HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2069

CHEMISTRY PAPER 1

8:30 – 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 18 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. This question-answer book consists of 11 pages.
2. Read carefully the instructions on the Answer Sheet. Write your Name, Class and Class Number in the spaces provided.
3. 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.
4. All questions carry equal marks.
5. 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.
6. You should mark only ONE answer for each question. If you mark more than one answer, you will receive NO MARKS for that question.
7. No marks will be deducted for wrong answers.

1. Which of the following statements are true about the three atoms?

	Atom **X**	Atom **Y**	Atom **Z**
Number of protons	6	6	4
Number of neutrons	6	8	5

(1) Atom **X** and **Y** are isotopes
(2) Atom **Z** has 4 electrons
(3) All three atoms have 2 occupied electron shells.

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

2. Which of the following statements about graphite is **INCORRECT?**

A. Each carbon atom in graphite is bonded to 3 other carbon atoms by covalent bonding.
B. Only covalent bonding exists in graphite.
C. Graphite has a very high melting point.
D. Graphite has a giant covalent structure.

3. Quicklime is added to water, what is the product of the reaction?

A. Limewater
B. Marble
C. Calcium hydrogencarbonate
D. Calcium Oxide

4. The following table shows the melting points and electrical conductivity of three compounds **L, M, N.**

	Melting point	Electrical conductivity
Compound **L**	800 ºC	Conducts in molten state or in aqueous solution
Compound **M**	-56 ºC	Does not conduct electricity
Compound **N**	230 ºC	Conducts in solid and molten state

Which of the following best describes the chemical structures of the three compounds

	Compound **L**	Compound **M**	Compound **N**
A.	Giant ionic structure	Giant metallic structure	Giant ionic structure
B.	Giant covalent structure	Simple molecular structure	Giant metallic structure
C.	Giant ionic structure	Simple molecular structure	Giant metallic structure
D.	Giant metallic stucture	Simple molecular structure	Giant covalent structure

5. Which of the following statements are true about sodium (Na) and potassium (K)

(1) They can both react with cold water.
(2) They have similar chemical properties.
(3) They have the same electronic arrangement.

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

6. Iron can be produced from iron(III) oxide by carbon reduction with the following reaction.

$$2Fe_2O_{3(s)} + 3C_{\ s} \rightarrow 4Fe_{\ s} + 3CO_{2(g)}$$

Which of the following statements about the above reaction is true?

A. Iron is the reducing agent.
B. The reaction is a redox reaction.
C. Heat is not required for the reaction to proceed.
D. In the industrial process of extracting iron, $CO_{2(g)}$ is the only gaseous product.

7. You are tasked with processing acidic chemical waste before discharging it. Which of the following chemicals should you use to neutralize the acidic solution?

(1) Calcium carbonate
(2) Potassium hydroxide solution
(3) Ammonia

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

8. 50 cm^3 of 0.25M $Fe_2(SO_4)_{3(aq)}$ is added to 50 cm^3 of 0.45M $CaCl_{2(aq)}$, what is the theoretical mass of $CaSO_{4(s)}$ obtained in the subsequent reaction?

A. 5.11g
B. 2.55g
C. 3.06g
D. 4.26g

9. Which of the following statements concerning the reaction between excess calcium carbonate and dilute hydrochloric acid is **incorrect**.

A. An acidic gas product is given off.
B. The reaction is a neutralization reaction.
C. Calcium chloride can be extracted from the mixture.
D. Calcium carbonate solid dissolves in the solution.

10. Which of the following measures can prevent an iron block from rusting?

(1) Place a tin block on top of the iron block.
(2) Connect the iron block to the negative terminal of a DC power supply.
(3) Put a layer of greasing oil over the iron block

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

11. Consider the following chemical equation:

$$\boldsymbol{x}NaOH + SiO_2 \rightarrow Na_{\boldsymbol{x}}SiO_3 + \boldsymbol{y}H_2O$$

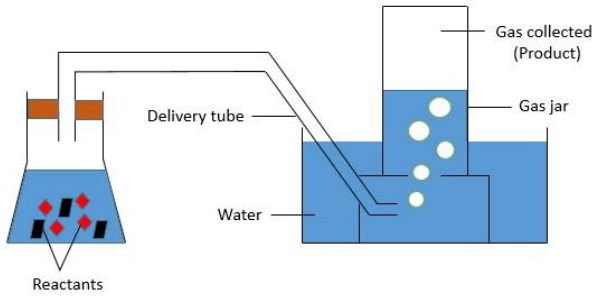
What is the ratio ***x : y***?

A. 2:1
B. 1:1
C. 1:2
D. 3:2

12. A student is using titration to determine the concentration of a reactant **K**, he found that he is using much more titrant than his friends who are doing the same task. Which of the following can be the reason to explain this?
    A. He rinsed the conical flask with distilled water before each titration trial.
    B. He forgot to remove the filter funnel from the top of the burette after filling it up.
    C. He rinsed the pipette with distilled water only but not with reactant **K**.
    D. He rinsed the burette with distilled water only but not with the titrant

13. Which of the following statements regarding sulphuric acid is correct?
    (1) Concentrated sulphuric acid can act as a dehydrating agent.
    (2) Dilute sulphuric acid can react with copper metal.
    (3) Concentrated sulphuric acid can react with copper metal.
    A. (1) and (2) only
    B. (1) and (3) only
    C. (2) and (3) only
    D. (1), (2) and (3)

14. Refer to the following experimental diagram to collect a gaseous product.



    Given that the reactants are citric acid and zinc metal, which of the following are true about the gas collected.
    (1) The gas can dissolve in water to give an acidic solution.
    (2) The gas can react explosively with oxygen.
    (3) A glowing splint can be relighted when put inside a test tube of the gas.
    A. (1) and (2) only
    B. (1) and (3) only
    C. (2) and (3) only
    D. (1), (2) and (3)

15. Calculate the molarity of $Cl^-_{(aq)}$ when 100 cm^3 of 0.4M sodium chloride solution is mixed with 50cm^3 of 0.7M aluminium chloride solution.
    A. 0.55M
    B. 0.96M
    C. 0.67M
    D. 0.5M

16. Which of the following concerning 1M $NH_{3(aq)}$ and 1M $NaOH_{(aq)}$ is correct.
    A. They have the same pH values.
    B. The same number of moles of HCl is required to neutralize both solutions.
    C. They both appear blue when a few drops of universal indicator is added to each of the solutions.
    D. They both react with dilute $H_2SO_{4(aq)}$ to produce the same amount of heat

17. Consider the two molecules, C_5H_{12} and CH_3COOH, which of the following statements are correct?
    (1) C_5H_{12} molecules can form hydrogen bonds with CH_3COOH molecules.
    (2) CH_3COOH is polar while C_5H_{12} is non-polar.
    (3) Both compounds can undergo substitution reaction when mixed with Br_2 in an organic solvent and under UV light.
    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 pairs of reactants will react to give a clear solution?
    A. $NaOH_{(aq)}$ in excess and $FeCl_{2(aq)}$
    B. $NH_{3(aq)}$ in excess and $AgNO_{3(aq)}$
    C. $KOH_{(aq)}$ in excess and $ZnSO_{4(aq)}$
    D. $NH_{3(aq)}$ in excess and $Cu(NO_3)_{2(aq)}$

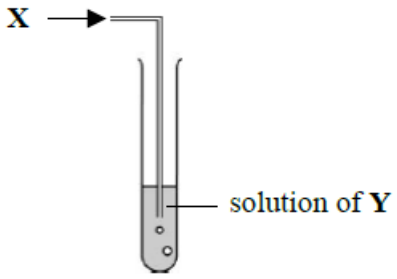
19. Which of the following metal electrode pairs will produce the largest voltage when used as cathodes and anodes of a chemical cell.
    A. Zn and Ag
    B. Zn and Cu
    C. Mg and Ag
    D. Mg and Cu

20. Consider the following reaction, which of the following statements are true?

$$Cl_2 + H_2O \rightarrow HOCl + HCl$$

    (1) The oxidation number of Cl in both product compounds are 0.
    (2) Chlorine is reduced.
    (3) Chlorine is oxidized.
    A. (1) only
    B. (2) only
    C. (1) and (3) only
    D. (2) and (3) only

21. Gas **X** is bubbled into solution **Y** as shown below.



Which pair of gas **X** and solution **Y** will exhibit no observable change?

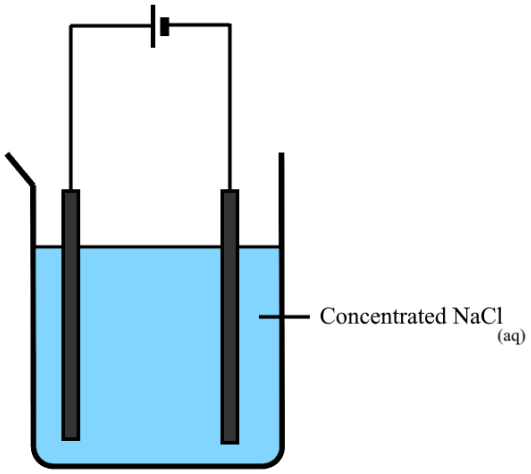
	Gas **X**	Solution **Y**
A.	$Cl_{2(g)}$	$Br_{2(aq)}$
B.	$SO_{2(g)}$	$KMnO_{4(aq)}$
C.	$O_{2(g)}$	$ZnSO_{4(aq)}$
D.	$O_{2(g)}$	$FeSO_{4(aq)}$

22. In which of the following compounds does P exhibit highest oxidation number?
    A. PCl_5
    B. H_3PO_3
    C. PH_3
    D. P_4

23. Which of the following molecules contains a dative covalent bond?
    A. BCl_3
    B. NH_3
    C. H_3O^+
    D. H_2SO_4

24. In a chemical cell, which of the following solutions can be used as the electrolyte?
    A. Ethanol
    B. Distilled water
    C. Octane
    D. Dilute sulphuric acid

Refer to the following diagram to answer questions 25-27.



25. What are the observations at the cathode and anode (both made of graphite)?

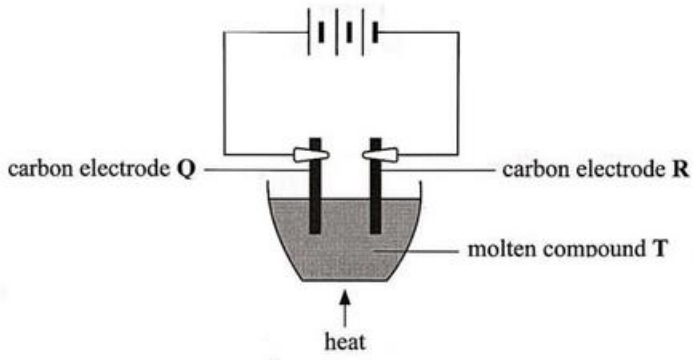
	Cathode	Anode
A.	Silvery solids are formed	Pale green gas is given off
B.	Colourless gas bubbles evolve	Colourless gas bubbles evolve
C.	Silvery solids are formed	Colourless gas bubbles evolve
D.	Colourless gas bubbles evolve	Pale green gas is given off

26. Suppose a piece of moist blue litmus paper is placed above anode, what will be observed?
    A. The blue litmus paper turns red and then white.
    B. The blue litmus paper turns red.
    C. The blue litmus paper turns pale green due to chlorine gas.
    D. There are no observable changes.

27. After a while, what will happen to the solution?
    A. Becomes more dilute.
    B. Becomes more concentrated.
    C. Becomes sodium hydroxide solution.
    D. Becomes hydrochloric acid.

28. In an electroplating reaction, $CrCl_3$ is produced as chemical waste, which of the following substances can be used to process it?
    A. KNO_3
    B. NaOH
    C. H_2SO_4
    D. $SO_{2(g)}$

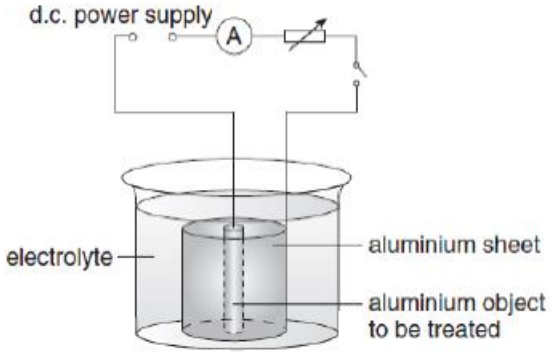
29. The following set-up is used to electrolyse molten compound **T**. **T** is a hydride of metal **M**. During electrolysis, hydrogen is given out at electrode **Q**.



During electrolysis, if the number of moles of metal **M** atoms produced is equal to that of hydrogen molecules produced, what is the oxidation number of **M** in compound **T**?
    A. +2
    B. +1
    C. -1
    D. -2

30. Which of the following shows the oxidizing power of group VII elements?
    A. $F_2 < Cl_2 < Br_2 < I_2$
    B. $F^- < Cl^- < Br^- < I^-$
    C. $F_2 > Cl_2 > Br_2 > I_2$
    D. $F^- > Cl^- > Br^- > I^-$

31. Which of the following about the anodization setup is/are correct?



(1) The electrolyte **MUST** be dilute sulphuric acid
(2) The aluminium object to be treated should be connected to the positive terminal of the DC power supply.
(3) The aluminium sheet can be replaced by a graphite electrode
    A. (1) only
    B. (2) only
    C. (1) and (3) only
    D. (2) and (3) only

32. Refer to the following process of producing sodium hydroxide from sodium carbonate

$\text{Step } 1 - \text{Na}_2\text{CO}_3 \xrightarrow{500\ ^\circ\text{C}} \text{Na}_2\text{O} + \text{CO}_2$

$\text{Step } 2 - \text{Na}_2\text{O} + \text{H}_2\text{O} \rightarrow 2\text{NaOH}$

Which of the following reactions are involved in the process?

(1) Thermal decomposition
(2) Neutralisation
(3) Redox reaction

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

33. Which of the following descriptions about common chemical cells in daily life are correct.

(1) Zinc-carbon cells' terminal voltage remains constant as they are used.
(2) Nickel-metal hydride cells can be recharged.
(3) Silver oxide batteries are examples of primary cells.

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

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

Statement **1**	Statement **2**
Galvanization can protect iron from rusting when the layer of zinc coating is scratched.	Zinc is more reactive than iron

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.

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

Statement **1**	Statement **2**
Solid citric acid powder can turn blue litmus paper red	Citric acid is a weak acid

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.

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

Statement **1**	Statement **2**
Sodium is higher in the electrochemical series than calcium.	Sodium is more reactive than calcium.

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 1A