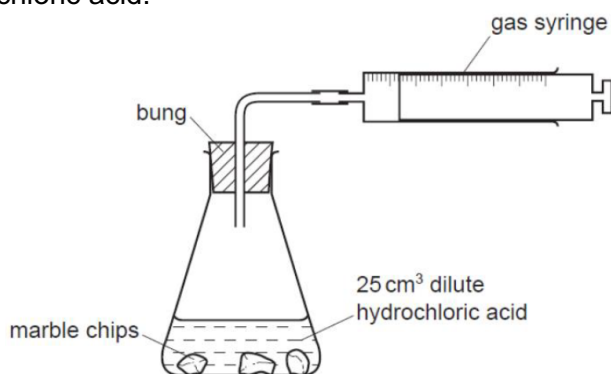


XINMIN SECONDARY SCHOOL CHEMISTRY PRELIMS 2022 P1

- 1 An unknown white solid, M, melts between 171 °C and 174 °C. When chromatography is performed with water as the solvent, M produces only one spot on the chromatogram.

Which statement must be true about M?

- A M can sublime.
 - B M is an ionic compound.
 - C M is impure as it melts over a range of temperatures.
 - D M is pure as it produced only 1 spot on the chromatogram.
- 2 The apparatus shown in the diagram below was set up by a student to measure the volume of carbon dioxide gas produced when different masses of marble chips were added to 25 cm³ of dilute hydrochloric acid.



Which other apparatus did the student use for his experiment?

- A Filter funnel and mass balance
 - B Filter funnel and stopwatch
 - C Measuring cylinder and mass balance
 - D Measuring cylinder and stopwatch
- 3 Two isotopes of carbon, C-12 and C-13 are found combined in a giant molecule. The average relative atomic mass of carbon in the giant molecule is 12.4.

What is the proportion of C-12 atoms in the giant molecule?

- A 50%
- B 60%
- C 70%
- D 80%

- 4 Three elements X, Y and Z belong to the same period in the Periodic Table. The properties of the oxide formed by the three elements are shown below.

oxide of X:	Insoluble in water and aqueous sodium hydroxide but dissolves readily in dilute hydrochloric acid
oxide of Y:	Has low boiling point and does not react with both aqueous sodium hydroxide and dilute hydrochloric acid
oxide of Z:	Insoluble in water but dissolves in both aqueous sodium hydroxide and dilute hydrochloric acid

Based on the statements above, arrange X, Y and Z in order of increasing atomic number in the Periodic Table.

- A** X, Y, Z
- B** Y, X, Z
- C** X, Z, Y
- D** Y, Z, X
- 5 Elements X and Y are in Group VII of the Periodic Table. X is a liquid while Y is a solid at room temperature and pressure.
- Which statement is correct?
- A** Atoms of X has more protons than atoms of Y.
- B** X displaces Y from an aqueous solution of Y.
- C** Y is a stronger oxidising agent than X.
- D** Molecules of Y have more atoms than molecules of X.
- 6 What can be deduced about two gases that have the same relative molecular mass?
- A** They have the same rate of diffusion at room temperature and pressure.
- B** They have the same solubility in water at room temperature.
- C** They have the same number of atoms in one molecule.
- D** They have the same boiling point.

- 7 Which substance will react with dilute sulfuric acid to produce a colourless solution only?
- A zinc hydroxide
 B copper(II) oxide
 C sodium carbonate
 D barium chloride

- 8 An ion has 23 electrons and a mass number of 56.
 What is the charge on the ion if it has 30 neutrons?

A -2 B +2 C -3 D +3

- 9 The table below shows the physical properties of substances P, Q, R and S.

Substance	Melting point / °C	Electrical conductivity	
		in solid state	in molten state
P	High	Poor	Good
Q	High	Good	Good
R	High	Poor	Poor
S	Low	Poor	Poor

Using the information from the table, which statement is true about substances P, Q, R and S?

- A Substance R consists of weak bonds between the atoms.
 B Substance S exists in a simple molecular structure.
 C Substance P contains mobile electrons to conduct electricity when in molten state.
 D Substance Q consists of strong electrostatic attractions between oppositely charged ions.
- 10 In 1986, an accident in Chernobyl Nuclear Power Plant resulted in the melting of its nuclear reactor core, and the release of radioactive isotopes into the atmosphere.

One of these radioactive isotopes is $^{131}_{53}\text{I}$, which has been linked to an increased risk of thyroid cancer.

Which statement about $^{131}_{53}\text{I}$ is correct?

- A An atom of $^{127}_{53}\text{X}$ is an isotope of $^{131}_{53}\text{I}$.
 B An atom of $^{131}_{53}\text{I}$ has 78 nucleons.
 C An ion of $^{131}_{53}\text{I}$ has 131 neutrons.
 D A molecule of $^{131}_{53}\text{I}$ has a relative molecular mass of 184.

- 11 A sample of potassium oxide, K_2O , is dissolved in 250 cm^3 of distilled water. 25.0 cm^3 of the solution is neutralised by 15.0 cm^3 of 1 mol/dm^3 dilute sulfuric acid.

What is the mass of potassium oxide dissolved in 250 cm^3 of distilled water?

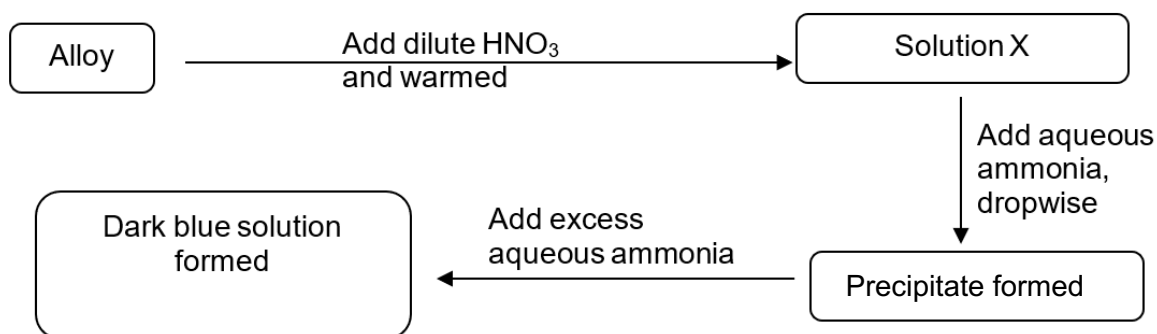
- A 6.9 g
- B 8.1 g
- C 14.1 g
- D 28.2 g

- 12 A piece of seashell has a mass of 23.0 g. Seashell contains impure calcium carbonate. When analysed, the seashell is found to contain 0.226 moles of pure calcium carbonate.

What is the percentage purity of calcium carbonate in the piece of seashell?

- A 0.4 %
- B 0.983 %
- C 1.70 %
- D 98.3 %

- 13 A student conducted the following tests on a sample of alloy containing two metals.



What are the two possible metals present in the alloy?

- A iron and zinc
- B aluminium and copper
- C zinc and copper
- D lead and iron

- 14 Aqueous copper(II) sulfate is electrolysed using copper electrodes.

Which statement is true?

- A A colourless gas is liberated at the anode.
- B The electrolyte turns from blue to colourless.
- C A reddish-brown solid is deposited at the cathode.
- D The electrolyte becomes acidic.

- 15 In electroplating a chromium bracelet with silver, which combination is correct?

	anode	cathode	electrolyte
A	bracelet	silver	silver nitrate
B	silver	bracelet	silver nitrate
C	bracelet	silver	chromium nitrate
D	silver	bracelet	silver chloride

- 16 Four different metals, zinc, silver, magnesium and iron were added separately in excess, to blue copper(II) sulfate solution in four beakers.

How many beaker(s) of solution will be colourless after a week?

- A 1 B 2 C 3 D 4

- 17 Hydrogen peroxide, H_2O_2 , reacts with an oxide, M_2O , as shown below.



What is the function of the oxide M_2O , in this reaction?

- A an oxidising agent
- B a reducing agent
- C a catalyst
- D a base

- 18 In the electrolysis of molten aluminium oxide, 4 moles of aluminium ions (Al^{3+}) were discharged at the cathode.

Which one of the following would be discharged by the same amount of electricity?

- A 4 mole of Cu^{2+} in the electrolysis of aqueous copper(II) sulfate
- B 6 moles of Pb^{2+} in the electrolysis of molten lead(II) bromide
- C 6 moles of Ag^+ in the electrolysis of aqueous silver nitrate
- D 12 moles of Zn^{2+} in the electrolysis of molten zinc sulfate

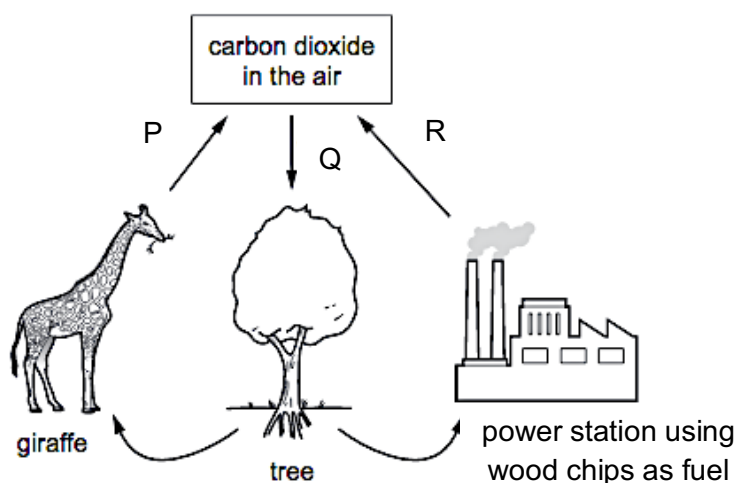
- 19 The following waste gases from a coal burning power station are passed through wet powdered calcium carbonate to reduce gaseous pollutants from escaping into the atmosphere.

sulfur dioxide	carbon monoxide	sulfur trioxide
nitrogen monoxide	nitrogen dioxide	carbon dioxide

How many waste gases will be removed by the wet powdered calcium carbonate?

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

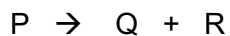
- 20 The diagram shows part of the carbon cycle. P, Q and R refer to specific processes of the carbon cycle.



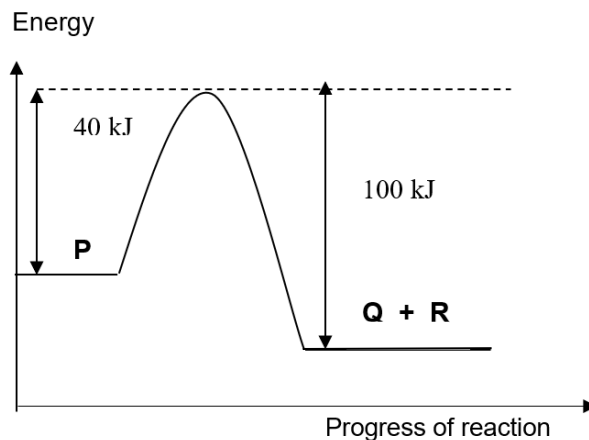
Which row correctly describe the energy changes of these processes?

- | | P | Q | R |
|---|-------------|-------------|-------------|
| A | endothermic | exothermic | endothermic |
| B | endothermic | endothermic | exothermic |
| C | exothermic | exothermic | endothermic |
| D | exothermic | endothermic | exothermic |

- 21 The diagram below represents the energy profile diagram for the reaction,



$$\Delta H = X \text{ kJ / mol}$$



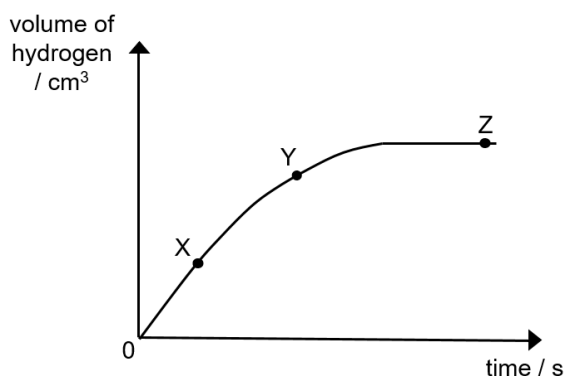
What is the value of X?

- A** - 60 **B** + 60 **C** - 140 **D** + 140
- 22 Which property shows an increasing trend in the elements, from Group I to Group VII, across a period of the Periodic Table?
- A** metallic character
B non-metallic character
C number of electron shells
D reactivity with water
- 23 Aerials in portable radios are made of a mixture of the oxides of calcium and iron known as 'ferrite'. It contains 18.5% calcium and 51.9% iron by mass.

Which is the empirical formula of 'ferrite'?

- A** CaFe_2O
B CaFe_2O_4
C Ca_2FeO_2
D $\text{Ca}_4\text{Fe}_2\text{O}$

- 24 The graph shows how the volume of hydrogen gas produced by the reaction between 50 cm³ of 2.0 mol/dm³ hydrochloric acid and an excess of magnesium varied with time.



Which statement is correct?

- A The reaction is faster at point Y than point X.
 - B All the magnesium has reacted at point Z.
 - C The volume of gas produced is doubled if 100 cm³ of 2.0 mol/dm³ hydrochloric acid is used.
 - D The time taken to reach completion decreases if 100 cm³ of 2.0 mol/dm³ hydrochloric acid is used.
- 25 Which is the overall equation for the reactions that take place in a hydrogen fuel cell?

At the positive electrode: $\text{O}_2 (\text{g}) + 2\text{H}_2\text{O} (\text{l}) + 4\text{e}^- \rightarrow 4\text{OH}^- (\text{aq})$

At the negative electrode: $2\text{H}_2 (\text{g}) + 4\text{OH}^- (\text{aq}) \rightarrow 4\text{H}_2\text{O} (\text{l}) + 4\text{e}^-$

- A $2\text{H}_2 (\text{g}) + \text{O}_2 (\text{g}) \rightarrow 2\text{H}_2\text{O} (\text{l})$
- B $2\text{H}_2\text{O} (\text{l}) \rightarrow 2\text{H}_2 (\text{g}) + \text{O}_2 (\text{g})$
- C $2\text{H}^+ (\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2 (\text{g})$
- D $4\text{OH}^- (\text{aq}) \rightarrow 2\text{H}_2\text{O} (\text{l}) + \text{O}_2 (\text{g}) + 4\text{e}^-$

26 Which of the statements are true of the Haber process?

- 1 Ammonia formed is condensed and obtained as a liquid.
- 2 Hydrogen gas is obtained from cracking of crude oil.
- 3 Nickel catalyst is used to increase the yield of ammonia.
- 4 Nitrogen gas is oxidised to form ammonia.

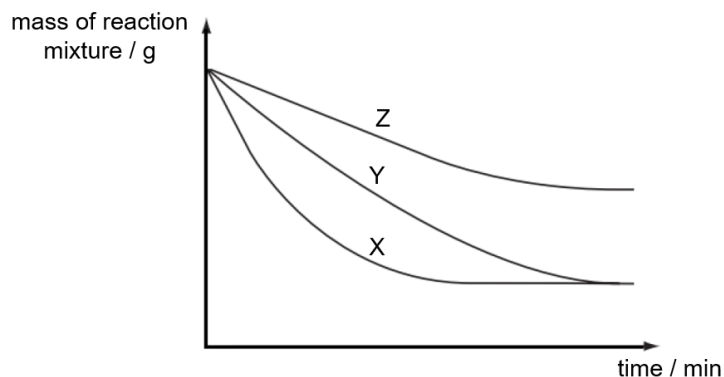
- A** 1 and 2 only
B 1 and 3 only
C 2 and 3 only
D 3 and 4 only

27 A student carried out two experiments under the same room temperature and pressure to investigate the speed of reaction of marble with 0.2 mol/dm^3 hydrochloric acid.

experiment 1: excess powdered marble is added to 20 cm^3 of dilute hydrochloric acid

experiment 2: excess marble chips is added to 20 cm^3 of dilute hydrochloric acid

The mass of the reaction mixture was measured at regular time intervals and plotted against time.



Which pair of curves is obtained in the two experiments?

	experiment 1	experiment 2
A	X	Y
B	Y	Z
C	X	Z
D	Y	X

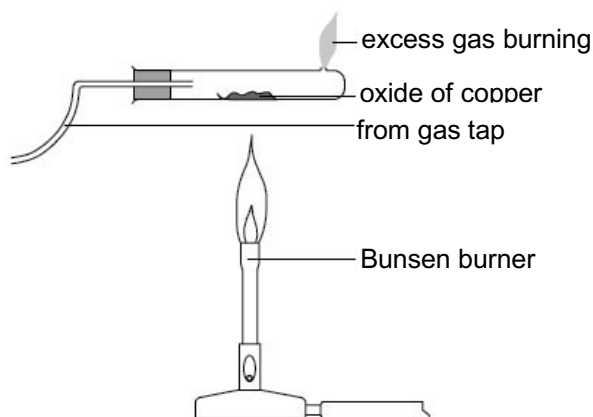
- 28 Tin is a metal between iron and lead in the reactivity series.

Which method is used for the extraction of tin from its ores?

- A heat with limestone
- B heat with carbon
- C electrolysis of the molten ore
- D heat with copper powder

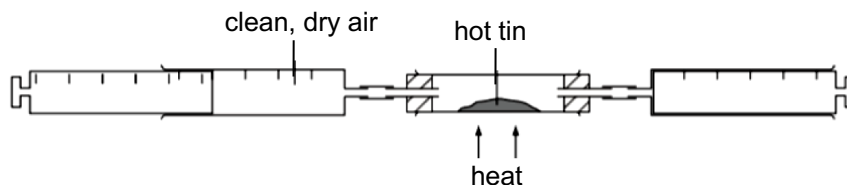
- 29 The following set-up is used to study the reduction of an oxide of copper by heating it with a gas.

The oxide of copper is Cu_2O , which is a red solid. What would be observed when the reaction has stopped, and what is the purpose of burning the excess gas?



	observation	purpose of burning excess gas
A	red solid turns pink	carbon dioxide is a pollutant
B	red solid remains unchanged	carbon monoxide used to reduce oxide is poisonous
C	red solid turns pink	hydrogen gas used to reduce oxide is highly flammable
D	red solid turns black	nitrogen dioxide gas used to reduce oxide is a pollutant

- 30 A sample of clean, dry air is passed over hot tin until all the oxygen in the air has reacted with tin.



The volume of air decreases by 30 cm^3 .

What was the estimated original volume of the sample of air?

- A 6 cm^3
 B 40 cm^3
 C 120 cm^3
 D 145 cm^3
- 31 Drops of chlorine, bromine and iodine water are added to petri-dishes containing salt solutions of other halides, shown below.

sodium chloride	sodium bromide	potassium iodide	
	P		chlorine water
		Q	bromine water
R			iodine solution

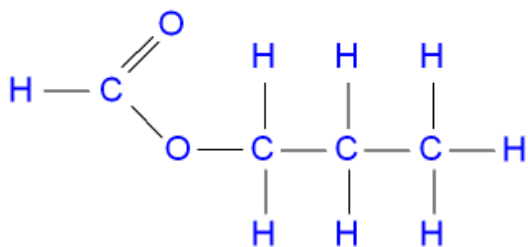
Which option correctly identifies what will be observed in dishes P, Q and R?

	P	Q	R
A	colourless solution turns orange	colourless solution turns brown	no visible reaction
B	orange solution turns colourless	brown solution turns orange	pale yellow solution turns brown
C	colourless solution turns orange	no visible reaction	colourless solution turns brown
D	orange solution turns colourless	no visible reaction	no visible reaction

- 32 The compound C_6H_{10} is a member of a hydrocarbon homologous series. Which one of the following is the first member of this series?

A C_2H_2
B C_2H_3
C C_2H_4
D C_2H_6

- 33 A compound associated with the smell or flavour of raspberries has the structure:



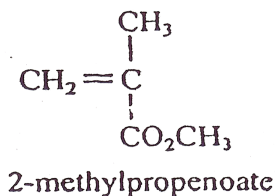
Which alcohol and carboxylic acid can be used to make this compound in the laboratory?

A butanol and ethanoic acid
B methanol and propanoic acid
C propanol and methanoic acid
D ethanol and ethanoic acid

- 34 Which comparison of the properties of pentane, C_5H_{12} and propane is true?

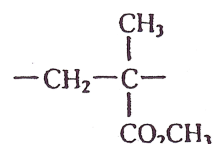
A Propane has a higher boiling point.
B Propane has a lower melting point.
C Propane is less flammable.
D Propane is more viscous.

- 35 In an artificial hip joint, bone cement is used to attach the polyethene cup for the joint to the pelvic girdle. Bone cement is formed by the polymerisation of 2-methylpropenoate and the process is highly exothermic.



Which one of the following is/are correct statements about this polymerisation?

1. The repeat unit of the polymer is



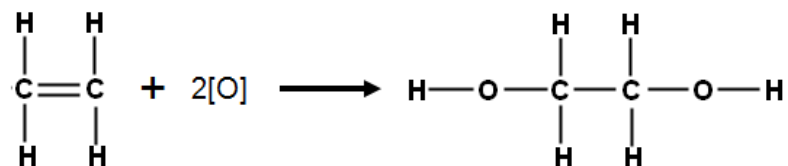
2. The formation of cement occurs by addition polymerisation.
3. Less energy is released in making two C–C bonds than absorbed in breaking a C=C bond.

- A 1 and 2
B 2 and 3
C 1 and 3
D 1, 2 and 3
- 36 A gaseous hydrocarbon Q, on heating with a catalyst, forms a solid compound R. Both Q and R have the same empirical formula.

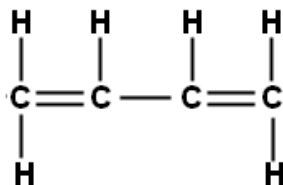
What type of reaction is this?

- A addition polymerisation
B condensation polymerisation
C hydrogenation
D substitution

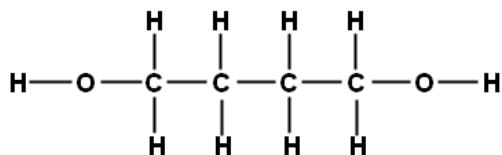
- 37 Cold, dilute potassium manganate(VII) can be used to oxidise alkenes to diols. An example is shown below with ethene. The [O] represents an oxygen atom from the oxidising agent.



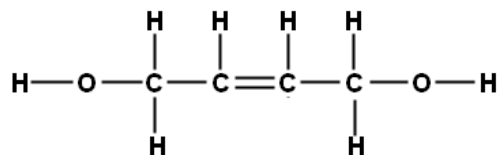
What is the product when the compound below is reacted with cold, dilute potassium manganate(VII)?



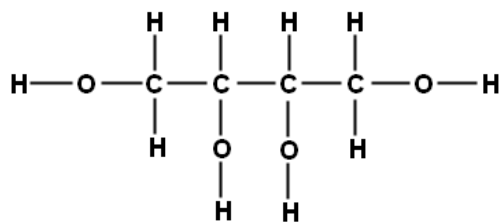
A



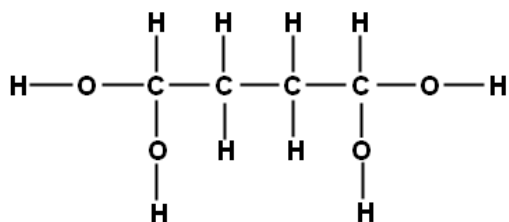
B



C



D



- 38 How many different alkenes have the molecular formula C_4H_8 ?

A 2

B 3

C 4

D 5

- 39 A carboxylic acid has the formula $C_2H_4O_2$.

What type of formula is this?

- A empirical formula
- B general formula
- C molecular formula
- D structural formula

- 40 An alcohol, X, was fully oxidised to a carboxylic acid. Neutralisation of the acid with calcium carbonate gave a salt of formula $(CH_3CO_2)_2Ca$.

What was alcohol X?

- A CH_3OH
- B C_2H_5OH
- C C_3H_7OH
- D C_4H_9OH

∞ End of Paper ∞