

Name : \_\_\_\_\_ (       )

Class : 4E1



# Greenridge Secondary School

## Preliminary Examination 2008

Subject : Pure Chemistry (5072)  
Secondary Four Express  
Paper 1

Date : 19 Sep 2008 (Friday)

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 **11**.

*You are allowed to use the Calculator.*

**DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO**

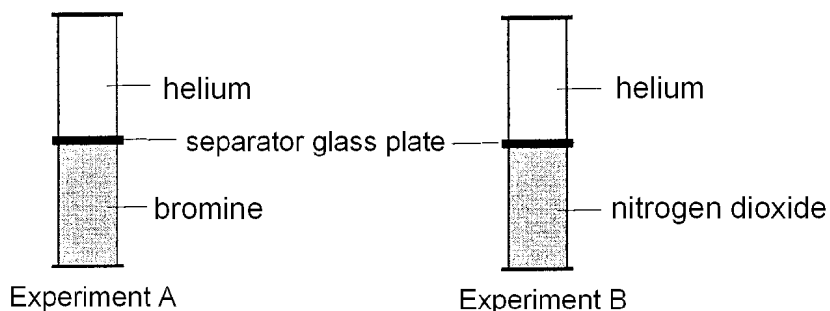
*Name of Setter: Mr Victor Lee*

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This question paper consists of **11** printed pages including this cover page

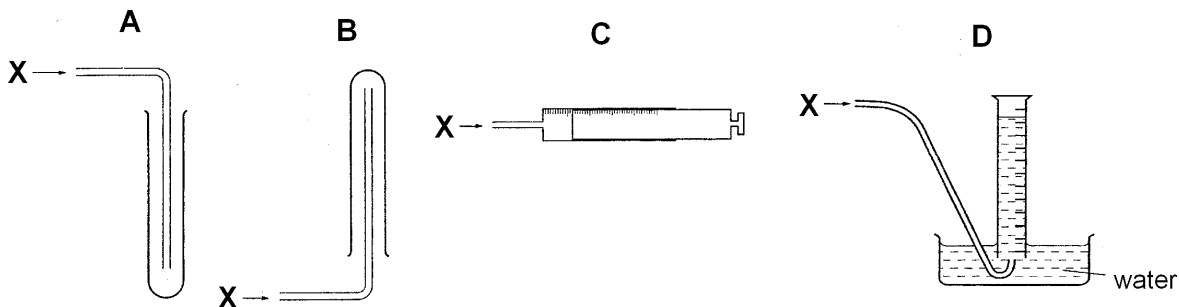
Answer all questions on the OTAS provided using only soft 2B pencil.

- Which of the following substances has a fixed boiling point?  
**A** air  
**B** ethanol  
**C** petrol  
**D** vinegar
- Two sets of experiments, **A** and **B**, were set up as shown below. Both bromine and nitrogen dioxide are brown gases. The separator glass plates were removed from the gas jars.



Which statement correctly describes the observation over a few days?

- The brown gases remained at the bottom of the jars in experiment **A** as bromine has greater density compared to nitrogen gas.
  - The brown gases remained at the bottom of the jars in experiment **B** as nitrogen dioxide has greater density compared to nitrogen gas.
  - The colour of gas in jars of experiment **A** becomes light brown throughout faster than in experiment **B**.
  - The colour of gas in jars of experiment **B** becomes light brown throughout faster than in experiment **A**.
- Gas **X** is denser than air and soluble in water. Which method can be used to *collect* and *measure* a dry sample of gas **X**?



4. Sodium chloride solution and lead(II) nitrate solution were mixed together and stirred. Two products, **P** and **Q**, are obtained from the reaction. The mixture is then filtered to obtain **P** as residue and **Q** as filtrate. Which of these is correct?

	<b>P</b>	<b>Q</b>
<b>A</b>	sodium nitrate	lead (II) chloride
<b>B</b>	sodium chloride	lead (II) nitrate
<b>C</b>	lead (II) nitrate	sodium chloride
<b>D</b>	lead (II) chloride	sodium nitrate

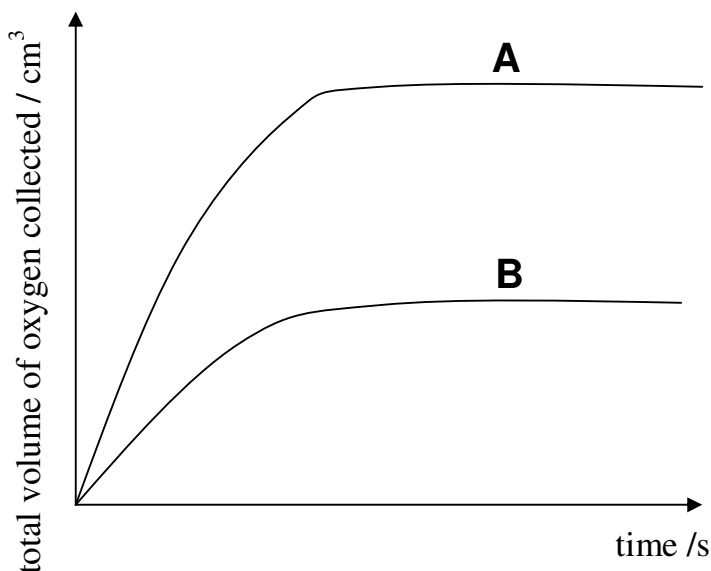
5. Which one of these pairs of elements would react together most violently?
- A** Rubidium and fluorine
  - B** Calcium and oxygen
  - C** Lithium and argon
  - D** Nitrogen and hydrogen
6. Which of the following consists of an element, a compound and a mixture?
- A** brass, water, sodium chloride
  - B** calcium oxide, air, ethanol
  - C** iron, methanol, aqueous lead (II) nitrate
  - D** bronze, stainless steel, graphite
7. An element **X** forms a positive ion with the electronic structure 2,8. What is the proton number of **X**?
- A** 8
  - B** 9
  - C** 10
  - D** 11
8. Which substance conducts electricity by means of mobile electrons?
- A** bromine
  - B** graphite
  - C** molten sodium chloride
  - D** aqueous copper (II) sulphate
9. Magnesium oxide has a melting point of 2800 °C. Which of the following statements explains the reason for this high melting point?
- A** The magnesium and oxygen atoms are held together by strong double covalent bonds.
  - B** The magnesium ions and the oxygen ions are held together by strong electrostatic forces in the giant crystal lattice.
  - C** The magnesium and oxygen atoms are joined together to form a giant molecular structure similar to silicon (IV) oxide.
  - D** The magnesium oxide exists as a simple covalent molecule with very strong van der Waals' forces between magnesium and oxygen atoms.

10. Calcium carbonate decomposes on heating to produce calcium oxide and carbon dioxide. In an experiment, a 40g calcium carbonate was heated strongly until constant mass. What volume of carbon dioxide, measured at room temperature and pressure, would be produced?
- A 9.6 dm<sup>3</sup>
  - B 17.6 dm<sup>3</sup>
  - C 24 dm<sup>3</sup>
  - D 960 dm<sup>3</sup>
11. When 10 cm<sup>3</sup> of a gaseous alkene burns in an excess of oxygen, 40 cm<sup>3</sup> of carbon dioxide are formed. Both volumes are measured at r.t.p. What is the formula of the alkene?
- A C<sub>2</sub>H<sub>4</sub>
  - B C<sub>2</sub>H<sub>6</sub>
  - C C<sub>4</sub>H<sub>8</sub>
  - D C<sub>4</sub>H<sub>10</sub>
12. 24dm<sup>3</sup> of hydrogen gas is mixed with same volume of oxygen gas and burnt. What will the resulting mixture contain?
- A 1 mol of steam
  - B 2 mols of steam
  - C 1 mol of steam + 0.5 mol of oxygen gas
  - D 1 mol of steam + 0.5 mol of hydrogen gas
13. Which of the following reacts with hydrochloric acid to produce hydrogen?
- A copper
  - B iron
  - C lead
  - D silver
14. A colourless solution X formed a white precipitate both with dilute sulphuric acid and aqueous silver nitrate. What could solution X possibly contain?
- I barium chloride
  - II lead (II) nitrate
  - III calcium chloride
- A I only
  - B II only
  - C III only
  - D I and III only
15. Which of the following substances can be added to the soil to reduce the acidity in a soil?
- A calcium sulphate
  - B ammonium nitrate
  - C calcium hydroxide
  - D potassium chloride

16. Which of the following salts **cannot** be prepared by reaction between a dilute acid and a metal?
- A calcium chloride
  - B copper(II) chloride
  - C iron (II) chloride
  - D zinc nitrate
17. A redox reaction will occur when aqueous iron(II) sulphate is added to
- A aqueous hydrochloric acid.
  - B aqueous barium nitrate.
  - C aqueous potassium iodide.
  - D acidified potassium manganate (VII).
18. Which of the following conversions is an example of reduction?
- A From iron (II) carbonate to iron (II) sulphate
  - B From copper (II) oxide to copper
  - C From zinc nitrate to zinc chloride
  - D From hydrochloric acid to chlorine
19. Zinc displaces copper from aqueous copper (II) sulphate because
- A zinc has a lower relative atomic mass than copper.
  - B zinc atoms readily oxidise  $\text{Cu}^{2+}$  ions to Cu atoms.
  - C zinc atoms lose electrons more readily than copper atoms.
  - D zinc sulphate has lower boiling point than copper (II) sulphate.
20. Metal **X** lies between zinc and lead in the reactivity series. Which of the following statements is correct about **X**?
- A It reduces magnesium oxide to magnesium on heating.
  - B It displaces zinc from an aqueous solution of a zinc salt.
  - C It displaces copper from aqueous copper (II) sulphate.
  - D It forms a hydroxide which dissolves in water.
21. Which of the following statements shows that magnesium is a metal?
- A It forms an oxide when it is exposed to the air.
  - B It conducts electricity in solid state.
  - C It reacts by giving away two electrons.
  - D It belongs to Period 2 of the Periodic Table.
22. A metal knife is to be electroplated with silver using aqueous silver nitrate as the electrolyte. Which of the following should be used as the anode?
- A graphite
  - B silver
  - C metal pen
  - D copper



28. Which of the following statements is true about an endothermic process?
- A A catalyst is required to start a chemical reaction.
  - B Heat and light energy is always absorbed in the process.
  - C It does not require an activation energy to start the chemical reaction.
  - D The total energy content of the reactants is less than that of the products.
29. Which of the following descriptions does **not** correctly describes an exothermic process?
- A It is a bond making process.
  - B The temperature in the surroundings increases.
  - C The process does not involve activation energy.
  - D The total energy content of the reactants is more than that of the products.
30. The graphs **A** and **B** represent the results of two experiments showing the catalytic decomposition of hydrogen peroxide,  $\text{H}_2\text{O}_2$ . Assuming that all other conditions are kept constant, which one of the following is the correct explanation for the results?



- | <b>Experiment A</b>  | <b>Experiment B</b>  |
|--|--|
| A 50cm <sup>3</sup> of 1.0M $\text{H}_2\text{O}_2$ was used.                                     | 25cm <sup>3</sup> of 2.0M $\text{H}_2\text{O}_2$ was used.                                     |
| B 50cm <sup>3</sup> of 0.5M $\text{H}_2\text{O}_2$ was used with 2.0g of $\text{MnO}_2$ .        | 50cm <sup>3</sup> of 0.5M $\text{H}_2\text{O}_2$ was used with 1.0g of $\text{MnO}_2$ .        |
| C 25cm <sup>3</sup> of 1.0M $\text{H}_2\text{O}_2$ was used with 1.0g of $\text{MnO}_2$ at 80°C. | 25cm <sup>3</sup> of 1.0M $\text{H}_2\text{O}_2$ was used with 0.5g of $\text{MnO}_2$ at 40°C. |
| D 25cm <sup>3</sup> of 1.0M $\text{H}_2\text{O}_2$ was used with 0.5g of $\text{MnO}_2$ .        | 25cm <sup>3</sup> of 0.5M $\text{H}_2\text{O}_2$ was used with 0.5g of $\text{MnO}_2$ .        |

31. Which set of conditions will make calcium carbonate react most quickly with hydrochloric acid?

- A marble powder and dilute hydrochloric acid at 40 °C
- B marble powder and dilute hydrochloric acid at 60 °C
- C marble chips and dilute hydrochloric acid at 40 °C
- D marble chips and dilute hydrochloric acid at 60 °C

32. Which of the following is **not** a property of ammonia?

- A It is highly soluble in water.
- B It turns red litmus blue.
- C It is a reducing agent.
- D It reacts with oxygen to form nitrogen and water.

33. The following gases are present in car exhaust fumes.

*carbon dioxide*      *nitrogen dioxide*      *octane*  
*carbon monoxide*      *nitrogen*      *water vapour*

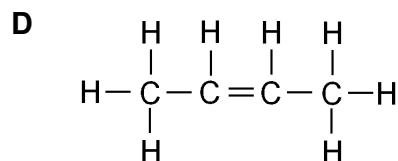
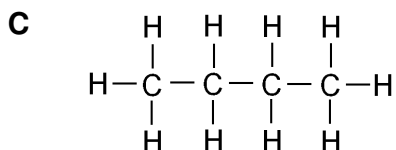
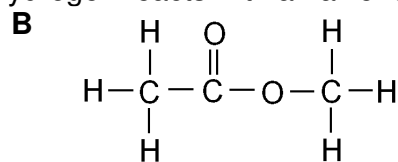
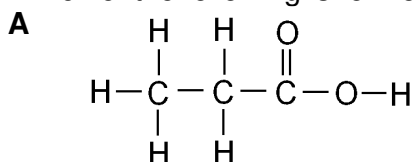
Which of these gases is also present in **unpolluted** air?

- A nitrogen only
- B nitrogen and water vapour only
- C nitrogen, carbon dioxide and water vapour only
- D octane, carbon monoxide, carbon dioxide and water vapour only

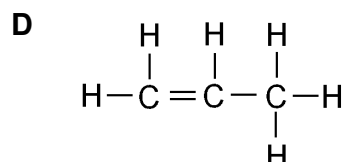
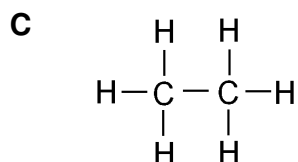
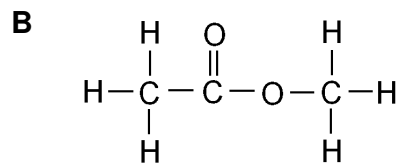
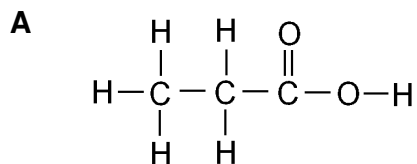
34. A sample of air was shaken with an alkaline solution of a compound called pyrogallol. The gases remaining did **not** support combustion. Which one of the following pairs of gases was removed from the air by the alkaline pyrogallol?

- A carbon dioxide and nitrogen
- B oxygen and carbon dioxide
- C oxygen and nitrogen
- D nitrogen and water vapour

35. Which of the following is formed when hydrogen reacts with an alkene?



36. An organic compound **X** reacts both with sodium hydroxide and with sodium carbonate. What could the structure of **X** be?



37. Which statement is true about propanol?

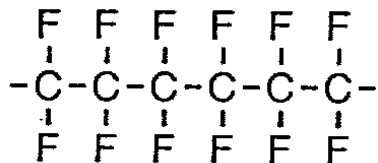
- A** It is formed by the catalytic addition of steam to propene.
- B** It is an unsaturated hydrocarbon.
- C** It is formed by the combustion of propene.
- D** It reacts ethanoic acid to form ethyl propanoate.

38. The structures of four compounds **P**, **Q**, **R** and **S** are shown. Which of the compounds are isomers of each other?

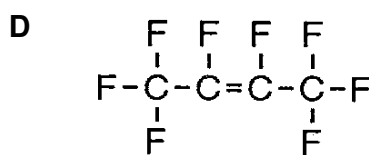
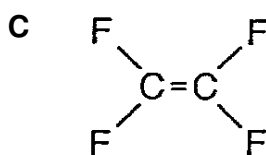
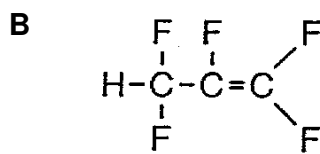
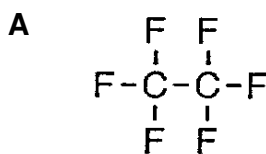
<b>P</b>	<b>Q</b>	<b>R</b>	<b>S</b>
$  \begin{array}{c}  \text{H} \quad \text{H} \quad \text{H} \\    \quad   \quad   \\  \text{H}-\text{C}-\text{O}-\text{C}-\text{C}-\text{H} \\    \quad   \quad   \\  \text{H} \quad \text{H} \quad \text{H}  \end{array}  $	$  \begin{array}{c}  \text{H} \\    \\  \text{H} \quad \text{O} \quad \text{H} \\    \quad   \quad   \\  \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\    \quad   \quad   \\  \text{H} \quad \text{H} \quad \text{H}  \end{array}  $	$  \begin{array}{c}  \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\    \quad   \quad   \quad   \\  \text{H}-\text{C}-\text{C}-\text{O}-\text{C}-\text{C}-\text{H} \\    \quad   \quad   \quad   \\  \text{H} \quad \text{H} \quad \text{H} \quad \text{H}  \end{array}  $	$  \begin{array}{c}  \text{H} \quad \text{H} \quad \text{H} \\    \quad   \quad   \\  \text{H}-\text{C}-\text{C}-\text{C}-\text{O}-\text{H} \\    \quad   \quad   \\  \text{H} \quad \text{H} \quad \text{H}  \end{array}  $

- A** P and Q only
- B** P, Q and R only
- C** P, Q and S only
- D** Q, R and S only

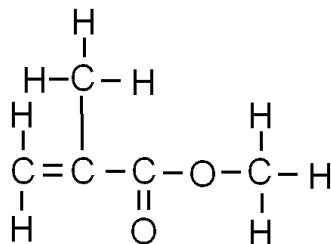
39. Polytetrafluoroethylene is better known by the trade name Teflon. It's used to make non-stick cooking pans, and anything else that needs to be slippery or non-stick. It has the following structure.



Which of the following is the monomer of Teflon?



40. Perspex is a thermoplastic and transparent plastic. Chemically, it is the synthetic polymer of methyl methacrylate. The structure of the monomer of perspex is shown.



Which description of Perspex is correct?

- |          | <u>type of polymer</u> | <u>polymer formed by</u>    |
|----------|------------------------|-----------------------------|
| <b>A</b> | ester                  | addition polymerisation     |
| <b>B</b> | hydrocarbon            | condensation polymerisation |
| <b>C</b> | polyester              | addition polymerisation     |
| <b>D</b> | nylon                  | condensation polymerisation |

~ The End ~

# The Periodic Table of the Elements

		Group															
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII						
7 Li Lithium 3	9 Be Beryllium 4											4 He Helium 2					
23 Na Sodium 11	24 Mg Magnesium 12	11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10	27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18				
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	101 Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 47	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium * 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
87 Fr Francium	88 Ra Radium	89 Ac Actinium											103 Lr Lawrencium				

\* 58 – 71 Lanthanoid series  
+ 90 – 103 Actinoid series

a	X
b	+

a = relative atomic mass  
 X = atomic symbol  
 b = proton (atomic) number

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71	
232 Th Thorium 90	238 Pa Protactinium 91	238 U Uranium 92	238 Pu Plutonium 94	238 Am Americium 95	238 Cm Curium 96	238 Bk Berkelium 97	238 Cf Californium 98	238 Es Einsteinium 99	238 Fm Fermium 100	238 Md Mendelevium 101	238 No Nobelium 102	238 Lr Lawrencium 103

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.)