**CATHOLIC SECONDARY SCHOOLS
ASSOCIATION OF NEW SOUTH WALES**

2009
**TRIAL HIGHER SCHOOL CERTIFICATE
EXAMINATION**

Chemistry

Morning Session
Thursday, 13 August 2009

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 9

Total marks – 100

Section I   Pages 2–23

75 marks
This section has two parts, Part A and Part B

Part A – 15 marks
- Attempt Questions 1–15
- Allow about 30 minutes for this part

Part B – 60 marks
- Attempt Questions 16–28
- Allow about 1 hour and 45 minutes for this part

Section II   Pages 25–34

25 marks
- Attempt ONE question from Questions 29–33
- Allow about 45 minutes for this section

3800-1

Section I
75 marks

Part A – 15 marks
Attempt Questions 1-15
Allow about 30 minutes for this part

Use the Multiple Choice Answer Sheet provided.

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1 Which of the following is an example of a synthetic biopolymer?

    (A) Biopol

    (B) Cellulose

    (C) Crude oil

    (D) Ethanol

2 Polystyrene is suitable for the manufacture of

    (A) shopping bags because of its biodegradability.

    (B) garden hoses because of its high melting point.

    (C) tool handles because of its rigidity.

    (D) carpets because of its ability to stretch and return to its original position.

3 Copper metal will form on the surface of an iron nail dropped into an aqueous solution of copper (II) sulfate because

    (A) copper ions have a positive charge.

    (B) iron atoms transfer electrons to copper ions.

    (C) electrons move from copper ions to iron atoms.

    (D) copper acts as an anode.

4   The table below lists the boiling points of some alkanols and their corresponding alkanoic acids.

Alkanols		Alkanoic Acids	
Substance	BP (K)	Substance	BP (K)
propan-1-ol	370	propanoic acid	414
butan-1-ol	390	butanoic acid	434
pentan-1-ol	411	pentanoic acid	459

What causes the alkanoic acids to have higher boiling points than their corresponding alkanols?

(A)   The greater dispersion forces between the molecules of the alkanoic acids

(B)   The ionic bonding that occurs in the alkanoic acids when they become ionised

(C)   The stronger acidic properties of the alkanoic acids

(D)   The greater extent of hydrogen bonding between the alkanoic acid molecules

5   Some radioisotopes used for medical purposes are produced on-site at the hospital by the decay of other unstable isotopes sourced from a nuclear reactor.

What is the main reason for producing the required isotope at a hospital rather than elsewhere?

(A)   Transport of some radioisotopes is considered too dangerous.

(B)   The short half-lives of these isotopes mean too much will decay during transport.

(C)   Gamma ray emitters cannot be transported with other radioisotopes because they may cause the other isotopes to decay during the trip.

(D)   Nuclear reactors cannot produce a variety of different isotopes all at the same time, so some need to be produced elsewhere.

6 A teacher found an old collection of indicators which she suspected were incorrectly labelled. She asked a student to check which indicators were correctly labelled by adding them to solutions of known pH.

The student's results are in the table below.

| Label on bottle of indicator	Colour of solutions of known pH after indicator added			
	pH = 1	pH = 4	pH = 7	pH = 11
Methyl orange	red	yellow	yellow	blue
Bromothymol blue	yellow	yellow	green	blue
Litmus	blue	blue	purple	red

Which bottles of indicator were labelled correctly?

(A) The methyl orange and the litmus

(B) The litmus and the bromothymol blue

(C) Only the bromothymol blue

(D) Only the methyl orange

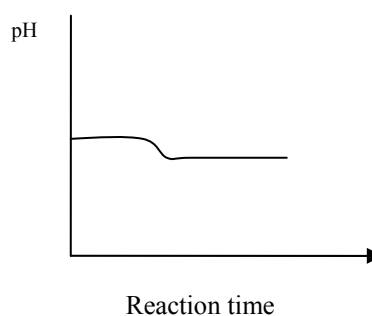**7** Which of the following is NOT classified as amphiprotic?

(A) HCO_3^-

(B) HSO_4^-

(C) H_3O^+

(D) H_2O

8   A warm unopened bottle of soda water was placed in a refrigerator. Which graph best shows the pH changes that occur in the bottle as a new equilibrium is established?
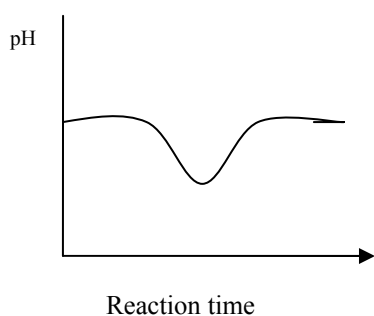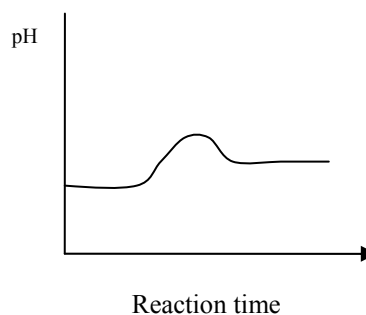
(A)

pH

Reaction time

(B)

pH

Reaction time

(C)

pH

Reaction time

(D)

pH

Reaction time
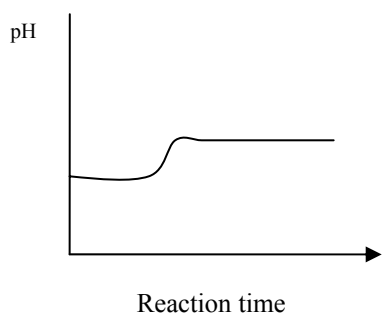
9   A titration was performed using 25.00 mL of a 0.100 mol L^{-1} ammonia solution and a 0.100 mol L^{-1} solution of a strong monoprotic acid. Which of the following will be required to observe a valid endpoint?

	Indicator	*Volume of Acid (mL)*
(A)	methyl orange	25.00
(B)	methyl orange	less than 25.00
(C)	phenolphthalein	25.00
(D)	phenolphthalein	less than 25.00

10   The pH of a 0.0541 mol L^{-1} solution of hydrochloric acid is most correctly expressed as

(A) 1.266803

(B) 1.267

(C) 1.27

(D) 1.3

11   The increase in atmospheric carbon dioxide has been linked to the burning of fossil fuels.

The combustion of octane produces 1.554 x10^7 kJ of energy per tonne of carbon dioxide produced.

Ethanol has been proposed as a more environmentally sound source of energy. The heat of combustion for ethanol is 1367 kJ mol^{-1}. The energy produced per tonne of carbon dioxide from the combustion of ethanol is

(A) 8.311 kJ

(B) 2.272 x 10^4 kJ

(C) 1.553 x 10^7 kJ

(D) 3.106 x 10^7 kJ

12   In the Haber process, iron on the surface of iron oxide (magnetite) is used because it

(A) shifts the equilibrium in the preferred direction.

(B) decreases the formation of unwanted waste products.

(C) removes unwanted oxygen and so prevents dangerous explosions.

(D) allows a lower temperature to be used.

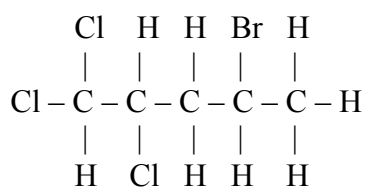**13**   Which reagent would be most suitable to use when testing for the presence of chloride ions in a sample?

(A) $AgNO_3$

(B) $Ba(NO_3)_2$

(C) $NaNO_3$

(D) $Cu(NO_3)_2$

14 The lake indicated in the diagram below is showing signs of eutrophication.
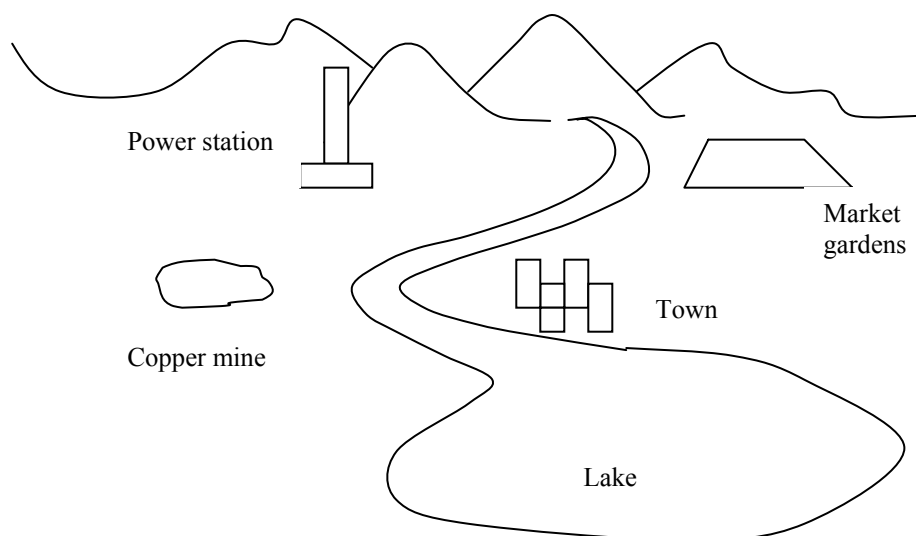
Which is the most likely source of contaminants that would result in this problem?

(A) Copper mine
(B) Power station
(C) Town
(D) Market gardens

15 What is the correct systematic name for the compound having the structure shown below?

$$\begin{array}{ccccc} \text{Cl} & \text{H} & \text{H} & \text{Br} & \text{H} \\ | & | & | & | & | \\ \text{Cl} - \text{C} - \text{C} - \text{C} - \text{C} - \text{C} - \text{H} \\ | & | & | & | & | \\ \text{H} & \text{Cl} & \text{H} & \text{H} & \text{H} \end{array}$$

(A) 4-bromo-1,1,2-trichloropentane
(B) 4,5,5-trichloro-2-bromopentane
(C) 2-bromo-4,5,5-trichloropentane
(D) 1,1,2-trichloro-4-bromopentane

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