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南洋女子中學校

Nanyang Girls' High School

Preliminary Examination 2023 Secondary 4

CHEMISTRY

6092/01

Paper 1 Multiple Choice

1 hour

Friday 25 August

1200 – 1300

Additional materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue, correction fluid or tape.

Write your name, register number and class in the spaces at the top of this page and on the Answer Sheet in the spaces provided.

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 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 15.

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

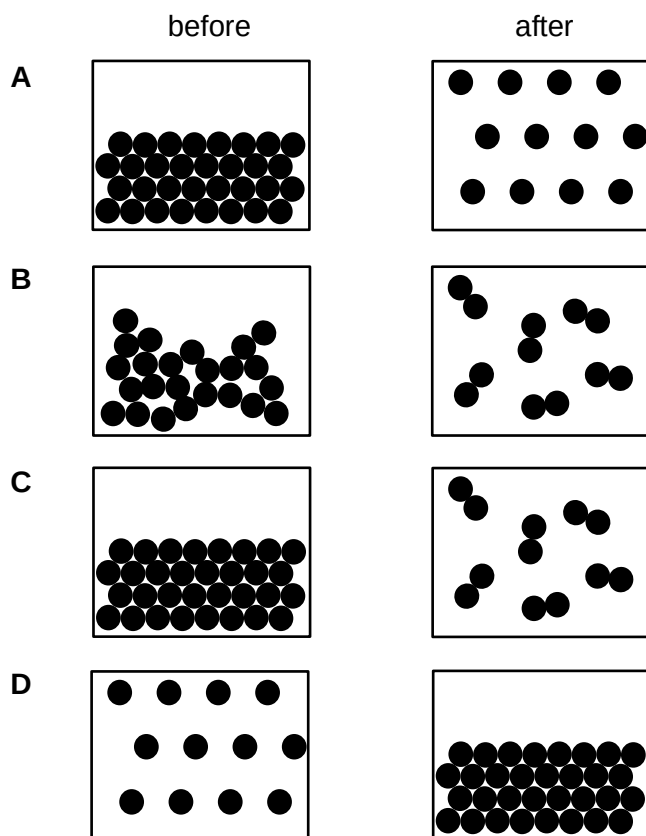
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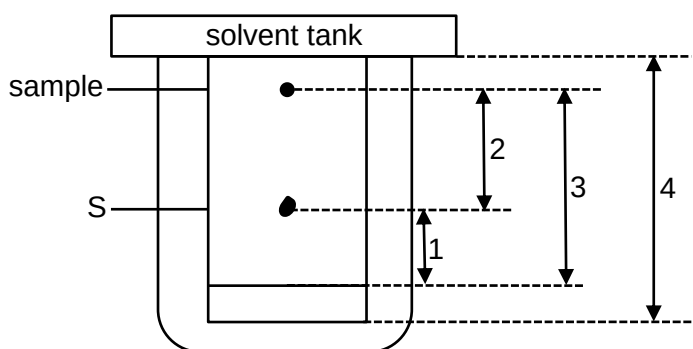
NANYANG GIRLS' HIGH SCHOOL

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- 1 Which of the following shows the states of matter before and after the sublimation of iodine?



- 2 The diagram below shows a descending chromatogram of a sample containing substance S. The solvent tank is at the top of the set up.



Which measurements are used to find the R_f value of S?

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

- 3 A student wants to measure the time taken for 1.5 g of zinc powder to dissolve in 50 cm³ of dilute sulfuric acid.

Which apparatus is essential to complete the experiment?

- 1 stopwatch
- 2 measuring cylinder
- 3 gas syringe
- 4 balance

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

- 4 Which row identifies a chemical change and a physical change?

	chemical change	physical change
A	boiling ethanol	burning ethanol
B	burning ethanol	evaporating ethanol
C	dissolving ethanol in water	burning ethanol
D	evaporating ethanol	dissolving ethanol in water

- 5 X³⁻ contains 24 particles. 17 of them are charged particles.

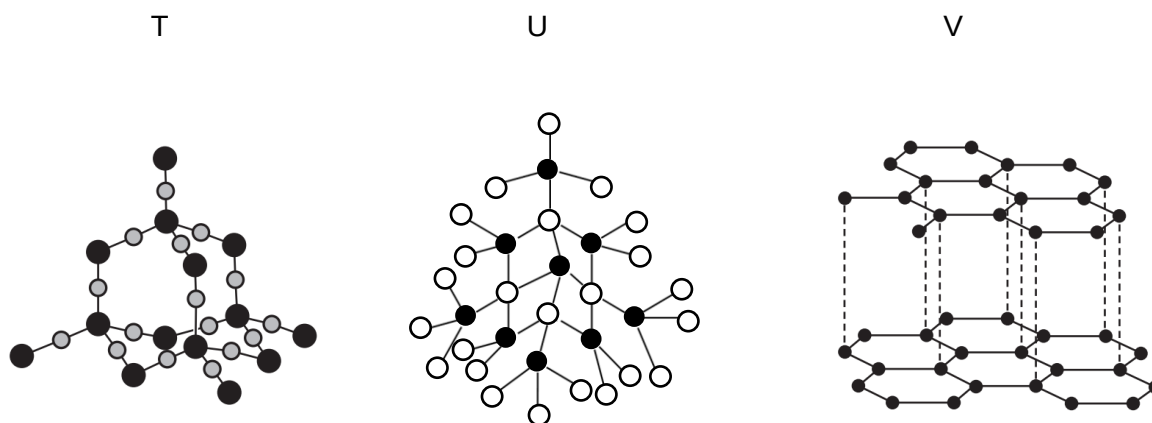
Which statement about the ion is correct?

- A** It contains 7 neutrons and 7 electrons.
- B** It contains 7 nucleons and 10 electrons.
- C** It contains 7 protons and 10 electrons.
- D** It contains 10 protons and 7 electrons.

- 6 Which of the following contains both covalent and ionic bonds?

- A** sodium methanoate
- B** methyl ethanoate
- C** lithium chloride
- D** calcium nitride

- 7 The following shows structures of three macromolecules T, U and V.



Identify T, U and V.

	T	U	V
A	diamond, C	silicon carbide, SiC	graphite, C
B	graphite, C	diamond, C	silicon carbide, SiC
C	silicon carbide, SiC	silicon dioxide, SiO ₂	graphite, C
D	silicon dioxide, SiO ₂	silicon carbide, SiC	graphite, C

- 8 Which compound contains the highest percentage of nitrogen by mass?



- 9 The carbonate of element Y undergoes thermal decomposition.



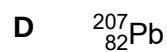
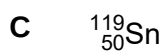
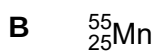
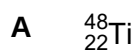
14.8 g of YCO₃ is heated and 1.8 dm³ of carbon dioxide, measured at room temperature and pressure, is produced.

What is the relative atomic mass of Y?

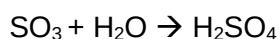
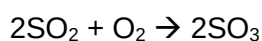
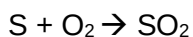


- 10 4.38 g of a metal oxide, ZO_2 contains 2.63 g of metal Z.

What is the identity of Z?



- 11 The equations show the reactions involved in the formation of sulfuric acid from sulfur.



How many moles of sulfuric acid are formed from 1.00 mole of sulfur?

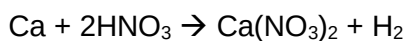
A 0.50

B 1.00

C 2.00

D 4.00

- 12 Calcium reacts with dilute nitric acid to form calcium nitrate and hydrogen.



4.0 g of calcium react with exactly 100 cm³ of 2 mol/dm³ nitric acid to give 2.4 dm³ of hydrogen, at room temperature and pressure.

Which row would give 4.8 dm³ of hydrogen at room temperature and pressure?

	mass of calcium/ g	nitric acid	
		volume/ cm ³	concentration/ mol/dm ³
A	4.0	100	2
B	4.0	200	1
C	8.0	100	1
D	8.0	200	2

- 13** Four different conditions under which lithium bromide is electrolysed using inert electrodes are listed.

- 1 concentrated aqueous lithium bromide
- 2 dilute aqueous lithium bromide
- 3 molten lithium bromide
- 4 solid lithium bromide

Under which conditions is a brown vapour formed?

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

- 14** What would be observed when aqueous copper(II) sulfate is electrolysed using a positive carbon electrode and a negative copper electrode?

	at the positive carbon electrode	at the negative copper electrode
A	electrode dissolves	brown solid deposit
B	electrode dissolves	effervescence
C	effervescence	brown solid deposit
D	effervescence	electrode dissolves

- 15** In an electrolysis experiment, the same amount of charge deposited 6.5 g of chromium and 4 g of copper. The charge on the copper ion was 2+.

What was the charge on the chromium ion?

[Ar: Cr, 52; Cu, 64]

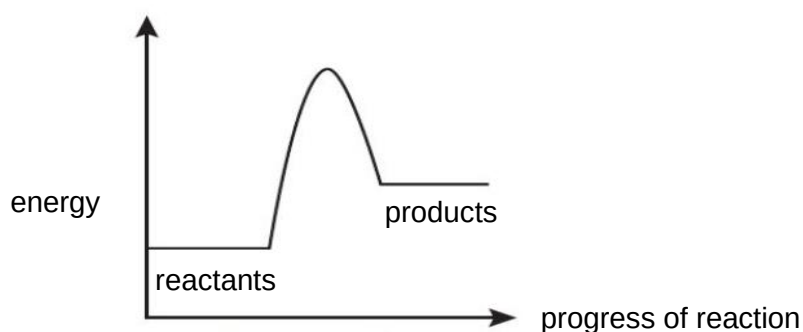
- A** +1 **B** +2 **C** +3 **D** +4

- 16** The hydrogen fuel cell is an alternative source of fuel to petrol.

What is incorrect about the hydrogen fuel cell?

- A** Chemical energy is converted to electrical energy.
B Hydrogen gas is oxidised in the process.
C The reaction that takes place is endothermic.
D Water is the only product.

- 17 The energy profile diagram shows the energy changes that occur as a reaction takes place.

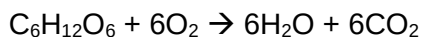


From the diagram, which statement about this reaction is correct?

- A Less energy were needed during bond breaking than released during bond forming.
 - B In the reaction, there was an increase in temperature of the surrounding.
 - C This reaction could be $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$.
 - D The reaction has a negative ΔH value.
- 18 A reversible reaction is exothermic in the forward reaction and the heat produced is 273 kJ/ mol. The activation energy for the forward reaction is 80 kJ/ mol.

What is the activation energy of the reverse reaction?

- A 80 kJ/ mol
 - B 193 kJ/ mol
 - C 273 kJ/ mol
 - D 353 kJ/ mol
- 19 An equation for respiration is as shown:

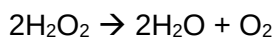


When 32.0 g of O_2 is reacted, 472 kJ of energy is released.

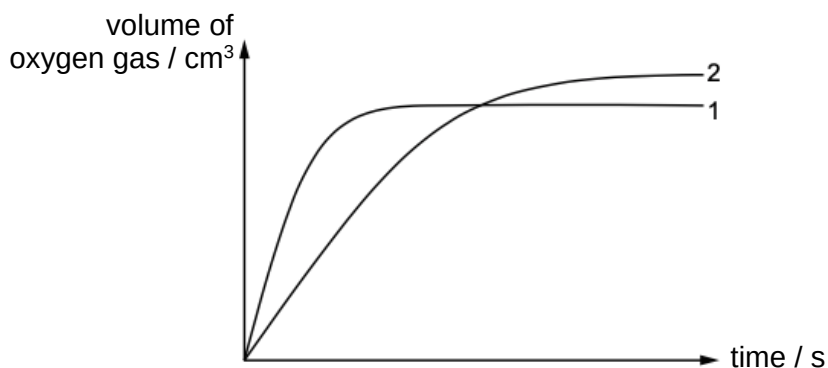
What is the enthalpy change of this reaction?

- A – 2832 kJ/ mol
- B – 472 kJ/ mol
- C + 2832 kJ/ mol
- D + 472 kJ/ mol

- 20 Decomposition of hydrogen peroxide produces oxygen gas as shown in the equation.



Experiment 1 was carried out with 50 cm³ of 0.1 mol/dm³ hydrogen peroxide and the results are shown in curve 1.



What change was made to the experiment to produce curve 2?

- A Using 50 cm³ of 0.05 mol/dm³ of hydrogen peroxide
 - B Using 125 cm³ of 0.05 mol/dm³ of hydrogen peroxide
 - C Using 50 cm³ of 0.15 mol/dm³ of hydrogen peroxide
 - D Using 125 cm³ of 0.15 mol/dm³ of hydrogen peroxide
- 21 Iron reacts with dilute hydrochloric acid at a constant temperature of 25°C.
Which statement about the rate of this reaction is correct?
- A It decreases as the reaction proceeds.
 - B It decreases then increases as the reaction proceeds.
 - C It increases as the reaction proceeds.
 - D It remains the same as the reaction proceeds.
- 22 Aqueous iron(III) chloride, FeCl₃, reacts with aqueous potassium iodide, KI.



Which statements are correct?

- 1 In the balanced equation, *a*, *b*, *c* and *d* have the same value.
 - 2 Potassium iodide is an oxidising agent.
 - 3 A dark brown solution is produced in the reaction.
- A 1 and 2 B 1 and 3 C 2 and 3 D 1,2 and 3

23 Which observations about bases are true?

- 1 A 1 mol/ dm³ solution of a weak base will have a higher pH than a 1 mol/ dm³ solution of a strong base.
- 2 pH gives a measure of the OH⁻ concentration in a solution.
- 3 Universal Indicator turns blue when placed in a solution of a weak base.
- 4 When bases react with acids, heat is always given out.

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

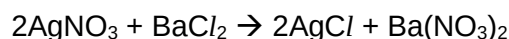
24 Beryllium hydroxide is an amphoteric white solid.

Which of the following confirms that beryllium hydroxide is amphoteric?

- A** beryllium hydroxide reacts with sodium hydroxide to give a colourless solution
- B** beryllium hydroxide reacts with sulfuric acid to give a colourless solution
- C** beryllium hydroxide forms beryllium oxide and water when heated
- D** beryllium hydroxide is insoluble in water

25 When silver nitrate and barium chloride are mixed, a white precipitate of silver chloride is formed.

The equation is shown.



Which row describes the solubility of the salts?

	soluble	insoluble
A	AgNO ₃	BaCl ₂ , Ba(NO ₃) ₂ , AgCl
B	AgNO ₃ , BaCl ₂	AgCl, Ba(NO ₃) ₂
C	AgNO ₃ , BaCl ₂ , Ba(NO ₃) ₂	AgCl
D	AgNO ₃ , BaCl ₂ , AgCl	Ba(NO ₃) ₂

26 Which methods are suitable for the preparation of both zinc chloride and copper(II) chloride?

- 1 reacting the metal oxide with warm dilute aqueous hydrochloric acid
- 2 reacting the metal with dilute aqueous hydrochloric acid
- 3 reacting the metal carbonate with dilute aqueous hydrochloric acid

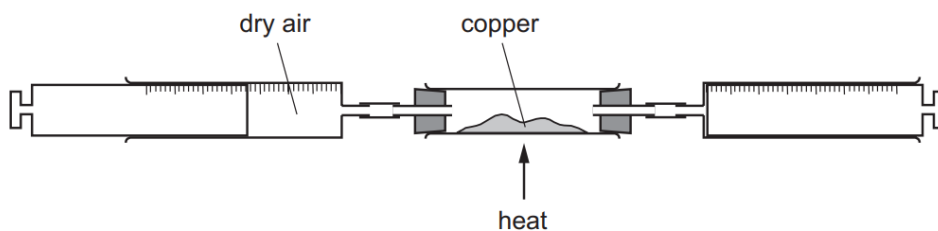
A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 1,2 and 3

- 27 Which method is most suitable for obtaining lead(II) sulfate?
- A Mix aqueous lead(II) nitrate and aqueous potassium sulfate, heat to evaporate all of the water, collect the solid and then wash and dry it.
- B Mix aqueous lead(II) nitrate and aqueous potassium sulfate, filter, collect the filtrate, crystallise, then wash and dry the crystals.
- C Mix aqueous lead(II) nitrate and dilute sulfuric acid, filter, then wash and dry the residue.
- D Titrate aqueous lead(II) hydroxide with dilute sulfuric acid, crystallise, then wash and dry the crystals.
- 28 Which statement about the elements in Group I and Group VII of the Periodic Table is true?
- A Bromine reacts with potassium chloride to produce chlorine.
- B Astatine is a monatomic non-metal.
- C Sodium has a higher melting point than potassium
- D Lithium reacts more vigorously with water than potassium.
- 29 Which row describes the properties of a transition element?

	melting point	density	forms coloured compounds
A	high	low	no
B	high	high	yes
C	low	low	no
D	low	low	yes

- 30 Which statement about metals and their compounds is **not** correct?
- A Heating magnesium powder with iron(III) oxide produces iron and a white smoke containing magnesium oxide.
- B Metals low in the reactivity series are generally extracted from their oxides by heating with carbon.
- C Unreactive metals are likely to be found as elements in soils or rocks.
- D When using hydrogen, higher temperatures are needed to reduce copper(II) oxide to copper than needed to reduce zinc oxide to zinc.

- 31 Dry atmospheric air is passed over hot copper as shown in the diagram below.



The volume of gas at the end of the reaction is 60 cm^3 .

What is the starting volume of dry atmospheric air?

- A** 66 cm^3 **B** 76 cm^3 **C** 90 cm^3 **D** 286 cm^3

- 32 Ammonia is manufactured by reacting hydrogen with nitrogen in the Haber Process.

Which row describes the sources of hydrogen and nitrogen and the conditions used in the manufacture of ammonia in the Haber process?

	source of hydrogen	source of nitrogen	temperature of reaction/ $^{\circ}\text{C}$	pressure of reaction/ atm
A	air	natural gas	250	65
B	air	natural gas	250	200
C	natural gas	air	450	65
D	natural gas	air	450	200

- 33 Iron from a blast furnace is treated with oxygen and with calcium oxide. Which substances in the iron are removed?

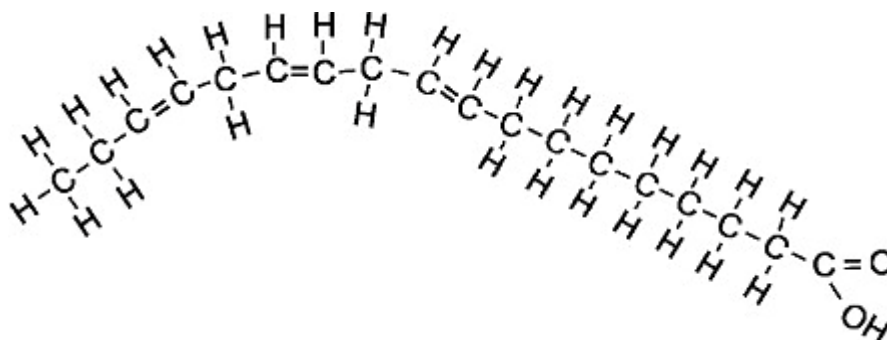
	oxygen removes	calcium oxide removes
A	carbon	acidic oxide
B	carbon	basic oxide
C	iron	acidic oxide
D	iron	basic oxide

- 34 Which statement explains why galvanising prevents iron from rusting?
- A Zinc forms an unreactive layer surrounding iron and prevents further reaction.
 B Zinc gains electrons from iron and prevents iron from oxidising.
 C Zinc is more reactive than iron and corrodes in preference to iron.
 D Zinc is more reactive than iron and loses electrons less easily than iron.

- 35 Which of the hydrocarbon burns with the least sooty flame?

- A C_2H_4
 B C_2H_6
 C C_3H_6
 D C_3H_8

- 36 The diagram shows a chemical structure of linolenic acid .



How many moles of hydrogen gas would react completely with one mole of linolenic acid?

- A 1 B 2 C 3 D 4

- 37 A hydrocarbon P, on heating with a catalyst, forms a solid compound Q.
 Both P and Q have the same empirical formula.
 What type of reaction is this?

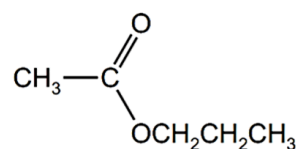
- A addition polymerisation
 B condensation polymerisation
 C hydrogenation
 D substitution

38 Which statements about the compound, $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ are correct?

- 1 It reacts with ammonia.
- 2 It oxidises to form butanol.
- 3 It is named propanoic acid.
- 4 It reacts with sodium carbonate.

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

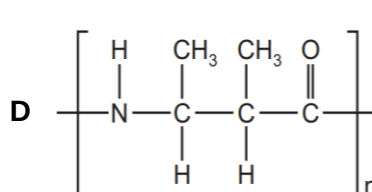
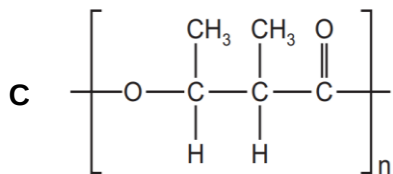
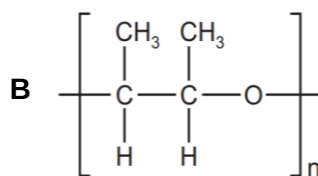
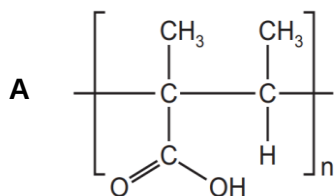
39 The structure of an ester is shown.



What is the name of the ester?

- A ethyl propanoate
 B methyl propanoate
 C propyl ethanoate
 D propyl methanoate

40 Which polymer structure has the same linkages as Terylene?



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