



# Cambridge IGCSE™ (9–1)

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## CHEMISTRY

0971/11

Paper 1 Multiple Choice (Core)

May/June 2025

45 minutes

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)

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### 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.

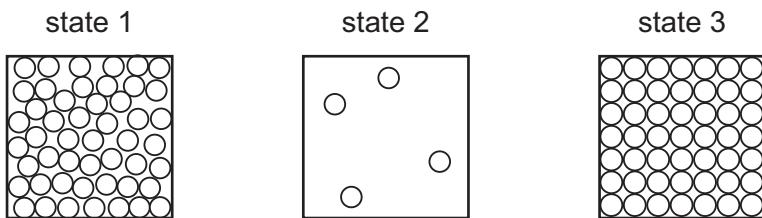
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This document has **16** pages. Any blank pages are indicated.

1 Which process happens when water vapour changes to rain?

A boiling  
B condensing  
C evaporating  
D freezing

2 The diagrams show the arrangement of particles in three different states of matter.



Which row describes the change in energy of the particles and in particle motion for the given change in state?

	change in state	energy of particles	particle motion
<b>A</b>	$1 \rightarrow 2$	decreases	decreases
<b>B</b>	$2 \rightarrow 1$	decreases	increases
<b>C</b>	$3 \rightarrow 1$	increases	increases
<b>D</b>	$1 \rightarrow 3$	increases	decreases

3 An atom of element Q contains 19 electrons, 19 protons and 20 neutrons.

What is Q?

A calcium  
B potassium  
C strontium  
D yttrium

4 Which part of an atom has a relative mass of 1 and a relative charge of 0?

A electron  
B neutron  
C nucleus  
D proton

5 Which row identifies the number of electrons, neutrons and protons in a particle which is an isotope of  $^{11}_5\text{B}$ ?

	electrons	neutrons	protons
<b>A</b>	5	5	5
<b>B</b>	5	6	5
<b>C</b>	6	5	6
<b>D</b>	6	6	6

6 Which statements about potassium iodide are correct?

- 1 It is formed from potassium anions and iodide cations.
- 2 It is a good electrical conductor when molten or in aqueous solution.
- 3 Potassium atoms share electrons with iodine atoms.

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

7 Which substances contain one or more shared pairs of electrons?

- 1 argon
- 2 methane
- 3 iron(III) oxide
- 4 chlorine

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

8 Which substance has a giant covalent structure at room temperature and pressure?

**A** ammonia  
**B** carbon dioxide  
**C** diamond  
**D** water

9 Which row shows the correct formula for the named substance?

	substance	formula
<b>A</b>	cobalt(II) chloride	$\text{Cu}_2\text{Cl}$
<b>B</b>	sodium carbonate	$\text{Na}_2\text{CO}_3$
<b>C</b>	xenon	$\text{Xe}_2$
<b>D</b>	ammonium sulfate	$\text{NH}_4\text{SO}_4$

10 The equation shows the thermal decomposition of magnesium carbonate.



[ $M_r$ :  $\text{MgCO}_3$ , 84]

Which mass of magnesium oxide is formed when 21.0 g of magnesium carbonate is completely decomposed?

**A** 1.9 g      **B** 4.0 g      **C** 10.0 g      **D** 40.0 g

11 Concentrated aqueous sodium chloride is electrolysed using inert electrodes.

What is the main product formed at the positive electrode (anode)?

**A** chlorine  
**B** hydrogen  
**C** oxygen  
**D** sodium

12 A hydrogen–oxygen fuel cell uses  $630 \text{ dm}^3$  of oxygen.

The oxygen for the reaction is extracted from clean, dry air.

What is the minimum volume of clean, dry air needed to provide this volume of oxygen?

**A**  $788 \text{ dm}^3$       **B**  $808 \text{ dm}^3$       **C**  $3000 \text{ dm}^3$       **D**  $3316 \text{ dm}^3$

13 Three statements about energy changes in chemical reactions are listed.

- 1 In an endothermic reaction, the temperature of the surroundings increases.
- 2 In an exothermic reaction, thermal energy is taken in from the surroundings.
- 3 In the reaction pathway diagram for an exothermic reaction, the energy level of the products is lower than the energy level of the reactants.

Which statements are correct?

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

14 When a small piece of a Group I metal is placed into a large beaker of cold water, a reaction occurs.

Four statements about this reaction are listed.

- 1 The metal melts.
- 2 Hydrogen is produced.
- 3 Steam is produced.
- 4 The pH of the solution increases.

Which statements about this reaction describe a physical change?

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

15 The equation for the decomposition of hydrogen peroxide is shown.



The reaction is exothermic.

When a small amount of a catalyst is added, the oxygen is produced more quickly.

Which statement about the catalyst is correct?

**A** The catalyst makes the reaction more exothermic.  
**B** The mass of catalyst is the same before and after the reaction.  
**C** The catalyst increases the final volume of oxygen produced.  
**D** All of the catalyst is used up in the reaction.

16 The equation for the reaction between copper(II) oxide and carbon is shown.



Which statement about this reaction is correct?

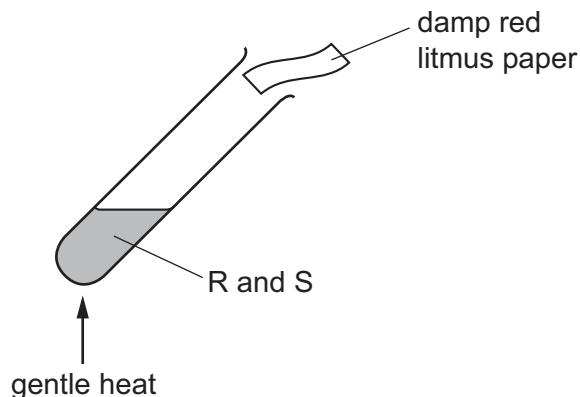
- A CuO is reduced.
- B  $\text{CO}_2$  is oxidised.
- C Cu is oxidised.
- D C is reduced.

17 Which row gives the colours observed when thymolphthalein and methyl orange are added separately to the named solution?

	solution	colour with thymolphthalein	colour with methyl orange
A	dilute $\text{HCl}$	colourless	yellow
B	dilute $\text{HCl}$	blue	red
C	aqueous $\text{NaOH}$	colourless	red
D	aqueous $\text{NaOH}$	blue	yellow

18 A mixture of two substances, R and S, is heated gently.

The damp red litmus paper turns blue.



What are R and S?

	R	S
A	a basic oxide	ammonium chloride
B	a basic oxide	sodium nitrate
C	an acidic oxide	ammonium chloride
D	an acidic oxide	sodium nitrate

19 Which reactants are used to make the salt copper(II) sulfate?

- A dilute acid + alkali
- B dilute acid + metal carbonate
- C dilute acid + metal
- D dilute acid + non-metal oxide

20 Which statement about the Periodic Table is correct?

- A The elements are arranged in order of increasing relative atomic mass.
- B The reactivity of the elements in Group I and in Group VII increases as the groups are descended.
- C Elements in the same period have similar chemical properties.
- D Elements in Group II form ions with a 2+ charge.

21 Part of the Periodic Table is shown.

Which element shows the most metallic character?

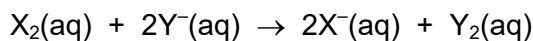
22 E is an element from Group I of the Periodic Table. Two properties of E are listed.

- It has a higher melting point than caesium.
- It has a lower density than sodium.

What is the identity of E?

- A** lithium
- B** potassium
- C** rubidium
- D** francium

23 An equation for the displacement reaction between aqueous halogen,  $X_2$ , and aqueous halide ions,  $Y^-$ , is shown.



Which row identifies  $X_2$  and  $Y^-$  and explains why the reaction takes place?

	$X_2$	$Y^-$	explanation
<b>A</b>	chlorine	iodide	chlorine is less reactive than iodine
<b>B</b>	chlorine	iodide	chlorine is more reactive than iodine
<b>C</b>	iodine	chloride	chlorine is less reactive than iodine
<b>D</b>	iodine	chloride	chlorine is more reactive than iodine

24 Some information about an element is shown.

melting point/ °C	1555
boiling point/ °C	2963
colour of oxide	brown
use of element	as a catalyst

What is the position of this element in the Periodic Table?

- A** Group I
- B** Group VII
- C** Group VIII
- D** transition elements

25 The table shows the observations when four metals, Q, R, S and T, are added separately to cold water and to dilute hydrochloric acid.

metal	observation with cold water	observation with dilute hydrochloric acid
Q	slow fizzing	fizzing
R	no reaction	fizzing
S	no reaction	no reaction
T	vigorous fizzing	vigorous fizzing

Which row gives the order of reactivity of the metals?

	least reactive	→			most reactive
A	S	Q	R	T	
B	T	R	Q	S	
C	S	R	Q	T	
D	T	Q	R	S	

26 Magnesium is reacted separately with dilute sulfuric acid and with steam.

Which row correctly identifies if hydrogen is formed as a product in each reaction?

	reaction with dilute sulfuric acid	reaction with steam	
A	✓	✓	key
B	✓	✗	✓ = hydrogen is formed
C	✗	✓	✗ = hydrogen is <b>not</b> formed
D	✗	✗	

27 Which statements about aluminium are correct?

- 1 It is more reactive than calcium.
- 2 The main ore of aluminium is bauxite.
- 3 It can be extracted from its oxide using carbon.
- 4 Brass is an alloy of aluminium and copper.

A 1 and 2      B 1 and 3      C 2 only      D 3 and 4

28 Steel is a mixture of iron and one or more other elements.

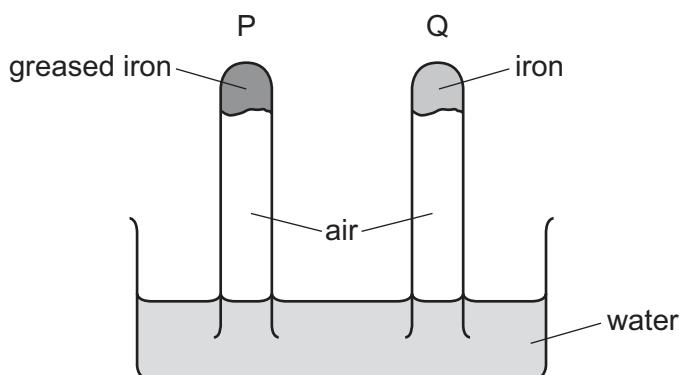
The table gives some information about three common types of steel.

	type of steel	elements added to iron	properties
1	high-carbon steel	carbon only	strong, brittle and corrodes
2	low-carbon steel	carbon only	soft, easily shaped and corrodes slowly
3	stainless steel	carbon, chromium and nickel	hard and resistant to corrosion

Which rows identify a type of steel that is suitable to make cutlery?

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

29 The diagram shows an experiment to investigate the corrosion of iron.



What happens to the water level in tubes P and Q?

	tube P	tube Q
A	rises	falls
B	no change	rises
C	falls	rises
D	no change	no change

30 Fertilisers are used to provide the three elements needed for improved plant growth.

Which two compounds would provide **all three** of these elements?

- A ammonium nitrate and calcium phosphate
- B ammonium nitrate and potassium sulfate
- C potassium nitrate and calcium phosphate
- D potassium phosphate and potassium sulfate

31 Which substances can be used to detect the presence of water?

- 1 anhydrous cobalt(II) chloride
- 2 anhydrous copper(II) sulfate
- 3 litmus
- 4 methyl orange

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

32 What is produced by the incomplete combustion of methane?

- A carbon monoxide
- B hydrogen
- C lead compounds
- D sulfur dioxide

33 Which row identifies compounds in the same homologous series?

	chemical properties	functional group
A	different	different
B	different	same
C	similar	different
D	similar	same

34 The molecular formula of compound Z is C<sub>4</sub>H<sub>10</sub>.

Which row identifies the substance that reacts with Z and describes the type of reaction that occurs?

	substance	type of reaction
<b>A</b>	chlorine	addition
<b>B</b>	chlorine	substitution
<b>C</b>	steam	addition
<b>D</b>	steam	substitution

35 Which list shows the fractions obtained from the fractional distillation of petroleum, in order of increasing boiling point?

- A** bitumen → diesel oil → fuel oil → lubricating oil
- B** diesel oil → gasoline → naphtha → kerosene
- C** gasoline → naphtha → kerosene → diesel oil
- D** kerosene → lubricating oil → naphtha → refinery gas

36 Three statements about cracking of larger alkane molecules are listed.

- 1 Cracking produces petrol for cars.
- 2 Cracking only produces short-chain alkenes.
- 3 Cracking produces alkenes used to make polymers.

Which statements are correct?

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

37 Some words used to describe organic compounds are listed.

- 1 hydrocarbon
- 2 monomer
- 3 saturated
- 4 unreactive

Which words describe ethene?

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

38 A student measures 25.00 cm<sup>3</sup> of dilute hydrochloric acid accurately.

Which piece of apparatus is most suitable?

- A beaker
- B measuring cylinder
- C burette
- D dropping pipette

39 Excess solid magnesium oxide is added to dilute nitric acid.

Which separation technique is used to remove the excess solid magnesium oxide after the reaction finishes?

- A chromatography
- B crystallisation
- C distillation
- D filtration

40 Four different aqueous metal nitrates are tested separately with aqueous sodium hydroxide, with dilute sulfuric acid and with a flame test.

Which row shows the correct set of results for the named aqueous metal nitrate?

	aqueous metal nitrate	with aqueous sodium hydroxide	with dilute sulfuric acid	flame test
A	sodium nitrate	no visible change	white precipitate	yellow flame
B	copper(II) nitrate	blue precipitate	no visible change	blue-green flame
C	barium nitrate	white precipitate	no visible change	blue-green flame
D	calcium nitrate	no visible change	white precipitate	yellow flame



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## The Periodic Table of Elements

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3	Li	4	Be	5	Li	6	Be	7	Li	8	Be	9	Li	10	Be	11	Li	12	Be	13	Li	14	Be	15	Li	16	Be	17	Li	18	Be	19	Li	20	Be	21	Li	22	Be	23	Li	24	Be	25	Li	26	Be	27	Li	28	Be	29	Li	30	Be	31	Li	32	Be	33	Li	34	Be	35	Li	36	Be	37	Li	38	Be	39	Li	40	Be	41	Li	42	Be	43	Li	44	Be	45	Li	46	Be	47	Li	48	Be	49	Li	50	Be	51	Li	52	Be	53	Li	54	Be	55	Li	56	Be	57	Li	58	Be	59	Li	60	Be	61	Li	62	Be	63	Li	64	Be	65	Li	66	Be	67	Li	68	Be	69	Li	70	Be	71	Li	72	Be	73	Li	74	Be	75	Li	76	Be	77	Li	78	Be	79	Li	80	Be	81	Li	82	Be	83	Li	84	Be	85	Li	86	Be	87	Li	88	Be	89	Li	90	Be	91	Li	92	Be	93	Li	94	Be	95	Li	96	Be	97	Li	98	Be	99	Li	100	Be	101	Li	102	Be	103	Li	104	Be	105	Li	106	Be	107	Li	108	Be	109	Li	110	Be	111	Li	112	Be	113	Li	114	Be	115	Li	116	Be	117	Li	118	Be	119	Li	120	Be	121	Li	122	Be	123	Li	124	Be	125	Li	126	Be	127	Li	128	Be	129	Li	130	Be	131	Li	132	Be	133	Li	134	Be	135	Li	136	Be	137	Li	138	Be	139	Li	140	Be	141	Li	142	Be	143	Li	144	Be	145	Li	146	Be	147	Li	148	Be	149	Li	150	Be	151	Li	152	Be	153	Li	154	Be	155	Li	156	Be	157	Li	158	Be	159	Li	160	Be	161	Li	162	Be	163	Li	164	Be	165	Li	166	Be	167	Li	168	Be	169	Li	170	Be	171	Li	172	Be	173	Li	174	Be	175	Li	176	Be	177	Li	178	Be	179	Li	180	Be	181	Li	182	Be	183	Li	184	Be	185	Li	186	Be	187	Li	188	Be	189	Li	190	Be	191	Li	192	Be	193	Li	194	Be	195	Li	196	Be	197	Li	198	Be	199	Li	200	Be	201	Li	202	Be	203	Li	204	Be	205	Li	206	Be	207	Li	208	Be	209	Li	210	Be	211	Li	212	Be	213	Li	214	Be	215	Li	216	Be	217	Li	218	Be	219	Li	220	Be	221	Li	222	Be	223	Li	224	Be	225	Li	226	Be	227	Li	228	Be	229	Li	230	Be	231	Li	232	Be	233	Li	234	Be	235	Li	236	Be	237	Li	238	Be	239	Li	240	Be	241	Li	242	Be	243	Li	244	Be	245	Li	246	Be	247	Li	248	Be	249	Li	250	Be	251	Li	252	Be	253	Li	254	Be	255	Li	256	Be	257	Li	258	Be	259	Li	260	Be	261	Li	262	Be	263	Li	264	Be	265	Li	266	Be	267	Li	268	Be	269	Li	270	Be	271	Li	272	Be	273	Li	274	Be	275	Li	276	Be	277	Li	278	Be	279	Li	280	Be	281	Li	282	Be	283	Li	284	Be	285	Li	286	Be	287	Li	288	Be	289	Li	290	Be	291	Li	292	Be	293	Li	294	Be	295	Li	296	Be	297	Li	298	Be	299	Li	300	Be	301	Li	302	Be	303	Li	304	Be	305	Li	306	Be	307	Li	308	Be	309	Li	310	Be	311	Li	312	Be	313	Li	314	Be	315	Li	316	Be	317	Li	318	Be	319	Li	320	Be	321	Li	322	Be	323	Li	324	Be	325	Li	326	Be	327	Li	328	Be	329	Li	330	Be	331	Li	332	Be	333	Li	334	Be	335	Li	336	Be	337	Li	338	Be	339	Li	340	Be	341	Li	342	Be	343	Li	344	Be	345	Li	346	Be	347	Li	348	Be	349	Li	350	Be	351	Li	352	Be	353	Li	354	Be	355	Li	356	Be	357	Li	358	Be	359	Li	360	Be	361	Li	362	Be	363	Li	364	Be	365	Li	366	Be	367	Li	368	Be	369	Li	370	Be	371	Li	372	Be	373	Li	374	Be	375	Li	376	Be	377	Li	378	Be	379	Li	380	Be	381	Li	382	Be	383	Li	384	Be	385	Li	386	Be	387	Li	388	Be	389	Li	390	Be	391	Li	392	Be	393	Li	394	Be	395	Li	396	Be	397	Li	398	Be	399	Li	400	Be	401	Li	402	Be	403	Li	404	Be	405	Li	406	Be	407	Li	408	Be	409	Li	410	Be	411	Li	412	Be	413	Li	414	Be	415	Li	416	Be	417	Li	418	Be	419	Li	420	Be	421	Li	422	Be	423	Li	424	Be	425	Li	426	Be	427	Li	428	Be	429	Li	430	Be	431	Li	432	Be	433	Li	434	Be	435	Li	436	Be	437	Li	438	Be	439	Li	440	Be	441	Li	442	Be	443	Li	444	Be	445	Li	446	Be	447	Li	448	Be	449	Li	450	Be	451	Li	452	Be	453	Li	454	Be	455	Li	456	Be	457	Li	458	Be	459	Li	460	Be	461	Li	462	Be	463	Li	464	Be	465	Li	466	Be	467	Li	468	Be	469	Li	470	Be	471	Li	472	Be	473	Li	474	Be	475	Li	476	Be	477	Li	478	Be	479	Li	480	Be	481	Li	482	Be	483	Li	484	Be	485	Li	486	Be	487	Li	488	Be	489	Li	490	Be	491	Li	492	Be	493	Li	494	Be	495	Li	496	Be	497	Li	498	Be	499	Li	500	Be	501	Li	502	Be	503	Li	504	Be	505	Li	506	Be	507	Li	508	Be	509	Li	510	Be	511	Li	512	Be	513	Li	514	Be	515	Li	516	Be	517	Li	518	Be	519	Li	520	Be	521	Li	522	Be	523	Li	524	Be	525	Li	526	Be	527	Li	528	Be	529	Li	530	Be	531	Li	532	Be	533	Li	534	Be	535	Li	536	Be	537	Li	538	Be	539	Li	540	Be	541	Li	542	Be	543	Li	544	Be	545	Li	546	Be	547	Li	548	Be	549	Li	550	Be	551	Li	552	Be	553	Li	554	Be	555	Li	556	Be	557	Li	558	Be	559	Li	560	Be	561	Li	562	Be	563	Li	564	Be	565	Li	566	Be	567	Li	568	Be	569	Li	570	Be	571	Li	572	Be	573	Li	574	Be	575	Li	576	Be	577	Li	578	Be	579	Li	580	Be	581	Li	582	Be	583	Li	584	Be	585	Li	586	Be	587	Li	588	Be	589	Li	590	Be	591	Li	592	Be	593	Li	594	Be	595	Li	596	Be	597	Li	598	Be	599	Li	600	Be	601	Li	602	Be	603	Li	604	Be	605	Li	606	Be	607	Li	608	Be	609	Li	610	Be	611	Li	612	Be	613	Li	614	Be	615	Li	616	Be	617	Li	618	Be	619	Li	620	Be	621	Li	622	Be	623	Li	624	Be	625	Li	626	Be	627	Li	628	Be	629	Li	630	Be	631	Li	632	Be	633	Li	634	Be	635	Li	636	Be	637	Li	638	Be	639	Li	640	Be	641	Li	642	Be	643	Li	644	Be	645	Li	646	Be	647	Li	648	Be	649	Li	650	Be	651	Li	652	Be	653	Li	654	Be	655	Li	656	Be	657	Li	658	Be	659	Li	660	Be	661	Li	662	Be	663	Li	664	Be	665	Li	666	Be	667	Li	668	Be	669	Li	670	Be	671	Li	672	Be	673	Li	674	Be	675	Li	676	Be	677	Li	678	Be	679	Li	680	Be	681	Li	682	Be	683	Li	684	Be	685	Li	686	Be	687	Li	688	Be	689	Li	690	Be	