



**Year 12 Semester One Examination, 2006**

**Question/Answer Booklet**

# CHEMISTRY

<b>Name:</b>	
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***Time allowed for this paper***

Reading time before commencing work: Ten minutes

Working time for paper: Three hours

***Materials required/recommended for this paper***

**To be provided by the supervisor**

This Question/Answer Paper

Separate Multiple Choice Answer Sheet

Chemistry Data Sheet

Part	Mark
1	/60
2	/70
3	/50
4	/20
Total	/200
%	

***To be provided by the candidate***

**Standard Items:** Pens, pencils, eraser or correction fluid and ruler

**Special Items:** A 2B, B or HB pencil for the separate Multiple Choice Answer Sheet and Calculators satisfying the conditions set by the Curriculum Council for this subject.

***Important note to candidates***

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

## Structure of this paper

Part	Number of questions available	Number of questions to be attempted	Suggested working time	Marks available
1 Multiple choice	30	ALL	55	60 (30%)
2 Short answer	12	ALL	60	70 (35%)
3 Calculations	5	ALL	45	50 (25%)
4 Extended answers	1	1	20	20 (10%)
Total marks				200 (100%)

## Instructions to candidates

1. Answer the questions according to the following instructions:

**Part 1** Answer **all** questions, using a 2B, B or HB pencil on the separate Multiple Choice Answer Sheet.

If you consider that two or more of the alternative responses are correct, choose the one you think is best. If you think you know an answer, mark it even if you are not certain you are correct. Marks will **not** be deducted for incorrect answers.

Feel free to write or do working on the question paper; many students who score high marks on the Multiple Choice Section do this.

**Parts 2, 3 and 4** Write your answers in the spaces provided in this Question/Answer Booklet. A blue or black ball point or ink pen should be used.

Questions containing specific instructions to show working should be answered with a complete, logical, clear sequence of reasoning showing how the final answer was arrived at; correct answers which do not show working will not be awarded full marks.

2. It is recommended that you spend your reading time mainly reading the Instructions to Candidates and Parts 2, 3 and 4.
3. At the end of the examination make sure that your name is on your Question/Answer Booklet and on your separate Multiple Choice Answer Sheet.

4. **Chemical Equations**

For full marks, chemical equations should refer only to those specific species consumed in the reaction and the new species produced. These species may be **ions** [for example  $\text{Ag}^+_{(\text{aq})}$ ], **molecules** [for example  $\text{NH}_{3(\text{g})}$ ,  $\text{CH}_3\text{COOH}_{(\text{l})}$ ,  $\text{CH}_3\text{COOH}_{(\text{aq})}$ ] or **solids** [for example  $\text{BaSO}_{4(\text{s})}$ ,  $\text{Cu}_{(\text{s})}$ ,  $\text{Na}_2\text{CO}_{3(\text{s})}$ ].

## PART 1 (60 marks = 30% of paper)

Answer ALL questions in Part 1 on the separate Multiple Choice Answer Sheet provided, using a 2B, B or HB pencil. Each question in this part is worth 2 marks.

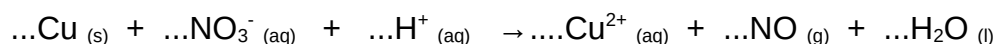
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1. The number of lone pairs of valence electrons in a molecule of chlorine is
  - a) 3
  - b) 4
  - c) 6
  - d) 7
  
2. In which of the following examples is the underlined substance acting as a base?
  - a)  $\text{NH}_3(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{NH}_4^+(\text{aq}) + \text{OH}^-(\text{aq})$
  - b)  $\text{H}_2\text{O}(\text{l}) + \text{O}^{2-}(\text{aq}) \rightarrow 2\text{OH}^-(\text{aq})$
  - c)  $2\text{K}(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow 2\text{K}^+(\text{aq}) + 2\text{OH}^-(\text{aq}) + \text{H}_2(\text{g})$
  - d)  $\text{H}_2\text{O}(\text{l}) + \text{CO}_3^{2-}(\text{aq}) \rightarrow \text{OH}^-(\text{aq}) + \text{HCO}_3^-(\text{aq})$
  
3. As the  $[\text{H}_3\text{O}]^+$  in a solution decreases, the  $[\text{OH}^-]$ 
  - a) increases and the pH increases
  - b) increases and the pH decreases
  - c) decreases and the pH increases
  - d) decreases and the pH decreases
  
4. The factor that makes a bond polar is the \_\_\_\_\_ of the atoms that are bonded to each other.
  - a) valence electrons
  - b) electronegativity difference
  - c) conductivity
  - d) dipole
  
5. The oxidation numbers of nitrogen in  $\text{HNO}_3$ ,  $\text{NO}$  and  $\text{NO}_3^-$  are
  - a)  $-1$ ,  $+2$  and  $+5$  respectively
  - b)  $-5$ ,  $+2$  and  $-5$  respectively.
  - c)  $+5$ ,  $+2$  and  $+5$  respectively.
  - d)  $+5$ ,  $+4$  and  $+5$  respectively.

6. What would be observed after an aqueous solution of iron (III) chloride was added to an aqueous solution of silver nitrate?

- a) A white precipitate settled out of a brown solution.
- b) A brown precipitate in a colourless solution.
- c) A metallic precipitate in a pale green solution.
- d) No reaction visible with the naked eye.

7. Balance the unbalanced equation below:



Which of the following gives the correct coefficients, reading from left to right in the balanced equation?

- a) 2, 3, 2, 2, 3 and 1
- b) 3, 2, 8, 3, 2 and 4
- c) 2, 2, 4, 2, 1 and 2
- d) 3, 1, 4, 3, 1 and 2

8. Five solutions were prepared by dissolving one mole of each of the salts listed below in one litre of water. Which solution would contain the greatest number of ions?

- a) Calcium nitrate.
- b) Sodium chloride.
- c) Ammonium sulfate.
- d) Aluminium nitrate.

9. When sugar ( $\text{C}_{11}\text{H}_{22}\text{O}_{11}$ ) is heated, it first melts and then on further heating is observed to char or blacken. This charring is due to formation of carbon. The two processes (melting and charring) can be related to the forces in the sugar crystals as follows:

- a) Both the melting and charring are due to the thermal energy overcoming the forces within the molecules
- b) The melting is due to thermal energy overcoming the forces between molecules; the charring is due to thermal energy overcoming the forces within the molecules.
- c) The melting is due to thermal energy overcoming the forces within the molecules; the charring is due to thermal energy overcoming the forces between the molecules.
- d) Both the melting and charring are due to the thermal energy overcoming the forces between the molecules.

10. A solution has a hydroxide ion concentration of  $1 \times 10^{-5}$  M. What is the hydrogen ion concentration of the solution?
- a)  $1 \times 10^{-1}$  M
  - b)  $1 \times 10^{-5}$  M
  - c)  $1 \times 10^{-9}$  M
  - d)  $1 \times 10^{-14}$  M
11. Ethanoic acid is classified as a weak acid. Which of the following best accounts for this?
- a) It is only sparingly soluble in water, resulting in a low concentration of molecules.
  - b) Its molecules hydrolyse in water solution to produce hydroxyl ions.
  - c) Its molecules do not react with any known acid-base indicator.
  - d) Its molecules have only a slight tendency to ionise in water solution.
12. An element Z has the following five successive molar ionisation energies (in kJ mol<sup>-1</sup>): 740, 1500, 7700, 10500, 13600. What would be the formula of the compound formed when Z reacts with oxygen?
- a) Z<sub>2</sub>O
  - b) ZO
  - c) Z<sub>2</sub>O<sub>3</sub>
  - d) ZO<sub>2</sub>
13. Which of the lists below indicate in correct order the colours of the following 1.0 mol L<sup>-1</sup> solutions of ions?
- $\text{CrO}_4^{2-}(\text{aq})$ ,  $\text{Mn}^{2+}(\text{aq})$ ,  $\text{Fe}^{2+}(\text{aq})$ ,  $\text{Zn}^{2+}(\text{aq})$
- a) orange, purple, brown, colourless
  - b) yellow, colourless, pale green, colourless
  - c) orange, colourless, pale green, colourless
  - d) yellow, purple, yellow, colourless
14. In each of the five lists below, 0.1 mol L<sup>-1</sup> samples of the three solutions shown are mixed together in equal proportions. Which combination will not produce a white precipitate?
- a)  $\text{Na}_2\text{CO}_3(\text{aq})$ ,  $(\text{NH}_4)_2\text{CO}_3(\text{aq})$ ,  $\text{K}_2\text{CO}_3(\text{aq})$
  - b)  $\text{Ba}(\text{OH})_2(\text{aq})$ ,  $\text{Pb}(\text{NO}_3)_2(\text{aq})$ ,  $\text{NH}_3(\text{aq})$
  - c)  $\text{NH}_4\text{NO}_3(\text{aq})$ ,  $(\text{NH}_4)_2\text{CO}_3(\text{aq})$ ,  $\text{Zn}(\text{NO}_3)_2(\text{aq})$
  - d)  $\text{H}_2\text{SO}_4(\text{aq})$ ,  $\text{KOH}(\text{aq})$ ,  $\text{BaCl}_2(\text{aq})$

15. Aqueous solutions of lithium carbonate, sodium ethanoate and ammonium sulfate are tested for pH.

Which of the following is the correct classification from the test?

	$\text{Li}_2\text{CO}_3$	$\text{CH}_3\text{COONa}$	$(\text{NH}_4)_2\text{SO}_4$
(a)	acidic	neutral	basic
(b)	basic	neutral	acidic
(c)	neutral	neutral	basic
(d)	basic	basic	acidic

16. For which of the following titrations is phenolphthalein a suitable indicator?

- a) A dilute solution of potassium permanganate with a dilute solution of oxalic acid.
- b) A dilute solution of sodium hydroxide with a dilute solution of ethanoic acid.
- c) A dilute solution of sodium carbonate with a dilute solution of hydrochloric acid.
- d) A dilute solution of hydrochloric acid with a dilute solution of ammonia.

17. An Arrhenius base is defined as a compound that

- a) accepts  $\text{OH}^-$  in solution
- b) releases  $\text{OH}^-$  in solution
- c) accepts  $\text{H}^+$  in solution
- d) donates  $\text{H}^+$  in solution

18. The conjugate acid of  $\text{H}_2\text{O}$  is

- a)  $\text{O}^{2-}$
- b)  $\text{OH}^-$
- c)  $\text{H}_3\text{O}^+$
- d)  $\text{H}_2\text{O}_2$

19. Which one of the following equations shows disproportionation?

- a)  $2\text{H}_2\text{O}_{2(\text{aq})} \rightarrow 2\text{H}_2\text{O}_{(\text{l})} + \text{O}_{2(\text{g})}$
- b)  $\text{Zn}_{(\text{s})} + \text{Cu}^{2+}_{(\text{aq})} \rightarrow \text{Zn}^{2+}_{(\text{aq})} + \text{Cu}_{(\text{s})}$
- c)  $\text{MnO}_4^{-}_{(\text{aq})} + 8\text{H}^{+}_{(\text{aq})} + 5\text{Fe}^{2+}_{(\text{aq})} \rightarrow \text{Mn}^{2+}_{(\text{aq})} + 4\text{H}_2\text{O}_{(\text{l})} + 5\text{Fe}^{3+}_{(\text{aq})}$
- d)  $2\text{Br}^{-}_{(\text{aq})} + \text{Cl}_{2(\text{g})} \rightarrow \text{Br}_{2(\text{l})} + 2\text{Cl}^{-}_{(\text{aq})}$

20. Which of the following are ALL strong bases?

- a) LiOH, NaOH and KOH
- b) RbOH, CsOH and  $\text{Ca}(\text{OH})_2$
- c)  $\text{Sr}(\text{OH})_2$  and  $\text{Ba}(\text{OH})_2$
- d) All the above

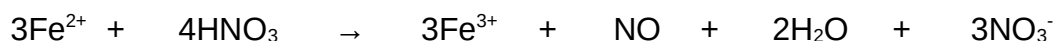
21. Oxidation occurs when

- a) a substance donates hydrogen ions.
- b) a substance becomes negatively charged.
- c) a substance gives up electrons.
- d) a substance gains electrons.

22. In which one of the following examples is bromine reduced?

- a)  $2\text{Br}^-_{(\text{aq})} + \text{Cl}_{2(\text{g})} \rightarrow \text{Br}_{2(\text{aq})} + 2\text{Cl}^-_{(\text{aq})}$
- b)  $\text{Br}_{2(\text{l})} + 2\text{I}^-_{(\text{aq})} \rightarrow 2\text{Br}^-_{(\text{aq})} + \text{I}_{2(\text{s})}$
- c)  $\text{NaBr}_{(\text{s})} \rightarrow \text{Na}^+_{(\text{aq})} + \text{Br}^-_{(\text{aq})}$
- d)  $\text{Pb}^{2+}_{(\text{aq})} + 2\text{Br}^-_{(\text{aq})} \rightarrow \text{PbBr}_{2(\text{s})}$

The next three questions refer to the equation below:



23. The substance oxidised is

- a)  $\text{Fe}^{2+}$
- b)  $\text{HNO}_3$
- c)  $\text{Fe}^{3+}$
- d) NO

24. The oxidising agent is

- a)  $\text{Fe}^{2+}$
- b)  $\text{HNO}_3$
- c)  $\text{Fe}^{3+}$
- d) NO

25. Which one of the following is NOT a redox reaction?

- a)  $2\text{Mg}_{(\text{s})} + \text{O}_{2(\text{g})} \rightarrow 2\text{MgO}_{(\text{s})}$   
b)  $\text{Zn}_{(\text{s})} + \text{Cu}^{2+}_{(\text{aq})} \rightarrow \text{Zn}^{2+}_{(\text{aq})} + \text{Cu}_{(\text{s})}$   
c)  $\text{Ag}^{+}_{(\text{aq})} + \text{Cl}^{-}_{(\text{aq})} \rightarrow \text{AgCl}_{(\text{s})}$   
d)  $2\text{Ag}_{(\text{s})} + \text{S}_{(\text{s})} \rightarrow \text{Ag}_2\text{S}_{(\text{s})}$

26. A substance which simultaneously oxidises and reduces itself is said to undergo a type of reaction known as

- a) hydrolysis.  
b) disproportionation.  
c) displacement.  
d) neutralisation.

The next two items refer to the following information:

Some of the properties of the substances W X Y and Z are given below:

			Electrical conductivity	
Substance	Hardness of Solid	Melting Temperature °C	of solid	of liquid
W	Soft	-114	Negligible	High
X	Soft	18	Negligible	Negligible
Y	Hard	810	Negligible	High
Z	Hard	2700	Negligible	Not measured (insoluble)

27. Which substance is most likely to have a covalent network lattice structure in the solid state?

- a) W  
b) X  
c) Y  
d) Z

28. The substance which is most likely to contain ionic bonds is

- a) W  
b) X  
c) Y  
d) Z



29. A redundant (reducing agent) is a substance which
- a) readily gives up electrons.
  - b) is easily reduced.
  - c) gives up hydrogen ions.
  - d) is highly electronegative.
30. What would you expect to observe when chlorine is added to a solution of sodium bromide.
- a) The solution would turn red.
  - b) A purple precipitate would be formed.
  - c) There would be no reaction.
  - d) The solution would become green.