N Examination Station

Paper 1	/ 20
Paper 2 Section A	/ 14
Paper 2 Section B	/ 16
Total	/ 50

Paper 1

For each question, choose the most suitable option (**A**, **B**, **C** or **D**).

1. Which of the following apparatus can be used to measure the time taken for 20 cm^3 of hydrogen gas to be produced from the reaction between an acid and a metal?

   A Beaker and thermometer

   B Gas syringe and stopwatch

   C Measuring cylinder and stopwatch

   D Thermometer and stopwatch

2. How can a mixture of sand and water be separated and the purity of water be determined?

	Method of Separation	Method of Determining the Purity of Water
A	filtration	checking if the liquid is clear
B	filtration	measuring the boiling point of the liquid
C	simple distillation	checking if the liquid is clear
D	simple distillation	measuring the boiling point of the liquid

3. Which of the following explains why a magnet is used to separate a sample of iron and sulfur powder?

   A Iron has a higher melting point than sulfur.

   B Iron is a good electrical conductor while sulfur is not.

   C Iron is a magnetic material while sulfur is not.

   D Iron is a metal while sulfur is a non-metal.

4. What happens to solid ammonium chloride when it is heated gently until it reaches its sublimation point?

   A Its particles become closer together.

   B Its particles move farther apart.

   C Its particles vibrate in their fixed positions.

   D The intermolecular forces of attraction between its molecules increase.

5. Deuterium is an isotope of hydrogen and has the chemical symbol D.

Which of the following statements about deuterium is **not** true?

A Deuterium can form an ion with the formula D^+.

B Deuterium has an atomic number of 2.

C Deuterium has one more neutron than hydrogen.

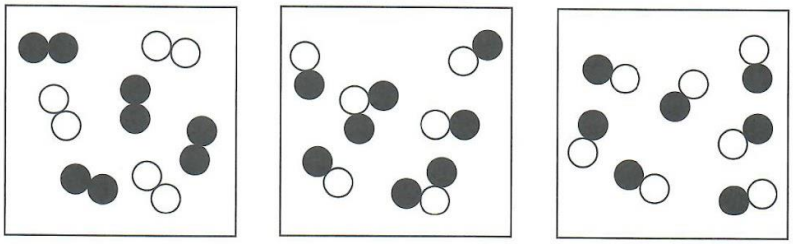
D The chemical formula of deuterium chloride is DCl.

6. Element **Q** has an electronic configuration of 2, 8, 2. Element **R** has an electronic configuration of 2, 5.

What type of bonding and chemical formula does a compound formed between **Q** and **R** have?

	Type of Bonding	Chemical Formula
A	covalent	Q_2R_3
B	covalent	Q_3R_2
C	ionic	Q_2R_3
D	ionic	Q_3R_2

7. The diagrams in Figure 1 represent three groups of substances.



I II III

Figure 1

Which of the following shows the groups of substances **correctly** matched to the diagrams?

	I	II	III
A	compound	mixture of compounds	compound
B	element	compound	mixture of elements
C	mixture of compounds	compound	mixture of elements
D	mixture of elements	mixture of compounds	compound

8. Which of the following chemical equations represents a reaction of an amphoteric oxide?

   A $CaO + SO_2 \longrightarrow CaSO_3$

   B $MgO + 2HCl \longrightarrow MgCl_2 + H_2O$

   C $P_2O_3 + 6NaOH \longrightarrow 2Na_3PO_3 + 3H_2O$

   D $ZnO + 2NaOH \longrightarrow Na_2ZnO_2 + H_2O$

9. Which of the following reactions does **not** result in a neutral solution formed?

   A $AgNO_3 + HCl \longrightarrow AgCl + HNO_3$

   B $Ca + 2HCl \longrightarrow CaCl_2 + H_2$

   C $NaOH + HCl \longrightarrow NaCl + H_2O$

   D $SO_2 + 2KOH \longrightarrow NH_4Cl$

10. Which of the following is an advantage of alloys?

    A They are more reactive than pure metals.

    B They are more soluble in water than pure metals.

    C They are stronger than pure metals.

    D They react vigorously with dilute acids.

11. What is the chemical formula of chromium(III) oxide?

    A CrO

    B CrO_3

    C Cr_2O_3

    D Cr_3O

12. A student compared the properties of copper and zinc.

    Which of the following about the two metals is **true**?

	Copper	Zinc
A	cannot form alloys with other metals	can form alloys with other metals
B	does not react with steam	reacts vigorously with steam
C	forms basic oxides only	forms acidic oxides only
D	reacts with acids	does not react with acids

13. Which of the following pairs of elements will react with each other most vigorously?

A Bromine and lithium

B Chlorine and sodium

C Fluorine and rubidium

D Iodine and potassium

14. Which of the following **correctly** shows one source and one harmful effect of oxides of nitrogen?

	Source	Harmful Effect
A	car engines	formation of acid rain
B	cattle	irritation of the respiratory tract
C	industries	ocean acidification
D	lightning	global warming

15. Study Figure 2.

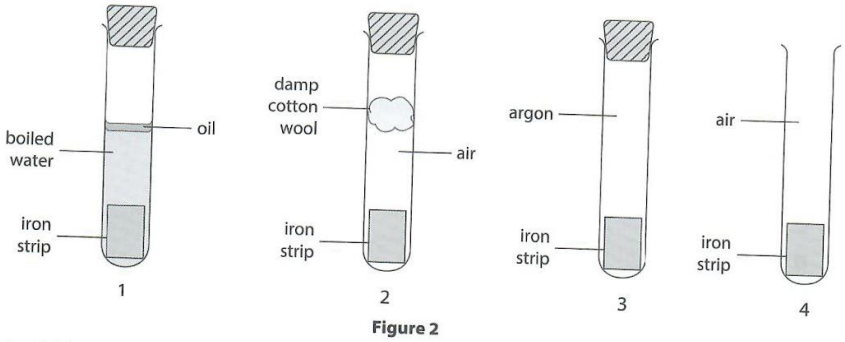


Figure 2

In which two test tubes would the iron strip rust?

A 1 and 2

B 1 and 3

C 2 and 4

D 3 and 4

16. Which of the following is **not** an issue related to the recycling of plastics?

A It is more costly than incineration.

B It produces wastewater which can pollute water bodies.

C It reduces the amount of non-biodegradable waste in landfills.

D It requires time and effort to be adopted as a lifestyle.

17. Which of the following is the same for one mole of ethane and one mole of ethene?
    - **A** Density
    - **B** Mass
    - **C** Number of carbon atoms in the compound
    - **D** Relative molecular mass

18. Which of the following can be used to distinguish between vegetable oil and margarine?
    - **A** Aqueous bromine
    - **B** Chlorine gas
    - **C** Hydrogen gas
    - **D** Universal Indicator

19. Which equation does **not** represent a reaction that an alkene can undergo?
    - **A** $C_2H_4 + Cl_2 \longrightarrow C_2H_4Cl_2$
    - **B** $C_2H_4 + H_2 \longrightarrow C_2H_6$
    - **C** $C_2H_4 + 2Br_2 \longrightarrow C_2H_2Br_2 + 2HBr$
    - **D** $C_2H_4 + 3O_2 \longrightarrow 2CO_2 + 2H_2O$

20. Which of the following pairs of substances have the same number of moles?
    - **A** 2 g of hydrogen and 2 g of helium
    - **B** 4 g of methane and 8.5 g of ammonia
    - **C** 6 g of carbon and 6 g of magnesium
    - **D** 44 g of carbon dioxide and 40 g of argon

Paper 2

Section A

Answer **all** questions in this section.

1. The chemical formulae of some substances are listed below.

Al_2O_3	CO	CaO	$CuSO_4$
Fe	NH_3	NO_2	ZnO

Match the chemical formulae listed above to the descriptions of these substances.

(a) It is a colourless and odourless air pollutant. [1]

(b) It undergoes rusting. [1]

(c) It is made up of cations with a valency of 3 and can react with both acids and alkalis. [1]

(d) It contains both ionic and covalent bonds. [1]

2. Solid ammonium carbonate was added into sodium hydroxide solution and a gas was produced.

(a) Identify the gas produced. [1]

(b) Describe the effect of the gas on litmus paper. [1]

(c) Name the apparatus that can be used to measure the volume of gas produced. [1]

3. An analysis was done on two food colourings, **X** and **Y**, using chromatography. Methanol was used as the solvent.

Figure 3 shows the chromatogram obtained.

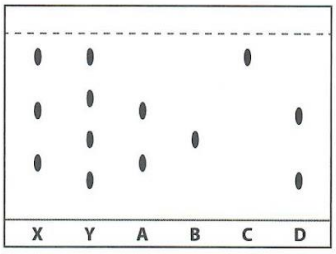


Figure 3

(a) Based on the chromatogram, explain whether **X** is a pure substance. [1]

(b) If pigment **D** is toxic, explain which food colouring should be used. [1]

(c) Which pigment is most soluble in the solvent used? Explain your answer. [1]

(d) If the solvent used was changed to water, would the same chromatogram be obtained? Explain why. [1]

4. Substance **X** is a liquid at room temperature and pressure. Figure 4 shows its cooling curve.

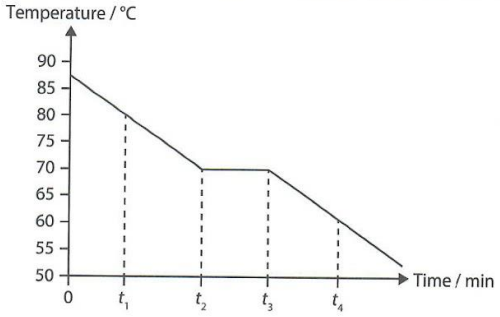


Figure 4

(a) Suggest the physical state of substance **X** at t_1 min. [1]

(b) State whether energy is gained or lost between t_2 min and t_3 min. [1]

(c) Describe the arrangement and movement of particles of substance **X** at t_4 min. [1]

Section B

Answer any **two** questions.

5. A student carried out experiments in the laboratory to investigate the reactions of some halogens. He added the halogens into different salt solutions. Table 1 shows whether a reaction occurred in each salt solution.

Table 1

Salt Solution \ Halogen	fluorine	chlorine	bromine	iodine
sodium fluoride		×	×	×
sodium chloride	✓		×	×
sodium bromide	✓	✓		×
sodium iodide	✓	✓	✓	

Key:
✓ reaction occurred
× no reaction

(a) (i) Write a balanced ionic equation, with state symbols, for the reaction of chlorine and sodium bromide. [1]

(ii) Explain why chlorine does **not** react with sodium fluoride. [1]

(b) (i) Arrange the four halogens in order of increasing reactivity. [1]

(ii) Explain the trend in reactivity of the halogens down Group 17 of the periodic table. [2]

(c) Explain why fluorine exists as a gas at room temperature while sodium fluoride is a solid at room temperature. [3]

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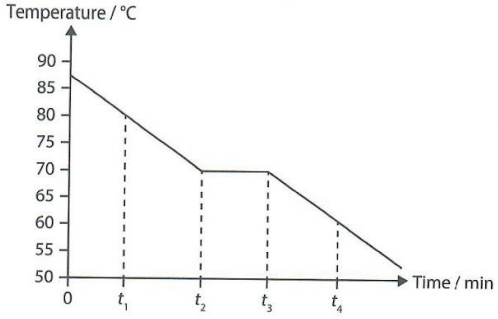

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6. An alloy made up of copper and zinc was added to dilute hydrochloric acid. The mass of the alloy before and after the reaction are shown in Table 2.

Table 2

Mass Before the Reaction / g	10.5
Mass After the Reaction / g	6.3

(a) Draw a diagram to show the arrangement of particles in the alloy. [2]

(b) (i) One of the metals in the alloy did not react with hydrochloric acid.

Identify the metal and explain why it did not react with the acid. [2]

(ii) Hence, determine the number of moles of the metal that reacted with hydrochloric acid. [1]

(c) Describe the change in the pH of the reaction mixture during the reaction. [1]

(d) Copper exists as two isotopes with atomic masses of 63 and 65 respectively.

In terms of the number of particles in the isotopes, describe **one** similarity and **one** difference between copper-63 and copper-65. [2]

7. Figure 5 shows some reactions that involve ethene.

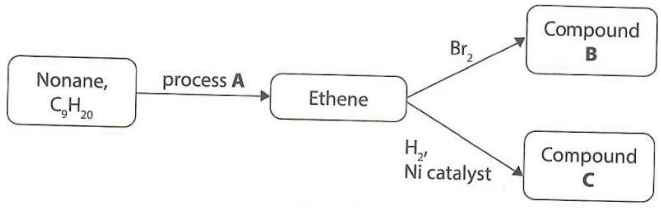

Figure 5

(a) (i) Identify process **A** and state why it is important. [2]

(ii) Hydrogen gas may be produced in process **A**. Describe a test that can be used to identify it. [1]

(b) Draw the full structural formulae of compounds **B** and **C**. [2]

(c) Draw the dot-and-cross diagram of compound **C**. [2]

(d) Ethene undergoes addition polymerisation. Write a chemical equation to represent this reaction. [1]