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SECONDARY FOUR EXPRESS / FIVE NORMAL (ACADEMIC)
GENERAL CERTIFICATE OF EDUCATION (ORDINARY LEVEL)
MOCK PAPER

SCIENCE (PHYSICS/CHEMISTRY) 5086/01

SCIENCE (CHEMISTRY/BIOLOGY) 5088/01

Paper 1 Multiple Choice

1 hour

ADDITIONAL MATERIALS: Optical Answer Sheet (x1)

INSTRUCTIONS TO CANDIDATES

Write your **NAME**, **CENTRE NUMBER** and **INDEX NUMBER** at the top of this page and on the OAS paper. **Shade your index number on the OAS paper.**

There are **20** questions on this paper. 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 OAS paper.

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

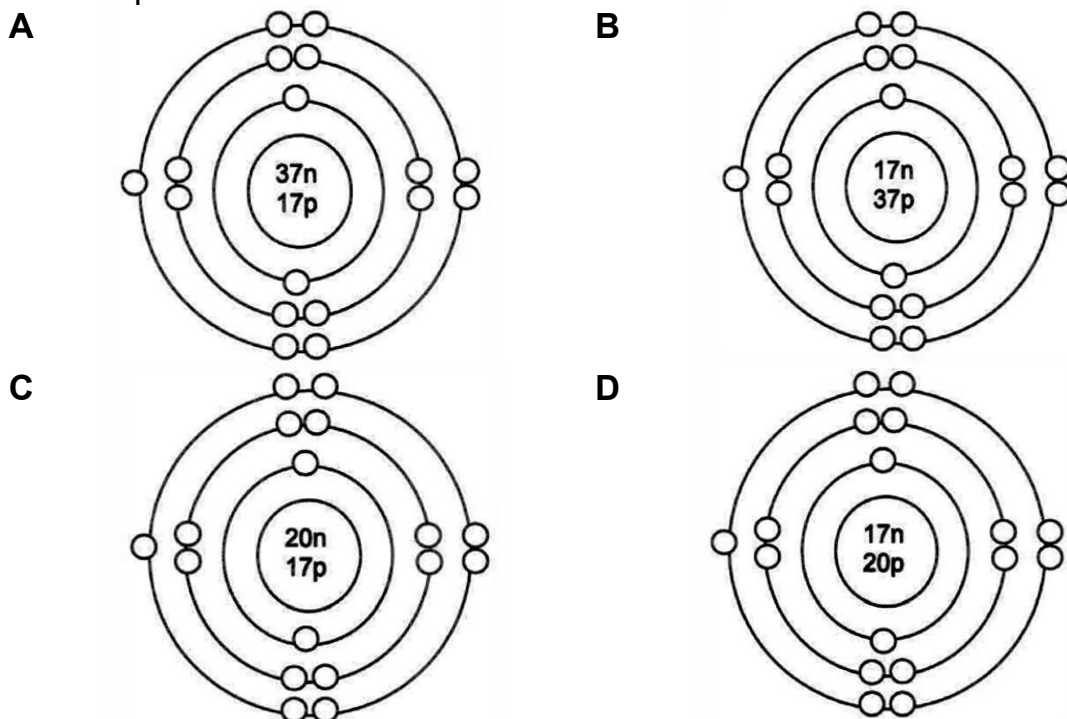
Any rough working should be done in this booklet.

A copy of the Data Sheet is printed on page 9.

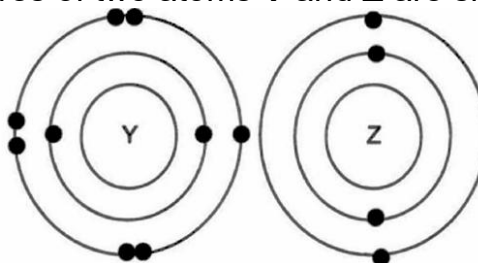
A copy of the Periodic Table is printed on page 10.

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

- 1 An atom of chlorine is represented by $^{37}_{17}\text{Cl}$. Which option shows the structure of this atom?



- 2 The electronic structures of two atoms **Y** and **Z** are shown.



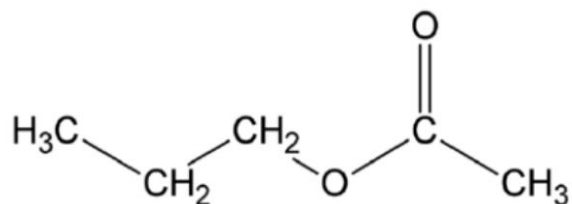
Y and Z can combine together to form a bond.
Which row describes the bonding and formula of the compound?

	type of bonding	formula
A	covalent	YZ
B	ionic	ZY
C	covalent	Y_2Z_7
D	ionic	ZY_2

- 3 Which ions are present in solid calcium phosphate, $\text{Ca}_3(\text{PO}_4)_2$?

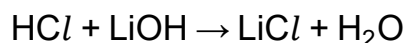
- A** Ca^{3+} and PO_4^{2-}
B Ca^{2+} and PO_4^{3-}
C Ca^{3-} and PO_4^{2+}
D Ca^{2-} and PO_4^{3+}

- 4 The diagram below shows an organic molecule, propyl ethanoate.



How many pairs of electrons are used in bonding in the molecule?

- A** 1
B 2
C 14
D 17
- 5 Two statements about the structure and properties of metals are given.
- Statement 1: Metals are malleable and most have high melting points.
Statement 2: Metals are good conductors of electricity.
- Which of the following correctly describes statements 1 and 2?
- A** Both statements are correct, and Statement 2 explains Statement 1.
B Both statements are correct, but Statement 2 does not explain Statement 1.
C Statement 2 is correct but statement 1 is incorrect.
D Statement 1 is correct but statement 2 is incorrect.
- 6 Hydrochloric acid reacts with lithium hydroxide as shown below.



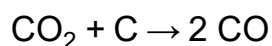
What is the volume of hydrochloric acid of concentration 2.0 mol/dm^3 needed to fully react with 25.0 cm^3 of lithium hydroxide of concentration 1.0 mol/dm^3 ?

- A** 12.5 cm^3
B 25.0 cm^3
C 50.0 cm^3
D 100.0 cm^3

- 10 Which element in the table is an alkali metal?

	Melting point / °C	density / g/cm ³
A	-39	13.60
B	-7	3.10
C	98	0.97
D	1093	8.92

- 11 Carbon dioxide reacts with carbon to form carbon monoxide.



Which row describes what happens to the carbon dioxide and to the carbon during the reaction?

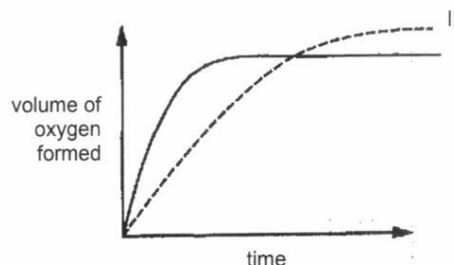
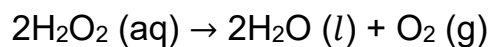
	CO ₂	C
A	oxidised	oxidised
B	oxidised	reduced
C	reduced	oxidised
D	reduced	reduced

- 12 Excess magnesium ribbon is reacted with 10 cm³ of dilute hydrochloric acid. The hydrogen gas produced is collected and measured.

Which change to the reaction conditions would increase the rate of reaction **and** the volume of the hydrogen produced?

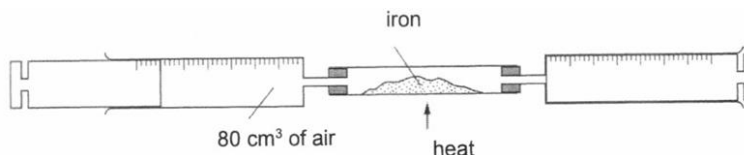
- A** Use a lower temperature.
- B** Use a transition metal catalyst.
- C** Use concentrated hydrochloric acid.
- D** Use powdered magnesium.

- 13** Curve I is obtained by observing the decomposition of 100 cm³ of 1 mol/dm³ aqueous hydrogen peroxide, catalysed by manganese (IV) oxide.



Which alteration to the conditions will produce curve II?

- A** adding some 0.1 mol/dm³ aqueous hydrogen peroxide
 - B** lowering the temperature
 - C** using a better catalyst
 - D** using less manganese (IV) oxide
- 14** 80.0 cm³ of a sample of air is trapped in a syringe. The air is slowly passed over heated iron in a tube until there is no further decrease in volume.



When cooled to the original temperature, what volume of gas remains?

- A** 16.8 cm³
 - B** 40.0 cm³
 - C** 60.0 cm³
 - D** 63.2 cm³
- 15** Methane reacts with an excess of chlorine in the presence of ultraviolet light to form a mixture of products.

How many of these products contain one carbon atom and one or more chlorine atoms?

- A** 1
- B** 2
- C** 3
- D** 4

- 16** Which statement about alkanes is **incorrect**?
- A** A molecule of propane contains 2 carbon atoms.
 - B** The general formula is C_nH_{2n+2} .
 - C** They react with chlorine in a substitution reaction under ultraviolet light.
 - D** The possible products of incomplete combustion are water, soot and carbon monoxide.
- 17** Bitumen contains an organic compound with the molecular formula of $C_{20}H_{42}$. It undergoes a process called catalytic cracking, to form hydrocarbons with shorter carbon chains which are higher in demand. The chemical equation is given as shown:
- $$C_{20}H_{42} \rightarrow 2C_6H_{12} + \text{compound K} + H_2$$
- What is the identity of compound K?
- A** C_4H_8
 - B** C_4H_{10}
 - C** C_8H_{16}
 - D** C_8H_{18}
- 18** The fermentation of sugar from corn produces bioethanol as an alternative to fossil fuel.
- Burning bioethanol is considered more environmentally sustainable.
- Which statement explains why burning bioethanol is considered more environmentally sustainable?
- A** Burning bioethanol releases no greenhouse gases.
 - B** Corn growth absorbs the carbon dioxide released when burning bioethanol.
 - C** Production of bioethanol uses less land and water resources.
 - D** The treatment of waste after extraction of sugar from corn is safe for the environment.
- 19** Which of the following shows the effect of climate change correctly?

	climate change phenomenon	effects of climate change
A	ocean warming	coral reefs are bleached
B	desertification	high temperatures cause death of elderly and frail
C	heat waves	sea levels increase
D	glacial retreat	food production decreases

20 Which statements about the pollutant (sulfur dioxide) are correct?

1. It is colourless and odourless.
2. It is formed during volcanic eruptions.
3. It reacts with haemoglobin in the blood.
4. It causes acid rain formation.

A 1 and 3

B 1 and 4

C 2 and 3

D 2 and 4

Colours of Some Common Metal Hydroxides

aluminium hydroxide	white
calcium hydroxide	white
copper(II) hydroxide	light blue
iron(II) hydroxide	green
iron(III) hydroxide	red-brown
zinc hydroxide	white

Group																	
1	2	13										17	18				
		1 H hydrogen 1															
		Key proton (atomic) number atomic symbol name relative atomic mass															
3 Li lithium 7	4 Be beryllium 9																
11 Na sodium 23	12 Mg magnesium 24	3	4	5	6	7	8	9	10	11	12	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											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl 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	lanthanoids		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 Tl 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 —	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 —	114 Fl flerovium —	115 Mc moscovium —	116 Lv livermorium —	117 Ts tennessine —	118 Og oganesson —

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

The Avogadro constant, $L = 6.02 \times 10^{23} \text{ mol}^{-1}$

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