Name : _____ ( ) Class : 3E1

Greenridge Secondary School

End–of–Year Examination 2007

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

Date : 3 Oct 2007 **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 **9**

This paper consists of 9 printed pages, including this page.

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

1. Magnesium chloride has a melting point of 714℃ and a boiling point of 1412℃. At which temperature does a concentrated aqueous solution of magnesium chloride begin to boil?
   A 96℃
   B 104℃
   C 714℃
   D 1412℃

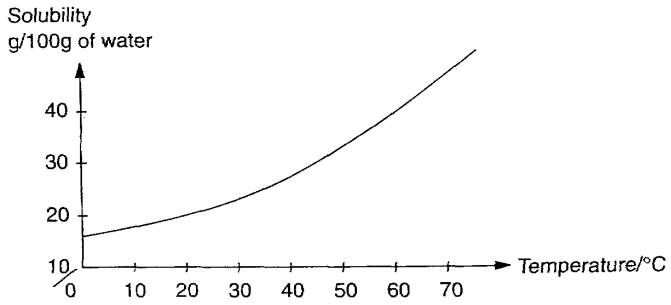
2. In the preparation of sodium chloride using titration method, dilute hydrochloric acid is added to 25.0 cm^3 of aqueous sodium hydroxide in a conical flask using screen methyl orange as indicator. Which piece of apparatus could be used to add the acid to the alkali to get the most accurate result?
   A pipette
   B gas syringe
   C burette
   D measuring cylinder

3. To help diagnose illness, chromatography is performed on patient's urine to determine the presence of amino acids. Which one of the following should be done as amino acids are invisible to our naked eyes?
   A change the solvent
   B change the urine sample
   C spray locating agents on the chromatogram
   D use fractional distillation instead of chromatography

4. An unknown liquid **X** does **not** have a fixed boiling point. It can be separated by fractional distillation into two different liquids **M** and **N** because **M** and **N**
   A are elements.
   B are immiscible in each others.
   C have different boiling points.
   D have different densities.

5. John was provided with a mixture containing 50g of blue copper (II) sulphate and a small amount of sand. He performed the following steps to remove the insoluble sand to obtain a pure sample of copper (II) sulphate crystals. First, he dissolved the mixture into 100g of hot water at 60℃ until no more can dissolve. Next, he filtered to remove insoluble sand and excess copper (II) sulphate. Finally, the filtrate was left to cool from 60℃ to 20℃.

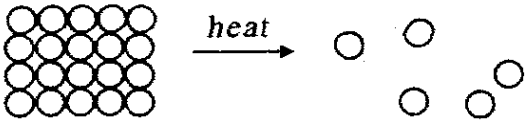
   The graph shows the solubility curve for copper(II) sulphate:



What is the maximum amount of copper(II) sulphate crystals obtained at 20°C?

A 20g
B 40g
C 50g
D 100g

6. The diagram shows what happens to the particles of a solid when it is heated in air.



Which word describes this change?

A combustion
B dissolving
C melting
D sublimation

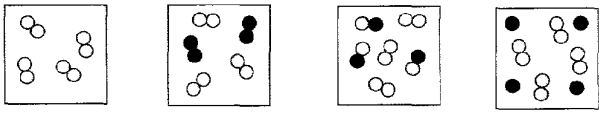
7. Particles can escape from the surface of a liquid at temperatures below its boiling point. This is called

A evaporation.
B sublimation.
C boiling.
D diffusion.

8. Which one of the following lists contains two mixtures?

A Water, zinc
B Limewater, water
C Calcium oxide, Calcium
D Sea water, air

9. Which diagram shows a mixture of two elements?



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

10. **Z** has an atomic number of 12 and mass number of 23. What is the atomic structure and formula of the **ion** of **Z**?

	electrons	**formula of ion**
A	8	Z^{2+}
B	8	Z^{2-}
C	10	Z^{2+}
D	10	Z^{2-}

11. Which one of the following sets consists only of the electronic structures of metals from the same period?

A	2,8,3	2,8,4	2,8,5
B	2,8,1	2,8,2	2, 8,3
C	2,1	2,8,1	2,8,8,1
D	1	2	2,1

12. Which of the following element exists as small monatomic particles?
    A helium
    B chlorine
    C hydrogen
    D iodine

13. An element X has two isotopes, which may be represented as ^{235}X and ^{238}X. How does ^{238}X differ from ^{235}X?
    A It has 3 more protons and 3 more electrons.
    B It has 3 more protons, but no more electrons.
    C It has 3 more neutrons and 3 more electrons.
    D It has 3 more neutrons, but no more electrons.

14. 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 insoluble in water.

15. A crystal of magnesium oxide is held together by
    A single covalent bonds.
    B double covalent bonds.
    C positive ions in a 'sea of electrons'.
    D the attraction of oppositely charged ions.

16. What is the number of pairs of shared electrons in a ammonia molecule (NH_3)?
    A 1
    B 2
    C 3
    D 6

17. When chlorine gas combines directly with a hot solid element **Y**, a white solid, **Y**Cl_3 is formed. Which element could be **Y**?
    A aluminium
    B copper
    C magnesium
    D sodium

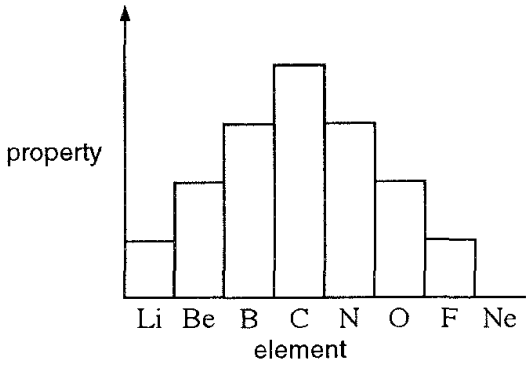
18. Which one of the following statements explains why aluminium oxide has a very high melting point of 2045°C?
    A The crystal lattice of aluminium oxide resembles that of diamond.
    B There are very strong ionic bonds between aluminium ions and oxide ions in the crystal lattice.
    C The crystal lattice consists of aluminium ions and oxide ions in a 'sea of electrons'.
    D Aluminium atoms and oxygen atoms are joined by strong double covalent bonds.

19. The atoms of element **X** have the electronic configuration 2,8,5.
    Which statement about element **X** is correct?
    A It forms an ionic compound with sodium.
    B It forms an ion of formula $\mathbf{X}^{3+}$.
    C It has 15 valence electrons.
    D It exists as a gas at room temperature and pressure.

20. Which set of properties are those of an ionic compound?

	conductivity of solid	conductivity of molten compound	conductivity of aqueous solution
A	Good	Good	Good
B	Good	Good	Poor
C	Poor	Good	Good
D	Poor	Good	Poor

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



    Which property of these elements is shown on the chart?
    A the number of valence electrons
    B the valency of the element
    C the proton number
    D the strength of bond with hydrogen

22. Which statement about a new element, which has six outer electrons in its atoms, is correct?
    A It is a good conductor of electricity in molten state.
    B It forms a covalent compound with hydrogen.
    C It forms a positive ion.
    D It forms covalent compounds with Group I elements.

23. Which statements concerning transition elements are correct?
    I They have high melting points.
    II They are more reactive than Group I metals.
    III They form coloured compounds.

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

24. Which statement concerning the ions of the Group VII elements is correct?
    I Each contains an even number of electrons.
    II Each contains equal number of protons and electrons.
    III Each has 7 valence electrons in its outer shell.

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

25. Selenium is found in group VI of the Periodic Table. Which of the following formula is correct?
    A HSe
    B H_2Se_3
    C Se_4
    D H_2SeO_4

26. Which one of the following metals does **not** react with dilute hydrochloric acid to give hydrogen?
    A magnesium
    B silver
    C calcium
    D zinc

27. When zinc is added to a solution of a metal sulphate, the metal is deposited and zinc ions are produced in solution. The metal deposited could be
    A calcium.
    B potassium.
    C copper.
    D sodium.

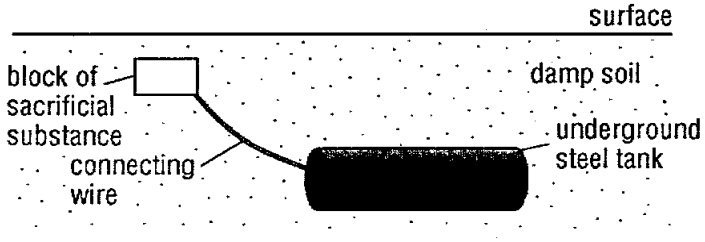
28. Aluminium cooking utensils are commonly used in kitchens. Which one of the following properties of aluminium has **no** relevance to its choice as a material for this purpose?
    A It is a good conductor of electricity.
    B It is a good conductor of heat.
    C It is resistant to corrosion.
    D It has a high melting point.

29. An element which lies between calcium and magnesium in the reactivity series would be expected to

I react with aluminium oxide when heated.
II liberate hydrogen from dilute hydrochloric acid.
III displace sodium from an aqueous solution of a sodium salt.
IV form a carbonate which decomposes to give the metal on heating.

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

30. One way in which the corrosion of underground steel tanks can be prevented is by sacrificial protection as shown.



Which element is most suitable for use as the sacrificial substance?

A carbon
B potassium
C copper
D magnesium

31 Which one of the following is an amphoteric oxide?

A carbon dioxide
B copper(II) oxide
C iron (III) oxide
D tin (IV) oxide

32. Which one of the following pairs consists of substances that produce a precipitate when their aqueous solutions are mixed?

I sodium nitrate, barium chloride
II sodium chloride, silver sulphate
III sodium sulphate, barium chloride
IV sodium chloride, barium nitrate

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

33. Why is sulphuric acid described as dibasic?

A Each molecule contains two OH^- ions.
B Each molecule can produce two hydrogen ions.
C Sulphur can form two acids, H_2SO_4 and H_2SO_3.
D Sulphuric acid can produce two different ions, H^+ and SO_4^{2-}.

34. In which of the following reactions do the products formed **not** include a salt?
A copper(II) sulphate with sodium hydroxide
B copper(II) carbonate with sulphuric acid
C copper(ll) oxide with sulphuric acid
D copper(II) oxide with carbon monoxide

35. Which of the following salts **cannot** be prepared by a reaction between a dilute acid and a metal?
A silver chloride
B iron(II) chloride
C magnesium sulphate
D zinc sulphate

36. Which substance is **not** used to prepare zinc chloride by reaction with hydrochloric acid?
A zinc carbonate
B zinc nitrate
C zinc hydroxide
D zinc oxide

37. What is the ionic equation for the neutralisation of aqueous sodium hydroxide with dilute sulphuric acid?
A $H^+ + OH^- \rightarrow H_2O$
B $Na^+ + NO_3^- \rightarrow NaNO_3$
C $2Na^+ + SO_4^{2-} \rightarrow Na_2SO_4$
D $NaOH + H^+ \rightarrow Na + H_2O$

38. Which element forms an oxide that reacts with water to give an acidic solution?
A calcium
B carbon
C sodium
D copper

39. Which compound is made industrially using hydrogen gas?
A ammonia
B ethanol
C methane
D water

40 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

~ End of Paper ~

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 +															

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

* 58 – 71 Lanthanoid series

\+ 90 – 103 Actinoid series

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.)