Name:			Index Number:		Class:	

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

C

CHEMISTRY

2 October 2024
2 hours 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Section C
Answer **one** question.
Write your answers in the spaces provided.

For examiner's use only:

Total	/ 10
working / units / significant figures	☐ –1 if checked

The number of marks is given in brackets [ ] at the end of each question or part question.
A copy of the Periodic Table is printed on page 8.

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

A maximum of 1 mark will be deducted from your total mark for failure to show your working in calculations and misuse of units and/or significant figures, i.e. failure to quote units where necessary, the inclusion of units in quantities defined as ratios or quoting answers to an inappropriate number of significant figures.

Section C

Answer **one** question from this section.

10 This question is about distillation.

(a) Desalination is the process of converting sea water into drinking water. Older processes used a distillation method to desalinate the water, as shown in Fig. 10.1.

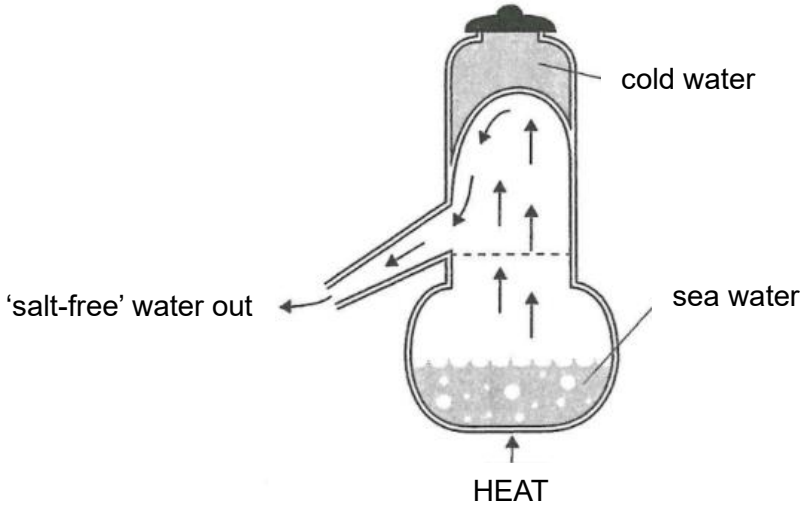

Fig. 10.1

The removal of salt is only one stage of the process of producing drinking water from sea water. Other stages are:

stage 1 removing solid particles of suspended substances such as fine sand
stage 2 adding chlorine to kill bacteria that may enter the water during its distribution

Explain how distillation produces 'salt-free' water, and suggest whether each of the stages mentioned above, stage 1 and stage 2, should happen before or after the distillation.

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…… [4]

(b) Table 10.1 shows the boiling points of four different alcohols, **A**, **B**, **C** and **D**.

Table 10.1

alcohol	**A**	**B**	**C**	**D**
boiling point / °C	56	78	122	160

A student suggested that the set-up shown in Fig. 10.2 could be used to separate the mixture of alcohols.

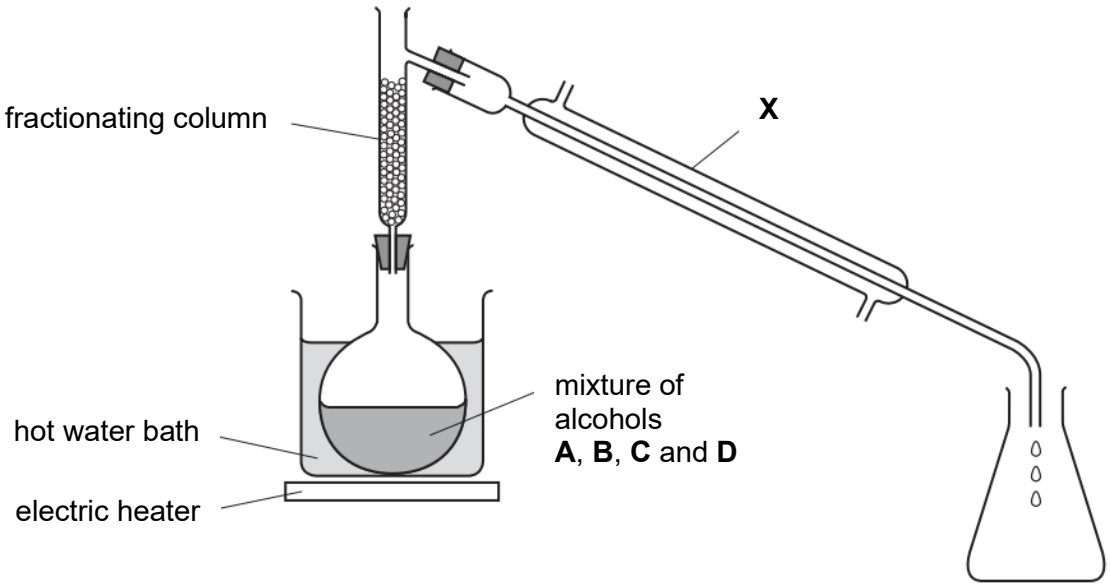

Fig. 10.2

(i) Name apparatus **X**.

…… [1]

(ii) Apparatus **X** needs to have cold water flowing through it.

Draw an arrow on Fig. 10.2 to show where the cold water enters apparatus **X**. [1]

(iii) A piece of apparatus is missing from the set-up in Fig. 10.2. This means that the separation will not work.

Draw on Fig. 10.2 the piece of apparatus which is missing.

Explain why the separation will **not** work without this piece of apparatus.

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…….…… [2]

(iv) A hot water bath **cannot** be used to separate alcohols **C** and **D**.

Explain why.

……..……..

……..……..

…….. [2]

[Total: 10]

11 This question is about experiments involving the collection of gases.

(a) Fig. 11.1 shows the apparatus a student used to prepare a dry sample of chlorine gas.

Chlorine is dense than air.

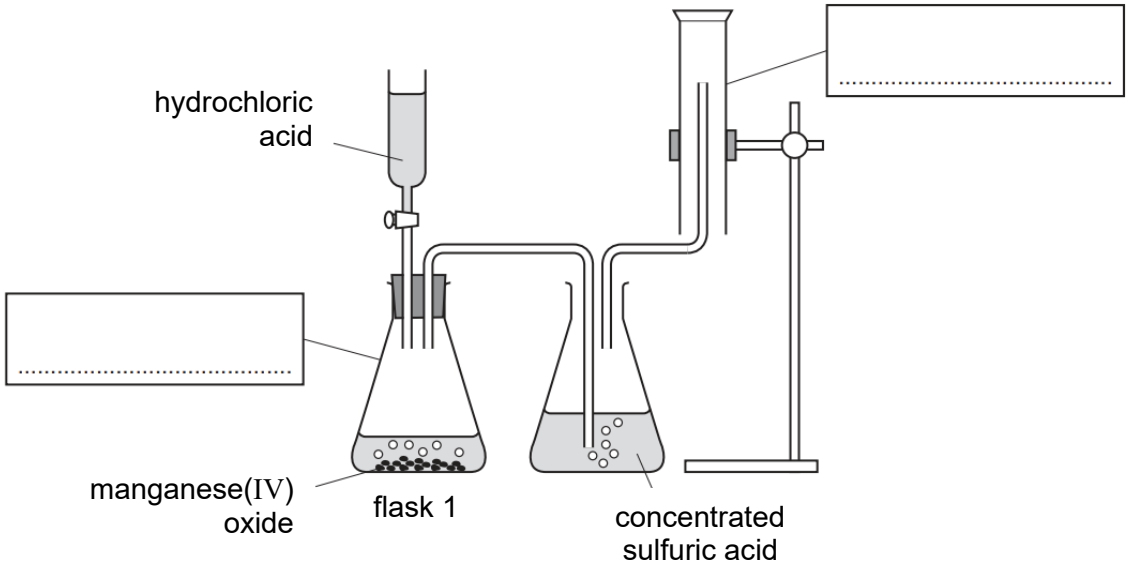

Fig. 11.1

(i) Fill in the boxes in Fig. 11.1 by naming the apparatus. [1]

(ii) Use Fig. 11.1 to identify **two** mistakes the student made.

1 ……

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2 ……

……

[1]

(iii) Explain why the gas produced in flask 1 is passed through concentrated sulfuric acid.

…… [1]

(iv) Is the reaction between hydrochloric acid and manganese(IV) oxide neutralisation?

Explain your answer.

……

…… [1]

(b) In another experiment, dilute hydrochloric acid was added to magnesium metal to produce a gas.

(i) Complete the diagram in Fig. 11.2 to show how the gas produced could be collected and the volume measured. A gas syringe is **not** provided.

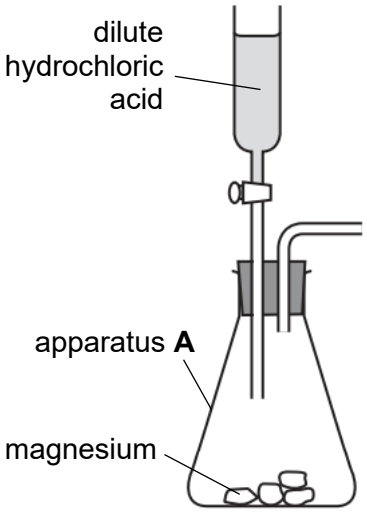

Fig. 11.2

[2]

(ii) At the end of the experiment, there were unreacted magnesium metal and aqueous magnesium chloride solution left in apparatus **A**.

Describe an experimental procedure to find the mass of unreacted magnesium metal **and** the mass of dissolved magnesium chloride in the solution in apparatus **A**.

You may assume that magnesium chloride is stable to heat.

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…… [4]

[Total: 10]

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The Periodic Table of Elements

Group																	
1	2											13	14	15	16	17	18
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9		**Key** proton (atomic) number atomic symbol name relative atomic mass									5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24	3	4	5	6	7	8	9	10	11	12	13 A*l* aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 C*l* chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 T*l* thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –	113 Nh nihonium –	114 F*l* flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).
The Avogadro constant, $L = 6.02 \times 10^{23}$ mol^{-1}.