



**PYMBLE LADIES' COLLEGE**  
**SEMESTER 2, 2003**  
**YEAR 11 ~ CHEMISTRY**  
**QUESTION and ANSWER BOOK**

**Monday 8<sup>th</sup> September**

**TIME ALLOWED: 2 HOURS**

**TOTAL MARKS 67**

**DIRECTIONS TO CANDIDATES**

**ANSWER ALL QUESTIONS**

**PART A:** 13 Multiple Choice questions, each worth one mark.  
Indicate your answers on the Multiple Choice Answer Sheet provided.

**PART B:** 14 Extended response questions.  
Marks for each question are indicated  
Answer each question in the space provided.

**A Periodic Table and solubility data are provided.**

**PART A**

Total Marks – 13

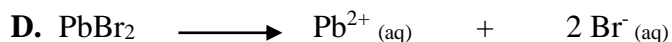
Attempt ALL questions

Select the alternative that best answers the question.  
Mark your answers on the Multiple Choice Answer Sheet provided.  
*[Allow about 20 minutes for this part]*

- Pure substances are classified as compounds when:
  - they can be decomposed to simpler substances.
  - they cannot be decomposed.
  - they possess a constant set of properties.
  - chemical reactions cannot simplify them.
  
- Which of the following four mixtures CANNOT be separated by filtration?
  - dirt and water
  - smoky air
  - salty water
  - a suspension of metal filings in oil
  
- Which of the following is not a reasonable equation for the formation of an ion from its neutral atom?
  - $F_{(g)} + \text{electron} \longrightarrow F^{-}_{(g)} + \text{energy}$
  - $Mg_{(g)} + \text{energy} \longrightarrow Mg^{+}_{(g)} + \text{electron}$
  - $Li_{(g)} + \text{electron} \longrightarrow Li^{+}_{(g)} + \text{energy}$
  - $Ba_{(g)} + \text{energy} \longrightarrow Ba^{2+}_{(g)} + 2 \text{ electrons}$

4. Element P has three valence electrons and element Q has six valence electrons. The formula for the compound formed between P and Q would be
- A. PQ
  - B. P<sub>3</sub>Q<sub>6</sub>
  - C. P<sub>3</sub>Q<sub>2</sub>
  - D. P<sub>2</sub>Q<sub>3</sub>
5. What stage in the production of copper from its ores would be the most expensive in terms of energy?
- A. Crushing the ore
  - B. Smelting the copper mineral
  - C. Electrorefining
  - D. Concentration of the ore body.
6. In a pair of combining elements, which statement is true
- A. The greater the difference in electronegativity, the more likely they are to form an ionic bond
  - B. The smaller the difference in electronegativity, the more likely they are to form an ionic bond
  - C. Differences in electronegativity have nothing to do with what type of bond forms
  - D. When there is a difference in electronegativity in a covalent compound a non-polar molecule will form
7. The volume of carbon dioxide released at 25 °C and 100 kPa when 200g of calcium carbonate decomposes to form calcium oxide and carbon dioxide is closest to
- A. 24.8 L
  - B. 49.6 L
  - C. 22.7 L
  - D. 12.4L

8. Select the equation that represents an ionisation reaction in water



9. A student is supplied with a  $4.0 \text{ molL}^{-1}$  sulfuric acid ( $\text{H}_2\text{SO}_4$ ), solution. Calculate the mass of solute present in 100 mL of this solution

A. 39.2g

B. 392g

C. 9.8g

D. 98 g

10. One litre of a solution contains 0.98g of sodium sulfate, (formula mass is 142) The concentration of sodium ions in this solution is:

A.  $1.38 \times 10^{-3} \text{ molL}^{-1}$

B.  $1.38 \times 10^{-2} \text{ molL}^{-1}$

C.  $3.45 \times 10^{-3} \text{ molL}^{-1}$

D.  $3.45 \times 10^{-2} \text{ molL}^{-1}$

11. The main reason for the existence of a large number of carbon compounds is:

A. Carbon has the ability to form a variety of bonds

B. Carbon has an atomic mass of 12.01

C. Carbon is the only element that can combine with both metals and non-metals

D. Carbon is the most widely distributed element

12. The correct name for the structure  $\text{CH}_3\text{-CH}_2\text{-CH=CH-CH}_2\text{-CH}_2\text{-CH}_3$  is
- A. 3-heptyne
  - B. 4-heptene
  - C. 3-hexene
  - D. 3-heptene
13. Fractional distillation is the first step used to separate the components of crude oil. This step separates the components according to their boiling points. Which is the order that best represents the order of the fractions from the top (lowest boiling point) to the bottom of the fractioning tower?
- A. kerosene, bitumen, lubricating oils, gas, petrol
  - B. gas, petrol, kerosene, lubricating oils, bitumen
  - C. bitumen, lubricating oils, kerosene, petrol, gas
  - D. lubricating oils, bitumen, gas, petrol, kerosene

**PART B**

Total marks – 54

Attempt ALL questions 14 – 27

Show all relevant working in questions involving calculations.

*[Allow about 1 hour and 40 minutes for this part]*

14. A student is given a mixture of three solid compounds and is asked to separate them. She listed the compounds and some properties that she thought might be helpful to her task in the table below:

Substance	M.P. (°C)	B.P. (°C)	Relative Density	Solubility in Water	Solubility in Toluene
Lead iodide	402	872	5.1	No	No
Napthalene	80	218	1.0	No	Yes
Potassium iodide	681	1324	2.9	Yes	No

How could she separate the mixture?

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**(3 marks)**

15. Use Lewis Dot diagrams to show the following atoms and the compound that each pair form. Name the type of bonding in each compound.

(a) Sodium and Bromine

(b) Carbon and Oxygen

(5 marks)

16. Glucose ( $C_6H_{12}O_6$ ) is the major product of photosynthesis in plants.

a) When 0.22 mol of glucose is dissolved in 400 mL of water find the molarity of the solution.

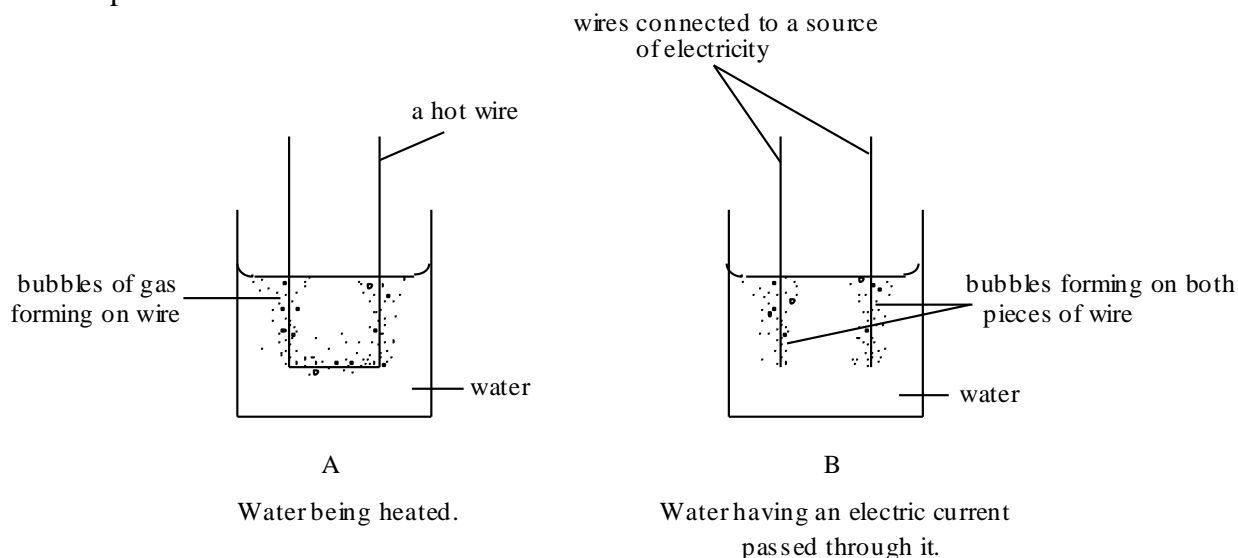
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b) How much water would you add to 250 mL of a 0.345 M glucose solution to dilute it to a 0.2 M solution? Show all working

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(3 marks)

17. The diagrams below show two ways in which gas bubbles can be produced from a sample of water:



The gas bubbles produced in A when cooled to room temperature formed a liquid the same as the original water.

The gas bubbles produced in B, when cooled to room temperature remained as gases. The gas collected at one wire will make a glowing match burst into flame again. The gas collected at the other wire burns explosively when ignited.

a) At first sight the processes occurring in A and B appear similar. Give two ways in which the processes are different from each other.

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b) Would you classify the changes occurring in A and B as physical or chemical changes?

A.....

B.....

c) On the basis of what happened in B, would you classify water as an element or a compound? Explain your answer.

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**(5 marks)**



18. Octane, a major component of petrol burns in a plentiful supply of air to form carbon dioxide and water.

a) Write a balanced equation for this reaction

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b) Calculate the mass of water formed from the complete combustion of 300g of octane.

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c) Calculate the volume of carbon dioxide formed from the complete combustion of 300g of octane (at 0°C and 100 kPa)

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**(5 marks)**

19. Potassium fluoride solution was added to an equal volume of lead nitrate solution, each solution had a concentration of 1.0 molL<sup>-1</sup>.

a) Write a net ionic equation for the precipitation reaction that resulted.

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b) Apart from the formation of a precipitate what other property could be measured to show a chemical reaction had occurred?

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**(2 marks)**

Consider the elements of Period 2 of the Periodic Table.

- a) Which element has the highest first ionisation energy? Explain why.

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- b) Write the formula for the most ionic chloride formed by elements in this period.

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- c) Hydrogen forms compounds with many of the elements in Period 2. Write the formula for and name a covalent hydride.

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**(4 marks)**

20. X, Y, W and Z are all metals. Look at the table below.

	Reaction with hot water	Reaction with steam	Reaction with hydrochloric acid	Reaction with cold water
X	yes	yes	yes	yes
Y	no reaction	yes	yes	no reaction
W	no reaction	no reaction	no reaction	no reaction
Z	yes	yes	yes	no reaction

- a) Arrange these metals in decreasing order of reactivity, ie. from the least reactive to the most reactive.

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- b) Y is a reactive divalent metal. ie. It forms  $Y^{2+}$  ions.  
Write a balanced equation for its reaction with hydrochloric acid

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- c) X is a metal from Group 1 of the Periodic Table.  
Write the equation for its reaction with water.

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**(5 marks)**

21. The common alloys, steel, brass and solder are used for a variety of purposes.

a) What is an alloy?

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b) In the table below describe **one** use for each alloy and relate this use to its properties.

alloy	Use	Relation of use to properties
Brass (copper and zinc)		
Solder (tin and lead)		

(5 marks)

22. The specific heat capacity for water is one of the highest known,  $4.2 \text{ JK}^{-1}\text{g}^{-1}$  while for ethanol it is  $2.4 \text{ JK}^{-1}\text{g}^{-1}$

a) Explain what is meant by the specific heat capacity of a substance.

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b) Explain why water's ability to absorb heat is important to aquatic systems and to life on earth generally .

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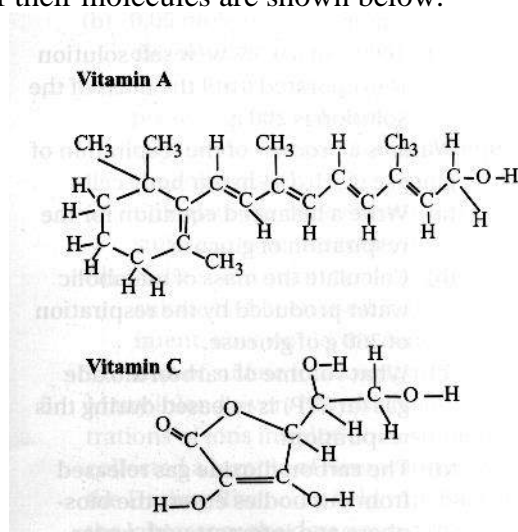
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**(3 marks)**

23. Vitamin A and Vitamin C are important for our health.  
The structures of their molecules are shown below.



- a) Determine the molecular formula for Vitamin C and hence its empirical formula.

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- b) Explain fully, using the appropriate features of the molecules' structure, the reason that Vitamin C is a water-soluble vitamin while Vitamin A is not.

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- c) The normal concentration of Vitamin C in blood plasma is 1 mg per 100mL  
Express this concentration in parts per million.  
(note: take density of blood plasma as  $1\text{g mL}^{-1}$   
ppm = mg / kg)

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**(5 marks)**

24. Diamond is the hardest substance known while graphite is quite soft. Think about their structures and explain this difference in hardness. You may use diagrams to assist your explanation.

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**(3 marks)**

25. Explain how the energy stored in fossil fuels got there. Include at least one chemical equation in your answer.

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**(2 marks)**

26. a) Draw and label the structures for hexane and ethene

b) Which of these hydrocarbons will have the higher boiling point and why?

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**(4 marks)**

**END OF PAPER**