2016-DSE
CHEM

PAPER 1A

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2016

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.

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

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. A flame test conducted for a sample gives a brick-red flame. The sample may contain

   A. chalk.
   B. quartz.
   C. graphite.
   D. rock salt.

2. Which of the following is the electron diagram (only electrons in the outermost shells are shown) of lithium sulphide ?

   A. $Li:\ddot{S}:$
   B. $[Li]^+[:\ddot{S}:]^-$
   C. $[Li]^+\ [:\ddot{S}:]^{2-}\ [Li]^+$
   D. $[:\ddot{Li}:]^+[:\ddot{S}:]^{2-}[:\ddot{Li}:]^+$

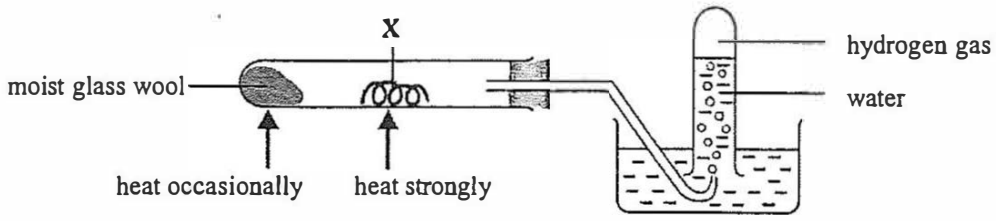
3. Consider the following information concerning metal **Y** :

   (1) **Y** reacts vigorously with water.
   (2) **Y** forms an oxide with chemical formula Y_2O.
   (3) An atom of **Y** has five occupied electron shells.

   Y may be

   A. silver (Ag).
   B. caesium (Cs).
   C. strontium (Sr).
   D. rubidium (Rb).

4. Consider the following experimental set-up :



   Which of the following would NOT be **X** ?

   A. iron
   B. zinc
   C. copper
   D. magnesium

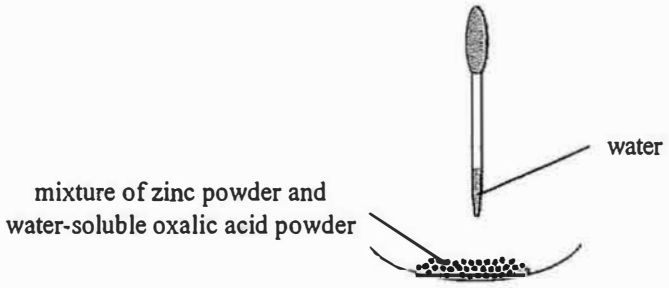
5. Tin plating is used to prevent iron cans from rusting because

A. tin provides sacrificial protection to iron.
B. tin layer prevents iron from exposure to air.
C. tin is higher than iron in the metal reactivity series.
D. tin and iron form an alloy which does not corrode.

6. The pH of a sample of sulphuric acid is 2.6. 100 cm^3 of this sample is mixed with 100 cm^3 of water. What is the pH of the resulting mixture ?

A. 5.8
B. 2.9
C. 2.6
D. 1.3

7. Consider the following experimental set-up :



A colourless gas is given out when water is dropped to the mixture. Which of the following statements is correct ?

A. Oxalic acid ionises in water to give hydrogen ions.
B. Zinc ionises in water to give zinc ions.
C. Water reacts with oxalic acid to give the colourless gas.
D. Water reacts with zinc to give the colourless gas.

8. Which of the following pairs of substances, when mixed together, can be used to prepare copper(II) sulphate crystals ?

A. CuO(s) and $H_2SO_4(aq)$
B. CuO(s) and $MgSO_4(aq)$
C. Cu(s) and $H_2SO_4(aq)$
D. Cu(s) and $MgSO_4(aq)$

9. 1 mol of a hydrocarbon requires 9 mol of oxygen for complete combustion. Which of the following may be this hydrocarbon ?

A. C_6H_6
B. C_6H_{10}
C. C_6H_{12}
D. C_6H_{14}

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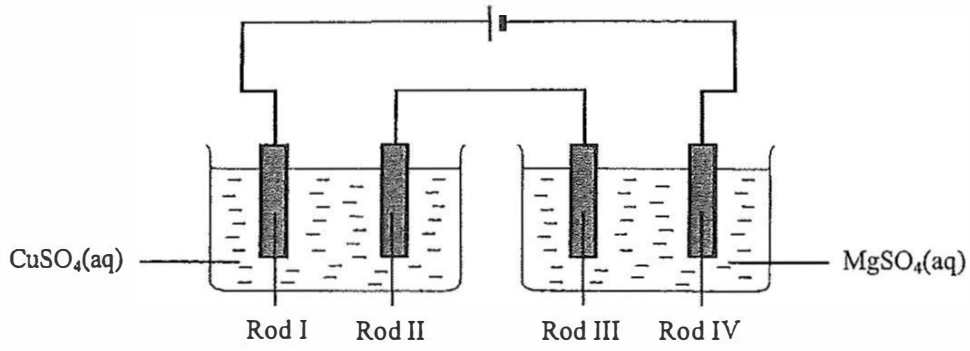
10. Which of the following CANNOT be converted into substances that are less harmful when passed through a catalytic converter ?

A. nitrogen oxides
B. sulphur dioxide
C. carbon monoxide
D. unburnt hydrocarbons

11. In which of the following compounds does nitrogen have the highest oxidation number ?

A. NF_3
B. N_2H_4
C. $NaNH_2$
D. $HONH_2$

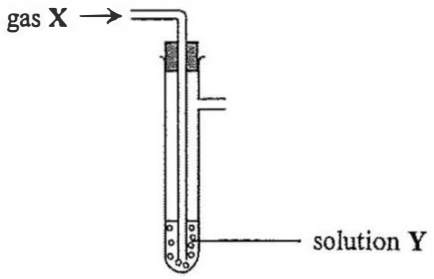
12. The diagram below shows the set-up used in an electroplating experiment involving four iron rods :



On which of the following iron rods would a metal be plated ?

A. Rod I
B. Rod II
C. Rod III
D. Rod IV

13. Gas **X** is bubbled steadily into solution **Y** as shown in the diagram below :



In which of the following combinations would NOT have a visible change in solution **Y** ?

	gas **X**	solution **Y**
A.	$Cl_2(g)$	KI(aq)
B.	$O_2(g)$	$FeSO_4(aq)$
C.	$CO_2(g)$	acidified $KMnO_4(aq)$
D.	$SO_2(g)$	acidified $Na_2Cr_2O_7(aq)$

14. Which of the following is NOT a redox reaction ?

A. $2AgBr(s) \rightarrow 2Ag(s) + Br_2(g)$
B. $SO_2(g) + 2H_2S(g) \rightarrow 3S(s) + 2H_2O(l)$
C. $2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$
D. $Ca(HCO_3)_2(aq) \rightarrow CaCO_3(s) + H_2O(l) + CO_2(g)$

15. The following equation shows the reaction when a secondary cell is discharging :

$2NiO(OH)(s) + Cd(s) + 2H_2O(l) \rightarrow 2Ni(OH)_2(s) + Cd(OH)_2(s)$

Which of the following half equations shows the change at the negative electrode when the cell is being recharged ?

A. $Cd(s) + 2OH^-(aq) \rightarrow Cd(OH)_2(s) + 2e^-$
B. $Cd(OH)_2(s) + 2e^- \rightarrow Cd(s) + 2OH^-(aq)$
C. $Ni(OH)_2(s) + OH^-(aq) \rightarrow NiO(OH)(s) + H_2O(l) + e^-$
D. $NiO(OH)(s) + H_2O(l) + e^- \rightarrow Ni(OH)_2(s) + OH^-(aq)$

16. Which of the following compounds has the highest boiling point ?

A. HF
B. HCl
C. PH_3
D. H_2Se

17. Which of the following statements concerning petroleum is / are correct ?

(1) It is a source of aliphatic hydrocarbons.
(2) It can be separated into liquids of different viscosity by a separating funnel.
(3) It is a fossil fuel derived from ancient marine organisms.

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

Go on to the next page

18. Which of the following statements concerning vinegar is / are correct ?

(1) The process of forming hydrogen ions in vinegar is reversible.
(2) Neutralisation occurs when sugar is added to vinegar.
(3) The pH of vinegar used in kitchen is around 1.

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

19. The hazard warning label below is displayed on a bottle containing chemical **Z** :

Which of the following chemicals may **Z** be ?

(1) sodium
(2) trichloromethane
(3) concentrated aqueous ammonia

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

20. Pb is an element in Group IV of the Periodic Table and can form Pb^{2+} ion. Which of the following statements are correct ?

(1) The change from Pb^{2+} ion to Pb atom is a reduction.
(2) Both Pb atom and Pb^{2+} ion have the same number of protons.
(3) Both Pb atom and Pb^{2+} ion have the same number of occupied electron shells.

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 molecules have a similar shape ?

(1) BCl_3
(2) NH_3
(3) PF_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 are exothermic ?

(1) placing calcium oxide in water
(2) placing a zinc strip in a copper(II) sulphate solution
(3) passing hydrogen chloride gas into a sodium hydroxide solution

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.	During anodisation, the aluminium oxide on the surface of aluminium is reduced to metal.	The corrosion resistance of aluminium can be enhanced by anodisation.
24.	The standard enthalpy change of formation of a compound must be a negative value.	Under standard conditions, a compound must be energetically more stable than its constituent elements.

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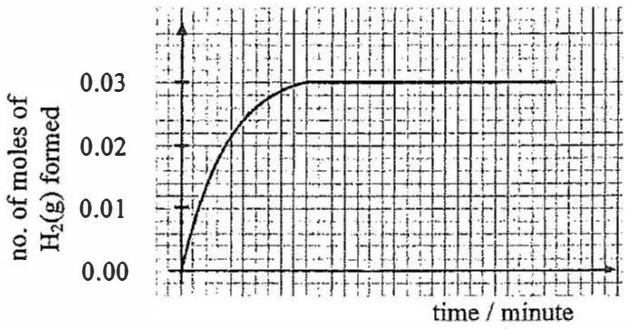
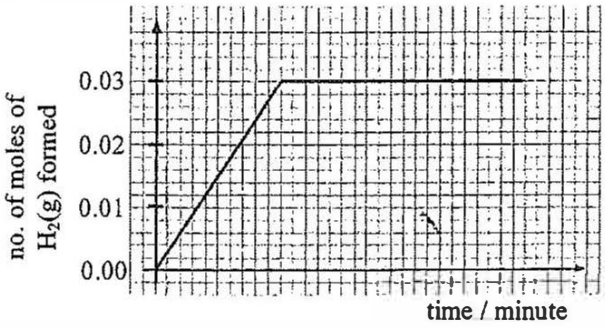
PART II

25. In an experiment, 0.03 mol of Mg(s) is allowed to react with 20.0 cm^3 of 1.0 M HCl(aq). Which of the following graphs best represents the results of the experiment ?

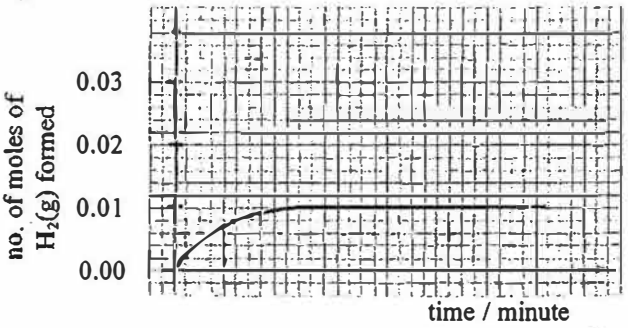
A.



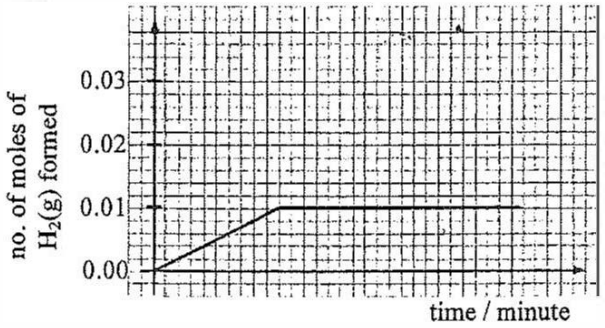
B.



C.



D.



26. The following reaction has attained equilibrium in a fixed volume container :

$CO(g) + H_2O(g) \rightleftharpoons CO_2(g) + H_2(g) \qquad \Delta H = -41.1\ kJ\ mol^{-1}$

Which of the following is correct if the temperature of the system is increased ?

A. The pressure of the system remains unchanged.
B. Both the rates of forward and backward reaction increase.
C. The equilibrium constant of the reaction remains unchanged.
D. The respective yields of $CO_2(g)$ and $H_2(g)$ increase to the same extent.

27. Consider the following equilibrium system :

$Br_2(aq) + H_2O(l) \rightleftharpoons HOBr(aq) + H^+(aq) + Br^-(aq)$

Which of the following can turn the colour of the system paler ?

A. passing HCl(g) into the system
B. passing HBr(g) into the system
C. adding NaBr(s) to the system
D. adding NaOH(s) to the system

28. Which of the following statements concerning but-1-ene and butan-1-ol is INCORRECT ?

A. Both of them can decolourise acidified $KMnO_4(aq)$.
B. Butan-1-ol can react with $PBr_3(l)$ while but-1-ene cannot.
C. Both of them can react with $H_2(g)$ in the presence of platinum.
D. But-1-ene can be obtained from heating butan-1-ol with $Al_2O_3(s)$.

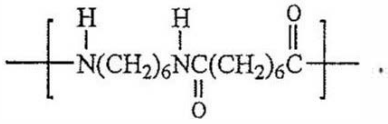
29. The molecular formula of compound **X** is $C_4H_4O_4$. It has two $-COOH$ groups. How many isomers may **X** have ?

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

30. Which of the following trends involving Na, Mg and Al is INCORRECT ?

A. Melting point of metal : Al > Mg > Na
B. Electronegativity of metal : Al > Mg > Na
C. Metal reactivity with water : Na > Mg > Al
D. Base strength of metal oxide : $Al_2O_3 > MgO > Na_2O$

31. Which of the following statements concerning nylon-6,6 is / are correct ?

(1) It can be used to make ropes.
(2) The polymerisation in forming it is a hydrolysis process.
(3) Its repeating unit is  .

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

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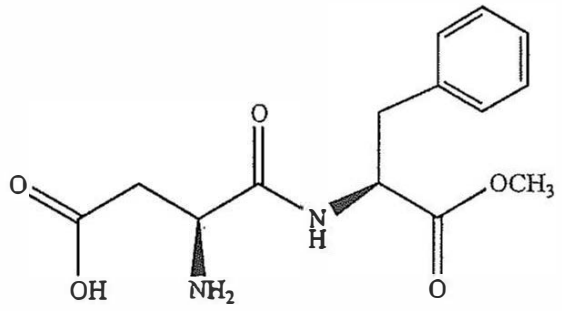
32. Aspartame is an artificial sweetener. The structure of it is shown below :



Which of the following statements concerning an aspartame molecule is / are correct ?

(1) It has two ester groups.
(2) It has two chiral centres.
(3) It has two amide groups.

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

33. Which of the following statements are correct ?

(1) Magnesium oxide dissolves faster in 1 M HCl(aq) than in 1 M CH_3CO_2H(aq).
(2) Powdered marble dissolves faster in 1 M HCl(aq) than granular marble does.
(3) H_2O_2(aq) decomposes faster in the presence of MnO_2(s) than without MnO_2(s).

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

34. Consider the following reaction :

$Br_2(aq) + HCOOH(aq) \rightarrow CO_2(g) + 2HBr(aq)$

Which of the following can be measured in order to follow the progress of the reaction ?

(1) the volume of gas formed
(2) the turbidity of the reaction mixture
(3) the colour intensity of the reaction mixture

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

35. Soap can

(1) be made from fats.
(2) emulsify oily particles.
(3) increase the surface tension of water.

Which of the following combinations is correct ?

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

Directions : Question 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**
36.	$P_4O_{10}(s)$ can react with NaOH(aq).	$P_4O_{10}(s)$ is an acidic oxide.

END OF SECTION A