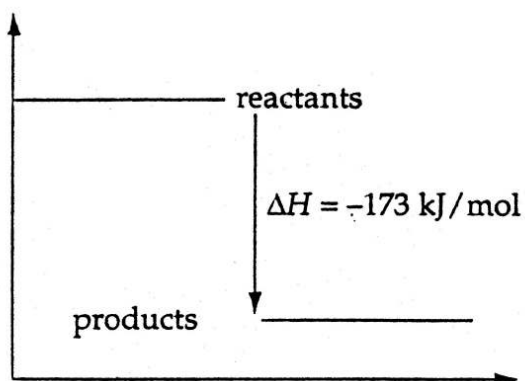
Which anion was present in the solution?

- A carbonate
- B chloride
- C nitrate
- D sulphate

38. Which one of the following equations shows a reaction involving the largest amount of energy change?

- | | | |
|---|---|-------------------------------|
| A | $H_2(g) + Cl_2(g) \longrightarrow 2HCl(g)$ | $\Delta H = -182 \text{ kJ}$ |
| B | $H_2(g) + I_2(g) \longrightarrow 2HI(g)$ | $\Delta H = +50.1 \text{ kJ}$ |
| C | $CO(g) + H_2(g) \longrightarrow H_2O(g) + C(s)$ | $\Delta H = -129 \text{ kJ}$ |
| D | $N_2(g) \longrightarrow 2N(g)$ | $\Delta H = +470 \text{ kJ}$ |

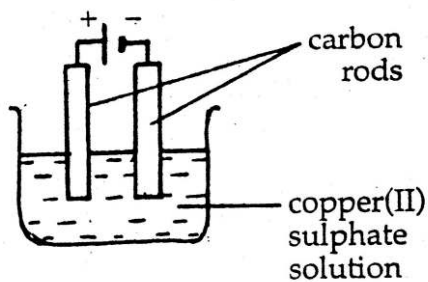
- 39 Ammonia reacts with hydrogen chloride to form ammonium chloride and this reaction can be shown by an energy level diagram.



The diagram suggests that the reactions is

- A exothermic and heat is given out to the surroundings.
 - B exothermic and heat is absorbed from the surroundings.
 - C endothermic and heat is given out to the surroundings.
 - D endothermic and heat is absorbed from the surroundings.
40. Which fluid is a **non-electrolyte**?
- A alcohol
 - B molten lead bromide
 - C salt solution
 - D sulphuric acid

Questions 41 and 42 refer to the following diagram.



41. The process shown in the diagram is called
- A combustion.
 - B electrolysis.
 - C oxidation.
 - D reduction.
42. When a current is passed through the copper sulphate solution, bubbles of gas are produced at one of the carbon rods. What happens to the other rod?
- A Bubbles of the same gas are produced at this rod.
 - B Bubbles of a different gas are produced at this rod.
 - C The carbon rod dissolves into the solution.
 - D The carbon rod gets covered with a layer of copper metal.

Use the following information to help you answer questions 43 and 44.

A student conducts 2 experiments at room temperature.

In **experiment 1** – 3 g of lumps of zinc was reacted with excess dilute hydrochloric acid.

In **experiment 2** – 3 g of powdered zinc was reacted with excess dilute hydrochloric acid.

Experiment 2 proceeded at a faster rate than **experiment 1**. The volume of hydrogen gas produced during reaction was 50 cm³.

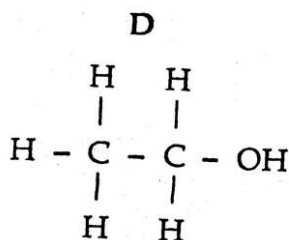
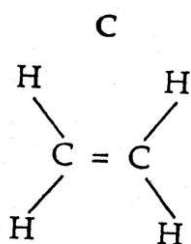
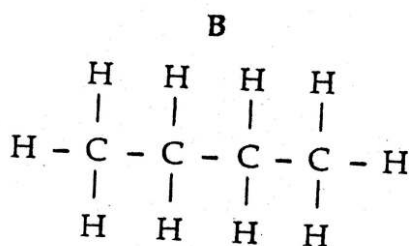
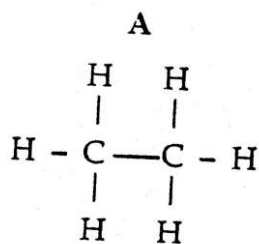
43. What would be the volume of hydrogen gas produced in **experiment 1**?

- A 25.0 cm³
- B 50.0 cm³
- C 75.0 cm³
- D 100.0 cm³

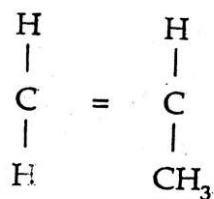
44. If **experiment 2** were repeated at a higher temperature, the results obtained would show

- A the same volume of gas produced in a shorter period of time.
- B a larger volume of gas produced in a shorter period of time.
- C a larger volume of gas produced in the same period of time.
- D the same volume of gas produced in a longer period of time.

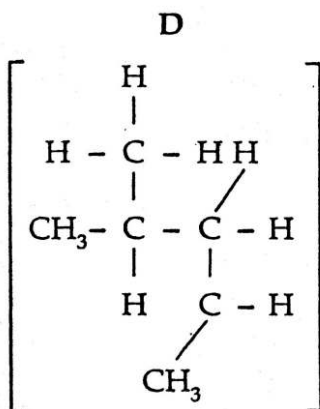
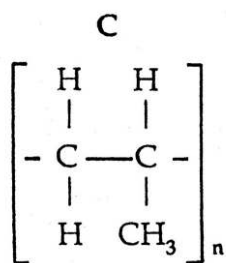
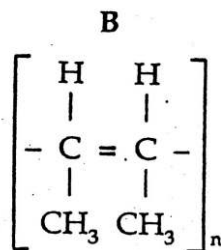
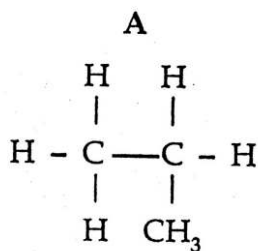
45. Which structural formula shows an unsaturated compound?



46. The structural formula of the monomer propene is shown in the diagram.



Propene



Which diagram correctly represents the polymer, polypropene?

47. What substance is produced when ethanol is oxidised?

- A ethane
- B ethanoic acid
- C ethene
- D propanol

48. Iron can be extracted from the ore named

- A Galena.
- B Haematite.
- C Cinnabar.
- D Rock salt.

49. Some plastics are biodegradable.

"Biodegradable" means –

- A Can damage marine life.
- B Can be acted upon by bacteria and rot away.
- C Can damage plants and animals on land.
- D Can be recycled to make shoe soles, toys, etc.

50. Potassium chloride (KCl) is a fertilizer.

What percent of potassium chloride is potassium?

- A 39%
- B 35.5%
- C 52.3%
- D 47.65%

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CHEMISTRY

PAPER 2

Friday **29 MAY 1998** 2:20 – 3:50 P.M.

Additional materials:
Periodic Table

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 and candidate number 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.

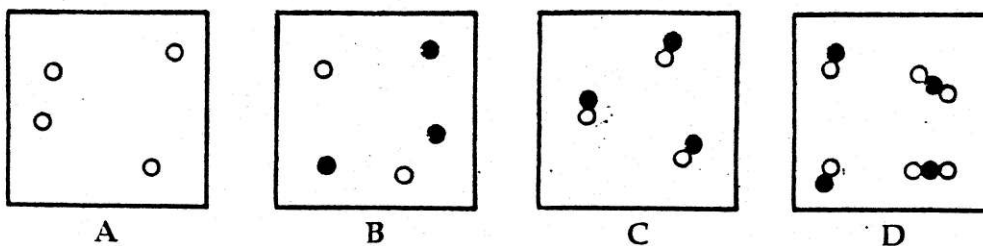
The mark for each part-question is given in brackets [].

ADDITIONAL INFORMATION

Volume of 1.0 mole of gas at r.t.p. is 24,000 cm³.

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

1. The diagrams show the arrangement of atoms in four substances.



- (a) By referring to the lettered diagram, explain why

(i) A is an element, _____

(ii) B is a mixture of elements, _____

(iii) C is a compound _____

(iv) D is a mixture of compounds, _____

(v) A is a pure monatomic gas. _____

_____ [5]

- (b) Describe a suitable method of obtaining iron from a mixture of iron filings and sulphur powder.

_____ [1]

(c) Iron filings and sulphur powder react together when heated.

(i) Is this a physical or a chemical change?

_____ [1]

(ii) What do you see during the reaction which confirms your answer to part (i)?

_____ [1]

(iii) Write the word equation for this reaction.

_____ [2]

Total marks [10]

2. Part of the periodic table is shown below. The letters A to F stand for six of the elements, but they are NOT the correct chemical symbols of the elements.

(a) Use the Periodic Table to give

- (b) Answer parts (i) to (vi) by writing one of the letters A to F. Each letter may be used once, more than once or not at all.

- (c) Name the type of bonding present in the compound of C and D.

Total marks [10]

3. Bromine does not occur naturally as an element, it occurs as a compound magnesium bromide in sea water. It is extracted from sea water by the oxidation process. Chlorine is used to oxidise the bromide ion from magnesium bromide to bromine.

With reference to this information, answer the following questions:

- (a) (i) Define the term oxidation.

_____ [1]

- (ii) Give a reason for the displacement of the bromide ion from its compound by chlorine.

_____ [1]

- (b) State **ONE** way by which chlorine is used in the Bahamas to prevent the spread of diseases.

_____ [1]

- (c) Fluorine, chlorine, bromine, iodine and astatine are a family of elements.

- (i) State the name given to this family of elements.

_____ [1]

- (ii) The boiling points of some of the members of this family are:

Element	Boiling point °C
Fluorine	-188
Chlorine	-35
Bromine	59
Iodine	184
Astatine	_____ [1]

Predict the boiling point of Astatine by filling in the blank.

- (d) (i) Draw a molecule of chlorine (Cl_2) showing its outer electrons ONLY. [2]

- (ii) What type of bonding exists between atoms in a molecule of chlorine?

_____ [1]

- (e) What colour change would you expect to SEE when chlorine gas is bubbled into potassium bromide solution?

from _____ to _____ [2]

Total marks [10]

4. Some common household chemicals and their pH numbers are:

Household chemical	pH number
ammonia	12
oven cleaner	13
table salt	7
vinegar	3
toothpaste	10

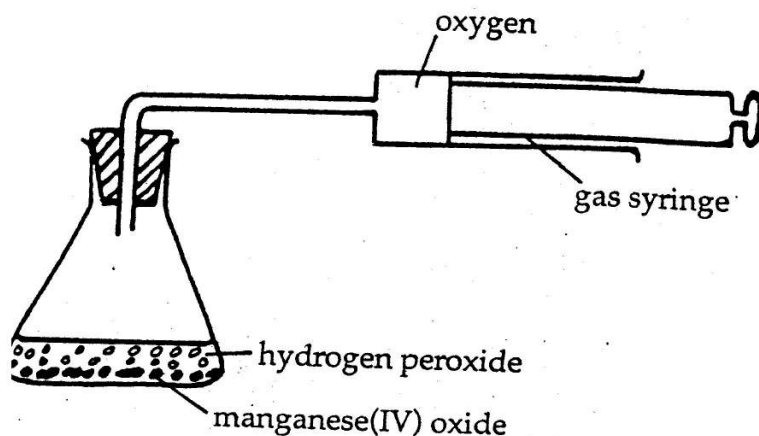
From the list choose an **ACID** and a **BASE**.

- (a) (i) household acid, _____
- (ii) household base, _____ [2]
- (iii) What kind of reaction would take place between the two substances you have named?
- _____ [1]
- (iv) How would you identify unlabelled bottles of say, ammonia and vinegar by a simple test?
- _____ [1]
- (b) Write the chemical symbol for the ions that make an acid acidic and a base, alkaline.
- (i) acidic ion symbol _____
- (ii) basic ion symbol _____ [2]
- (c) Complete the following equation for the general reaction between:
- Acid + Base $\longrightarrow$ _____ + _____ [2]
- (d) An old medical book says that treatment for a mosquito bite is to dab it with toothpaste, for a wasp sting, vinegar is a remedy. If this is true, what might be deduced about the chemical nature of the mosquito bite and wasp sting?
- (i) mosquito bite, _____
- (ii) wasp sting, _____ [2]

Total marks [10]

[Turn over

5. Hydrogen peroxide can be decomposed using a catalyst of manganese(IV) oxide. The apparatus shown is used to measure the volume of oxygen produced at regular intervals during the course of the reaction.



- (a) Name a household use of hydrogen peroxide.
- _____ [1]
- (b) (i) What does the catalyst do to the rate of this chemical reaction?
- _____ [1]
- (ii) Name ONE other factor that alters the reaction rate.
- _____ [1]
- (c) State TWO observations that would indicate that this reaction has been completed.
- (i) Observation 1 _____
- (ii) Observation 2 _____ [2]
- (d) (i) 1 g of catalyst was used in the experiment. What mass of catalyst would remain after the hydrogen peroxide had completely decomposed?
- _____ [1]
- (ii) Explain your answer to (d) (i).
- _____ [1]

- (e) Complete the following word equation for the decomposition of hydrogen peroxide.

hydrogen peroxide $\longrightarrow$ _____ + oxygen [1]

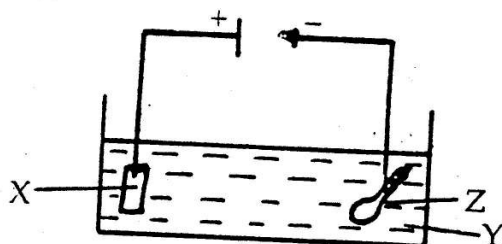
- (f) Briefly explain how you would test for oxygen, and give the result for a positive test.

(i) Test _____

(ii) Result _____ [2]

Total marks [10]

6. A metal spoon is to be silver-plated.



- (a) Name the electrode which is formed by the spoon.
_____ [1]
- (b) (i) Name the electrode X. _____
(ii) Name the liquid Y. _____ [2]
- (c) On the diagram, draw arrows to show the direction of flow of electrons through the wires. [1]
- (d) A suitable liquid for Y is an aqueous solution of silver nitrate.
(i) Name the cation in silver nitrate _____
(ii) Which electrode does the cation move towards? _____ [2]

- (e) An experiment was carried out to see if certain substances conducted an electric current.

The results are given below. Use this information to answer parts (i) to (iii).

Substance	State	Conductivity	Products
A	solid	no	none
B	liquid	yes	sodium, chlorine
C	liquid	no	none
D	liquid	yes	hydrogen & oxygen
E	_____	_____	none

- (i) Give the letter of the substance that produces a poisonous gas during electrolysis.
 _____ [1]
- (ii) Which substance is a sugar solution?
 _____ [1]
- (iii) If E is the "lead" taken from a common pencil complete the table for E.
 [2]

Total marks [10]

7. Commonwealth Breweries is built very near harbour facilities and the ocean.

(a) Suggest **TWO** reasons why this company chose this type of location.

reason 1 _____

reason 2 _____ [2]

(b) (i) Suggest an advantage for the company to use recycled bottles.

_____ [1]

(ii) Suggest **TWO** stages that the recycled bottles must pass through before they can be filled with the company product.

_____ [2]

(c) (i) Name the chemical process that produces the alcohol.

_____ [1]

(ii) Name a naturally occurring material that could be changed to alcohol using this process.

_____ [1]

(iii) Name an organism that is used in this process.

_____ [1]

(iv) The maximum amount of alcohol that can be produced by this process is about 14%, after which the reaction always stops. Suggest a reason why the reaction stops.

_____ [1]

(d) Most bottled beers contain 12 fluid oz. of beer containing 5% alcohol. Calculate the actual volume of alcohol in a bottle of beer.

_____ [1]

Total marks [10]

8. The results of the reaction of different metals with dilute hydrochloric acid are given below.

Metals	Reaction with dilute hydrochloric acid
Aluminium	Slow in the beginning, becoming more rapid, producing hydrogen gas
Copper	No reaction
Calcium	Reacts rapidly producing hydrogen gas
Potassium	Too reactive to be used with acids
Iron	Fairly slow, producing hydrogen gas

- (a) Arrange the metals in order of chemical reactivity.

_____ [2]

- (b) From the list, select **ONE** metal that

(i) reacts with cold water; _____

(ii) does **NOT** react with water or steam; _____

(iii) produces a self-protecting coating _____ [3]

- (c) The rusting of iron is a nuisance.

(i) What **TWO** substances must be present to make iron rust?

_____ [2]

(ii) Write the chemical name for rust.

_____ [1]

Objects made of iron or steel can be protected from rusting by covering them with a layer of zinc.

(iii) Name the zinc plating process.

_____ [1]

(iv) Give **ONE** other way by which rusting can be prevented.

_____ [1]

Total marks [10]

End]

School Number	Candidate Number
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CHEMISTRY

PAPER 3

Wednesday **10 JUNE 1998** 1:00 – 2:30 P.M.

Additional materials:

Lined paper

Graph paper

Periodic table

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS
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BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS AND INFORMATION FOR CANDIDATES

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

Write your school number and candidate number at the top of this page as well as at the top of all line paper used.

Answer **ALL** the questions in Section A 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 questions or parts of questions are given in brackets [].

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

Additional information:

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

The volume of one mole of gas at room temperature and pressure is $24,000 \text{ cm}^3$

This question paper consists of 10 printed pages and 2 blank pages.

SECTION A

1. Germanium, Ge, is an element in Group IV of the Periodic Table. The properties of germanium are predictable by knowing the position of germanium relative to silicon and tin.

- (a) Complete the table by predicting the properties of germanium using the information supplied in the table.

Property	Silicon, Si	Tin, Sn	Germanium, Ge
m.p. °C	1410	232	_____
density g/cm ³	2.33	7.31	_____
appearance	grey solid	silvery metal	_____
formula of oxide	SiO ₂	SnO ₂	_____

[4]

- (b) Another property of group IV is their ability to conduct electricity.

- (i) Explain how the non-metal graphite, a form of carbon can conduct electricity.

[2]

- (ii) Explain how the metal tin is able to conduct electricity.

[2]

- (c) If 3 g of diamond are burned, 11 g of carbon dioxide are produced every time.

On a mathematical basis, how does this result prove that diamond contains only carbon atoms?

[2]

Total marks [10]

2. Aminomethane, with a formula of CH_3NH_2 , is a colourless gas with a pungent, choking smell. It is very soluble in water and produces an alkaline solution.

(a) Draw a diagram showing the full structural formula of aminomethane.

[2]

(b) Calculate,

(i) the relative molecular mass for this compound.

[1]

(ii) the number of moles in 62.0 g of aminomethane.

[2]

(c) Ammonia gas and aminomethane are similar.

(i) What would you expect to SEE if aminomethane and hydrogen chloride were placed at opposite ends of a glass tube and allowed to diffuse?

[1]

(ii) Write a chemical equation for the reaction.

[2]

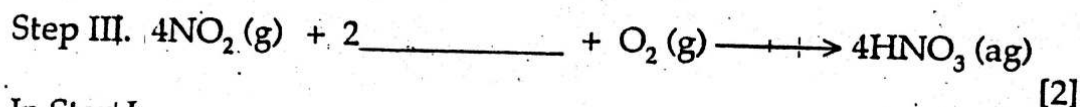
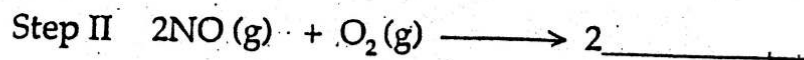
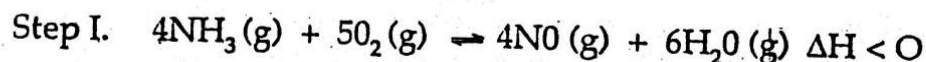
(iii) Which gas, aminomethane or hydrogen chloride, will diffuse faster? Explain your answer.

[2]

Total marks [10]

3. Nitric acid is a very important chemical produced industrially. Manufacture of nitric acid takes place in three steps:

- (a) Complete the following steps by filling in the missing reactants or products.



- (b) In Step I.

- (i) Name the industrial process that produces ammonia.

_____ [1]

- (ii) Explain the meaning of $\Delta H < 0$, (ΔH is negative).

_____ [1]

- (iii) Why is the catalyst platinum used in the form of a wire gauze instead of lump platinum?

_____ [1]

- (iv) What happens to the unreacted gases in step I?

_____ [1]

- (v) Name the product of the reaction between ammonia and nitric acid.

_____ [1]

- (vi) Give a use for this product.

_____ [1]

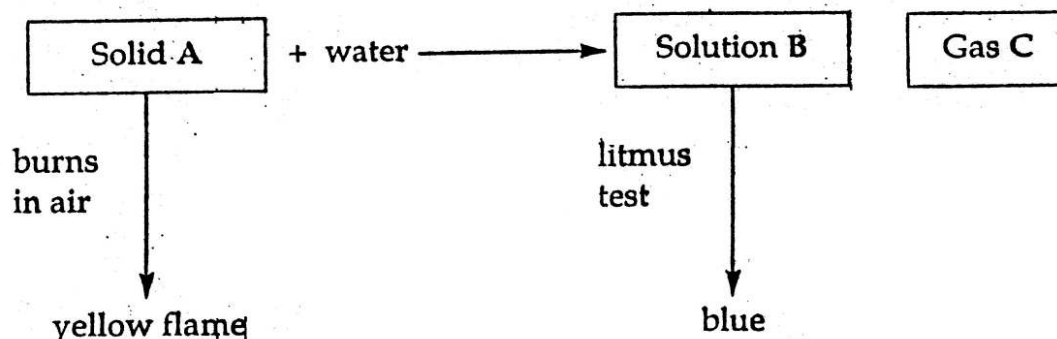
- (c) Using step III, calculate the mass of nitric acid (HNO_3) obtained when 64 g of oxygen (O_2) is used to convert the reactants into nitric acid.

_____ [2]

Total marks [10]

4. Study the diagrams and then identify the substances A to F

Solid A burns in air with a yellow flame. When A is dissolved in water there is an exothermic reaction. Solution B and gas C are produced.



(a) Name

(i) solid A _____

(ii) solution B _____

(iii) gas C _____

[3]

(b) Describe a test for gas C and give the result you would expect.

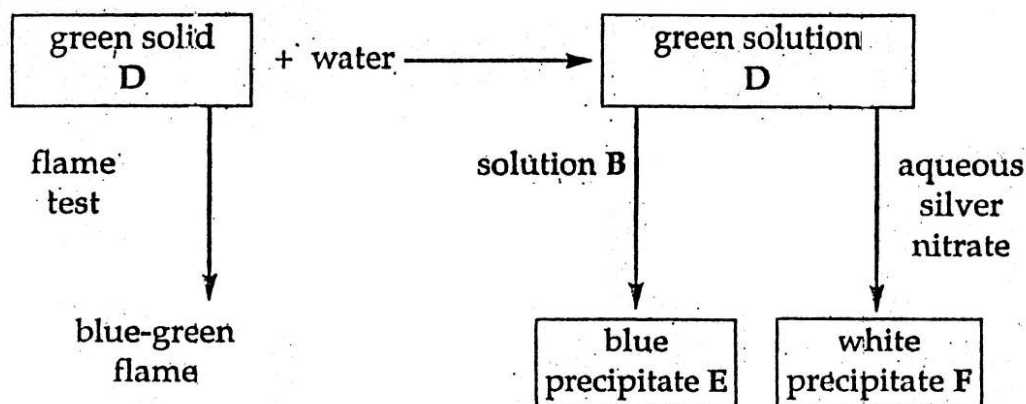
(i) Test _____

(ii) Result _____ [2]

Salt D is a green crystalline solid. It colours a flame green-blue. Salt D is dissolved in water and the solution divided into two parts.

When solution B is added to the solution of salt D, a blue precipitate F is formed

When aqueous silver nitrate is added to a solution of salt D, a white precipitate F is formed.



(c) name

(i) salt D _____

(ii) blue precipitate E _____

(iii) white precipitate F _____ [3]

(d) (i) Give a confirmatory test for white precipitate F.

_____ [1]

(ii) What would be seen if excess ammonia is added to blue precipitate E?

_____ [1]

Total marks [10]

SECTION B

This section has **THREE** questions numbered 5, 6 and 7.

Candidates are reminded that they are to complete **ONLY TWO** questions in this section.

- 5 (a) The following question is about the manufacture of sulphuric acid.
- The reaction between oxygen and sulphur dioxide to form sulphur trioxide is reversible. Write a balanced equation that summarizes this information. [3]
- (b) (i) Explain why sulphur dioxide should not be allowed to leak into the environment and give one effect of the consequences. [2]
- (ii) Name another gas that affects the environment in a similar way and a source of this gas. [2]
- (c) Describe what would be seen when concentrated sulphuric acid is added to
- (i) copper sulphate crystals
- (ii) sugar
- and explain the function of the sulphuric acid in the reactions. [6]
- (d) (i) What is the gaseous product of the reaction between concentrated sulphuric acid and copper? [3]
- (ii) What does this show about the way in which copper acts in this reaction? Explain your answer. [3]
- (e) An acid was analysed and found to contain 2.44% hydrogen, 39.04% sulphur and 58.52% oxygen by mass. Determine its empirical formula. [4]

Total marks [20]

6

The following results were obtained when 50.0 cm^3 of molar 1 (M) hydrochloric acid reacted with 5.0 g of powdered magnesium carbonate and the volume of gas evolved was measured at regular intervals. The temperature was kept constant.

Time/minutes	1	2	3	4	5	6	7	8
Total volume of gas/ cm^3	280	420	490	530	550	560	560	560

- (a) (i) Plot and label a graph of total volume of gas (y-axis) against time (x-axis). [6]
- (ii) How long did the reaction take to produce 400 cm^3 of gas? [1]
- (iii) On the graph indicate with a clear label when the reaction has stopped. [1]
- (iv) Explain how, and why, the rate of the reaction changes as the reaction proceeds. [2]
- (b) Write a balanced chemical equation for the reaction between magnesium carbonate and hydrochloric acid. [2]
- (c) Using Kinetic Theory, explain how the initial rate of reaction would be affected by
- (i) an increase in temperature.
- (ii) an increase in particle size. [4]
- (d) Carbon dioxide is important to some local industries.
- Name TWO of these industries and explain the importance of carbon dioxide to each of the industries you named. [4]

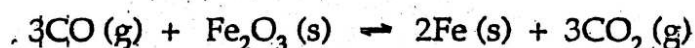
Total marks [20]

- (a) In the industrial production of iron,
- (i) Name the ore from which iron is extracted and write its formula. [2]

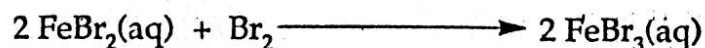
The coke added to a blast furnace is involved in two reactions.

- (ii) Write balanced equations for each of these reactions. [4]
- (ii) Why is limestone added to the charge in the blast furnace. [1]

Consider the reaction between carbon monoxide and iron(III) oxide.



- (b) What is the oxidation state of carbon in
- (i) carbon monoxide,
- (ii) carbon dioxide? [2]
- (c) What is the oxidation state of iron in
- (i) iron(III) oxide,
- (ii) elemental iron? [2]
- (d) Given that 144 dm³ of carbon monoxide (CO) reacts with excess iron(III) oxide Fe₂O₃, calculate
- (i) volume of carbon dioxide (CO₂) produced, [2]
- (ii) mass of iron (Fe) produced. [3]
- (e) When bromine water is added to a solution of iron(II) bromide the following reaction occurs.



Write an ionic half equation for the oxidation and reduction reactions. [4]

Total marks [20]