Name: _____

Teacher : Ms Fernandez Ms Dodd   Ms Irwin
Circle your teacher's name

S T R A T H F I E L D   G I R L S   H I G H   S C H O O L

2006 Year 11
Final Preliminary Examination
Preliminary Chemistry

General Instructions

Reading time - 5 minutes

Working time - 2 hours

Write using black or blue pen.

Draw diagrams using pencil.

Calculators may be used

A **data sheet** and a **Periodic Table** are
   provided at the back of this paper

Write your name and teacher's name on
   this cover page and on the
   Multiple Choice Answer Sheet.

Total marks - 75

Part A
Multiple Choice -15 marks

Questions 1 - 15 (1 mark each)

Allow about 25 minutes for this
section

Part B
Written Responses - 60 marks

Attempt questions 16 — 28

Allow about 95 minutes for this
section

Exam Requirements
1 exam paper
Data sheet and Periodic Table (Detach from back of exam)
Multiple Choice Answer Sheet (Detach from back of exam)

WRITE ALL ANSWERS IN THE APPROPRIATE SPACES PROVIDED IN
THE EXAMINATION PAPER

Part A
Total marks (15)
Attempt questions 1-15
Allow about 30 minutes for this part

Select the alternative A, B, C and D that best answer the question and indicate your choice with a cross (X) in the appropriate space on the grid below.

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	A	B	C	D
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1   What of the following pairs of elements would most likely form an ionic bond?
        (A)   Oxygen and fluorine
        (B)   Sodium and potassium
        (C)   Calcium and sulfur
        (D)   Silicon and carbon

2.   In which of the following do BOTH processes involve physical changes?

        (A)   Burning coal; evaporating alcohol
        (B)   Melting sugar; dissolving alcohol in water
        (C)   Boiling water; forming rust on a nail
        (D)   Burning alcohol; discolouring silver salts in the presence of light

3.   Caffeine melts at 178^0c. It is insoluble in water at room temperature but is readily soluble in liquid
        chloroform which has a boiling point of 62^0C

        What is the correct method of separating a mixture of chloroform and caffeine so that both
        substances are collected?

        (A)   Filtration
        (B)   Distillation
        (C)   Fractional distillation
        (D)   Recrystallisation

4.   A student performing a first hand investigation to test the activity of metals made the following
        observations.
        "When the metal was dropped into water a colourless gas slowly bubbled off. The gas was
        collected and tested with a flame. The test produced a small explosion."

        The metal used by the student was most likely:

        (A)   Potassium
        (B)   Copper
        (C)   Zinc
        (D)   Calcium

5.   Which of the following trends is evident when moving down the Group q elements: lithium, sodium,
        and potassium?

        (A)   A decrease in ionisation energy
        (B)   An increase in valency
        (C)   A decrease in atomic radius
        (D)   An increase in melting point,

6.   The mass of 3.01×10^{23} molecules of carbon dioxide is:
   (A)   12 g
   (B)   22 g
   (C)   32 g
   (D)   44 g

7   Which one of the following is a common copper ore?

   (A)   Brass with 67% Cu and 33% Zn
   (B)   Cryolite Na_3AlF_6
   (C)   Chalcopyrite $CuFeS_2$
   (D)   Blister copper with 97% Cu

8   Use the following solubility rules to determine which combination of solution forms a precipitate:

Solubility of ionic compounds	
Compounds that are soluble	**Compounds that are insoluble**
Group 1 and NH4= compounds	Phosphates (except Group) 1 and NH_4^+ compounds
Nitrates	Hydroxides (except Group 1 and NH_4+. Ba^{2+} and Ca^{2+} compounds)
Acetates	
Chlorines (except Ag^+ and $Pb^{2+)}$	
Sulfates (except Ag^+ an, Ba^{2+}, Ca^{2+} and $Pb^{2+)}$	

   (A)   Calcium and sodium chloride
   (B)   Barium chloride and sodium nitrate
   (C)   Sodium nitrate and lithium hydroxide
   (D)   Magnesium acetate and potassium phosphate

9.   Water makes up a large proportion of cells and carries out a temperature regulating effect in cells. This is due to water having a relatively high:

   (A)   Heat capacity
   (B)   Viscosity
   (C)   Surface tension
   (D)   Density

10.   The name of the following compound is
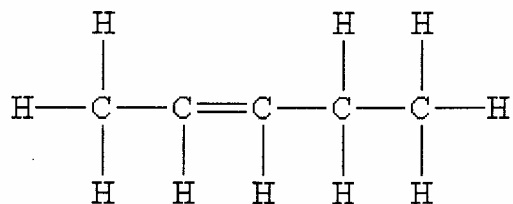
(A)   1-pentene
(B)   3-pentene
(C)   pentane
(D)   2-pentene

11.   Consider the reaction energy profile shown below.
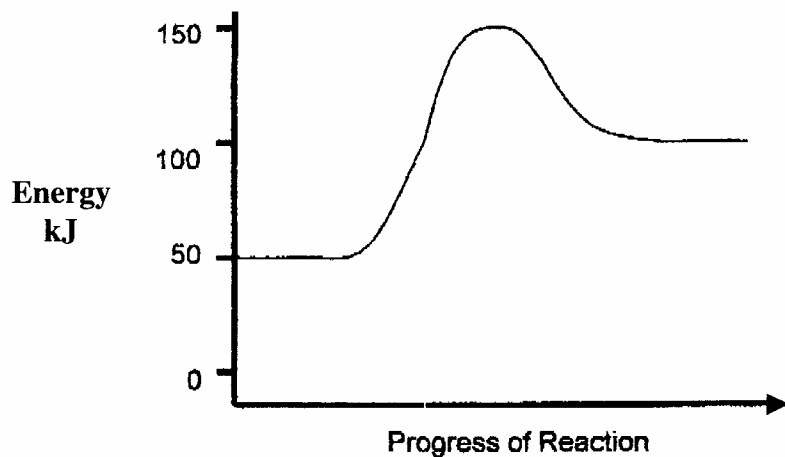
The reaction represented above is:

(A)   Exothermic with an activation energy of 100kJ
(B)   Endothermic with an activation energy of 50J
(C)   Exothermic with an activation energy of 150kJ
(D)   Endothermic with an activation energy of 100kJ

12.   A match must be struck along the matchbox for it to ignite. This is to provide
(A)   The required activation energy for the reaction
(B)   Mixing of the reactants with oxygen
(C)   A catalyst for the reaction
(D)   The energy for the combustion reaction.

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13. Examine the solubility curves for some compounds, from the figure below.
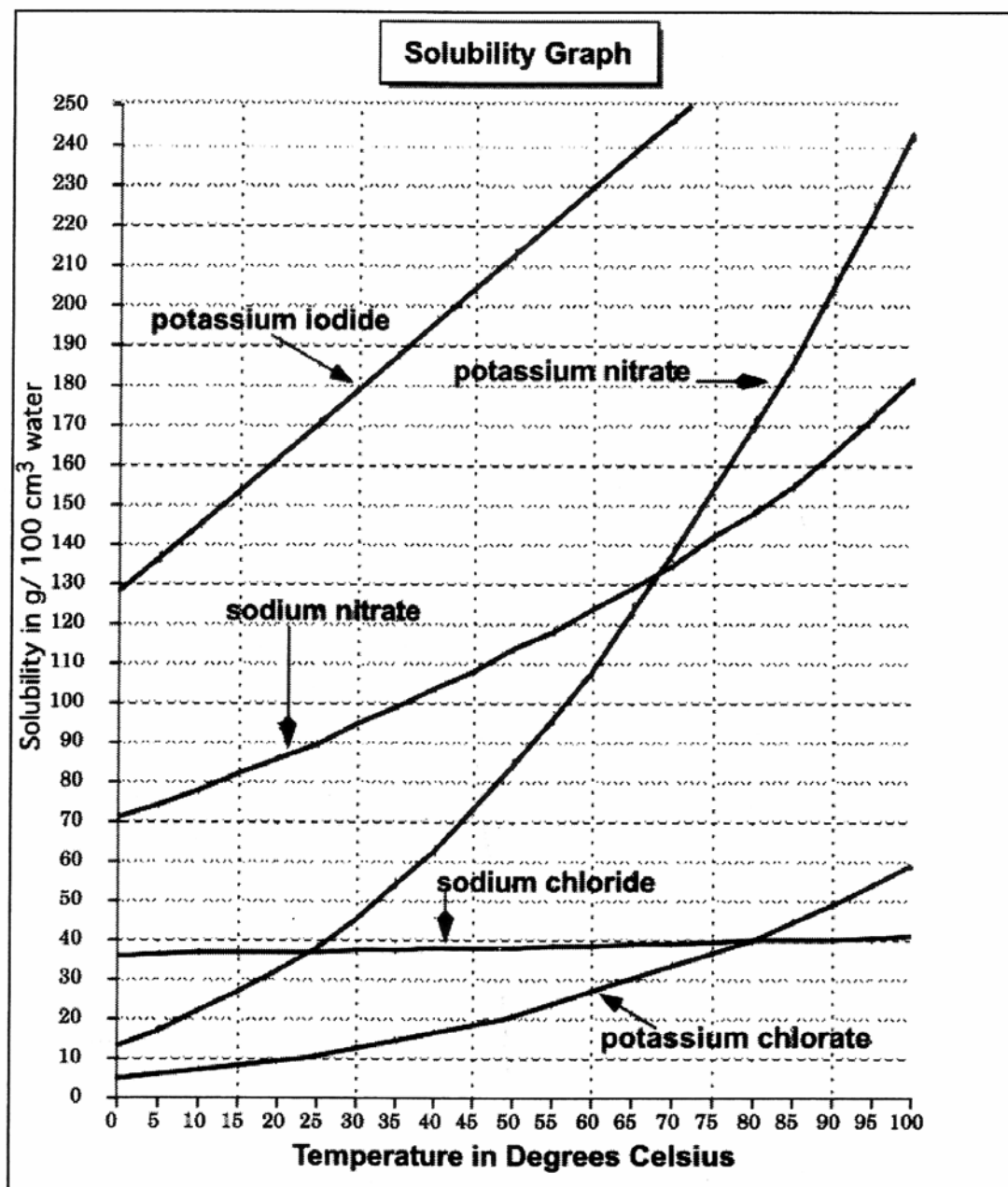
The minimum mass of potassium nitrate to prepare 50ml of saturated solution at 80^{0}C is closest to:

(A)   75 g
(B)   85 g
(C)   150 g
(D)   170 g

14.   The raw materials for photosynthesis include:

        (A)   Oxygen and carbon dioxide
        (B)   Oxygen and water
        (C)   Carbon dioxide and water
        (D)   Glucose and carbon dioxide

15.   What volume of water needs to be added to 250ml of a 0.5 mol L^{-1} solution of sodium hydroxide to change its concentration to 0.1 mol L^{-1}?
        (A)   50ml
        (B)   62.5mL
        (C)   1000mL
        (D)   1250mL

Part B
Total marks (60)
Attempt question 16 – 28
Allow about 1 hour 30 minutes for this part

Write you answers in the space provided after each question.

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Question 16 (5 marks)

A chemist heated a sample of magnesium in a flask and injected a stream of chlorine gas. The magnesium reacted with the chlorine and formed an ionic compound.

(a)   Name and write the formula of the ionic compound formed.   1

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(b)   Using Lewis electron dot structure show how the ions form during the reaction.
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(c)   Write an overall equation for the reaction
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(d)   Describe how the bonding in the ionic compound arises.
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Question 17 (5 marks)

Examine the table below which shows the melting points of water and substances of similar size

Substance	Melting point (^{0}C)	Boiling point(^{0}C)
Neon (Ne)	-249	-256
Hydrogen fluoride (HF)	-83	-20
Water (H2o)	0	100
Ammonia (NH3)	-78	-33
Methane (CH4)	-182.5	-161.5

(a)   Draw the Lewis dot structure and shape of the water molecule   2

(b)   In terms of intermolecular forces explain why the melting point and boiling point of water is significantly different from the other substance shown in the table.   2
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(c)   Describe ONE other property of water in terms of its intermolecular forces.   1

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Question 18 (3 marks)

Explain what is meant by thermal pollution and discuss the implications for aquatic life if a body of water is affected by thermal pollution.   3

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Question 19 (7 marks)

An instant cold pack, sold for treatment of sporting injuries, contains solid ammonium nitrate and a weak inner plastic bag of water, Punching the pack breaks the inner bag and causes the ammonium nitrate to dissolve in the water, and the contents become very cold.,

    (a)   Is this process exothermic or endothermic? Explain your answer   2

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    (b)   Write an ionic equation for dissolving ammonium nitrate in water   1

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    (c)   During the course you performed a first hand investigation to determine the molar heat of solution of a compound. Outline how you achieved this and in your answer explain how you used the relationship $\Delta H = mc \Delta T$

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Question 20 (4 marks)

The reaction between vinegar and a 10 cm strip pf magnesium ribbon is carried out in an insulated container.

A data logger is used to record the increase in the temperature, initially 250C, as the reaction proceeds. The data logger output is shown below:
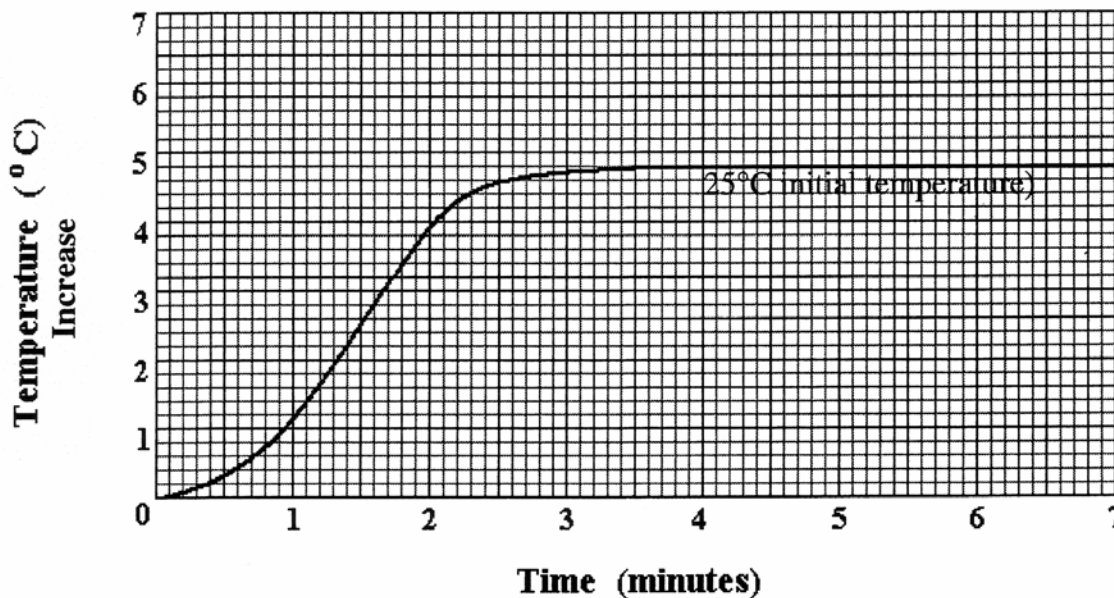
a)   On the above grid sketch a possible graph for the same reaction, with an initial temperature of 350C.   **2**

(b)   Justify any difference or similarities in the two graph.   **2**

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Question 21 (7 marks)

The table below shows some of the properties of five elements , V, W, X, Y, and Z

Element	Melting Point (°C)	Boiling Point (°C)	Electrical Conductivity (Msm^{-1})	Density (g ml-)
V	119	445	10-21	1.96
W	961	2210	60	10.5
X	114	183	10-13	4.94
Y	1410	3270	0.07	2.26
Z	3410	5930	19	19.3

(a)   In table form, classify the five elements into metals, semi-metals and non metals .   **3**

(b)   Write the letter/s for the elements that consist of:

(1)   A three dimensional lattice of atoms that are covalently bonded: ……………

(11)   A three dimensional lattice of ions in a sea of delocalised electrons: …………

(111)   molecules with relatively weak intermolecular forces………………………   **3**.

(c)   Choose ONE of the elements from the table, and in relation to its physical properties describe a possible use for it.   **1**

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Question 22 (5 marks)

Outline the experimental steps that would be required to determine to percentage mass of calcium sulfate in a rock sample made up of crystals of calcium sulfate and sodium chloride. Calcium sulfate is insoluble in water while sodium chloride is soluble in water, **5**

In your experiment you are also required to retain separate samples of each of the compounds found in the rock sample.

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Question 23 (4 marks)

A student performed a first hand investigation on the mass of magnesium oxide produced from the combustion of magnesium.

The results obtained from the experiment are recorded in the following table.   **1**

Material to be weighed	Mass (g)
Crucible and lid	31.100
Crucible, lid and magnesium	31.300
Magnesium	
Crucible, lid and magnesium oxide	31.388
Magnesium oxide	
Oxygen the combined with magnesium	

(a)   Add entries to the right had column to complete the table.   **1**

(b)   Calculate the empirical formula from the experiment results.   **2**

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(c)   Compare the formula obtained from the experiment results with the accepted

formula of magnesium oxide and suggest a reason fro any discrepancy.   **1**

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Question 24 (5 marks)

During you course you investigated the extraction of metals from the ores.

(a)   Copper oxide is produced in the first stage of the extraction of copper from copper carbonate $CuCo_3$.   2

Describe the energy input required for this process and write an equation for the reaction.

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(b) Compare the energy requirements for the extraction of copper from its ores to that of aluminium from its ores.   **1**

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(c)   Justify the increased recycling of aluminium and other metals in our society and across the world.   **2**

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Question 25 (3 marks)

Sodium will extract readily both with water and with dilute hydrochloric acid,

(a)   Write equations for the reaction of sodium with water and with dilute hydrochloric acid.   **2**

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(b)   Write a half equation to show the electron reaction of sodium in the above reactions

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Question 26 (5 marks)

5.0 grams of sodium hydroxide was dissolved in 200mL of water. Excess aluminium nitrate solution was added to the sodium hydroxide solution to precipitate all the hydroxide as aluminium hydroxide.   **2**

(a)   Calculate the concentration of the original sodium hydroxide   .

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(b)   Write an ionic equation for the formation of the precipitate.   **1**

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(c)   Determine the mass of precipitate that formed.   **2**

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Question 27 (4 marks)

(a)   When two grams of each substance in the table is added to 100mL of water, the expected outcome would be:

(Complete the following table on solubility by using the words soluble and insoluble)   **2**

Substance added to water	Solubility
Cellulose	
Sucrose	
Iodine	
Silicon Dioxide	
Sodium Chloride	

(b)   Account for the solubility of sodium chloride in water,   **2**

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Question 28 (3 marks)

Ethane and ethene are examples of hydrocarbons containing two carbon atoms.

(a)   Explain how these different compounds, each containing two carbon atoms, are able to exist.   **2**

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(b)   Write a chemical equation to represent INCOMPLETE combustion of ethane

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End of paper