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CATHOLIC HIGH SCHOOL
End-of-Year Examination
Secondary 3 (O-Level Programme)

A

CHEMISTRY

2 October 2024
2 hours 15 minutes

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, class and index number on the Answer Sheet in the spaces provided.

There are **thirty** questions in this Section. Answer **all** questions. For each question, there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 8 of Section C.

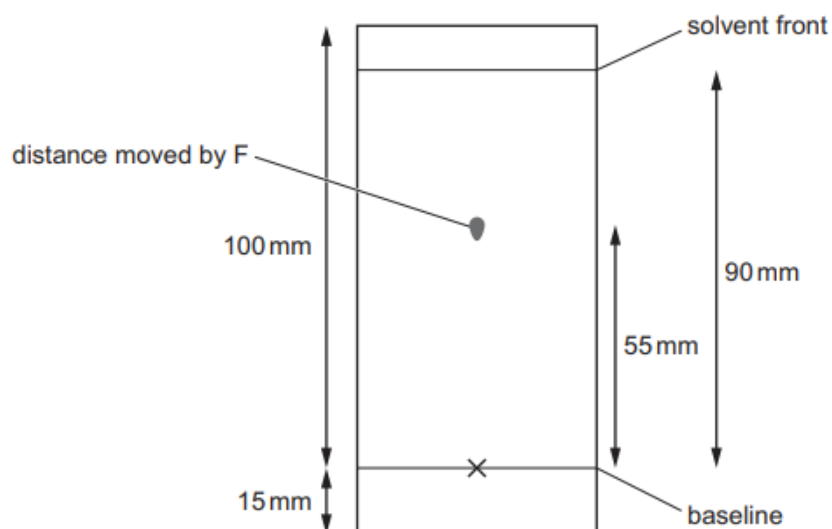
The use of an approved scientific calculator is expected, where appropriate.

For examiner's use only:

Total	/ 30
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Section A

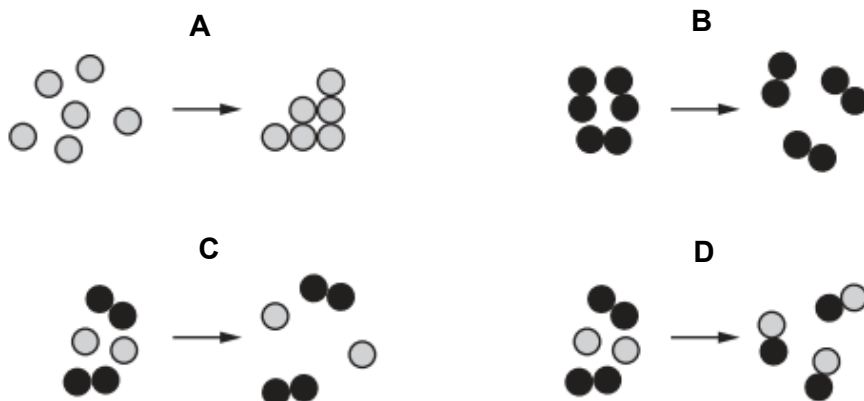
- 1 Which piece of apparatus is used to measure exactly 26.30 cm^3 of a liquid?
- A beaker
B burette
C measuring cylinder
D pipette
- 2 The measurements from a chromatography experiment using substance F are shown. The diagram is **not** drawn to scale.



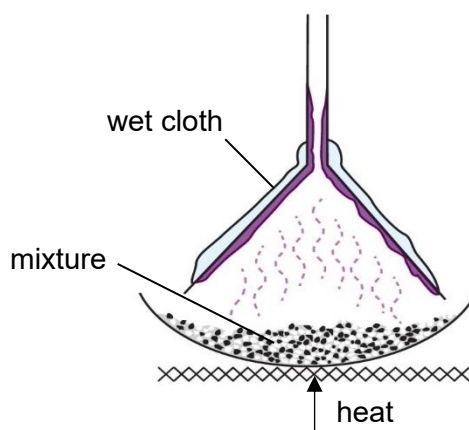
What is the R_f value of F?

- A 0.55 B 0.61 C 0.90 D 1.64
- 3 A student accidentally mixed 50 cm^3 of water with 50 cm^3 of oil.
- Which method would allow him to obtain 25 cm^3 of the oil most easily?
- A filtration
B fractional distillation
C simple distillation
D use of a separating funnel

- 4 Which diagram represents a chemical change?



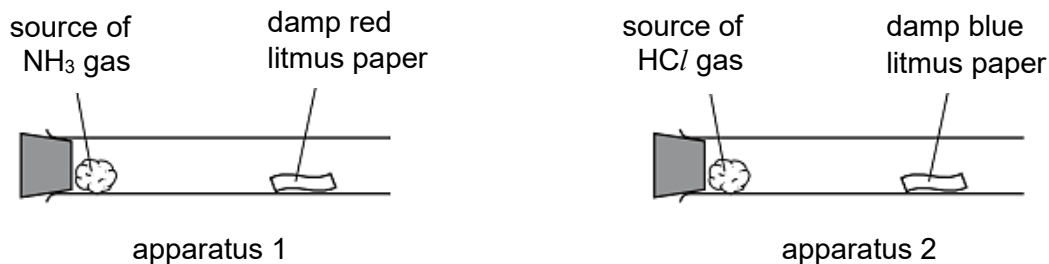
- 5 Which mixture can be separated by using the set-up below?



- A aluminium and silicon dioxide
 B ammonium chloride and naphthalene
 C iodine and sodium chloride
 D silicon dioxide and potassium sulfate
- 6 Bromine gas and air are mixed together to form a homogeneous mixture in a closed vessel.
- Bromine has a higher density than air.
- What will be observed after several hours?
- A The two gases remain mixed.
 B The two gases separate, a layer of air above bromine gas.
 C The two gases separate, a layer of bromine gas above air.
 D There is insufficient information, as it depends on the proportion of each gas in the vessel at the beginning.

- 7 A student investigated the diffusion of two gases, NH_3 and HCl .

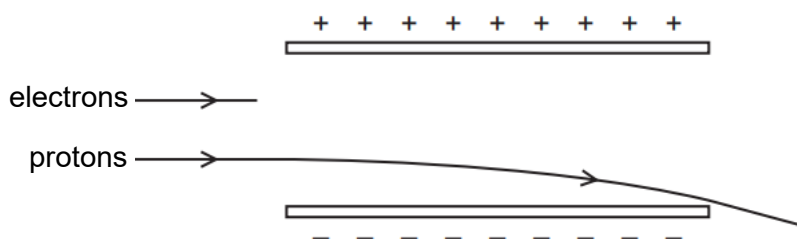
Two sets of apparatus were set up as shown at room temperature and pressure.



The damp red litmus paper in apparatus 1 changed colour after 30 seconds.

How long did it take for the damp blue litmus paper to change colour in apparatus 2?

- A 21 seconds
 - B 30 seconds
 - C 64 seconds
 - D The damp blue litmus paper would not change colour.
- 8 The diagram shows the path followed by protons as they pass between two charged plates.



What happens to electrons passing between the same two charged plates?

- A They are deflected downwards by the same extent as the protons.
- B They are deflected downwards to a smaller extent than the protons.
- C They are deflected upwards.
- D They are not deflected at all.

9 What is the chemical formula of ammonium manganate(VII)?

- A** NH_4MnO_4 **B** $\text{NH}_4(\text{MnO}_4)_2$ **C** $(\text{NH}_4)_2\text{MnO}_4$ **D** $\text{NH}_4(\text{MnO}_4)_3$

10 A covalent molecule Q contains only six shared electrons.

What is Q?

- A** Cl_2
B CO_2
C H_2O
D NH_3

11 The table shows the electronic configuration of the atoms of five elements.

element	electronic configuration
V	1
W	2, 2
X	2, 4
Y	2, 5
Z	2, 8, 1

Which pair of elements can combine to form an ionic compound?

- A** V and Y
B V and Z
C W and Z
D X and Y

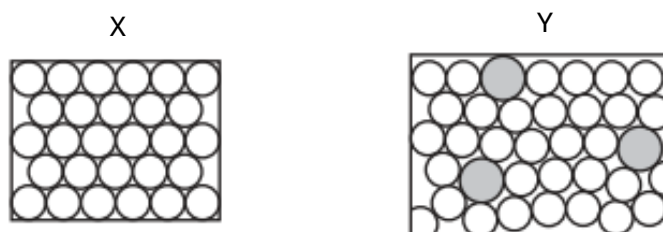
12 Which row correctly describes the properties of an ionic compound?

	melting point / °C	electrical conductivity at room temperature and pressure
A	−38	conducts
B	−7	does not conduct
C	801	does not conduct
D	1540	conducts

- 13 Which particles are responsible for the conduction of electricity through iron, graphite and aqueous sodium chloride?

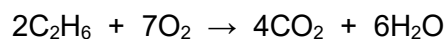
	iron	graphite	aqueous sodium chloride
A	electrons	electrons	ions
B	electrons	ions	electrons
C	electrons	ions	ions
D	ions	electrons	electrons

- 14 The diagrams show the structures of two substances used to make electrical conductors.



Which statement correctly describes X and Y?

- A** X is a solid and Y is a liquid.
B X is an element and Y is a compound.
C Y is harder and stronger than X.
D Y is more malleable than X.
- 15 What is the mass of aluminium in 204 g of aluminium oxide, Al_2O_3 ?
- A** 26 g **B** 27 g **C** 54 g **D** 108 g
- 16 The equation for the complete combustion of ethane, C_2H_6 , is shown.



Which volume of carbon dioxide, measured at room temperature and pressure, is formed when 0.25 moles of ethane is burnt in excess oxygen?

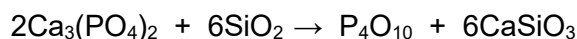
- A** 6 dm³ **B** 12 dm³ **C** 24 dm³ **D** 48 dm³

- 17 An aqueous solution of ethanoic acid, CH_3COOH , has a concentration of 2 mol/dm^3 .

Which statement about this solution is correct?

- A 20 g of ethanoic acid is dissolved in 10 cm^3 of water.
- B 30 g of ethanoic acid is dissolved in 250 cm^3 of water.
- C 60 g of ethanoic acid is dissolved in 1 dm^3 of water.
- D 120 g of ethanoic acid is dissolved in 2 dm^3 of water.

- 18 In an experiment, 310 g of $\text{Ca}_3(\text{PO}_4)_2$ is reacted with 120 g of SiO_2 according to the equation below.

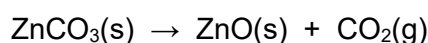


What is the number of moles of P_4O_{10} formed?

[M_r : $\text{Ca}_3(\text{PO}_4)_2$, 310 ; SiO_2 , 60]

- A 0.333 mol B 0.500 mol C 0.667 mol D 1.00 mol

- 19 Zinc oxide is produced by heating zinc carbonate according to the equation below.



What is the percentage yield of zinc oxide if 125 g of zinc carbonate, on heating, produces 65 g of zinc oxide?

[M_r : ZnCO_3 , 125; ZnO , 81]

- A 48.0% B 52.0% C 64.8% D 80.2%

- 20 Which has a mass equal to that of 3.01×10^{23} carbon atoms?

- A a piece of pure graphite containing 1.5 mol of carbon atoms
- B 0.500 mol of C_{60} molecules
- C 6.00 g of impure diamond chips
- D 12.0 dm^3 of carbon dioxide measured at room temperature and pressure

21 Which statements about strong and weak acids are always correct?

- 1 Strong acids ionise to a greater extent in water than weak acids.
- 2 Strong acids are more concentrated than weak acids.
- 3 Strong acids have a lower pH than weak acids.

A 1 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

22 Which ionic equation represents the reaction of aqueous sodium hydroxide with dilute nitric acid?

- A** $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$
- B** $\text{Na}^+ + \text{NO}_3^- \rightarrow \text{NaNO}_3$
- C** $\text{Na}^+ + \text{HNO}_3 \rightarrow \text{NaNO}_3 + \text{H}^+$
- D** $\text{NaOH} + \text{H}^+ \rightarrow \text{Na}^+ + \text{H}_2\text{O}$

23 Both magnesium carbonate and magnesium oxide react with dilute sulfuric acid.

In what way are both reactions the same?

- A** A gas is produced.
- B** An acid is neutralised by a soluble base.
- C** Sulfuric acid is acting as an oxidising agent.
- D** Water is a product.

24 In an accident at a factory, some dilute acid was spilt.

Which substance, when added in excess, removes the acid without leaving an alkaline solution?

- A** aqueous ammonia
- B** aqueous sodium hydroxide
- C** solid ammonium nitrate
- D** solid calcium carbonate

- 25** A 100 cm³ solution of hydrochloric acid has the same concentration as a 100 cm³ solution of ethanoic acid.

Which statement about the two solutions is **incorrect**?

- A** Both hydrochloric acid and ethanoic acid are monobasic.
- B** The same amount of H⁺ ions is available for reaction with excess magnesium oxide in both acids.
- C** When excess magnesium carbonate is added to both acids, the reaction with hydrochloric acid will produce a greater volume of gas.
- D** When excess magnesium is added to both acids, effervescence is more vigorous with the hydrochloric acid.
- 26** The table shows the solubility of some salts of metal Y in water.

salt	solubility in water
carbonate	insoluble
iodide	soluble
sulfate	soluble

What is metal Y?

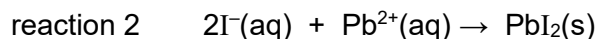
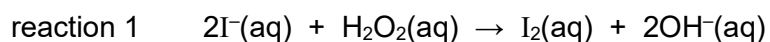
- A** calcium
- B** iron
- C** potassium
- D** silver
- 27** An excess of aqueous sodium hydroxide is added to an aqueous solution of salt X and boiled.

Ammonia gas is only given off after aluminium foil is added to the hot solution.

What could X be?

- A** ammonium chloride
- B** ammonium iodide
- C** sodium chloride
- D** sodium nitrate

28 The equations for two reactions of iodide ions are shown.



Which statement is correct?

- A** Both reactions are redox reactions.
- B** Neither reaction is a redox reaction.
- C** Only reaction 1 is a redox reaction.
- D** Only reaction 2 is a redox reaction.

29 Which change involves reduction?

- A** $\text{C}_2\text{H}_6 \rightarrow \text{C}_2\text{H}_4$
- B** $\text{CO}_3^{2-} \rightarrow \text{CO}_2$
- C** $\text{N}_2 \rightarrow \text{NH}_3$
- D** $\text{OH}^{-} \rightarrow \text{H}_2\text{O}$

30 Which statement about aqueous potassium iodide is correct?

- A** It changes from brown to colourless in a redox reaction.
- B** It changes from purple to colourless in a redox reaction.
- C** It is used to test for an oxidising agent.
- D** It is used to test for a reducing agent.

– End of Section A –

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