



CATHOLIC SECONDARY SCHOOLS
ASSOCIATION OF NEW SOUTH WALES

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Centre Number

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Student Number

2010
TRIAL HIGHER SCHOOL CERTIFICATE
EXAMINATION

Chemistry

Morning Session
Friday, 6 August 2010

General Instructions

- Reading time – 5 minutes
- Working time – 3 hours
- Write using black or blue pen
- Draw diagrams using pencil
- Board-approved calculators may be used
- Use the Data Sheet and Periodic Table provided
- Use the Multiple Choice Answer Sheet provided
- Write your Centre Number and Student Number at the top of this page and page 13

Total marks – 100

Section I

Pages 2–26

75 marks

This section has two parts, Part A and Part B

Part A – 20 marks

- Attempt Questions 1–20
- Allow about 35 minutes for this part

Part B – 55 marks

- Attempt Questions 21–33
- Allow about 1 hour and 40 minutes for this part

Section II

Pages 30–38

25 marks

- Attempt ONE question from Questions 34–38
- Allow about 45 minutes for this section

Disclaimer

Every effort has been made to prepare these 'Trial' Higher School Certificate Examinations in accordance with the Board of Studies documents, *Principles for Setting HSC Examinations in a Standards-Referenced Framework* (BOS Bulletin, Vol 8, No 9, Nov/Dec 1999), and *Principles for Developing Marking Guidelines for Examinations in a Standards Referenced Framework* (BOS Bulletin, Vol 9, No 3, May 2000). No guarantee or warranty is made or implied that the 'Trial' Examination papers mirror in every respect the actual HSC Examination question paper in any or all courses to be examined. These papers do not constitute 'advice' nor can they be construed as authoritative interpretations of Board of Studies intentions. The CSSA accepts no liability for any reliance, use or purpose related to these 'Trial' question papers. Advice on HSC examination issues is only to be obtained from the NSW Board of Studies.

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Section I
75 marks

Part A – 20 marks

Attempt Questions 1-20

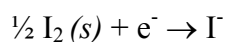
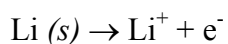
Allow about 40 minutes for this part

Use the Multiple Choice Answer Sheet provided.

- 1** Which of the following is the best description of cellulose?
- (A) A condensation polymer made from ethylene monomers
 - (B) A condensation polymer made from glucose monomers
 - (C) An addition polymer made from ethylene monomers
 - (D) An addition polymer made from glucose monomers
- 2** In an experiment 6.0 g of propan-1-ol underwent complete combustion to produce carbon dioxide and water.
- What volume of carbon dioxide was produced at 25°C and 100 kPa?
- (A) 2.5 L
 - (B) 3.4 L
 - (C) 3.8 L
 - (D) 7.4 L
- 3** The fuel E10 consists of 10% ethanol blended with petrol consisting mainly of octane.
- Which of the following statements best explains the solubility of ethanol in petrol?
- (A) Ethanol undergoes hydrogen bonding with petrol which increases its solubility.
 - (B) Ethanol contains a polar –OH group improving its solubility in hydrocarbons.
 - (C) Ethanol and petrol are both non-polar molecules and soluble in each other.
 - (D) Ethanol contains a short hydrocarbon chain which allows it to be soluble in petrol.

- 4 The lithium iodide solid-state battery has specific applications such as in cardiac pacemakers, due to its long life span.

The reactions of this battery are shown below:



Which of the following is correct for the chemistry at the anode of the lithium iodide cell?

- (A) The oxidation state of lithium increases.
 - (B) The oxidation state of lithium decreases.
 - (C) The oxidation state of iodine increases.
 - (D) The oxidation state of iodine decreases.
- 5 The molar heat of combustion of ethanol is 1367 kJ mol^{-1} .
Assuming no heat losses to the surroundings, what mass of ethanol must be combusted to raise the temperature of 0.250 kg of water from 20.0°C to 60.0°C ?

- (A) $1.41 \times 10^{-3} \text{ g}$
- (B) $2.11 \times 10^{-3} \text{ g}$
- (C) 1.41 g
- (D) 2.11 g

- 6 Bromine water, $\text{Br}_2(\text{aq})$, is a reddish solution which can be used to distinguish between saturated and unsaturated hydrocarbons.

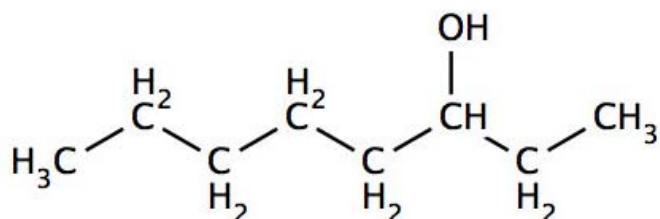
In a darkened laboratory, a student placed 5 mL of hexane into a test tube and 5 mL of hex-1-ene into another test tube. Three drops of bromine water were added to both test tubes. After shaking the test tubes, the student immediately recorded his observations.

<i>Test Tube</i>	<i>Observation</i>
1	The reddish colour faded rapidly
2	A coloured layer remained

Which of the following would best represent the species present in test tubes 1 and 2 immediately after the reaction?

	<i>Test Tube 1</i>	<i>Test Tube 2</i>
(A)	C_6H_{14} , Br_2	C_6H_{12} , $\text{C}_6\text{H}_{12}\text{Br}_2$
(B)	C_6H_{14} , Br_2 , H_2O	C_6H_{12} , $\text{C}_6\text{H}_{12}\text{Br}_2$, H_2O
(C)	$\text{C}_6\text{H}_{12}\text{Br}_2$	C_6H_{14} , Br_2
(D)	C_6H_{12} , $\text{C}_6\text{H}_{12}\text{Br}_2$, H_2O	C_6H_{14} , H_2O , Br_2

- 7 What is the systematic name for the following compound?



- (A) Heptan-5-ol
 (B) Heptan-3-ol
 (C) Octan-5-ol
 (D) Octan-3-ol

- 8** Samples of 0.1 mol L^{-1} hydrochloric acid and 0.1 mol L^{-1} acetic acid were tested. The hydrochloric acid was found to have a lower pH than the acetic acid.

Which of the following best explains this observation?

- (A) The hydrochloric acid is more concentrated than the acetic acid.
- (B) The acetic acid produces more hydronium ions than the hydrochloric acid.
- (C) Hydrochloric acid ionises to a greater extent than acetic acid.
- (D) An error occurred during the testing as the two acids should have the same pH.

- 9** The mass ratio of alcohol to organic acid reacted in an esterification process is 1:1.

The ester produced could be

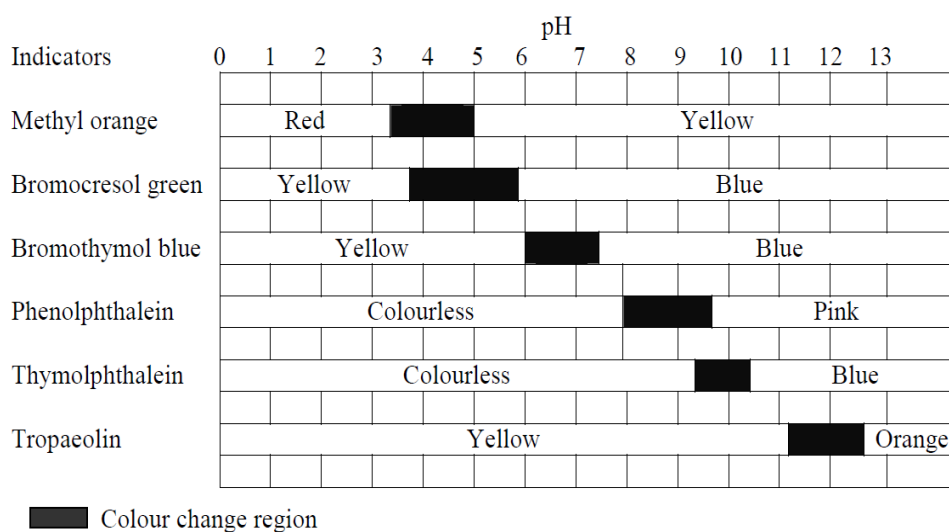
- (A) ethyl ethanoate.
- (B) butyl propanoate.
- (C) propyl butanoate.
- (D) ethyl propanoate.

- 10** The pH of pure water at 25°C is 7, whereas the pH of unpolluted rainwater is close to 6.

Which of the following substances contributes most to this difference in pH?

- (A) CO_2
- (B) SO_2
- (C) NO_2
- (D) O_3

11 The chart below shows the pH colour change ranges for various indicators.



The pH ranges of common household substances are shown below.

<i>Household substance</i>	<i>pH range</i>
Orange juice	3-4
Milk	6-7
Baking soda solution	10-11
Liquid ammonia	12-13

A substance was tested with the following indicators. The results are shown below.

<i>Indicator</i>	<i>Colour</i>
Methyl orange	Yellow
Bromocresol green	Blue
Phenolphthalein	Colourless
Thymolphthalein	Colourless

The substance is most likely to be

- (A) orange juice.
- (B) milk.
- (C) baking soda solution.
- (D) liquid ammonia.

- 12** A student pipetted 25.0 mL of a sodium hydroxide solution into a conical flask, added a few drops of phenolphthalein indicator and titrated this with a 0.015 mol L^{-1} solution of hydrochloric acid. The volume of hydrochloric acid required was 11.55 mL.

What is the concentration of sodium hydroxide (expressed to the correct number of significant figures)?

- (A) $6.930 \times 10^{-3} \text{ mol L}^{-1}$
 - (B) $6.93 \times 10^{-3} \text{ mol L}^{-1}$
 - (C) $6.9 \times 10^{-3} \text{ mol L}^{-1}$
 - (D) $7 \times 10^{-3} \text{ mol L}^{-1}$
- 13** Which of the following is classified as the conjugate base of water?
- (A) OH^-
 - (B) H_3O^+
 - (C) O^-
 - (D) O^{2-}

- 14** The synthesis of ammonia is a reversible reaction that can reach equilibrium.

Why does the industrial process to produce ammonia NOT reach equilibrium?

- (A) The reaction is extremely slow.
- (B) There is insufficient ammonia produced.
- (C) The addition of a catalyst changes the rate of the reaction.
- (D) The system is not closed as reactants and products are added and removed.

- 15 A lawn fertiliser lists the sulfate content as 38.5% (w/w).

What mass of barium sulfate precipitate would be expected to form if a 1.50 g sample of the fertiliser were analysed by reacting the sample with excess barium nitrate solution?

- (A) 0.238 g
(B) 0.578 g
(C) 1.40 g
(D) 3.64 g

- 16 In order to determine the possible cations in a sample of water, a student followed the following procedure.

	<i>Method</i>	<i>Observation</i>
Step 1	Excess hydrochloric acid was added to a portion of the sample.	A white precipitate formed, which did not darken when left exposed to UV light.
Step 2	The precipitate from Step 1 was filtered off and the filtrate retained.	
Step 3	Dilute sulfuric acid was added to some of the filtrate from Step 2.	No precipitate formed.
Step 4	Excess sodium hydroxide was added to some of the filtrate from Step 2.	A precipitate formed, which turned yellowish on standing for several hours.

The cations in the sample are likely to be

- (A) Pb^{2+} and Fe^{2+}
(B) Fe^{2+} and Ag^+
(C) Na^+ and Pb^{2+}
(D) Ag^+ and Na^+

- 17** Hardness of natural water sources results from
- (A) increasing the acidity of a body of water.
 - (B) the presence of excessive concentrations of calcium and magnesium ions.
 - (C) the presence of iron-based minerals from rocks.
 - (D) the presence of excessive concentrations of phosphate and nitrate ions.
- 18** Black smoke emitted from the exhaust of a motor cycle is most likely caused by
- (A) excessive heat energy in the combustion chamber.
 - (B) excessive build up of carbon dioxide in the combustion chamber.
 - (C) insufficient oxygen present in the combustion chamber.
 - (D) insufficient fuel present in the combustion chamber.
- 19** What flame colour is produced by calcium ions in a flame test?
- (A) Red
 - (B) Blue
 - (C) Green
 - (D) Yellow
- 20** Which alternative best fits the properties of gaseous oxygen and the oxygen free radical?

	<i>Gaseous oxygen</i>		<i>Oxygen free radical</i>	
(A)	more reactive	monatomic	less reactive	molecular
(B)	less reactive	molecular	more reactive	monatomic
(C)	less reactive	monatomic	more reactive	molecular
(D)	more reactive	molecular	less reactive	monatomic

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