



福建中學

FUKIEN SECONDARY SCHOOL

S6 Mock Examination (2021-2022)
Chemistry Paper 1
(2 hours 30 minutes)

Date : 24th January 2022
Time : 8:30a.m.-11:00a.m.

Name : _____
Class : _____ No. : _____

GENERAL INSTRUCTIONS

1. There are **TWO** sections, A and B, in this Paper. You are advised to finish Section A in about 45 minutes.
 2. Section A consists of multiple-choice questions in this question paper, while Section B contains conventional questions printed separately in Question-Answer Book **B**.
 3. Answers to Section A should be marked on the Multiple-choice Answer Sheet while answers to Section B should be written in the spaces provided in Question-Answer Book **B**. **The Answer Sheet for Section A and the Question-Answer Book for Section B will be collected separately at the end of the examination.**
 4. A Periodic Table is printed on the back of Question-Answer Book **B**. Atomic numbers and relative atomic masses of elements can be obtained from the Periodic Table.
-

INSTRUCTIONS FOR SECTION A (MULTIPLE-CHOICE QUESTIONS)

1. Read carefully the instructions on the Answer Sheet. Write your name, class and class number in the spaces provided.
2. When told to open this book, you should check that all the questions are there. Look for the words **'END OF SECTION A'** after the last question.
3. All questions carry equal marks.
4. **ANSWER ALL QUESTIONS.** You are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured.
5. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.
6. No marks will be deducted for wrong answers.

This section consists of two parts. There are 24 questions in PART I and 12 questions in PART II.

Choose the best answer for each question.

Candidates may refer to the Periodic Table printed on the back of Question-Answer Book B.

Part I

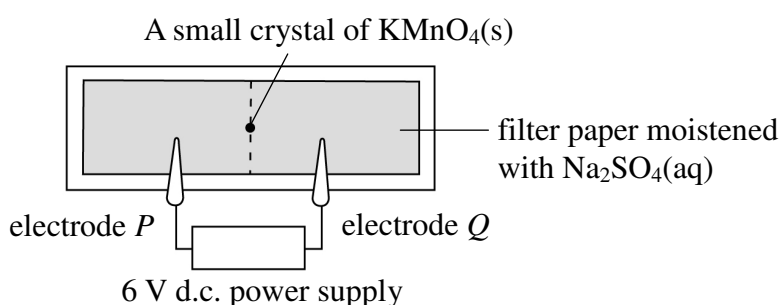
1. Which of the following combinations is INCORRECT?

	<u>Chemical</u>	<u>Hazard warning label</u>
A.	Hydrogen	Explosive
B.	Concentrated nitric acid	Oxidizing
C.	Concentrated sodium hydroxide solution	Corrosive
D.	Chlorine	Toxic

2. Element Q belongs to Group VI. It combines with element R to give a compound with a formula of RQ_2 . The compound does not conduct electricity in aqueous solution or molten state. To which group of the Periodic Table does R probably belong?

- A. Group II
- B. Group IV
- C. Group V
- D. Group 0

3. The following diagram shows the set-up used to indicate the presence of ions in potassium permanganate. When the circuit is closed, a purple patch moves slowly to the left-hand side.



Which of the following statements about the experiment is INCORRECT?

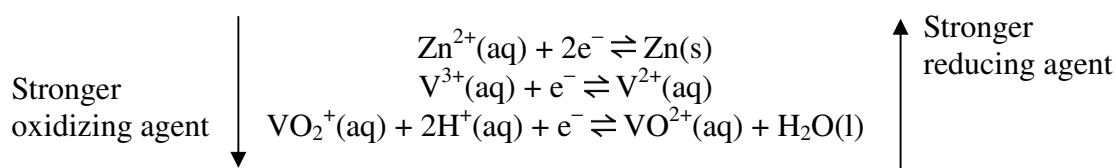
- A. Electrode P is the positive pole.
- B. Permanganate ion is responsible for the purple patch.
- C. $Na_2SO_3(aq)$ can be used to replace $Na_2SO_4(aq)$.
- D. The purple patch will move faster when the 6 V d.c. power supply is replaced by a 12 V d.c. power supply.

Direction: Questions 4 and 5 refer to four metals X , A , B and C . The table below shows the results of some experiments carried out using the metals and their compounds.

	Metal A	Metal B	Metal C
Reaction with water	No observable change	No observable change	Colourless gas bubbles evolve
Reaction with $X^{2+}(\text{aq})$	No observable change	Some grey deposits form	Some grey deposits form and colourless gas bubbles evolve
Heating the metal oxide with charcoal	A shiny solid forms	No observable change	No observable change

4. Which of the following is the correct order of decreasing reactivity of the metals?
- A. $B > C > A > X$
B. $B > X > C > A$
C. $C > B > X > A$
D. $C > X > B > A$
5. Which of the following metals is most likely to be metal C ?
- A. Calcium
B. Iron
C. Copper
D. Silver
6. Which of the following methods is the most suitable for preparing aluminium sulphate?
- A. Adding excess aluminium metal to sodium sulphate solution
B. Adding excess aluminium nitrate to dilute sulphuric acid
C. Adding excess aluminium carbonate to sodium sulphate solution
D. Adding excess aluminium oxide to dilute sulphuric acid
7. 30.0 cm^3 of 0.10 M aqueous ammonia is completely neutralized by 20.0 cm^3 of dilute sulphuric acid to form an ammonium salt solution. What is the concentration of the resultant salt solution?
- A. $0.020 \text{ mol dm}^{-3}$
B. $0.030 \text{ mol dm}^{-3}$
C. $0.050 \text{ mol dm}^{-3}$
D. $0.075 \text{ mol dm}^{-3}$

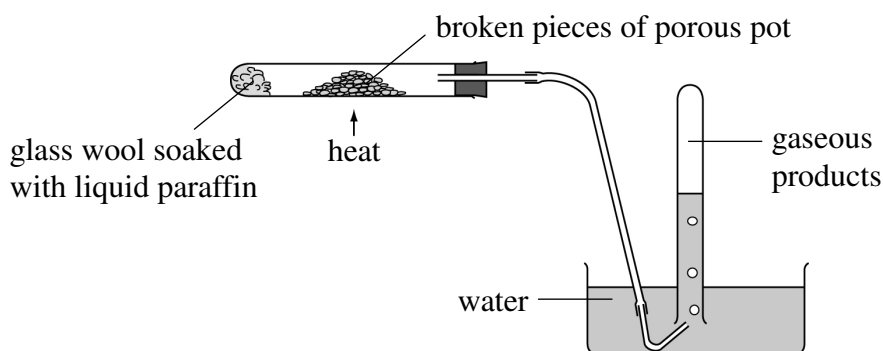
8. Consider the following part of the Electrochemical Series:



Which of the following reactions is feasible?

- A. $2\text{V}^{2+}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow 2\text{V}^{3+}(\text{aq}) + \text{Zn}^{2+}(\text{aq})$
- B. $2\text{V}^{2+}(\text{aq}) + \text{Zn}^{2+}(\text{aq}) \rightarrow 2\text{V}^{3+}(\text{aq}) + \text{Zn}(\text{s})$
- C. $2\text{VO}_2^{+}(\text{aq}) + 4\text{H}^{+}(\text{aq}) + \text{Zn}^{2+}(\text{aq}) \rightarrow \text{Zn}(\text{s}) + 2\text{VO}^{2+}(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$
- D. $2\text{V}^{3+}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{Zn}^{2+}(\text{aq}) + 2\text{V}^{2+}(\text{aq})$

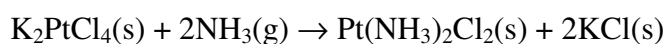
9. The following diagram shows the set-up for cracking liquid paraffin.



Which of the following statements about the experiment is correct?

- A. At the beginning of the experiment, the glass wool should be heated strongly.
- B. Large broken pieces of porous pot should be used so that the catalytic process is more efficient.
- C. The gaseous products can be collected over water because they are not soluble in water.
- D. The gaseous products can turn acidified potassium dichromate solution from orange to green.

10. Consider the following reaction:

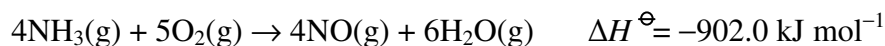


When 20.0 g of K_2PtCl_4 reacts with 5.0 g of NH_3 , what is the mass of NH_3 unreacted?

(Relative atomic masses: H = 1.0, N = 14.0, Cl = 35.5, K = 39.1, Pt = 195.1)

- A. 1.73 g
- B. 3.36 g
- C. 4.18 g
- D. 4.37 g

11. Consider the following thermochemical equation:



Given:

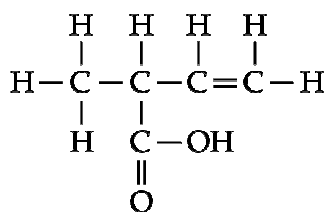
$$\Delta H_f^\ominus[\text{NH}_3(\text{g})] = -45.9 \text{ kJ mol}^{-1}$$

$$\Delta H_f^\ominus[\text{H}_2\text{O}(\text{g})] = -241.8 \text{ kJ mol}^{-1}$$

What is the standard enthalpy change of formation of nitrogen monoxide?

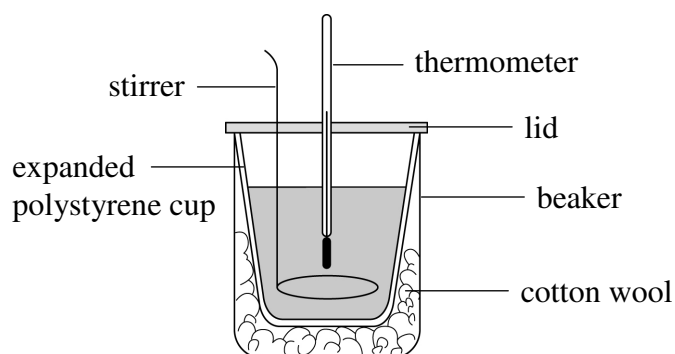
- A. $+91.3 \text{ kJ mol}^{-1}$
B. $+365.2 \text{ kJ mol}^{-1}$
C. $-183.1 \text{ kJ mol}^{-1}$
D. $-732.4 \text{ kJ mol}^{-1}$
12. For the preparation of sodium ethanoate, a titration between sodium hydroxide (in a conical flask) and ethanoic acid (in a burette) is carried out. Which of the following combinations of the indicator and the colour change at the end point is correct?
- | | <u>Indicator</u> | <u>Colour change at the end point</u> |
|----|------------------|---------------------------------------|
| A. | Methyl orange | From red to orange |
| B. | Methyl orange | From yellow to orange |
| C. | Phenolphthalein | From colourless to very pale pink |
| D. | Phenolphthalein | From pink to colourless |
13. Which of the following pairs of reactants will give the greatest temperature rise when they are mixed under the same conditions?
- A. 25 cm^3 of 2 M NaOH(aq) and 25 cm^3 of 2 M H_2SO_4 (aq)
B. 50 cm^3 of 1 M NaOH(aq) and 50 cm^3 of 1 M H_2SO_4 (aq)
C. 20 cm^3 of 5 M NaOH(aq) and 10 cm^3 of 5 M H_2SO_4 (aq)
D. 20 cm^3 of 5 M NH_3 (aq) and 10 cm^3 of 5 M H_2SO_4 (aq)
14. Which of the following pairs of aqueous solutions CANNOT be distinguished by using concentrated nitric acid?
- A. Ammonium carbonate and sodium hydrogencarbonate
B. Iron(II) chloride and iron(III) sulphate
C. Magnesium sulphite and zinc sulphate
D. Sodium nitrate and sodium iodide

15. What is the systematic name of the following compound?



- A. 2-methylbut-3-en-1-oic acid
B. 3-methylbut-1-en-4-oic acid
C. 3-methylbut-1-enoic acid
D. 2-methylbut-3-enoic acid
16. Which of the following statements is correct?
- A. Evaporation of sea water can give pure sodium chloride.
B. Fractional distillation of petroleum can give natural gas.
C. Strong heating of haematite can give iron.
D. Electrolysis of molten bauxite can give aluminium.
17. Which of the following processes are involved during the weathering of marble in nature?
- (1) Conversion of calcium carbonate to calcium hydrogencarbonate
(2) Thermal decomposition of calcium hydroxide
(3) Formation of carbonic acid
- A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)
18. Which of the following substances will cause an increase of pH of 1.0 M $\text{H}_2\text{SO}_4(\text{aq})$ upon mixing?
- (1) 1.0 M phosphoric acid (H_3PO_4)
(2) Distilled water (H_2O)
(3) Baking soda (NaHCO_3)
- A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

19. Consider the following simple calorimeter:



Which of the following enthalpy changes can be determined using the above calorimeter?

- (1) Enthalpy change of the reaction between hydrochloric acid and sodium hydroxide solution
- (2) Enthalpy change of the reaction between calcium oxide and dilute sulphuric acid
- (3) Enthalpy change of combustion of sucrose

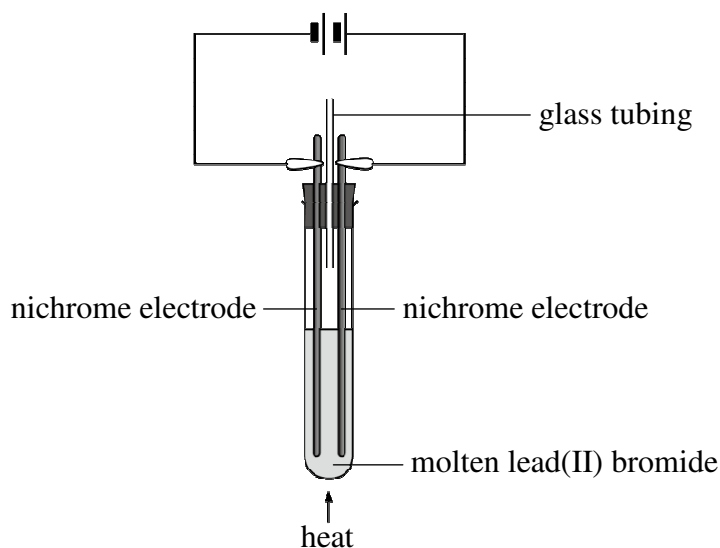
- A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

20. Which of the following statements about a ^{35}Cl atom and a ^{37}Cl atom is/are correct?

- (1) Their nuclei have different charges.
- (2) The number of protons equals to the number of electrons for each atom.
- (3) 1.0 g of ^{35}Cl has the same number of atoms as 1.0 g of ^{37}Cl .

- A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

21. Consider the following set-up. Lead(II) bromide is heated until it becomes molten.



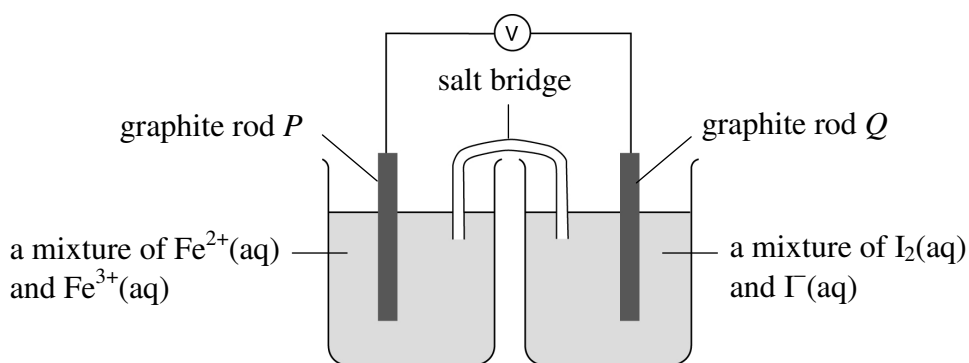
Which of the following statements about the experiment are correct?

- (1) Redox reactions take place on the surface of the nichrome electrodes.
 - (2) The experiment should be carried out in the fume cupboard.
 - (3) The glass tubing in the set-up should be removed so as to prevent the leakage of bromine.
- A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

22. Which of the following statements about water are correct?

- (1) Water has a higher density than ice because ice has an open structure.
 - (2) Water has a higher boiling point than hydrogen fluoride because there is a more extensive hydrogen bonding between water molecules.
 - (3) Water is immiscible with hexane because water molecules cannot form hydrogen bonds with hexane molecules.
- A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

23. Refer to the following set-up:



Given that $\text{Fe}^{3+}(\text{aq})$ is a stronger oxidizing agent than $\text{I}_2(\text{aq})$, which of the following statements about the set-up is/are correct when the cell operates?

- (1) The anodic reaction is $\text{Fe}^{2+}(\text{aq}) \rightarrow \text{Fe}^{3+}(\text{aq}) + \text{e}^{-}$.
 - (2) The solution around *Q* becomes deeper in colour.
 - (3) Electrons flow from *P* to *Q* through the external circuit.
- A. (1) only
 B. (2) only
 C. (1) and (3) only
 D. (2) and (3) only

24. Consider the following statements and choose the best answer:

1st statement

Town gas is a petroleum fraction.

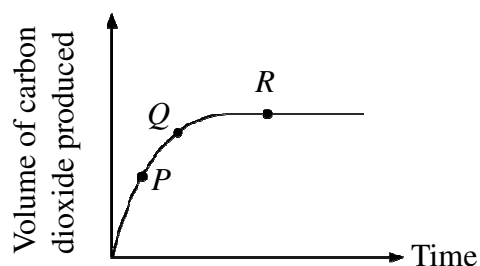
2nd statement

Town gas contains methane.

- A. Both statements are true and the 2nd statement is a correct explanation of the 1st statement.
 B. Both statements are true but the 2nd statement is NOT a correct explanation of the 1st statement.
 C. The 1st statement is false but the 2nd statement is true.
 D. Both statements are false.

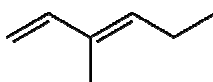
Part II

25. A known volume of dilute hydrochloric acid is allowed to react with excess calcium carbonate. The graph below shows the change in volume of carbon dioxide produced with time.



Which of the following statements about the graph is **INCORRECT**?

- A. The initial rate of the reaction is equal to the slope of tangent at time $t = 0$.
 - B. All hydrochloric acid has been used up at R .
 - C. The instantaneous rate at P is higher than that at Q .
 - D. The same graph can be obtained when the experiment is repeated using dilute sulphuric acid of the same molarity and volume.
26. Consider the following compound:



Which of the following is the major product when excess hydrogen bromide is added to the compound?

- A.
- B.
- C.
- D.

27. Which of the following statements about manganese and its compounds is **INCORRECT**?

- A. The oxidation number of manganese in MnO_4^{2-} is +6.
- B. In alkaline medium, permanganate ions are reduced by sulphur dioxide to form a brown precipitate.
- C. Manganese(IV) oxide can be used as a catalyst for the decomposition of hydrogen peroxide solution.
- D. Manganese is often mixed with iron in making stainless steel.

28. Which of the following combinations of reactions and methods of measuring reaction rate is INCORRECT?

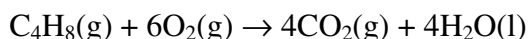
	<u>Reaction</u>	<u>Method of measuring reaction rate</u>
A.	Displacement reaction between Cu(s) and AgNO ₃ (aq)	Measure the change in colour intensity of the reaction mixture
B.	Catalytic decomposition of H ₂ O ₂ (aq) in the presence of a detergent	Measure the change in height of foam
C.	Neutralization reaction between MgO(s) and H ₂ SO ₄ (aq)	Measure the change in mass of the reaction mixture
D.	Substitution reaction between CH ₃ COCH ₃ (aq) and I ₂ (aq) in the presence of H ⁺ (aq)	Titrimetric analysis

29. The following table shows the atomic number of elements A, B and C.

Element	Atomic number
A	13
B	17
C	19

Which of the following statements concerning A, B and C is INCORRECT?

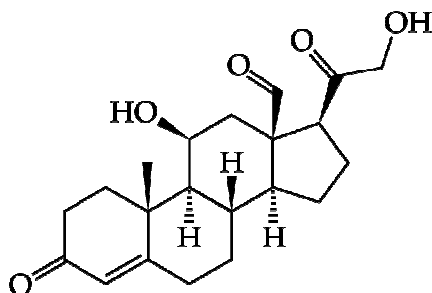
- A. The oxide of A is amphoteric.
 - B. B has a simple molecular structure.
 - C. Compared with an atom of A, the number of delocalized electrons in an atom of C is greater.
 - D. B reacts with C to form a compound which conducts electricity in the molten state.
30. But-1-ene (C₄H₈) reacts with oxygen according to the following equation:



At a certain temperature and pressure, 35 cm³ of C₄H₈(g) is mixed with 300 cm³ of O₂(g) and the mixture is then ignited. Assuming that the combustion is complete, what is the total volume of the gaseous mixture at the end of the reaction?

- A. 140 cm³
- B. 230 cm³
- C. 320 cm³
- D. 440 cm³

31. The following diagram shows the structure of aldosterone (a hormone).



Which of the following statements concerning aldosterone are correct?

- (1) It exhibits optical isomerism.
 - (2) It has an aldehyde group.
 - (3) Colourless gas bubbles evolve when it reacts with sodium carbonate solution.
- A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

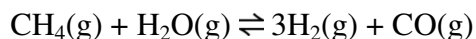
32. Which of the following statements concerning nylon 6.6 are correct?

- (1) Nylon 6.6 is stronger than polyethene.
 - (2) It is a condensation polymer.
 - (3) Hexane-1,6-diol and hexanedioyl dichloride can polymerize to give nylon 6.6.
- A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

33. Which of the following statements concerning but-1-ene and but-2-ene is/are correct?

- (1) They both exhibit *cis-trans* isomerism.
 - (2) They give different yields of 2-chlorobutane when reacting with excess HCl.
 - (3) They give different products when reacting with hydrogen.
- A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

34. Hydrogen can be produced by the following reversible reaction in the presence of nickel(II) oxide catalyst:

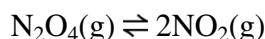


Which of the following actions would increase the yield of hydrogen?

- (1) Increase the pressure of the reaction chamber
- (2) Remove carbon monoxide from the reaction mixture continuously
- (3) Use more nickel(II) oxide catalyst

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

35. Consider the following endothermic reaction taking place in a closed container:



colourless brown

When the temperature of the system is increased at constant pressure, which of the following statements is/are correct?

- (1) The colour of the gaseous mixture becomes paler.
- (2) The value of the equilibrium constant of the reaction increases.
- (3) The rates of both forward and backward reactions increase.

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

36. Consider the following statements and choose the best answer:

1st statement

Aspirin is an antacid.

2nd statement

Aspirin contains a carboxyl group.

- A. Both statements are true and the 2nd statement is a correct explanation of the 1st statement.
- B. Both statements are true but the 2nd statement is NOT a correct explanation of the 1st statement.
- C. The 1st statement is false but the 2nd statement is true.
- D. Both statements are false.

END OF SECTION A