Cambridge Assessment International Education

Cambridge O Level

CHEMISTRY **5070/11**

Paper 1 Multiple Choice **October/November 2024**

1 hour

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- There are **forty** 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Any blank pages are indicated.

1 Which row shows both a property of a gas and the correct explanation for this property?

	property	explanation for the property
A	Gases flow easily.	The bonds within the molecules are weak.
B	The pressure of a sample of gas increases when the volume is decreased.	The particles collide more frequently with the walls of the container.
C	The volume of a sample of gas increases when the temperature is increased.	The particles in a gas are far apart.
D	The spread of perfume particles is due to diffusion.	Diffusion is the movement of particles from an area of low concentration to one of high concentration.

2 When measured under the same conditions of temperature and pressure, which gas diffuses at the same rate as nitrogen?

A ammonia, NH_3

B carbon monoxide, CO

C ethane, C_2H_6

D oxygen, O_2

3 X and Y are both elements, one of which is a non-metal.

1 mole of X is added to 1 mole of Y and they are heated together.

X and Y react completely to form substance Z.

Substance Z cannot be easily separated to form X and Y.

Three statements are given.

1 Y must be the non-metal.

2 X and Y formed a compound on heating.

3 Substance Z has the empirical formula XY.

Which statements are correct?

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

4 An ion has an electronic configuration of 2,8,8.

It has a 2– charge and a nucleon number of 36.

How many neutrons are present in the nucleus of this ion?

A 16 **B** 18 **C** 19 **D** 20

5 The formulae for two ions are given.

$^{72}_{34}X^{2-}$ $^{74}_{34}X^{2-}$

Which statement is correct?

A The chemical properties of both ions are the same.

B The number of electrons in each ion is different.

C The number of neutrons in each ion is the same.

D The number of protons in each ion is different.

6 Which pair of molecules have the same number of electrons in covalent bonds?

A CH_3OH and C_2H_4

B CO_2 and H_2O

C NH_3 and N_2

D O_2 and Cl_2

7 Chrome alum is a salt that contains two different cations and one anion.

The ions present in chrome alum are K^+, Cr^{3+} and SO_4^{2-}.

What is the formula of the salt?

A $KCrSO_4$ **B** $KCr(SO_4)_2$ **C** $KCr(SO_4)_3$ **D** $K_2Cr(SO_4)_3$

8 The table gives some information about barium and chlorine.

	relative atomic mass	group in Periodic Table
barium	137	II
chlorine	35.5	VII

Using this information only, a student makes three statements.

1 There is more than one isotope of chlorine.

2 There may be more than one isotope of barium.

3 The relative formula mass of barium chloride is 208.

Which statements are correct?

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

9 Which mass of carbon contains the same number of atoms as 16.0 g of sulfur?

A 0.5 g **B** 6.0 g **C** 8.0 g **D** 12.0 g

10 Compound X contains carbon, hydrogen and oxygen only.

It has an M_r of 90.

100 g of compound X contains 40.0 g of carbon and 6.7 g of hydrogen.

How many oxygen atoms are there in each molecule of compound X?

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

11 Aqueous copper(II) sulfate is electrolysed using copper electrodes.

Which row describes the changes that take place during the electrolysis?

	mass of anode	mass of cathode	colour of solution
A	increases	decreases	becomes paler
B	increases	decreases	stays the same
C	decreases	increases	becomes paler
D	decreases	increases	stays the same

12 Which row describes one advantage and one disadvantage of using a hydrogen-oxygen fuel cell to power a road vehicle?

	advantage	disadvantage
A	The fuel cell obtains the oxygen from the air.	The hydrogen has to be stored in a very strong tank.
B	The fuel cell obtains the oxygen from the air.	The only chemical product causes acid rain.
C	The fuel cell obtains the oxygen from water.	The hydrogen has to be stored in a very strong tank.
D	The fuel cell obtains the oxygen from water.	The only chemical product causes acid rain.

13 Which statement about exothermic and endothermic reactions is correct?

A In an endothermic reaction, energy is used to break bonds but no energy is released when bonds form.

B In an endothermic reaction, energy is released when bonds form but more energy is used to break bonds.

C In an exothermic reaction, energy is released both by breaking and by forming bonds.

D In an exothermic reaction, energy is released when bonds form but no energy is needed to break bonds.

14 Two gases react together to produce a single product. The rate of the reaction is affected by an increase in pressure. The reaction is catalysed by platinum.

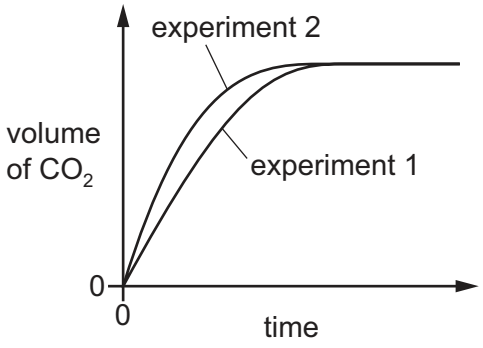
Which row describes one effect on this reaction of increasing pressure and one effect on this reaction of adding platinum?

	one effect of increasing pressure	one effect of adding platinum
A	The rate of the reaction decreases.	The activation energy, E_a, decreases.
B	The rate of the reaction decreases.	The activation energy, E_a, increases.
C	The rate of the reaction increases.	The activation energy, E_a, decreases.
D	The rate of the reaction increases.	The activation energy, E_a, increases.

15 Calcium carbonate reacts with excess dilute hydrochloric acid to form carbon dioxide.

The reaction is investigated in two experiments.

The rate of the reactions is compared by measuring the volume of carbon dioxide formed over time in each experiment. The two rates are compared by plotting graphs.



Which statement about experiments 1 and 2 is correct?

A Experiments 1 and 2 both slow down as the reaction proceeds.

B Experiments 1 and 2 must both use acid of the same concentration.

C Experiments 1 and 2 must have been done at the same temperature.

D Experiment 2 uses larger lumps of calcium carbonate. All other conditions stay the same.

16 If calcium carbonate is heated in a closed container, it will decompose, forming calcium oxide and carbon dioxide. Calcium oxide and carbon dioxide can recombine to form calcium carbonate.

After some time, a position is reached where calcium carbonate is decomposing, and calcium oxide and carbon dioxide are recombining at the same rate.

What is this position called?

A activation energy

B backward reaction

C equilibrium

D neutralisation

17 Which set of conditions is used in the Contact process?

	temperature / °C	pressure / atm	catalyst
A	100	200	V_2O_5
B	300	200	Fe
C	450	2	Fe
D	450	2	V_2O_5

18 Copper forms a red oxide, Cu_2O, and a black oxide, CuO.

In the presence of a catalyst, aqueous hydrogen peroxide, H_2O_2, decomposes to form water.

The black oxide has copper in a .....1..... oxidation state than in the red oxide.

In forming water, hydrogen peroxide is .....2..... .

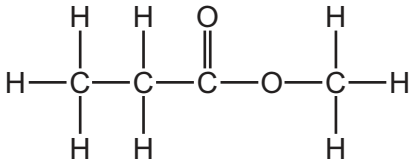
Which words correctly complete gaps 1 and 2?

	1	2
A	higher	reduced
B	higher	oxidised
C	lower	reduced
D	lower	oxidised

19 An organic compound, X, has a molecular formula $C_4H_8O_2$ and turns damp blue litmus paper red.

What is the displayed formula of X?

A



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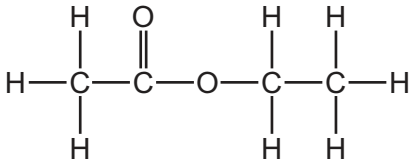

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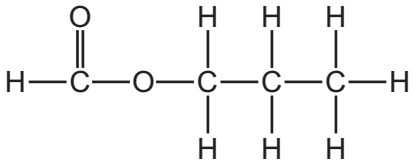

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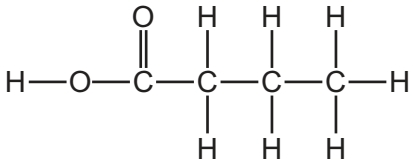


20 Which statement about oxides is correct?

A All acidic oxides are gases at room temperature.

B All basic oxides dissolve in water to give alkalis.

C Amphoteric oxides react with acids, alkalis and water.

D Potassium oxide is a basic oxide.

21 A student is provided with suitable apparatus, distilled water and the following reagents.

solid magnesium hydroxide solid lead carbonate

dilute nitric acid aqueous sodium chloride aqueous sodium sulfate

Which salts can the student prepare as a pure dry sample?

A lead nitrate, magnesium nitrate, lead chloride, lead sulfate and magnesium sulfate

B lead nitrate, magnesium nitrate, lead chloride and lead sulfate only

C lead nitrate, magnesium nitrate and lead chloride only

D lead nitrate and magnesium nitrate only

22 When heated, copper(II) sulfate crystals, $CuSO_4 \cdot 5H_2O$, react as shown.

$$CuSO_4 \cdot 5H_2O(s) \rightarrow CuSO_4(s) + 5H_2O(g)$$

When .....1..... copper(II) sulfate, which is .....2..... in appearance, is heated, it forms .....3..... copper(II) sulfate, which is .....4..... in appearance.

Which words correctly complete gaps 1, 2, 3 and 4?

	1	2	3	4
A	anhydrous	blue and crystalline	hydrated	white and powdery
B	hydrated	colourless and crystalline	anhydrous	blue and powdery
C	hydrated	blue and powdery	anhydrous	colourless and crystalline
D	hydrated	blue and crystalline	anhydrous	white and powdery

23 Which formula represents the oxide of element Z in Group II of the Periodic Table?

A ZO **B** Z_2O_2 **C** ZO_3 **D** Z_2O

24 Element X is in Group I.

Some statements about element X are given.

- X is **not** the least dense element in Group I.
- X is more reactive than potassium.
- X has an A_r value less than 100.

Which element is X?

A lithium

B sodium

C rubidium

D caesium

25 A student makes three statements about metals and non-metals.

1 All alloys contain at least one metal.

2 All metals are good thermal and electrical conductors.

3 All solid non-metals are malleable.

Which statements are correct?

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

26 Group I elements and transition elements are metals.

Student X suggests that the Group I elements are above hydrogen in the reactivity series but that not all transition elements are above hydrogen.

Student Y suggests that the densities of Group I elements are lower than those of the transition elements.

Which students are correct?

A both X and Y

B X only

C Y only

D neither X nor Y

27 The equations for three reactions are given.

1 $2O^{2-} \rightarrow O_2 + 4e^-$

2 $C + O_2 \rightarrow CO_2$

3 $CaO + SiO_2 \rightarrow CaSiO_3$

These reactions take place in the extraction of metals.

Which row is correct?

	reaction in extraction of aluminium only	reaction in extraction of iron only	reaction in extraction of aluminium and iron
A	1	2	3
B	1	3	2
C	2	1	3
D	2	3	1

28 The domestic water supply is treated to make it safe to drink.

Which row identifies the treatment and its effect?

	chlorination	filtration	sedimentation
A	removes nitrates	removes solids	removes nitrates
B	kills microbes	removes soluble compounds	removes solids
C	removes solids	kills microbes	removes soluble compounds
D	kills microbes	removes solids	removes solids

[Turn over

29 Sodium phosphate, Na_3PO_4, and ammonium nitrate, NH_4NO_3, are both used as fertilisers.

Which row shows the correct percentage by mass of the element in each compound that improves plant growth?

	% of the element in Na_3PO_4 that improves plant growth	% of the element in NH_4NO_3 that improves plant growth
A	19	18
B	19	35
C	42	18
D	42	35

30 Three processes are shown.

1 the decomposition of vegetation

2 emissions from a car engine

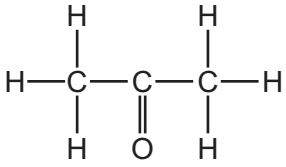
3 photosynthesis

Which row shows a gas produced in each process?

	process 1	process 2	process 3
A	carbon monoxide	hydrogen	oxygen
B	carbon monoxide	nitrogen monoxide	carbon dioxide
C	methane	nitrogen monoxide	oxygen
D	methane	hydrogen	carbon dioxide

31 Which compound is **not** an alkane, alkene, alcohol or carboxylic acid?

A



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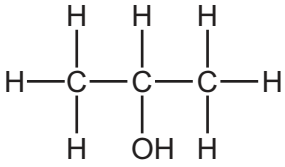

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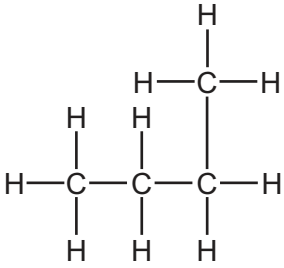

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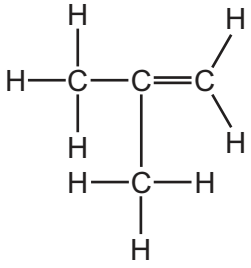


32 Alkenes can be produced by the cracking of alkanes, such as decane, $C_{10}H_{22}$.

Which equation shows the cracking of decane to produce two different alkenes and at least one other product?

A $C_{10}H_{22} \rightarrow 2C_2H_4 + C_3H_6 + C_4H_{10}$

B $C_{10}H_{22} \rightarrow H_2 + 2C_2H_4 + C_3H_6 + C_5H_{10}$

C $C_{10}H_{22} \rightarrow 2C_3H_6 + C_4H_{10}$

D $C_{10}H_{22} \rightarrow H_2 + 2C_2H_4 + 2C_3H_6$

33 Alkenes undergo addition reactions with bromine to form dibromoalkanes.

Which statement is correct?

A Ethene and bromine react to produce 1,1-dibromoethane.

B Propene and bromine react to produce 1,3-dibromopropane.

C But-2-ene and bromine react to produce 2,2-dibromobutane.

D But-1-ene and bromine react to produce 1,2-dibromobutane.

34 How many moles of oxygen are required for the complete combustion of 2 moles of ethanol?

A 3 **B** 4 **C** 6 **D** 7

35 Two reactions are shown.

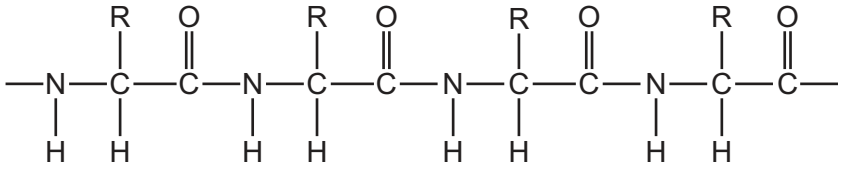
reaction 1 $CH_2CH{=}CH_2OH + H_2 \xrightarrow{Ni}$ compound X

reaction 2 compound X $\xrightarrow[KMnO_4(aq)]{\text{acidified}}$ compound Y

Which row is correct?

	name of compound X	type of compound Y
A	propan-1-ol	carboxylic acid
B	propan-1-ol	ester
C	butan-1-ol	carboxylic acid
D	butan-1-ol	ester

36 A section of the structure of a protein is shown.



How many amino acid monomer molecules have been used to make this section of the structure?

A 2 **B** 3 **C** 4 **D** 5

37 Which piece of apparatus is used to measure exactly 27.3 cm^3 of a liquid?

A a burette

B a condenser

C a measuring cylinder

D a volumetric pipette

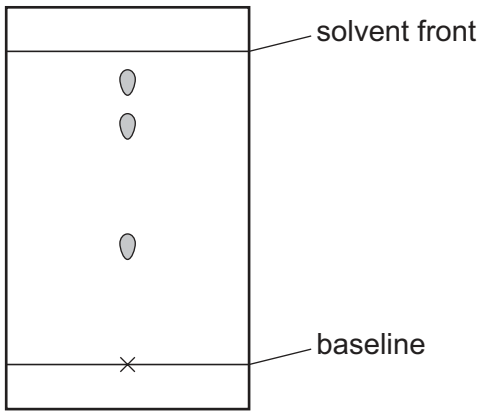
38 A student titrates aqueous sodium hydroxide with 0.1 mol/dm^3 hydrochloric acid. The titration results are used to calculate the concentration of the aqueous sodium hydroxide.

Which row is correct?

	apparatus to measure the volume of dilute hydrochloric acid	apparatus to measure the volume of aqueous sodium hydroxide
A	burette	measuring cylinder
B	burette	volumetric pipette
C	measuring cylinder	burette
D	volumetric pipette	volumetric pipette

39 A mixture of four coloured dyes is analysed by chromatography.

The result is shown.



Which change allows the four coloured dyes to be seen separately?

A Measure the R_f values of the spots carefully.

B Run the chromatogram for a longer time.

C Run the chromatogram using a different solvent.

D Use a locating agent.

40 An aqueous solution contains cations of metal X.

A precipitate forms when a few drops of aqueous sodium hydroxide are added to the solution.

The precipitate dissolves in excess aqueous sodium hydroxide.

What is a possible identity of metal X?

	aluminium	ammonium	zinc
A	✓	✗	✓
B	✓	✓	✗
C	✗	✗	✓
D	✗	✓	✗

key

✓ = yes

✗ = no

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The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											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	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 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 –	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 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

Key

atomic number
atomic symbol
name
relative atomic mass

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.).