

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY  
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2012

**CHEMISTRY PAPER 1**

8.30 am – 11.00 am (2 hours 30 minutes)

This paper must be answered in English

**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 page 20 of Question-Answer Book **B**. Atomic numbers and relative atomic masses of elements can be obtained from the Periodic Table.
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**INSTRUCTIONS FOR SECTION A (MULTIPLE-CHOICE QUESTIONS)**

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should first stick a barcode label and insert the information required in the spaces provided. No extra time will be given for sticking on the barcode label after the 'Time is up' announcement.
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.

Not to be taken away before the end of the examination session
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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 page 20 of Question-Answer Book B.

**PART I**

1. Which of the following substances CANNOT conduct electricity ?
  - A. Pt(s)
  - B.  $\text{PbBr}_2(\text{l})$
  - C. C(graphite)
  - D.  $\text{CH}_3\text{CH}_2\text{OH}(\text{l})$
  
2. A small amount of a powder can dissolve in water to form a clear solution. When this solution is mixed with  $\text{K}_2\text{CO}_3(\text{aq})$ , a white precipitate is obtained. What can the powder be ?
  - A. sodium sulphate
  - B. calcium sulphate
  - C. sodium hydroxide
  - D. calcium hydroxide
  
3. In an oxide of metal **M**, the mass percentage of **M** is 55.0%. What is the chemical formula of this oxide ?  
(Relative atomic masses: O = 16.0, **M** = 39.1)
  - A.  $\text{MO}_2$
  - B.  $\text{M}_2\text{O}$
  - C.  $\text{M}_2\text{O}_2$
  - D.  $\text{M}_2\text{O}_3$
  
4. Which of the following statements concerning  $\text{CH}_3\text{COOH}$  and  $\text{HCl}$  is correct ?
  - A.  $\text{CH}_3\text{COOH}$  is a stronger acid than  $\text{HCl}$ .
  - B. The pH of 0.1 M  $\text{CH}_3\text{COOH}(\text{aq})$  is lower than that of 0.1 M  $\text{HCl}(\text{aq})$ .
  - C. Both  $\text{CH}_3\text{COOH}(\text{aq})$  and  $\text{HCl}(\text{aq})$  react with  $\text{NH}_3(\text{aq})$ , each giving a salt.
  - D. Both  $\text{CH}_3\text{COOH}(\text{aq})$  and  $\text{HCl}(\text{aq})$  react with  $\text{Ag}(\text{s})$ , each giving a colourless gas.
  
5. Which of the following molecules is polar ?
  - A.  $\text{BF}_3$
  - B.  $\text{C}_{60}$
  - C.  $\text{NH}_3$
  - D.  $\text{SF}_6$

6. What is the oxidation number of Cu in  $\text{Cu}(\text{NH}_3)_4\text{Cl}_2$  ?

- A. 0
- B. +2
- C. +4
- D. +6

7. The standard enthalpy changes of combustion of some substances are shown below :

<u>Substance</u>	<u>Standard enthalpy change of combustion at 298 K / <math>\text{kJ mol}^{-1}</math></u>
$\text{H}_2(\text{g})$	-286
$\text{C}(\text{graphite})$	-394
$\text{CH}_3\text{CH}_2\text{OH}(\text{l})$	-1371

The standard enthalpy change of formation at 298 K of  $\text{CH}_3\text{CH}_2\text{OH}(\text{l})$  is

- A.  $-275 \text{ kJ mol}^{-1}$ .
- B.  $+275 \text{ kJ mol}^{-1}$ .
- C.  $+691 \text{ kJ mol}^{-1}$ .
- D.  $-3017 \text{ kJ mol}^{-1}$ .

8. Silicon and carbon react to form silicon carbide. The crystal structure of silicon carbide is similar to that of diamond. Silicon carbide is very hard because

- A. it has a high melting point.
- B. silicon atoms and carbon atoms form triple bonds.
- C. it has a giant network structure with strong covalent bonds.
- D. both silicon and carbon atoms have four outermost shell electrons.

9. Which of the following statements concerning an aluminium ore consisting mainly of  $\text{Al}_2\text{O}_3$  is correct ?

(Relative atomic masses: O = 16.0, Al = 27.0)

- A. Carbon can be used to extract aluminium from this ore.
- B. The abundance of this ore in the earth crust is very low.
- C. This ore contains more than 55% of aluminium by mass.
- D. Aluminium can be extracted from this ore due to the advancement of technology in applying electricity.

10. A sample of 1.02 g of potassium hydrogenphthalate ( $\text{C}_8\text{H}_5\text{O}_4\text{K}$ ) is dissolved completely in distilled water, and then diluted to  $250.0 \text{ cm}^3$ . What is the concentration of the solution obtained ?

(Relative atomic masses: H = 1.0, C = 12.0, O = 16.0, K = 39.1)

- A. 0.004 M
- B. 0.010 M
- C. 0.020 M
- D. 4.080 M

11. Compound **X** has the following structure :



The systematic name of **X** is

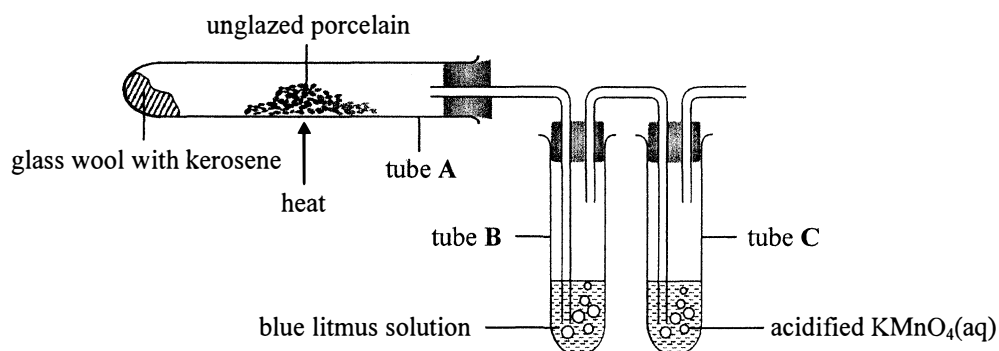
- A. prop-1-en-3-ol.  
B. prop-2-en-1-ol.  
C. 3-hydroxypropene.  
D. 1-hydroxyprop-3-ene.
12. Which of the following molecules is planar ?
- A.  $\text{BF}_3$   
B.  $\text{NH}_3$   
C.  $\text{CH}_4$   
D.  $\text{PCl}_5$
13. The tendency of being reduced of six ionic species increases in the order as shown below :
- $$\text{Ba}^{2+}(\text{aq}) < \text{Na}^+(\text{aq}) < \text{Mg}^{2+}(\text{aq}) < \text{H}^+(\text{aq}) < \text{Cu}^{2+}(\text{aq}) < \text{Hg}^{2+}(\text{aq})$$
- Which of the following statements is correct ?
- A.  $\text{Ba}(\text{s})$  does NOT react with  $\text{H}^+(\text{aq})$ .  
B.  $\text{Na}(\text{s})$  has a stronger reducing power than  $\text{Hg}(\text{l})$ .  
C.  $\text{Hg}^{2+}(\text{aq})$  is the weakest oxidising agent among the six species.  
D. Displacement reaction occurs when  $\text{Cu}(\text{s})$  is immersed in  $\text{MgSO}_4(\text{aq})$ .
14. Which of the following pairs of reactants would react in water to give out the largest amount of heat ?
- A. 1 mol of  $\text{HCl}$  and 1 mol of  $\text{KOH}$   
B. 1 mol of  $\text{H}_2\text{SO}_4$  and 2 mol of  $\text{KOH}$   
C. 1 mol of  $(\text{COOH})_2$  and 2 mol of  $\text{KOH}$   
D. 1 mol of  $\text{CH}_3\text{COOH}$  and 1 mol of  $\text{KOH}$
15. Which of the following statements concerning an  $^{131}\text{I}$  atom and a  $^{131}\text{Xe}$  atom is / are correct ?
- (1) They have the same number of protons.  
(2) They have different numbers of neutrons.  
(3) They have different numbers of outermost shell electrons.
- A. (1) only  
B. (2) only  
C. (1) and (3) only  
D. (2) and (3) only

16. Which of the following combinations is / are correct ?

	Object	Corresponding corrosion prevention method / principle
(1)	aluminium window frames	cathodic protection
(2)	galvanised iron buckets	sacrificial protection
(3)	tin-plated iron cans	alloying

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

17. The diagram below shows the set-up of an experiment :



The unglazed porcelain in tube A is strongly heated and the glass wool is occasionally heated. Which of the following statements is / are correct ?

- (1) A chemical reaction occurs at the glass wool.  
 (2) There is NO colour change in the solution in tube B.  
 (3) There is NO colour change in the solution in tube C.

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

18. Which of the following statements concerning a hydrogen-oxygen fuel cell is / are correct ?

- (1) It produces non-polluting product.  
 (2) The membrane in it selectively allows hydroxide ions to pass through.  
 (3) It can continuously produce electricity as long as hydrogen and oxygen are supplied under operating conditions.

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

19. In which of the following processes would a colourless gas evolve ?

- (1) Magnesium is added to dilute sulphuric acid.
- (2) Ammonium chloride is heated with calcium hydroxide.
- (3) Water is added to a solid mixture of citric acid and sodium hydrogencarbonate.

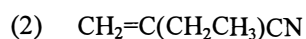
- A. (1) and (2) only
- B. (1) and (3) only
- C. (2) and (3) only
- D. (1), (2) and (3)

20. Which of the following methods can be used to distinguish between  $\text{ZnCl}_2(\text{aq})$  and  $\text{CaBr}_2(\text{aq})$  ?

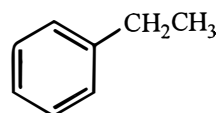
- (1) adding  $\text{NH}_3(\text{aq})$
- (2) performing flame test
- (3) evaporating to dryness

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

21. Which of the following compounds can be used as monomers to make addition polymers ?



(3)



- 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 processes involve redox reaction ?

- (1) mixing methanol and ethanol
- (2) mixing chlorine and methane under sunlight
- (3) mixing ethene and acidified  $\text{KMnO}_4(\text{aq})$

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

**Directions :** Each question below (Questions 23 and 24) consists of two separate statements. Decide whether each of the two statements is true or false; if both are true, then decide whether or not the second statement is a *correct* explanation of the first statement. Then select one option from A to D according to the following table :

- 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.

1st statement	2nd statement
23. When iron and copper are separately immersed in hexane completely, iron corrodes faster than copper.	Iron can be oxidised more readily than copper.
24. Burning fossil fuels can cause acid rain.	Burning fossil fuels produces carbon dioxide.

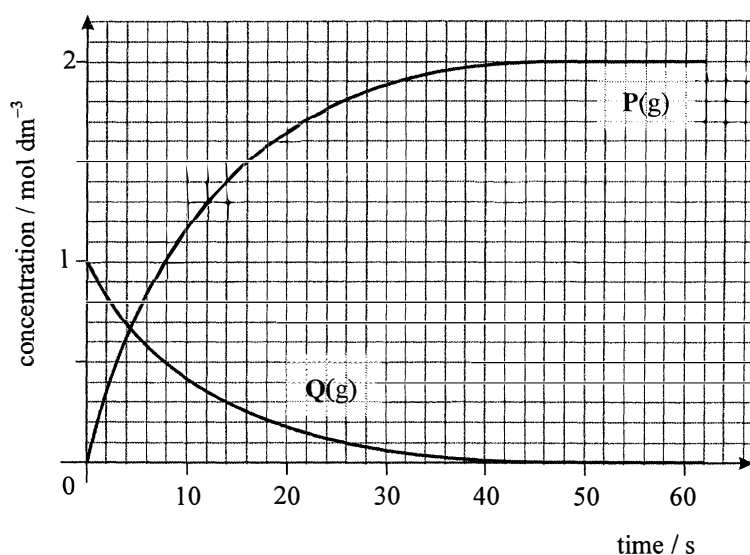
## PART II

25. What is the theoretical volume of carbon dioxide that can be obtained, at room temperature and pressure, when 1.2 g of  $\text{Na}_2\text{CO}_3(\text{s})$  reacts with 50  $\text{cm}^3$  of 1.0 M  $\text{HNO}_3$ ?

(Molar volume of gas at room temperature and pressure = 24  $\text{dm}^3$ ;  
Relative atomic masses: H = 1.0, C = 12.0, N = 14.0, O = 16.0, Na = 23.0)

- A. 272  $\text{cm}^3$
- B. 544  $\text{cm}^3$
- C. 600  $\text{cm}^3$
- D. 1200  $\text{cm}^3$

26. The concentration-time graph for a certain chemical reaction in a closed vessel of fixed volume is shown below:

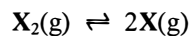


Which of the following chemical equations correctly represents the reaction?

- A.  $\text{P(g)} \rightarrow \text{Q(g)}$
- B.  $\text{Q(g)} \rightarrow \text{P(g)}$
- C.  $\text{P(g)} \rightarrow 2\text{Q(g)}$
- D.  $\text{Q(g)} \rightarrow 2\text{P(g)}$

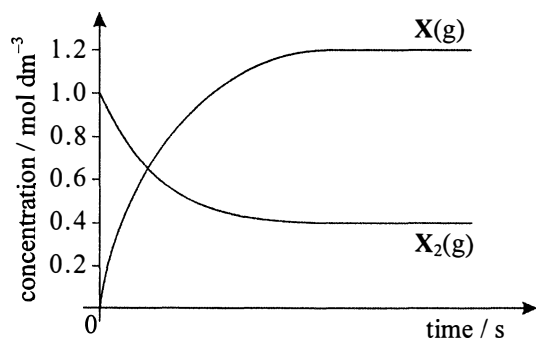


27. In a 1 dm<sup>3</sup> closed container, 1 mole of X<sub>2</sub>(g) undergoes decomposition to form X(g) until equilibrium is attained. The chemical equation concerned is shown below :

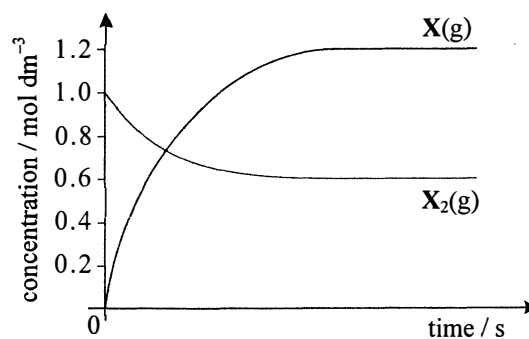


Which of the following graphs correctly shows the variation in concentrations of X<sub>2</sub>(g) and X(g) with time ?

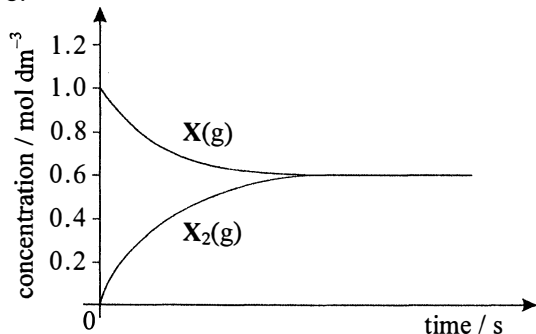
A.



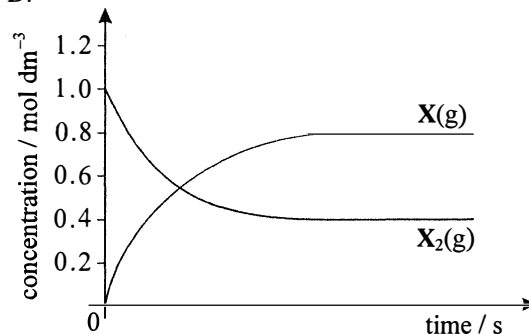
B.



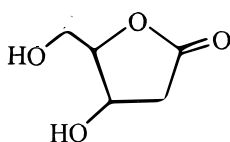
C.



D.



28. The structure of an organic compound is shown below :



Which of the following statements is correct ?

- A. The compound does NOT show enantiomerism.
- B. The molecular formula of the compound is C<sub>5</sub>H<sub>6</sub>O<sub>4</sub>.
- C. The compound contains a ketone group.
- D. The compound can be oxidised by acidified K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>(aq).

29. Which of the following statements concerning compound U ( $\text{CH}_3\text{CH}_2\text{CH}=\text{CHCH}_2\text{CH}_2\text{OH}$ ) is correct ?

- A. The empirical formula of U is  $\text{C}_3\text{H}_6\text{O}$ .
- B. The systematic name of U is hex-4-en-1-ol.
- C. U reacts with HCl to give a single product.
- D. U can separately turn  $\text{Br}_2(\text{aq})$  and acidified  $\text{KMnO}_4(\text{aq})$  colourless.

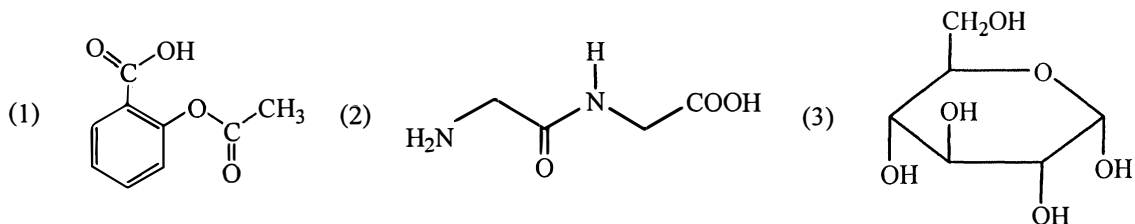
30. Which of the following ions can act as both an oxidising agent and a reducing agent ?

- A.  $\text{Fe}^{2+}(\text{aq})$
- B.  $\text{Cu}^{2+}(\text{aq})$
- C.  $\text{Cr}_2\text{O}_7^{2-}(\text{aq})$
- D.  $\text{MnO}_4^{-}(\text{aq})$

31. Which of the following oxides would form an acidic solution when added to water ?

- A. carbon dioxide
- B. silicon dioxide
- C. aluminium oxide
- D. lithium oxide

32. Which of the following structures represent(s) the active ingredient(s) in aspirin tablets ?



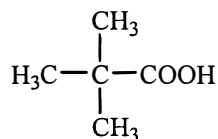
- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

33. Which of the following compounds can be formed when  $(\text{CH}_3)_2\text{C}(\text{OH})\text{CH}_2\text{CH}_3$  is dehydrated ?

- (1)  $(\text{CH}_3)_2\text{C}=\text{CHCH}_3$
- (2)  $(\text{CH}_3)_2\text{CHCH}=\text{CH}_2$
- (3)  $\text{CH}_2=\text{C}(\text{CH}_3)\text{CH}_2\text{CH}_3$

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

34. The structure of a compound is shown below :



Which of the following statements concerning the compound are correct ?

- (1) It can form a salt with aqueous ammonia.  
(2) It can be reduced to an alkanol by using  $\text{LiAlH}_4$ .  
(3) It can form an ester with methanol under suitable conditions.

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

**Directions :** Each question below (Questions 35 and 36) consists of two separate statements. Decide whether each of the two statements is true or false; if both are true, then decide whether or not the second statement is a *correct* explanation of the first statement. Then select one option from A to D according to the following table :

- 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.

1st statement		2nd statement
35.	Increasing reaction temperature can increase the yield for all reversible chemical reactions.	Increasing reaction temperature can shorten the time needed to attain equilibrium for all reversible chemical reactions.
36.	2-Chlorobut-1-ene shows geometrical isomerism.	2-Chlorobut-1-ene has a double bond.

**END OF SECTION A**