

Name : _____ ()

Class : 3E1



Greenridge Secondary School

End-of-Year Examination 2006

Subject : Pure Chemistry (5068)
Secondary Three Express
Paper 1

Date : 12 Oct 2006

Duration : 1 h

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INSTRUCTIONS TO CANDIDATES

Write your name, index number and class in the spaces at the top of this page and on the OMR sheet.

**HAND UP OTAS SHEET and QUESTION PAPER *SEPARATELY*.
DO NOT STAPLE THEM TOGETHER.**

There are **40** questions in this paper. Answer **all** questions.
Choose the one you consider correct and record your choice in soft 2B pencil on the OTAS sheet.

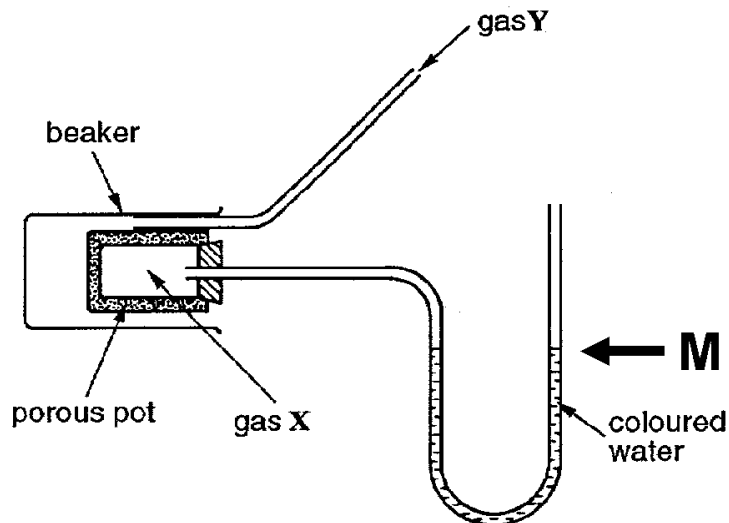
INFORMATION FOR CANDIDATES

Each correct answer is awarded 1 mark.
A copy of the Periodic Table is printed on page 10

This paper consists of 10 printed pages, including this page.

Answer **all** the questions in the OTAS sheet provided.

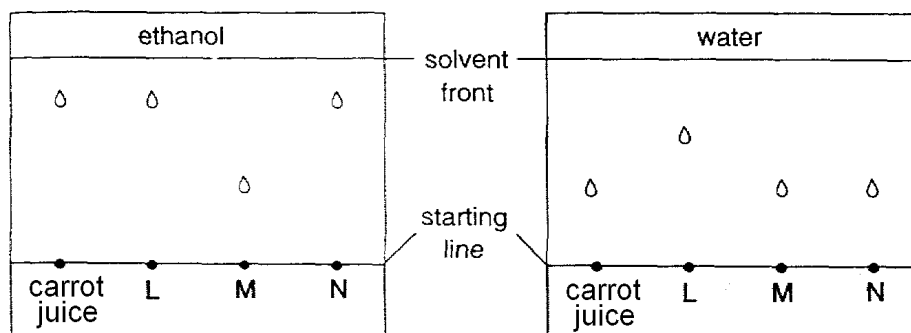
- 1 The apparatus below is used to show the diffusion of gases.



Which pair of gases **X** and **Y** would cause the water level at **M** to move up?

- | | X | Y |
|----------|-------------------------------|-------------------------------|
| A | CO | N ₂ |
| B | CO ₂ | SO ₂ |
| C | C ₂ H ₄ | C ₂ H ₆ |
| D | NO ₂ | O ₂ |
- 2 Which one of these processes involves a weakening of the forces of attraction between particles?
- A** Condensation
 - B** Crystallization
 - C** Freezing
 - D** Boiling
- 3 Gases can be compressed because
- A** their particles are smaller than those of liquids or solids.
 - B** there is plenty of space between their particles.
 - C** their particles are more compressible due to weak bonds.
 - D** their particles are randomly arranged.

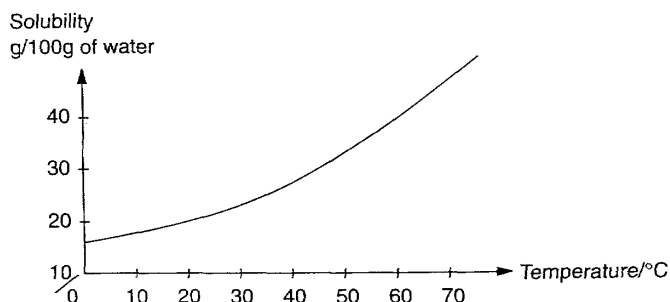
- 4 It was thought that carrot juice contained one or more of three different pigments L, M and N. Spots of each of these pigments were put on the starting line of two chromatograms along with a spot of carrot juice. The first chromatogram was developed with ethanol, the second with water. The results are shown below:



Which pigment(s) is(are) present in the carrot juice?

- A N only
- B L and N only
- C M and N only
- D L, M and N

- 5 The graph shows the solubility curve for copper(II) sulphate:

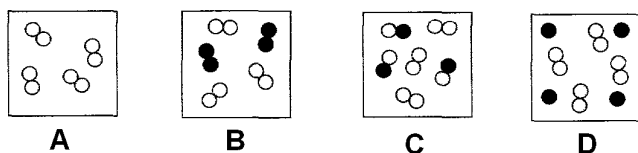


A sample of blue copper (II) sulphate has been contaminated with a small amount of black copper (II) oxide. A student performed the following steps to remove the insoluble copper (II) oxide to obtain a pure sample of copper (II) sulphate crystals. First, he dissolved the mixture to 200g of hot water at 60°C until no more can dissolve. Next, the saturated solution of copper(II) sulphate was filtered to remove insoluble copper (II) oxide. Finally, the filtrate was left to cool from 60°C to 20°C. What is the maximum amount of copper(II) sulphate crystals obtained at 20°C?

- A 20g
- B 40g
- C 80g
- D 120g

- 6 A solid is likely to be pure if it
A is soluble in water.
B is crystalline with an exact melting point.
C boils at an exact boiling point.
D has a high melting point.
- 7 Diamond is an allotrope of carbon. It is a macromolecule and therefore
A contains ions in a giant crystalline lattice.
B conducts electricity when molten.
C contains covalent bonds between carbon atoms.
D has a molecular formula of C₄.

- 8 Which diagram shows a mixture of one element and one compound?

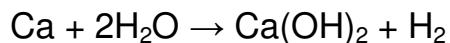


- 9 Which one of the following lists contains two mixtures?
A Air, water
B Limewater, water
C Quicklime, limewater
D Sea water, air
- 10 Which of the following substances does **not** have a fixed boiling point?
A Copper
B Glucose solution
C Ethanol
D Hydrogen chloride gas
- 11 The element with the atomic number 4 is likely to have similar chemical properties to the element with the atomic number
A 3.
B 5.
C 11.
D 12.
- 12 The atomic number of magnesium is 12. The electronic structure of the magnesium ion can be represented as
A 2, 8.
B 2, 8, 2.
C 2, 8, 8.
D 2, 8, 8, 2.

- 13 Which of the following elements has the greatest number of valence electrons?
- A Fluorine
 - B Helium
 - C Lithium
 - D Oxygen
- 14 Isotopes of an element have different
- A atomic numbers.
 - B numbers of electrons.
 - C numbers of electron shells (energy levels).
 - D numbers of neutrons.
15. Silicon and carbon are both from Group IV in the Periodic Table. Silicon dioxide is a solid at room temperature while carbon dioxide is a gas. The reason for this difference in state at room temperature is that
- A the covalent bonds in carbon dioxide are weaker than the covalent bonds in silicon dioxide.
 - B the ionic bonds present in silicon dioxide are stronger than the covalent bonds present in carbon dioxide.
 - C the intermolecular forces present in silicon dioxide are stronger than those present in carbon dioxide.
 - D the intermolecular forces present in carbon dioxide are weaker than the covalent bonds present in silicon dioxide.
- 16 **X** is a solid compound with very high melting point. **X** can conduct electricity only in molten state. What type of bonds would **X** have ?
- A Ionic bonds
 - B van der Waals forces
 - C Covalent bonds
 - D Metallic bonds
- 17 If element **P** has a atomic number of 17 and element **Q** has a proton number of 11, a chemical reaction between **P** and **Q** will form
- A an ionic compound with the formula, **QP**
 - B a covalent compound with the formula, **QP**
 - C an ionic compound with the formula, **QP₂**
 - D a covalent compound with the formula, **Q₂P**
- 18 X, Y and Z are three elements with consecutive proton (atomic) numbers. X has the lowest proton (atomic) number and Y is a noble gas. How is a stable compound formed between X and Z?
- A Each atom of X shares an electron with an atom of Z.
 - B Each atom of X shares a pair of electrons with an atom of Z.
 - C Each atom of X gives an electron to an atom of Z, to form X^+Z^- .
 - D Each atom of X receives an electron to form an atom of Z, to form X^-Z^+ .

- 19 What has a mass equal to that of one mole of water?
A 24 dm³ of water
B 24dm³ of steam
C One mole of steam
D One molecule of water

- 20 Calcium reacts with water according to the equation below.



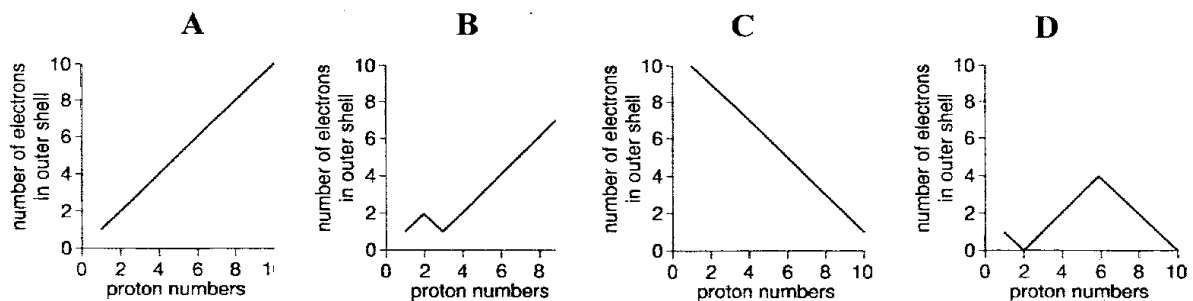
Which volume of hydrogen is produced at r.t.p. when 0.2 mol of calcium reacts?

- A 1.2 dm³
B 2.4 dm³
C 4.8 dm³
D 9.6 dm³
- 21 Which ion is present in the highest concentration in a 2 mol/dm³ aqueous solution of sodium sulphate?
A the hydrogen ion, H⁺_(aq)
B the hydroxide ion, OH⁻_(aq)
C the sodium ion, Na⁺_(aq)
D the sulphate ion, SO₄²⁻_(aq)
- 22 What is the ratio of the volume of 12dm³ of hydrogen (H₂) to the volume of 16 g of methane (CH₄), both volumes at r.t.p.?
A 1 to 1
B 1 to 2
C 1 to 8
D 2 to 1
- 23 Which of the following salts **cannot** be prepared by reacting a metal with a dilute acid?
A Calcium nitrate
B Magnesium sulphate
C Copper(II) sulphate
D Iron (II) chloride
- 24 Which of the following does **not** react with dilute sulphuric acid?
A zinc hydroxide
B zinc nitrate
C zinc metal
D zinc oxide

- 25 Which one of these salts is best prepared by reaction with an acid?
A Barium sulphate
B Lead (II) chloride
C Magnesium sulphate
D Silver chloride
- 26 Which of the following compounds dissolves in water to give a solution with pH greater than 7?
A Calcium carbonate
B Copper(II) hydroxide
C Silver chloride
D Sodium hydroxide
- 27 Which of the following is a characteristic property of acids in aqueous solution?
A They liberate ammonia from ammonium salts.
B They liberate carbon dioxide from carbonates.
C They give hydrogen with any metal.
D They have a pH greater than 7.
- 28 Why are industrial plants making ammonia and sulphuric acid often situated close to one another?
A Both industrial plants require the same raw materials.
B Ammonia reacts with sulphuric acid to produce a useful fertilizer.
C The pollutants from one industrial plant can be neutralised by the other.
D Both chemicals are corrosive and must be isolated from other factories.
- 29 A factory was allowing its acid waste to drain into a nearby river. The result was that fish and plant life were killed off. Which one of the following substances should be added to the acid waste to help prevent this water pollution?
A Aqueous ammonia solution
B Powdered calcium oxide
C Sand
D Powdered limestone
- 30 In the Contact Process for the manufacture of sulphuric acid, the sulphur trioxide formed is dissolved in
A concentrated nitric acid.
B concentrated sulphuric acid.
C dilute sulphuric acid.
D water at a pressure of 200 atmospheres.
- 31 In the Haber process, nitrogen and hydrogen react to form ammonia. What is the source of the nitrogen?
A Air
B Oil
C Limestone

D Sulphuric acid

- 32** Which graph shows the number of electrons in the outer shell of an atom, plotted against the proton (atomic) number for the first ten elements in the Periodic Table?



- 33** Why is iodine placed in the same group of the Periodic Table as fluorine, chlorine and bromine?

A It forms negatively charged ions.
B It has seven valence electrons.
C It is a coloured non-metal.
D It is found in the sea like other halogens.

- 34** The metal rubidium is below potassium in Group I of the Periodic Table. Which statement is most likely to be correct?

A Rubidium is less dense than potassium.
B Rubidium has a higher melting point than potassium.
C Rubidium reacts more vigorously than potassium with water.
D Rubidium displaces metallic potassium from aqueous potassium chloride. (

- 35** What gas is used to fill an electric light bulb to help the wire filament last as long as possible?

A Air
B Neon
C Argon
D Helium

- 36** What will happen when a piece of copper is added to aqueous zinc sulphate?

A There will be no reaction.
B Hydrogen will be evolved.
C A coating of zinc will appear on the surface of the copper.
D The solution turns blue.

- 37** Which of the following reacts with dilute hydrochloric acid to give hydrogen?

A Zinc oxide
B Zinc carbonate
C Zinc
D Zinc nitrate

38 What describes the solution formed and the gas evolved when sodium reacts with cold water?

| | Solution | Gas |
|----------|-----------------|------------|
| A | Alkaline | Alkaline |
| B | Alkaline | Neutral |
| C | Neutral | Alkaline |
| D | Neutral | Neutral |

39 Which substance can be reduced by heating with carbon?

- A** Aluminium oxide
- B** Calcium oxide
- C** Magnesium oxide
- D** Iron(III) oxide

40 What is a disadvantage of recycling metals?

- A** Collection and transportation costs money.
- B** Metal ores are a finite resource.
- C** Most metals corrode slowly in the environment.
- D** Scrap metal melts when heated.

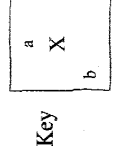
~ End of Paper ~

The Periodic Table of the Elements

| I | | II | | Group | | | | | | | | | | III | IV | V | VI | VII | 0 | | | | | | | | | | | | | | |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|---------------------------------|------------------------------|-------------------------------|-----------------------------|------------------------------|-------------------------------|-----------------------------|-------------------------------|----------------------------|-----------------------------|------------------------------|------------------------------|-----------------------------|-----------------------------|---------------------------------|----------------------------|------------------------------|------------------------------|------------------------------|---------------------------|------------------------------|--------------------------------|--------------------------------|-----------------------------|---------------------------------|------------------------------|--------------------------------|-----------------------------|-----------------------------|--------------------------|
| 7 Li Lithium 3 | 9 Be Beryllium 4 | 23 Na Sodium 11 | 24 Mg Magnesium 12 | 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 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 | 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 |
| 226 Fr Francium 87 | 226 Ra Radium 88 | 227 Ac Actinium 89 | 140 Ce Cerium 58 | 141 Pr Praseodymium 59 | 144 Nd Neodymium 60 | 146 Pm Promethium 61 | 150 Sm Samarium 62 | 152 Eu Europium 63 | 157 Gd Gadolinium 64 | 159 Tb Terbium 65 | 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 | 232 Pa Protactinium 91 | 238 U Uranium 92 | 238 Np Neptunium 93 | 241 Pu Plutonium 94 | 244 Am Americium 95 | 247 Cm Curium 96 | 251 Bk Berkelium 97 | 252 Cf Californium 98 | 257 Es Einsteinium 99 | 261 Fm Fermium 100 | 265 Md Mendelevium 101 | 269 No Nobelium 102 | 271 Lr Lawrencium 103 | | | |

* 58 - 71 Lanthanoid series
+ 90 - 103 Actinoid series

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



The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.)