

Name : _____ ()

Class : 4E1



Greenridge Secondary School

Preliminary Examination 2007

Subject : Chemistry (5068)
Secondary Four Express
Paper 1

Date : 18 Sep 2007

Duration : 1 h

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INSTRUCTIONS TO CANDIDATES

Write your name, index number and class on the answer sheet (OTAS) in the spaces provided.

There are forty questions in this paper. Attempt all questions. For each question, there are four possible answers labelled **A**, **B**, **C** and **D**. Choose the one you consider correct and record your choice in 2B pencil on the separate answer sheet (OTAS).

INFORMATION FOR CANDIDATES

Each correct answer will score one mark. A mark will not be deducted for a wrong answer. A copy of the Periodic Table is printed on page 13.

You are allowed to use the Calculator.

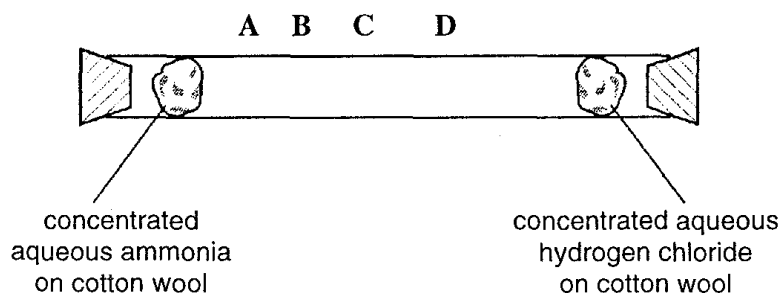
DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO

Name of Setter: Mr Victor Lee

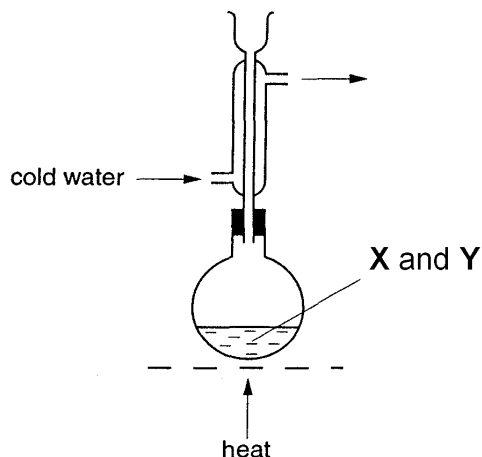
This question paper consists of **13** printed pages including this cover page

Answer all questions on the OTAS provided using only soft 2B pencil.

1. Ammonia (NH_3) and hydrogen chloride (HCl) diffuse in the tube shown. When these gases meet, they produce a white cloud of ammonium chloride. Where in the tube does the white cloud first appear?



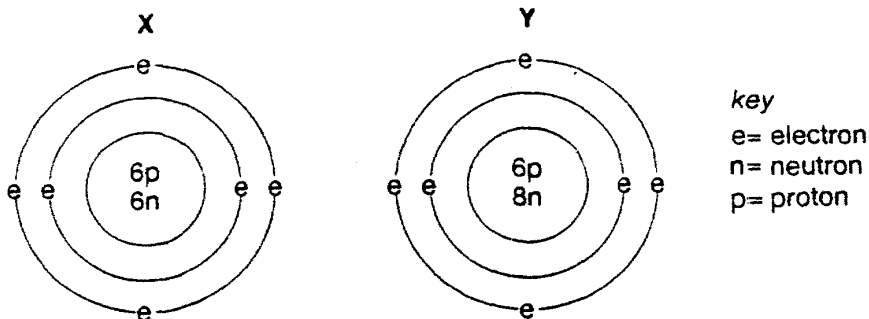
2. The diagram shows the apparatus used for the slow reaction between liquid X (boiling point 77°C) and liquid Y (boiling point 120°C) to produce a liquid Z (boiling point 150°C)



What is the purpose of the condenser?

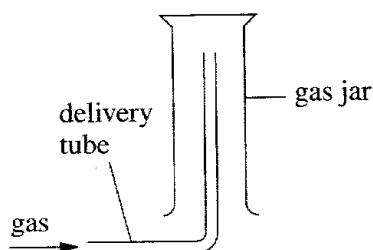
- A to enable X and Y to mix more efficiently
 - B to condense and collect the product Z
 - C to prevent X from escaping before the reaction is complete
 - D to prevent Y from escaping before the reaction is complete
3. Which of the following substances has a fixed boiling point?
- A sea water
 - B air
 - C methyl ethanoate
 - D petrol
4. An element X forms a negative ion with the electronic structure 2,8,8. What is the proton number of X?
- A 17
 - B 18
 - C 19
 - D 20

5. Two particles **X** and **Y** have the structures shown.



- Which term describes **X** and **Y**?
- A** allotropes
B ions
C isomers
D isotopes
6. In which pair do the elements combine to form a compound with an ionic lattice?
- A** carbon and hydrogen
B hydrogen and chlorine
C sodium and chlorine
D iron and carbon
7. Which of the following ions have the same number of electrons as an argon atom?
- A** fluoride and lithium
B fluoride and chloride
C potassium and chloride
D calcium and magnesium
8. Which substance contains covalent bonds, but also conducts electricity?
- A** bromine
B graphite
C mercury
D steel
9. Sodium hydrogencarbonate decomposes on heating:
 $2\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2$
- In an experiment, a 4 mol sample of sodium hydrogen carbonate was heated.
What volume of carbon dioxide, measured at room temperature and pressure, would be evolved ?
- A** 12 dm³
B 24 dm³
C 36 dm³
D 48 dm³

10. When 20 cm^3 of a gaseous alkane burns in an excess of oxygen, 80 cm^3 of carbon dioxide are formed. Both volumes are measured at r.t.p. What is the formula of the alkane?
- A** C_4H_8
B C_4H_{10}
C C_8H_{16}
D C_8H_{18}
11. 'Cracking' of hydrocarbons breaks them into smaller molecules. Which example of 'cracking' would produce the least volume of products from one mole of hydrocarbon? Assume that all measurements are made at the same temperature and pressure.
- A** $\text{C}_6\text{H}_{14(\text{g})} \rightarrow 3\text{C}_2\text{H}_4(\text{g}) + \text{H}_2(\text{g})$
B $\text{C}_8\text{H}_{18(\text{g})} \rightarrow 2\text{C}_3\text{H}_8(\text{g}) + \text{C}_2\text{H}_2(\text{g})$
C $\text{C}_{10}\text{H}_{22(\text{g})} \rightarrow \text{C}_8\text{H}_{18(\text{g})} + \text{C}_2\text{H}_4(\text{g})$
D $\text{C}_{12}\text{H}_{26(\text{g})} \rightarrow \text{C}_8\text{H}_{18(\text{g})} + 2\text{C}_2\text{H}_4(\text{g})$
12. Which one of the following represents sulphur in the lowest oxidation state?
- A** S
B SO_2
C H_2SO_4
D H_2S
13. In separate experiments, an excess of aqueous sodium hydroxide or aqueous ammonia was gradually added to a solution **X**. In both experiments, a precipitate was obtained which dissolved in an excess of the added reagent. What could **X** contain?
- A** copper(II) nitrate
B iron(II) nitrate
C iron(III) nitrate
D zinc nitrate
14. Which of the listed reactions produce a gas that can be collected using the setup below?

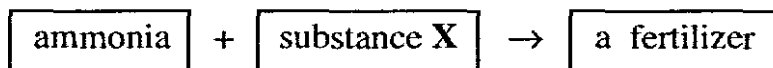


- Reaction I : potassium with water
 Reaction II: sodium carbonate with hydrochloric acid
 Reaction III: zinc with hydrochloric acid
 Reaction IV : calcium oxide with water

- A** I and II only
B I and III only
C II and III only
D II and IV only

15. Which two gases each change the colour of damp red litmus paper?
- A ammonia and chlorine
 - B ammonia and hydrogen chloride
 - C carbon dioxide and chlorine
 - D carbon dioxide and carbon monoxide
16. When aqueous sodium hydroxide is warmed with a substance **X**, there is **no** visible reaction. However, when a piece of aluminium foil is added, an alkaline gas is liberated. Which of the following could be **X**?
- A Ammonium nitrate
 - B Copper (II) nitrate
 - C Ammonium chloride
 - D Sodium nitrate
17. Both aqueous barium chloride and aqueous lead (II) nitrate gave a white precipitate when added to a sample of water. Which impurity did the water sample contain?
- I sulphate
 - II chloride
 - III carbonate
 - IV hydroxide
- A I and III only
 - B I and IV only
 - C II and III only
 - D II, III and IV only

18. The diagram shows a reaction used to manufacture fertilizer.



What could substance **X** be?

- A calcium oxide
 - B nitrogen
 - C sodium hydroxide
 - D sulphuric acid
19. Sulphur dioxide is bubbled into a test-tube containing aqueous bromine. The reddish brown aqueous bromine decolourised slowly. From the observation, we can deduce that sulphur dioxide is
- A an alkene
 - B a reducing agent
 - C an oxidizing agent
 - D a catalyst

20. Methane, sulphur dioxide and carbon dioxide are gases which affect the atmosphere and the environment. Which of the follow correctly states the effect of the pollutant on the environment?

- I Methane causes global warming
- II Sulphur dioxide causes acid rain
- III Carbon dioxide causes global warming
- IV Methane causes photochemical smog
- V Carbon dioxide causes depletion of the ozone layer

- A I, II and III only
- B II, III and IV only
- C III, IV and V only
- D I, II, III, IV and V

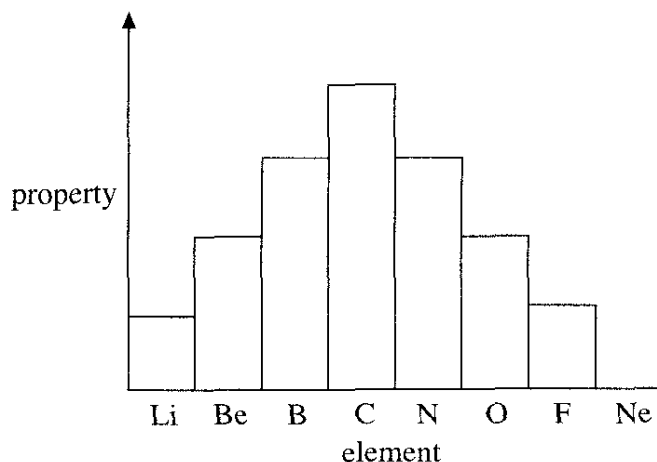
21. The water in a lake showed signs of eutrophication. What could be the cause of this?

- A increasing the amount of dissolved fertiliser
- B increasing the amount of dissolved oxygen
- C increasing the fish population
- D increasing in pH of water

22. Which statement about the elements in the Periodic Table is correct?

- A Group 0 elements are unreactive metals.
- B Group I elements form covalent chlorides.
- C Group VII elements form negative ions.
- D The elements become more metallic from left to right across a period.

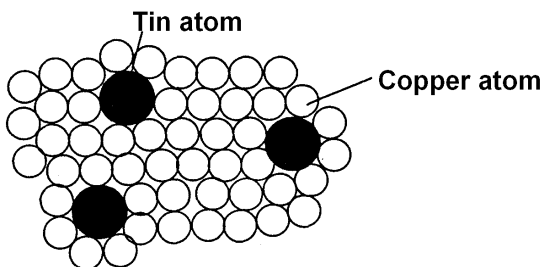
23. The bar chart shows the period of elements from lithium to neon.



Which property of these elements is shown on the chart?

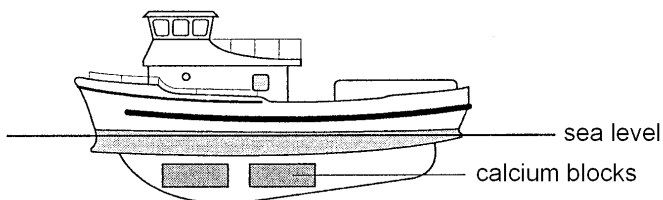
- A the valence of the element
- B the number of valence electrons
- C the proton (atomic) number
- D the relative atomic mass

24. The diagram shows the structure of bronze.



Why is bronze harder than pure copper?

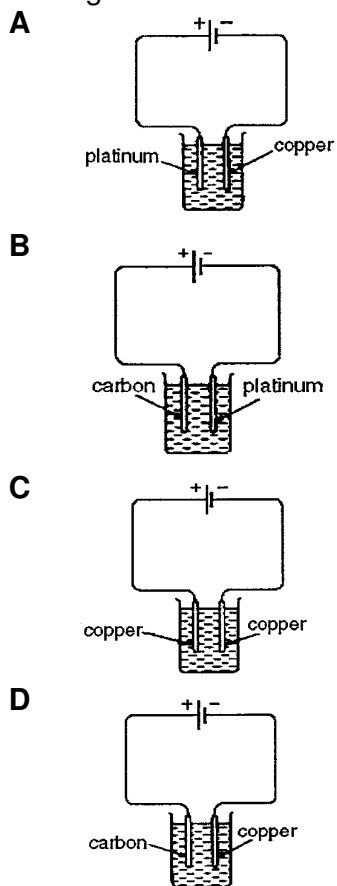
- A The tin atoms form strong covalent bonds with copper atoms.
 - B The tin atoms disrupts the regular arrangement of copper atoms.
 - C The tin atoms prevent the 'sea of electrons' from moving freely in the lattice.
 - D Tin atoms are harder than copper atoms.
25. Magnesium displaces copper from aqueous copper (II) sulphate because
- A magnesium has a higher relative atomic mass than copper.
 - B magnesium atoms lose electrons more readily than copper atoms.
 - C magnesium atoms can oxidise Cu^{2+} ions to Cu atoms.
 - D magnesium sulphate is more soluble than copper (II) sulphate.
26. The diagram shows a boat made from iron. John came up with an idea to use some calcium blocks attached to the iron below the water line to prevent corrosion of iron.



Why do you think that this method **cannot** work?

- A Calcium is more reactive than iron.
 - B Calcium cannot form a protective coating of calcium oxide on the iron.
 - C Calcium reacts readily with water to form an alkali.
 - D Calcium explodes violently in sea water causing the boat to sink.
27. Aqueous copper (II) sulphate is electrolysed using graphite anode and copper cathode.
What happens to the electrolyte?
- A It becomes more acidic.
 - B It becomes more alkaline.
 - C It turns deeper blue.
 - D It remains unchanged.

28. Aqueous copper(II) sulphate was electrolysed using different electrodes as shown in the diagrams below.

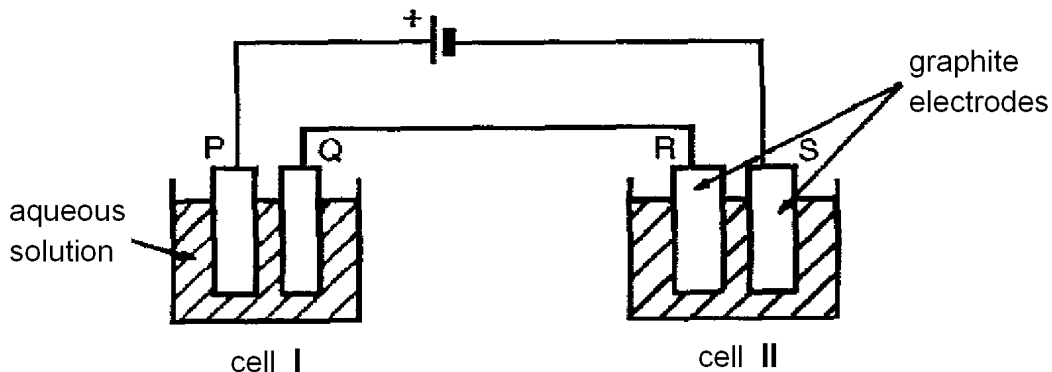


In which experiment, **A**, **B**, **C** or **D**, did the concentration of aqueous copper(II) sulphate remain constant?

29. A metal spoon is to be electroplated with silver using aqueous silver nitrate as the electrolyte. Which of the following should be used as the cathode?

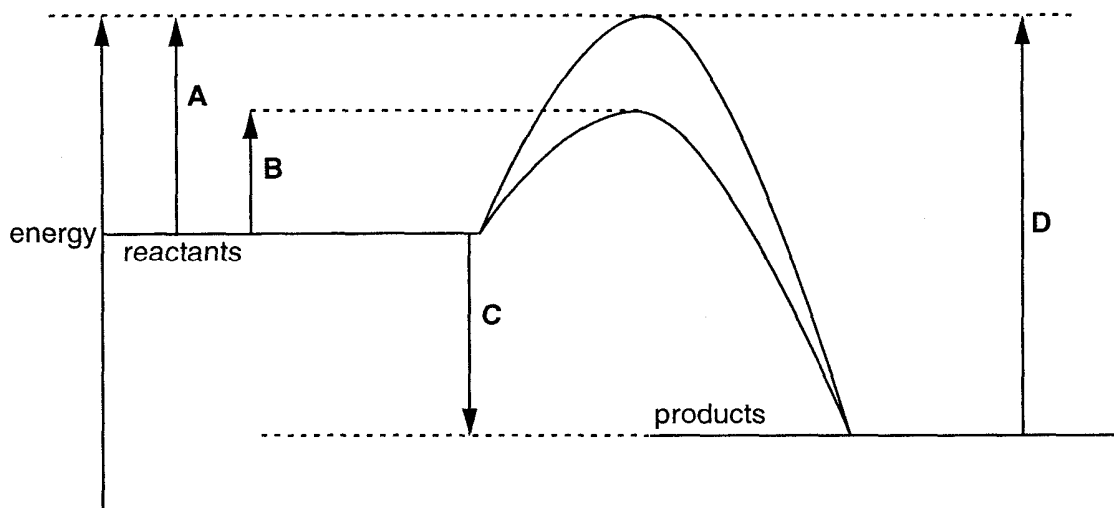
- A** graphite
- B** silver
- C** the spoon
- D** copper

30. In the diagram below each cell contains an aqueous solution of a single salt and all four electrodes are graphites. Electrodes **Q** and **S** increase in mass during the electrolysis but **no** gas is given off at **Q** or **S**.



If an increase in mass of **Q** is greater than the increase of mass of **S** in the same time, which of the following statements is necessarily true?

- A** The cation discharged in Cell I is different from the cation discharged in Cell II.
 - B** The anion of the solute in Cell I is different from the anion of the solute in Cell II.
 - C** The solution in Cell I is more concentrated than the solution in Cell II.
 - D** The loss of mass of electrode P is less than the loss of mass of electrode R.
- 31 The diagram shows an energy profile diagram for a chemical reaction. Which energy change is the activation energy for the catalysed reaction?

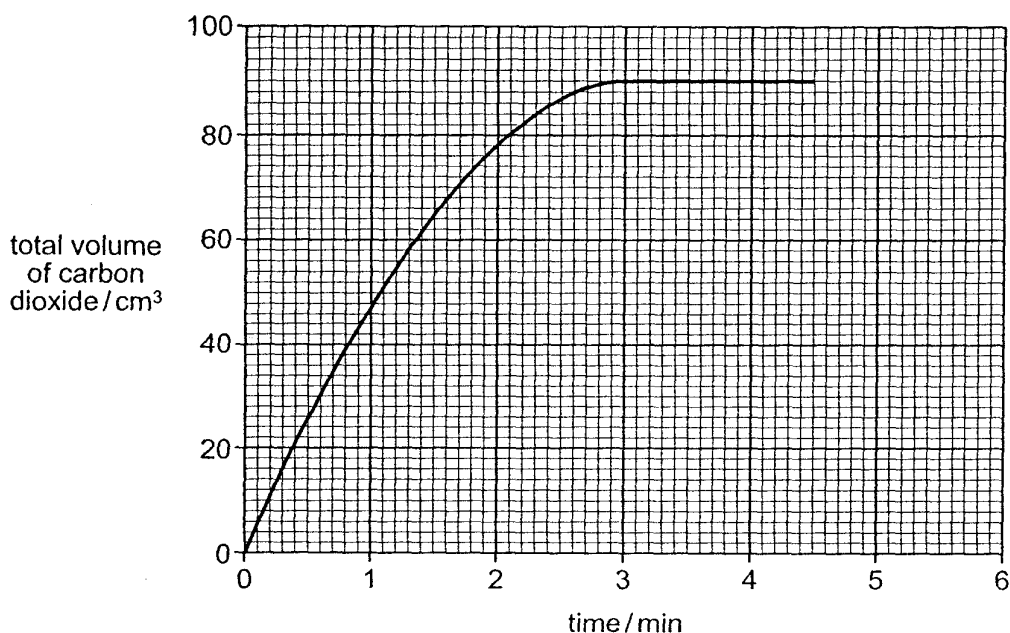


32. The table shows the energy released by the complete combustion of some compounds used as fuels.

compound	formula	M_r	ΔH in kJ/mol
methane	CH_4	16	-880
ethanol	$\text{C}_2\text{H}_5\text{OH}$	46	-1380
propane	C_3H_8	44	-2200
heptane	C_7H_{16}	100	-4800

Which fuel produces the most energy when 1 g of the compound is completely burned?

- A** ethanol
B heptane
C methane
D propane
33. The rate of the reaction between a given mass of calcium carbonate and an excess of hydrochloric acid is studied by collecting the carbon dioxide in a graduated syringe. The results are shown in the graph.



How much time is required for half the calcium carbonate to react?

- A** 0.95 min
B 1.5 min
C 2.0 min
D 3.0 min
34. Which gas is **not** produced when hydrocarbons are burnt in the internal combustion engine?
- A** carbon dioxide
B carbon monoxide
C hydrogen
D water

35. Which physical property of the alkanes increase as relative molecular mass increases?

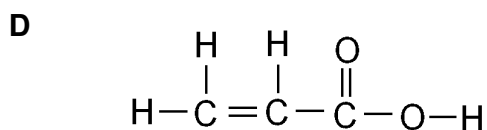
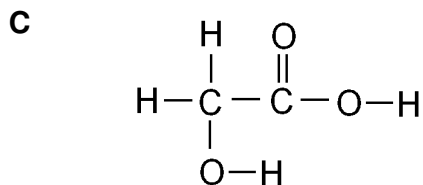
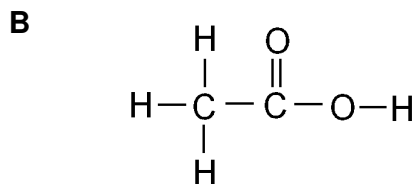
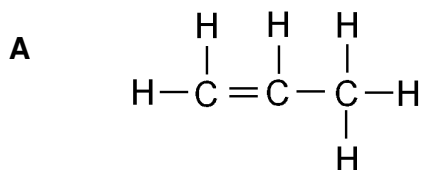
- I melting point
- II flammability
- III viscosity
- IV boiling point

- A** I and III only
- B** I, III and IV only
- C** II, III and IV only
- D** I, II, III and IV

36. The results of tests on compound **X** are shown.

test	result
add bromine water	turns colourless
add aqueous sodium carbonate	carbon dioxide formed

What is compound **X**?



37. Cholesterol is an organic molecule that occurs in the blood stream. What type of compound is cholesterol?

- A** an ester
- B** an alcohol
- C** an alkane
- D** an alkene

38. Which statement is **not** true about ethanol?
- I It is formed by the catalytic addition of steam to ethene.
 - II it is an unsaturated compound.
 - III It is formed by the fermentation of ethanoic acid.
 - IV It reacts with ethyl ethanoate to form ethanoic acid.
- A** I and II only
B I, II and III only
C I, II and IV only
D II, III and IV only
39. In the polymerisation of propene to form poly(propene), there is **no** change in
- A** boiling point.
 - B** density
 - C** mass.
 - D** molecular formula.
40. Which element is found in all macromolecule?
- A** carbon
 - B** nitrogen
 - C** oxygen
 - D** chlorine

~ **The End** ~

