



**TANJONG KATONG GIRLS' SCHOOL
PRELIMINARY EXAMINATION
SECONDARY FOUR EXPRESS
CHEMISTRY**

CANDIDATE
NAME

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CLASS

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INDEX
NUMBER

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CHEMISTRY

Paper 1 Multiple Choice

6092/01

24 August 2026

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Write your name, index number on the Answer Sheet.

There are **forty** questions in 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 Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

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.

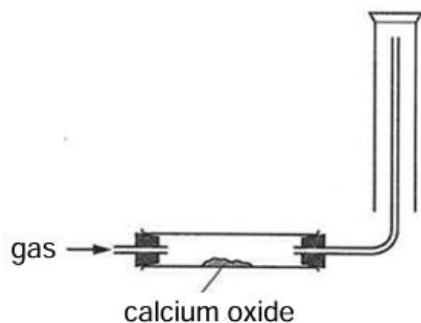
A copy of the Periodic Table is printed on page 23.

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

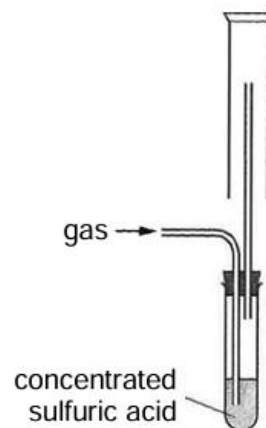
- 1 A gas dissolves readily in water, turns moist blue litmus paper red, and is denser than air.

Which set up should be used to dry and collect this gas?

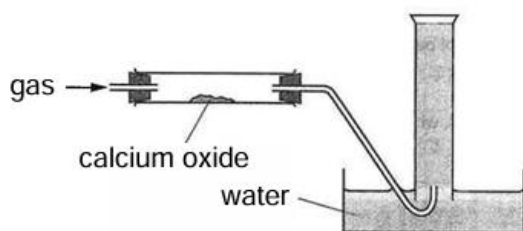
A



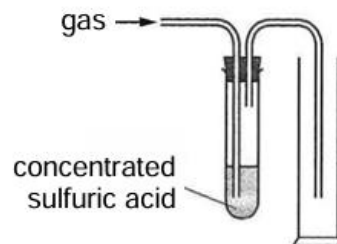
B



C



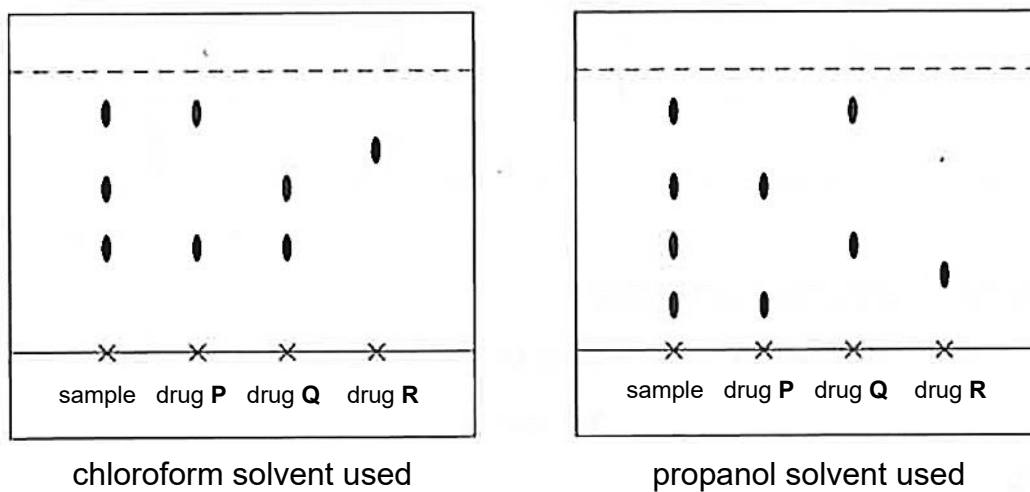
D



- 2 A student accidentally mixed 50 cm³ of oil and 5 g of solid calcium nitrate. Which sequence of separation would allow him to obtain pure samples of oil and solid calcium nitrate most easily?

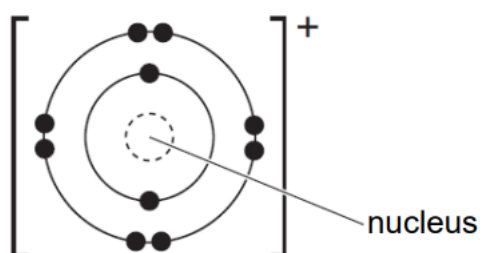
- A** Carry out simple distillation followed by crystallisation.
- B** Carry out filtration followed by washing the residue with water.
- C** Use a separating funnel, carry out chromatography followed by crystallisation.
- D** Add water with stirring, use a separating funnel followed by crystallisation.

- 3 Chromatography was carried out on a urine sample using two different solvents.



Based on the two chromatograms, which drug(s) is/are present in the urine sample?

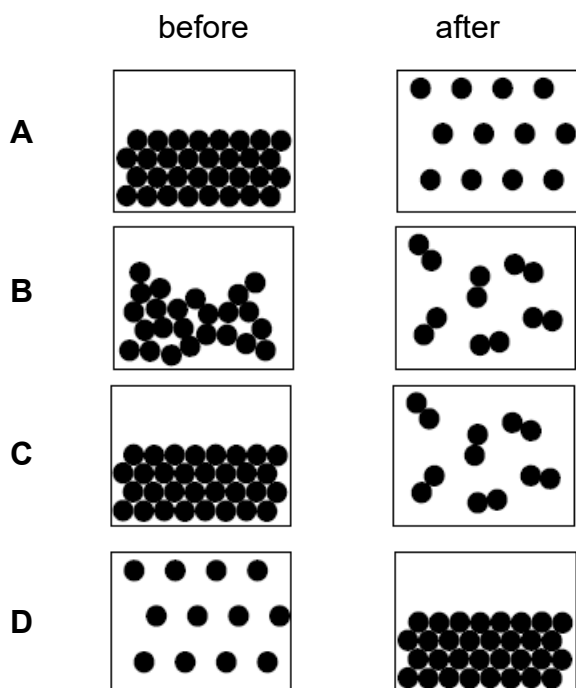
- A drug **P** only
 - B drug **Q** only
 - C drugs **P** and **Q** only
 - D drugs **P**, **Q** and **R**
- 4 The electronic structure of an ion is shown:



What is the number of protons in this ion?

- A 9
- B 10
- C 11
- D It cannot be deduced from this diagram.

- 5 Which diagrams show the physical states of iodine before and after sublimation?



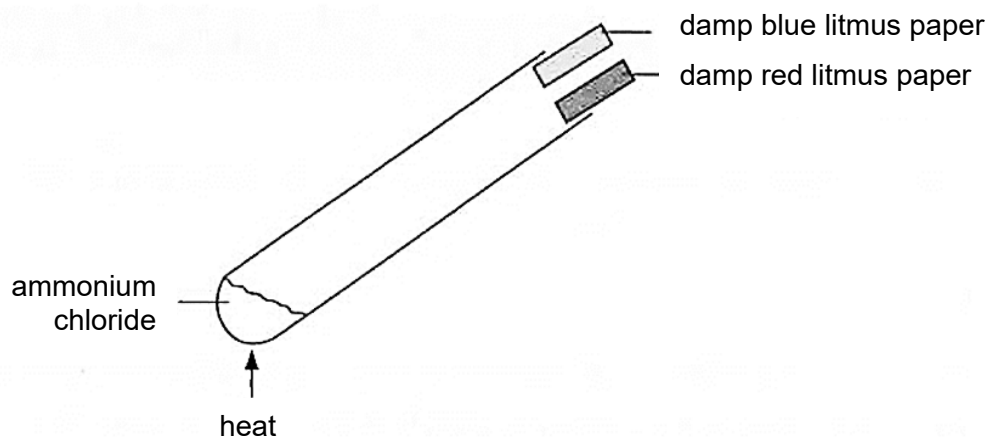
- 6 Four elements **W**, **X**, **Y**, and **Z** have consecutive, increasing proton (atomic) numbers.

Element **Y** exists as a colourless, monatomic gas at room temperature.

What is the chemical formula of a compound formed between **W** and chlorine?

- A WCl
- B W_2Cl
- C WCl_2
- D W_2Cl_3

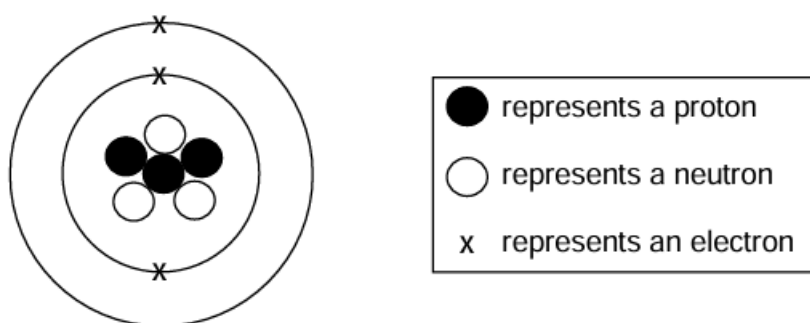
- 7 Ammonium chloride is heated strongly in a boiling tube. Damp blue and red litmus papers were placed at the mouth of the boiling tube.



Which row shows the correct sequence of observations that would be made?

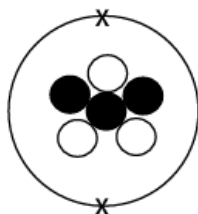
	first observed colour change	final colour of both litmus papers
A	The damp blue litmus paper turns red	red
B	The damp blue litmus paper turns red then bleaches	white
C	The damp red litmus paper turns blue	blue
D	The damp red litmus paper turns blue	red

- 8 The atomic structure of an element is shown.

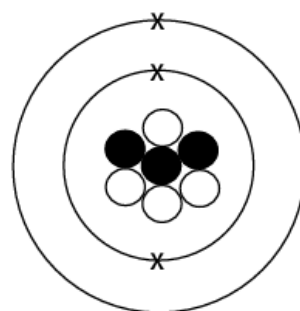


Which diagram shows the atomic structure of an isotope of this element?

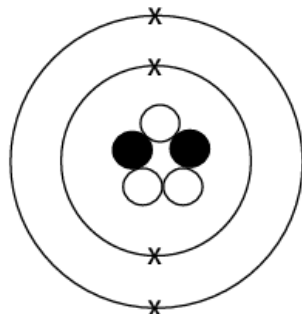
A



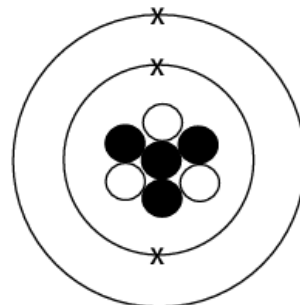
B



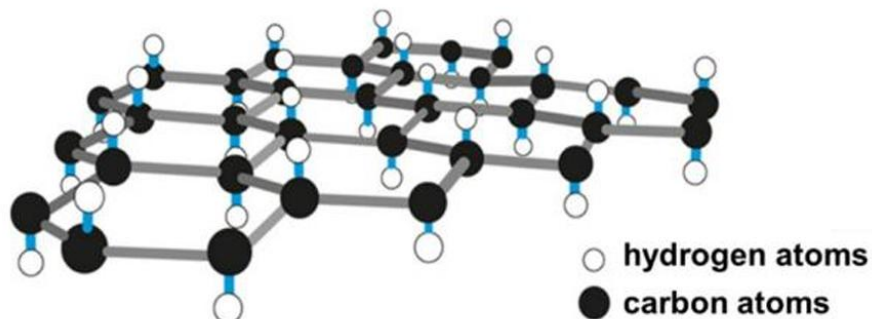
C



D



- 9 Since the discovery of graphite, scientists have been able to extract a single layer of carbon atoms (known as graphene) and convert it to another material known as graphane, by attaching one hydrogen atom to each carbon atom as shown below.

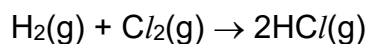


Which property of graphene is **not** likely to be shared by graphane?

- A It is insoluble in water.
B It is very strong.
C It has a high melting point.
D It is an electrical conductor.
- 10 0.1 mole of XC_l_2 combines with 10.8 g of water to form a hydrated salt, $\text{XC}_l_2 \cdot n\text{H}_2\text{O}$.

What is the value of n ?

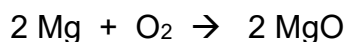
- A 6 B 8 C 10 D 12
- 11 Hydrogen reacts with chlorine to form hydrogen chloride.



What is the final volume of the gas mixture when 20 dm³ of hydrogen is reacted with 30 dm³ of chlorine?

- A 40 dm³
B 50 dm³
C 60 dm³
D 70 dm³

- 12** When 4.8 g of magnesium is heated in a crucible, 5.9 g of magnesium oxide is formed.

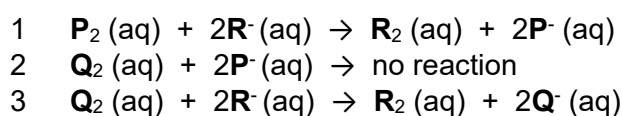


What is the percentage yield of magnesium oxide?

- A** 53% **B** 74% **C** 80% **D** 81%

- 13** **P**, **Q** and **R** are elements found in Group 17 of the Periodic Table.

Three reactions are carried out to determine the reactivity of **P**, **Q** and **R**.



Which statement about **P**, **Q** and **R** is correct?

- A** **P** has a darker colour than **R**.
B **Q** is a stronger oxidising agent than **R**.
C **Q** is more reactive than **P**.
D **R** is a gas at room temperature and pressure.

- 14** Strontium lies below calcium and magnesium in Group 2 of the Periodic Table.

Which property could be predicted for strontium?

- A** It forms a covalent compound with chlorine.
B It is displaced from its nitrate solution by magnesium.
C It is extracted from its ore by heating with carbon.
D It reacts readily with cold water to form an alkali.

- 15** **X, Y and Z** are in the same period of the Periodic Table.
- The oxide of **X** reacts with water to form a solution with pH less than 7.
 - The oxide of **Y** reacts with water to form a solution that turns damp red litmus paper blue.
 - The oxide of **Z** is soluble in both dilute hydrochloric acid and aqueous sodium hydroxide.

What is the order of increasing proton number for elements **X, Y** and **Z**?

- A** **X, Y, Z**
B **X, Z, Y**
C **Y, Z, X**
D **Z, Y, X**

- 16** Which of the following statements regarding caesium are correct?

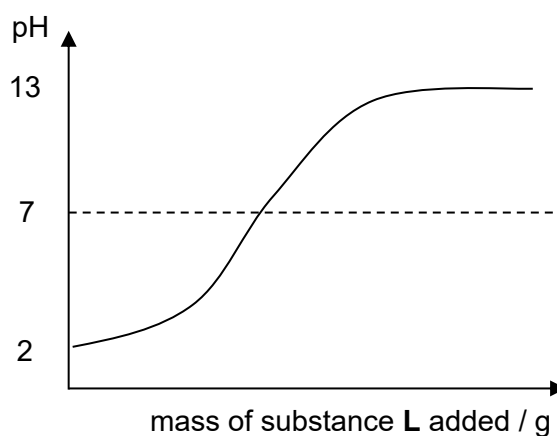
- 1 It reacts with water to form a metal oxide and hydrogen gas.
- 2 It reacts with dilute acid to release more heat than potassium.
- 3 It has a lower density than sodium.
- 4 It has a lower melting point than lithium.

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

- 17 Which element in the table is most likely to be a transition metal?

	melting point ($^{\circ}\text{C}$)	density (g/cm^3)	number of chlorides formed
A	-7	3.10	3
B	113	2.07	1
C	1083	8.92	2
D	1521	1.12	1

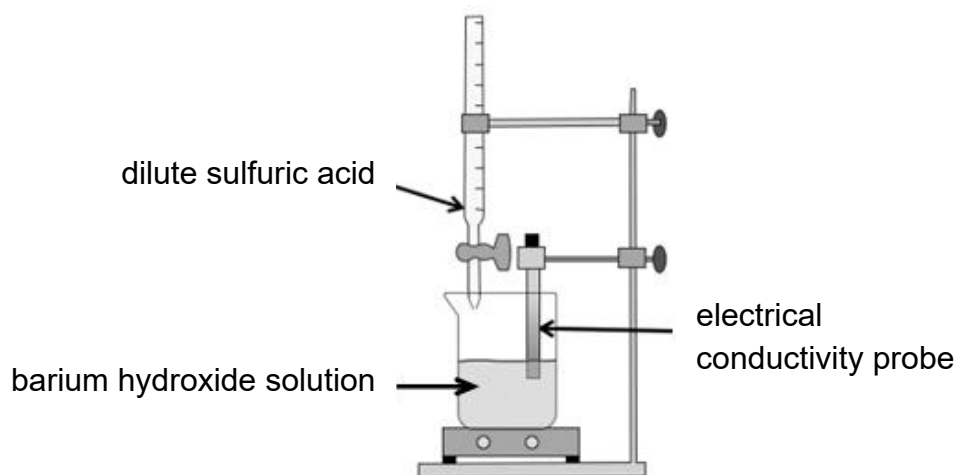
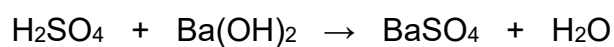
- 18 Substance **L** was added slowly until in excess, with stirring, to aqueous solution **J**. The changes in pH of the mixture are shown in the graph.



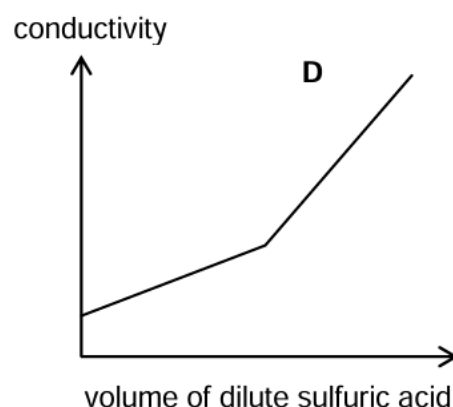
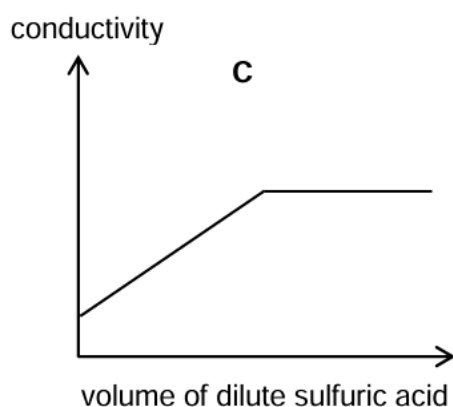
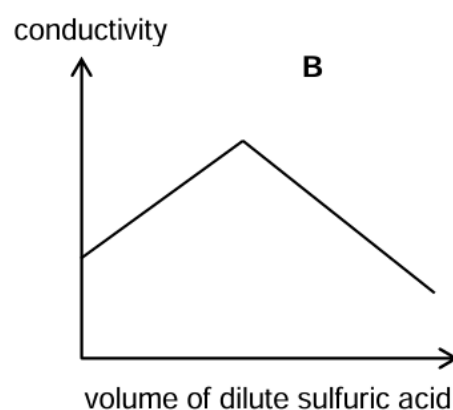
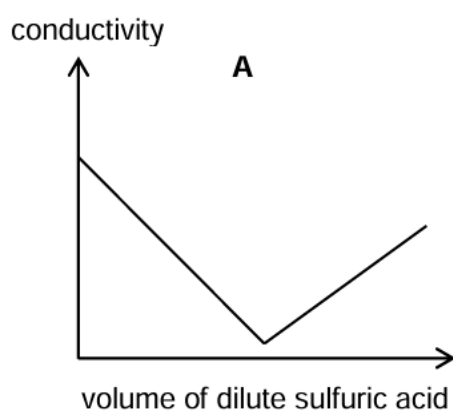
What could substances **L** and **J** be?

	substance L	substance J
A	aluminium oxide	sulfuric acid
B	magnesium oxide	ethanoic acid
C	potassium oxide	sulfuric acid
D	zinc oxide	ethanoic acid

- 19 A solution of barium hydroxide was titrated with dilute sulfuric acid from a burette. The electrical conductivity of the mixture was measured as dilute sulfuric acid was added until in excess.



Which graph shows the change in electrical conductivity over time?



- 20** Butterfly pea flower extract is commonly used in drinks and it changes colour according to different pH values. The table below shows the colours of butterfly pea flower extract at different pH.

pH range	colour
0 – 3	violet
4 – 8	blue
9 – 11	green
12 – 14	yellow

Which pair of substances can be distinguished by adding butterfly pea flower extract?

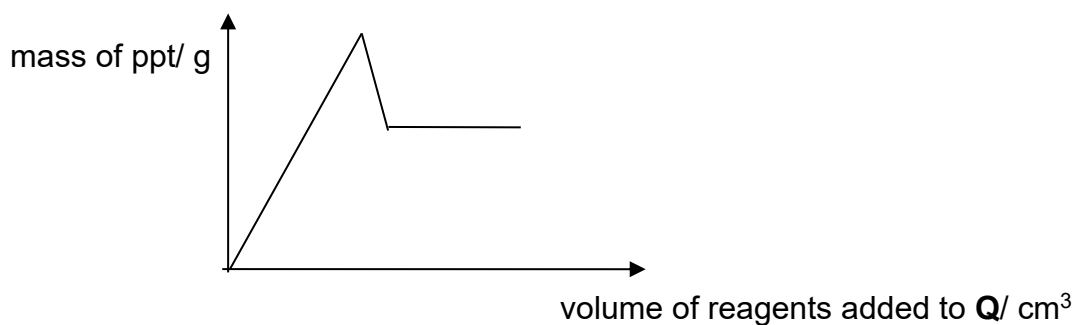
- A** aqueous ammonia and limewater
B acid rain and aqueous sodium chloride
C dilute hydrochloric acid and dilute sulfuric acid
D aqueous sodium sulfate and aqueous sodium chloride
- 21** When dilute hydrochloric acid is added to a white powder, a gas is produced. The remaining solution is tested separately with small volumes of both aqueous ammonia and aqueous sodium hydroxide. A white precipitate is produced in both tests. What is the white powder?
- A** aluminium oxide
B calcium oxide
C copper(II) carbonate
D zinc carbonate

22 Which method below will **not** produce ammonia?

- A heating aqueous zinc nitrate with aqueous sodium hydroxide after adding a piece of aluminium.
- B heating aqueous ammonium chloride with aqueous calcium hydroxide.
- C heating aqueous ammonium sulfate with aqueous sodium hydroxide.
- D heating aqueous ammonium sulfate with dilute hydrochloric acid.

23 In a qualitative analysis, reagent **P** is gradually added to a salt solution **Q** followed by the addition of a dilute acid.

The graph shows how the mass of the precipitate formed changes with the volume of reagents added.



Which row would produce the given result?

	reagent P added followed by dilute acid	anions in salt solution Q
A	add aqueous silver nitrate, followed by dilute nitric acid	Cl^- , CO_3^{2-}
B	add aqueous barium chloride, followed by dilute hydrochloric acid	CO_3^{2-}
C	add aqueous barium chloride, followed by dilute hydrochloric acid	Cl^- , SO_4^{2-}
D	add aqueous silver nitrate, followed by dilute nitric acid	I^-

- 24** Two solutions, **W** and **X**, are tested with several reagents, and the observations are shown in the table.

test	observation with W	observation with X
aqueous ammonia added	green precipitate formed, turned brown upon standing	white precipitate formed, soluble in excess to form a colourless solution
aqueous sodium hydroxide, and aluminium foil added, followed by warming	no gas given off	gas given off turns damp red litmus blue
dilute nitric acid added, followed by aqueous silver nitrate	yellow precipitate formed	no visible reaction

What are solutions **W** and **X**?

	W	X
A	iron(II) chloride	aluminium nitrate
B	iron(II) iodide	zinc nitrate
C	iron(II) iodide	aluminium nitrate
D	iron(III) iodide	zinc nitrate

- 25** In the Haber process,
- I The hydrogen needed can be obtained from the cracking of petroleum.
 - II The reaction chamber is pressurized to speed up the reaction.
 - III The ammonia formed is removed by condensation.

Which of the above options are correct?

- A** I and II
- B** I and III
- C** II and III
- D** I, II and III

26 A temperature of about 450 °C is used in the Haber Process.

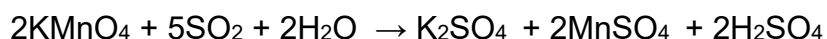
Why is the temperature of 1000 °C **not** used?

- A The volume of ammonia gas is too large to be collected
- B The percentage yield of ammonia is reduced
- C The volume of reactant gas is too large
- D The reaction is not achievable

27 Which reaction does **not** involve oxidation and/or reduction?

- A $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$
- B $\text{CuO} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O}$
- C $\text{Fe}_2(\text{SO}_4)_3 + 2\text{KI} \rightarrow 2\text{FeSO}_4 + \text{K}_2\text{SO}_4 + \text{I}_2$
- D $2\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$

28 The following redox reaction occurs between sulfur dioxide and acidified potassium manganate(VII).

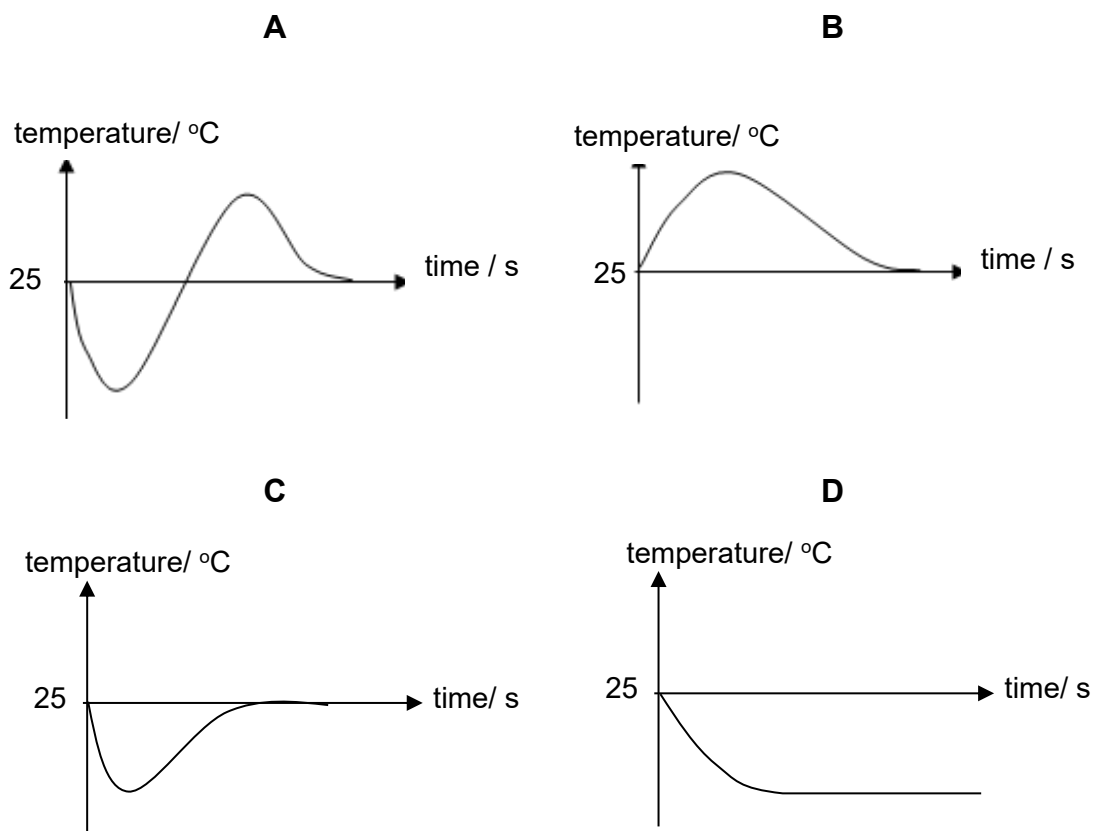


Which row shows the correct pair of oxidising and reducing agents used?

	oxidising agent	reducing agent
A	KMnO ₄	SO ₂
B	SO ₂	KMnO ₄
C	KMnO ₄	H ₂ O
D	H ₂ SO ₄	MnSO ₄

- 29 The dissolving of solid potassium iodide in water is an endothermic process.

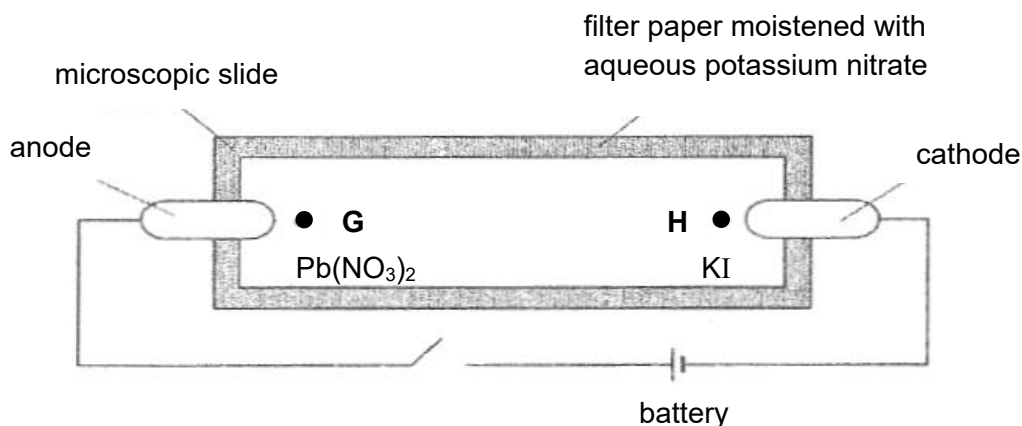
Which graph shows the temperature change that occurs when solid potassium iodide is stirred with water until no further change in temperature is observed?



- 30 In which electrolysis experiment would there be **no** change in the concentration of the solution?

	<u>electrodes</u>	<u>electrolyte</u>
A	carbon	aqueous copper(II) nitrate
B	copper	aqueous copper(II) nitrate
C	carbon	concentrated potassium chloride
D	platinum	dilute sulfuric acid

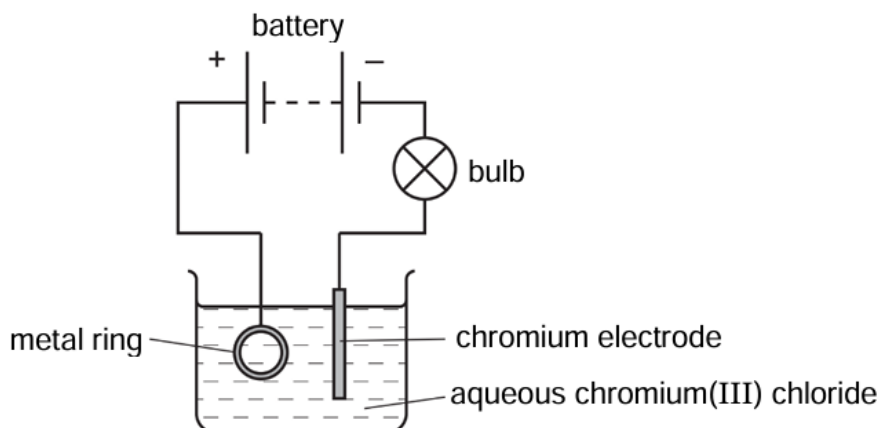
- 31 **G** is a spot containing concentrated lead(II) nitrate solution and **H** is a spot of containing concentrated potassium iodide solution.



What will occur in the above experiment?

- A** Lead is being deposited around the anode and a brown iodine stain is being formed around the cathode.
- B** A yellow precipitate of lead(II) iodide is formed between **G** and **H** on the filter paper.
- C** Potassium is being deposited around the cathode and hydrogen gas is being liberated at the anode.
- D** Hydrogen gas is being liberated at the anode and oxygen gas is being liberated at the cathode.

- 32 The diagram shows the apparatus used in an attempt to electroplate a metal ring with chromium.

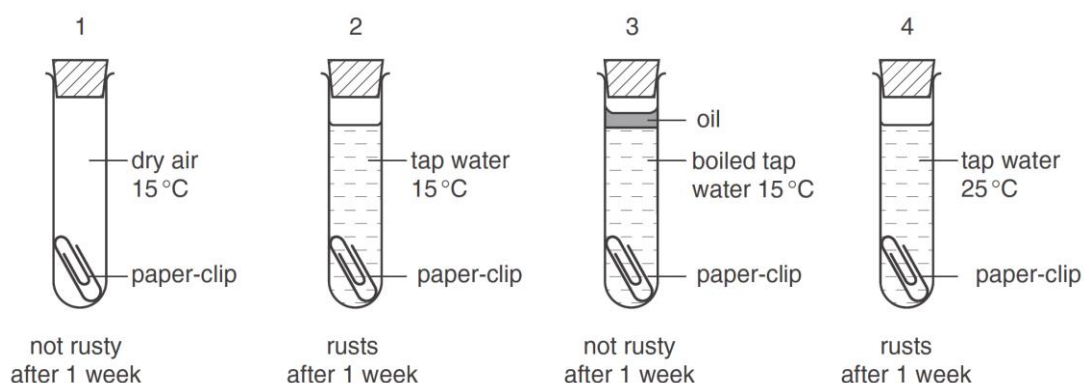


The experiment did **not** work.

Which change is needed in the experiment to make it work?

- A dissolve more solid chromium(III) chloride in the electrolyte
 - B increase the size of the chromium electrode
 - C switch the position of the ring and chromium electrode
 - D increase the voltage of the battery
- 33 Dilute sulfuric acid reacts with copper(II) oxide to form copper(II) sulfate and water.
- What would **not** alter the rate of this reaction?
- A the concentration of sulfuric acid
 - B the pressure at which the reaction takes place
 - C the size of the particles in copper(II) oxide
 - D the temperature of the reacting mixture

34 Four experiments involving rusting are shown.



Which two experiments can be used to show that oxygen is needed for iron to rust?

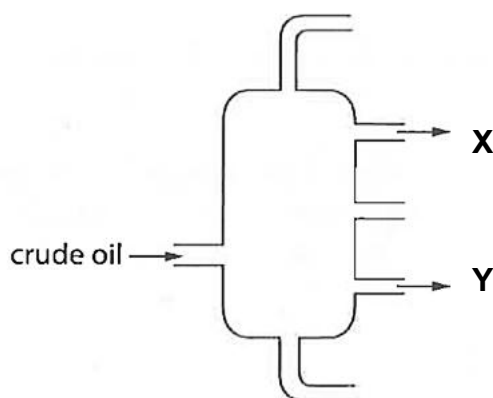
- A** 1 and 3
- B** 1 and 4
- C** 2 and 3
- D** 2 and 4

35 Which molecules would be found in the mixture resulting from the reaction involving chlorine and methane in the presence of ultraviolet light?

- 1 hydrogen chloride
- 2 dichloromethane
- 3 hydrogen

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

- 36** The figure below shows the fractional distillation of petroleum.



Which statement best describes the fractions at **X** and **Y**?

- A** The molecules in fraction **X** are larger than the molecules in fraction **Y**.
 - B** The molecules in fraction **X** are more flammable than the molecules in fraction **Y**.
 - C** The molecules in fraction **X** have higher boiling points than the molecules in fraction **Y**.
 - D** The molecules in fraction **X** contain more carbon atoms than the molecules in fraction **Y**.
- 37** There are many types of fatty acids.
- Stearic acid ($C_{17}H_{35}COOH$) is a natural, saturated fatty acid found abundantly in vegetable oils like cocoa and shea butter.
- Docosahexaenoic acid (DHA) is an omega-3 unsaturated fatty acid found in fish oil. It has the chemical formula, $C_{21}H_{31}COOH$.
- How many carbon - carbon double bond can be found in a molecule of DHA?

- A** 2
- B** 4
- C** 5
- D** 6

- 38** An organic compound **M** undergoes a 2-stage process to form $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$.

The reagents and conditions of the 2 reactions are as follows:

stage number	reagent	conditions
1	steam	high temperature and pressure, phosphoric(V) acid
2	acidified potassium manganate(VII)	heat

What could be a possible identity of compound **M**?

- A** butane
 - B** butene
 - C** propane
 - D** propene
- 39** One mole of hydrocarbon, $\text{C}_{12}\text{H}_{26}$, obtained from petroleum can undergo cracking to give three moles of C_2H_4 , one mole of C_3H_6 and one mole of hydrocarbon **Q**.

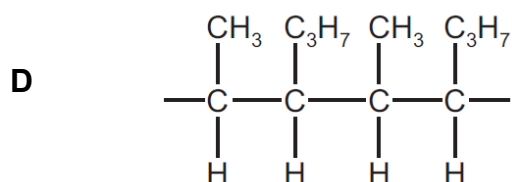
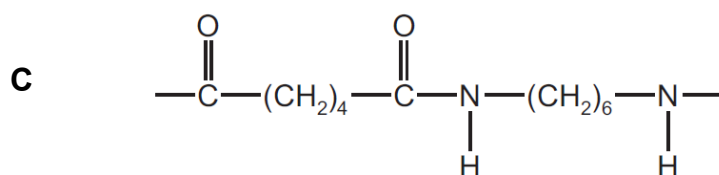
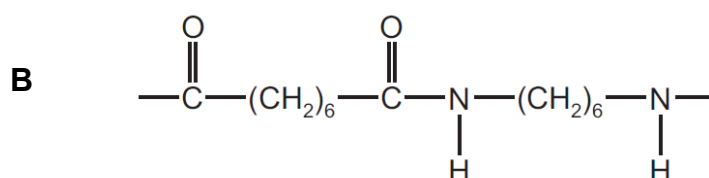
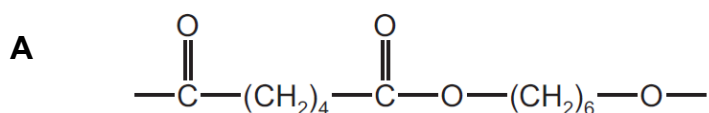
Which row correctly describes the molecules in hydrocarbon **Q** and the effect of **Q** on aqueous bromine?

	number of carbon atoms in a molecule of Q	effect of Q on aqueous bromine
A	3	decolourises
B	3	no effect
C	7	decolourises
D	7	no effect

40 **P** is a polymer that

- has six carbon atoms in each of the monomers from which it was formed.
- is **not** a polyester.
- is formed by condensation polymerisation.

What is a possible structure of **P**?



The Periodic Table of Elements

Group																	
1	2											13	14	15	16	17	18
Key proton (atomic) number atomic symbol name relative atomic mass							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	3	4	5	6	7	8	9	10	11	12	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 —		114 Fl flerovium —		116 Lv livermorium —		

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
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 —

actinoids

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).
The Avogadro constant, $L = 6.02 \times 10^{23} \text{ mol}^{-1}$

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