GREENRIDGE SECONDARY SCHOOL

Mid–year Examination 2007

Pure Chemistry 5068

Paper 1

Secondary Four Express

Date : 2 May 2007 **1 h**

Name: _____( ) Class: 4E1

Parent's signature & date: _____

INSTRUCTIONS TO CANDIDATES

Do **not** open this booklet until you are told to do so.
Write your name and index number on the answer sheet in the spaces provided.
There are **forty** questions in this paper. Answer **all** questions. For each question, there are four possible answers, A, B, C and D. Choose the one you consider correct and record your choice in soft **2B** pencil on the separate answer sheet.
Read very carefully the instructions on the answer sheet.

INFORMATION FOR CANDIDATES

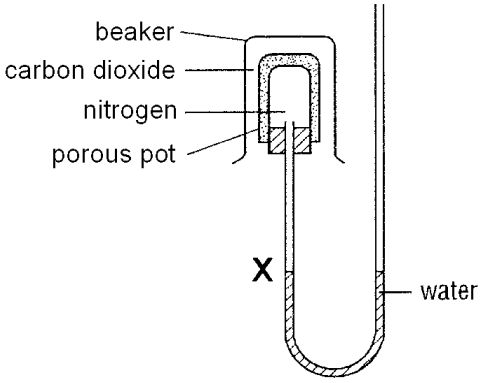
Each correct answer will score one mark. A mark will **not** be deducted for a wrong answer.
Any rough working should be done in this booklet.
A copy of the Periodic Table is printed on page **11**.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO

Name of Setter: Mr Victor Lee

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

1. A beaker of carbon dioxide was inverted over a porous pot containing nitrogen as shown. The water level at **X** rises.



What is the reason for this?

A Nitrogen is diatomic while carbon dioxide has 3 atoms per molecule.
B Nitrogen is dissolves into the water causing water to rise.
C Carbon dioxide molecules are too large to pass through porous pot.
D Nitrogen has a lower relative molecular mass than carbon dioxide.

2. You are asked to separate a suspension of sand in a solution of sodium chloride and ammonium chloride so as to obtain all three substances. To do this, the following processes can be used: evaporation, filtration and sublimation. In which order should you carry out these operations?

A evaporation; sublimation; filtration
B filtration; evaporation; sublimation
C sublimation; filtration; evaporation
D sublimation; evaporation; filtration

3. Impure lead contains some zinc. These two metals can be separated by distillation because they have different

A boiling points.
B density.
C reactivities.
D electrical conductivity

4. Which of the following ions contains the smallest number of electrons?

A N^{3-}
B K^{+}
C Li^{+}
D Mg^{2+}

5. What do both an atom and an ion of the isotope of magnesium, $^{23}_{12}Mg$, contain?

A 12 electrons
B 11 neutrons
C 11 protons
D 12 neutrons

6. In which of the following sets do all the compounds contain only ionic bonds?
   A calcium oxide, carbon dioxide, magnesium oxide
   B calcium oxide, magnesium oxide, sodium chloride
   C carbon dioxide, zinc sulphate, sodium chloride
   D copper (II) carbonate, hydrogen chloride, magnesium oxide

7. A compound **X** contains chlorine and one other element. Which one of the following properties of **X** indicates most clearly whether the bonds in **X** are ionic or covalent?
   A **X** is a crystalline solid at room temperature.
   B **X** does not conduct electricity when solid.
   C **X** conducts electricity when molten.
   D **X** is almost insoluble in water.

8. A crystal of sodium chloride is held together by
   A covalent bonds.
   B shared pairs of electrons.
   C positive ions in a 'sea of electrons'.
   D the attraction of oppositely charged ions.

9. 100 cm^3 of gaseous hydrogen contain ***n*** molecules. How many molecules are there in 50 cm^3 of gaseous methane under the same conditions of temperature and pressure?
   A $\frac{n}{5}$
   B $\frac{n}{2}$
   C n
   D 2n

10. 20.0 cm^3 of 2.0 mol/dm^3 potassium hydroxide just neutralise 25.0 cm^3 of a solution of sulphuric acid. What is the concentration of the acid?
    A 0.1 mol/dm^3
    B 0.8 mol/dm^3
    C 1.0 mol/dm^3
    D 1.25 mol/dm^3

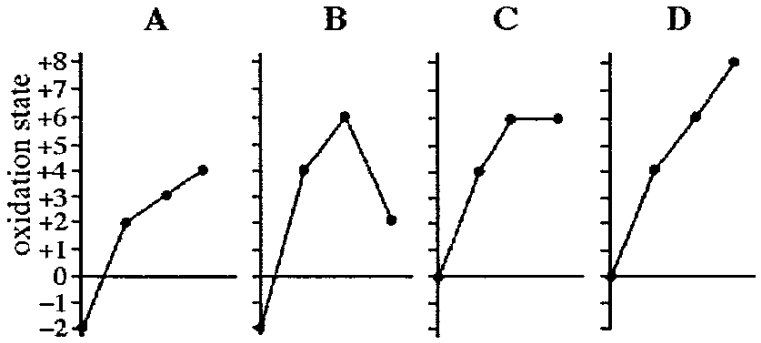
11. 20.0 cm^3 of a gaseous oxide of nitrogen were decomposed completely into 20.0 cm^3 of nitrogen and 10.0 cm^3 of oxygen at the same temperature and pressure. What is the formula of the oxide?
    A N_2O
    B NO_2
    C NO
    D N_2O_2

12. When a metal atom becomes an ion, it
    A gains electrons and is reduced.
    B gains protons and is oxidised.
    C loses electrons and is oxidised.
    D loses protons and is reduced.

13. The manufacture of sulphuric acid by the Contact process can be represented as follows.

$$S \rightarrow SO_2 \rightarrow SO_3 \rightarrow H_2SO_4$$

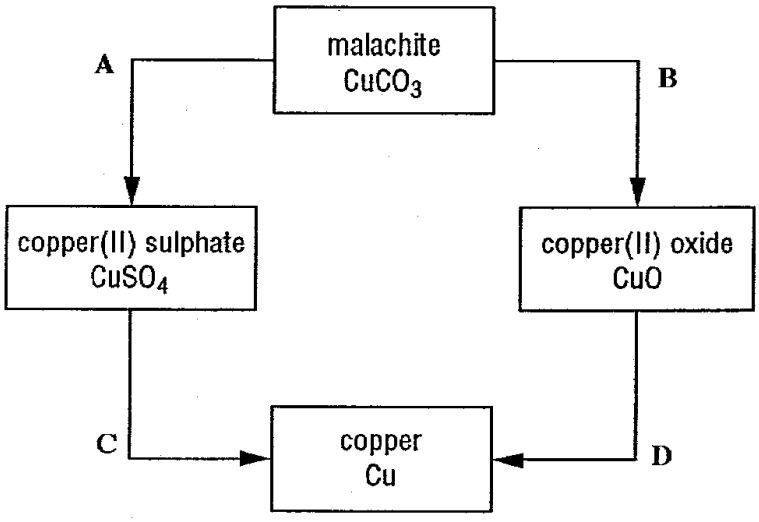
Which diagram shows the oxidation state (oxidation number) of sulphur at each stage of the process?



14. $20cm^3$ of 2.0 mol/dm^3 of aqueous sodium chloride is added to a beaker containing $10cm^3$ of 1.0mol/dm^3 of hydrochloric acid. What will be the pH of the mixture of aqueous sodium chloride and hydrochloric acid?

A 2
B 6
C 10
D 14

15. The diagram shows some reactions of copper compounds. Which change is made by adding an acid?



16. The table gives information about three indicators.

indicator	colour at pH 1	pH at which colour changes	colour at pH 12
thymol blue	red	3	yellow
congo red	blue	5	red
phenolphthalein	colourless	10	red

Which colours would be obtained when each indicator was added separately to pure water?

	thymol blue	congo red	phenolphthalein
A	red	blue	red
B	yellow	blue	colourless
C	yellow	blue	red
D	yellow	red	colourless

17. Which reactants could be used safely to prepare potassium chloride?
    A potassium and aqueous sodium chloride
    B potassium and dilute hydrochloric acid
    C aqueous potassium hydroxide and dilute hydrochloric acid
    D aqueous potassium sulphate and aqueous sodium chloride

18. Lead (II) sulphate is best prepared by adding aqueous sodium sulphate to
    A metal lead.
    B aqueous lead(II) nitrate.
    C powdered lead(II) nitrate.
    D powdered lead(II) carbonate.

19. Ammonia is made by the reaction between nitrogen and hydrogen:

$$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$$

This reaction is slow at room temperature and pressure. An increase in the yield of ammonia and the rate of reaction can be achieved by
    A increasing the pressure.
    B increasing the temperature.
    C adding a suitable catalyst.
    D cooling the reactants.

20. Which of the following sulphur compounds is used in the manufacture of paper from wood pulp?
    A Ammonium sulphate
    B Sulphur dioxide
    C Sulphur trioxide
    D Sulphuric acid

21. The exhaust gases from motor vehicles contain carbon monoxide. Why is carbon monoxide harmful to us?
    A It paralyses the lungs.
    B It corrodes lung tissue.
    C It forms oxyhaemoglobin in the blood.
    D It forms a stable compound with haemoglobin in the blood.

22. Which of the following gases is **not** responsible for the formation of photochemical smog?
    A Methane
    B Oxides of nitrogen
    C Ozone
    D Sulphur dioxide

23. The element silicon appears directly below carbon in the Periodic Table. Which one of these statements about silicon is true?
    A Silicon has 8 valence electrons.
    B Silicon forms an ionic chloride $SiCl_4$.
    C Silicon forms a colourless gas, SiO_2.
    D Silicon has a high melting point.

24. A new element called Kinium has been discovered. It is a white silvery solid with a low melting point. When warmed in a gas jar of chlorine it catches fire and produces clouds of white smoke. Which group in the Periodic Table would you place this new element in?
    A I
    B II
    C VII
    D VIII

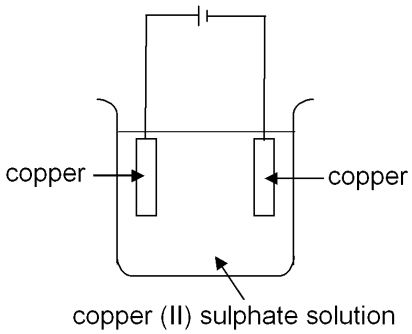
25. Why are metals good conductors of electricity?
    A Their atoms are packed together in a regular lattice arrangement.
    B They have delocalized electrons.
    C They have a stable octet electronic structure.
    D They are smooth which allows electrons to flow easily across their surface.

26. A metal pipe normally carries cold water. By accident the water is polluted by a small amount of sulphuric acid. As the polluted water passed through the pipe and it starts to react. Which metal is the pipe made of?
    A Calcium
    B Zinc
    C Copper
    D Silver

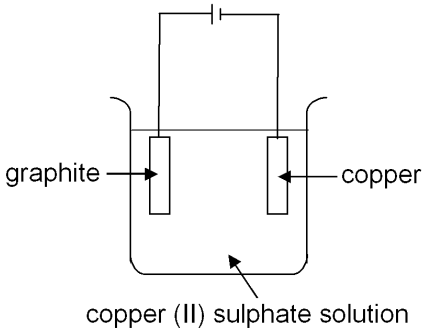
27. Aluminium is higher up in the reactivity series than iron. However, iron rusts (reacts with air and water) but aluminium does **not**. What is the reason for this?
    A Aluminium forms an inert oxide coat.
    B Aluminium oxide is amphoteric.
    C Iron (II) oxide is water soluble.
    D Iron (III) oxide is a basic oxide.

28. When an aqueous solution conducts electricity, there is always
    A a rise in temperature of the solution.
    B a metal deposited on the cathode.
    C a chemical change taking place.
    D hydrogen or oxygen gas produced at the electrodes.

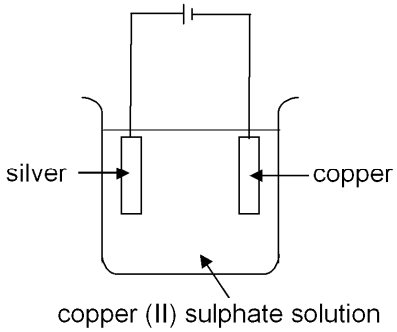
29. Aqueous copper (II) sulphate was electrolysed using different electrodes as shown below.



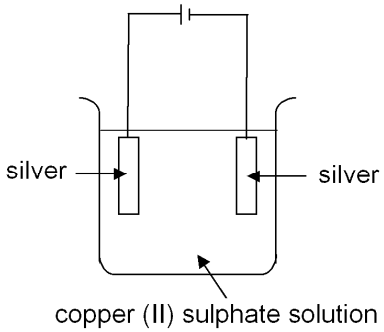
A



B



C

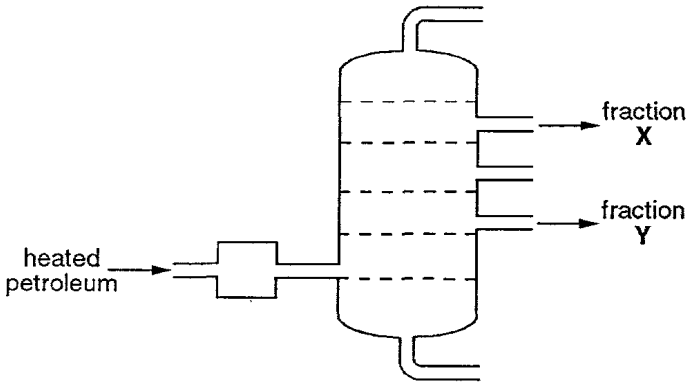


D

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

30. Why is cryolite used in the extraction of aluminium from aluminium oxide?
    A to dissolve aluminium oxide.
    B to form the reducing agent.
    C to prevent the anodes from burning away.
    D to remove acidic impurities from the aluminium oxide.

31. The diagram shows the fractional distillation of petroleum.



Which statements about fractions X and Y are correct?

	X burns more easily than Y	X has a higher boiling point than Y
A	yes	yes
B	yes	no
C	no	yes
D	no	no

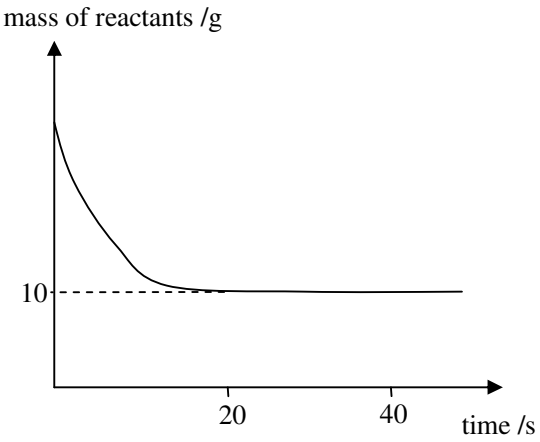
32. The equation below shows an exothermic reaction.

$$Mg_{(s)} + 2HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_{2(g)}$$

Which statement about this exothermic reaction is **incorrect**?

A Magnesium chloride is soluble in water.
B Magnesium is above hydrogen in the reactivity series.
C One mole of magnesium produces one mole of hydrogen gas.
D The total energy of the products is greater than that of the reactants.

33. In the reaction between hydrochloric acid and excess limestone, the change In mass of the reactants with time was sketched.

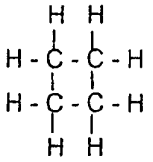


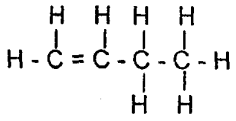
Which one of the following statements about the experiment is correct?

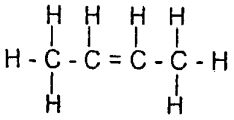
A The reaction took 40s to complete.
B The excess limestone has a mass that is less than 10 g.
C 10 g of carbon dioxide was formed in the flask.
D The speed of the reaction was constant throughout the experiment.

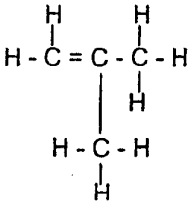
34. One of the fractions obtained by the fractional distillation of petroleum oil contains molecules with 1 to 4 carbon atoms in them. Which of the following molecules can be found in this fraction?
    A ethene, ethanol and propane
    B ethane, propene, pentane
    C methane, butane and propene
    D ethane, ethanol, ethanoic acid

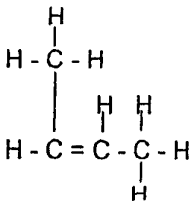
35. Which of the following compounds are isomers of each other?


Compound I


Compound II

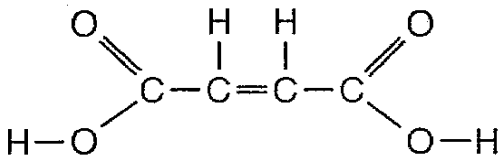

Compound III


Compound IV


Compound V

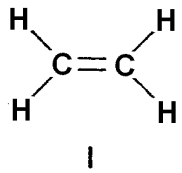
    A Compounds II and III only
    B Compounds II, III and IV only
    C Compounds I, II, III and IV only
    D Compounds I, II, III, IV and V.

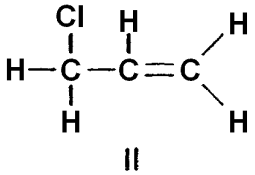
36. The structural formula of butenedioic acid is shown.

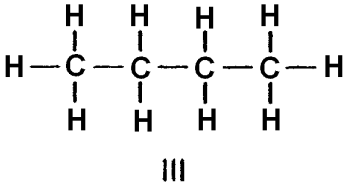


    Which statement about butenedioic acid is **not** correct?
    A It decolourises bromine.
    B Its aqueous solution reacts with sodium carbonate.
    C Its empirical formula is the same as its molecular formula.
    D Its relative molecular mass is 116.

37. Which of the substances below will **not** decolourise aqueous bromine?


I


II


III

    A I only
    B II and III only
    C III only
    D I, II and III only

38. Ethene is produced from ethanol by
    A dehydration.
    B fermentation.
    C hydration.
    D oxidation.

39. What are the products of the fermentation of sugar?
    A ethanol and carbon dioxide
    B ethanol and enzymes
    C ethanol and water
    D carbon dioxide and water

40. Which of the following ways **cannot** be used to distinguish between ethanoic acid and ethanol?
    A determining and comparing their densities
    B adding aqueous sodium carbonate
    C using blue litmus paper
    D mixing with water

~ The End ~

The Periodic Table of the Elements

Group																	
I	II										III	IV	V	VI	VII	0
						1 H Hydrogen 1										4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4										11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12										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 Yitrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	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	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 +															

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

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	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	Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103

Key: a X b — a = relative atomic mass; X = atomic symbol; b = proton (atomic) number

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