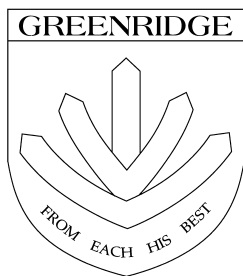


Name : _____ () Class : 4E1



GreenRidge Secondary School

Preliminary Examination 2002

Subject : Chemistry (5068)
Secondary Four Express
Paper 1

Date : 19 Sep 2002

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 OMR SHEET and QUESTION PAPER *SEPARATELY*.
DO NOT STAPLE THEM TOGETHER.

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

INFORMATION FOR CANDIDATES

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

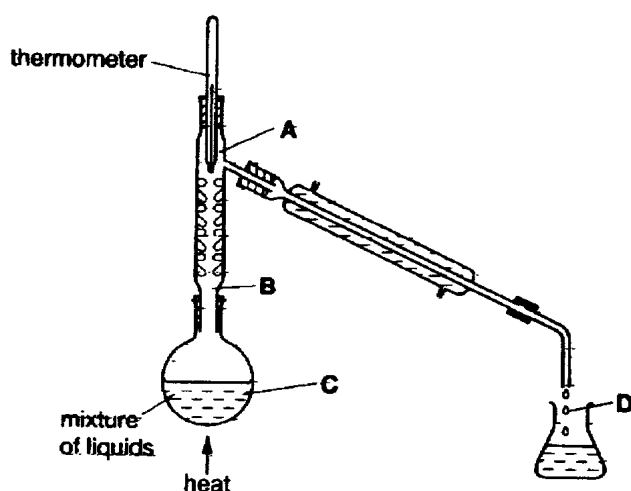
This paper consists of 10 printed pages, including this page.

1. The table shows the physical state of a substance at different temperatures.

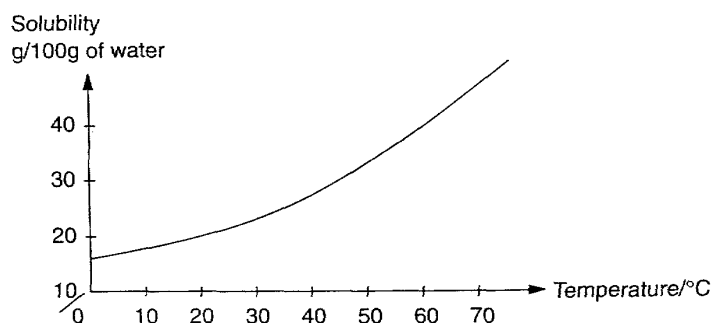
Temperature	-30°C	10°C	25°C	60°C	90°C
Physical State	solid	solid	liquid	liquid	gas

What could the melting point of the substance be?

- A. -20°C
B. 9°C
C. 20°C
D. 61°C
2. Equal volumes of two liquids that mix completely but do **not** react together are placed in the apparatus shown. The mixture is heated. When the thermometer first shows a steady reading, at which point will there be the highest proportion of the liquid with the higher boiling point?



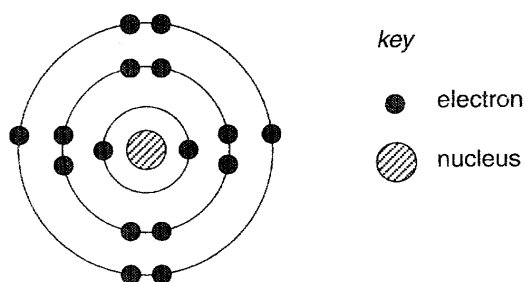
3. The graph shows the solubility curve for copper(II) sulphate:



If 25 cm³ of a saturated solution of copper(II) sulphate was cooled from 60°C to 20°C, what would be seen?

- A. The solution becomes lighter as 60 g of copper(II) sulphate crystallizes out.
B. The solution becomes lighter as 40 g of copper(II) sulphate crystallizes out.
C. The solution becomes lighter as 20 g of copper(II) sulphate crystallizes out.
D. The solution becomes lighter as 5 g of copper(II) sulphate crystallizes out.

4. A compound X is composed of two elements. Which one of the following properties is the best indication of whether the bonding is ionic or covalent?
- X is insoluble in water.
 - X is a crystalline solid.
 - X conducts electricity when molten.
 - X does not conduct electricity when solid.
5. In which one of these covalent compounds is there the *smallest* number of electrons shared?
- Ammonia gas
 - Chlorine gas
 - Nitrogen gas
 - Oxygen Gas
6. A particle consists of 2 electrons, 3 protons and 4 neutrons Which of these statements is/are true?
- It has a proton number of three.
 - It has a nucleon number of four.
 - It has a charge of +1.
- I only
 - I and II
 - I and III
 - I, II and III
7. The diagram represents an atom of an element X



- To which period of the Periodic Table does X belong?
- 0
 - 2
 - 3
 - 6
8. What is the concentration of iodine molecules in a solution containing 1.27 g of iodine in 500 cm³ of solution?
- 0.01 mol/dm³
 - 0.02 mol/dm³
 - 0.04 mol/dm³
 - 0.08 mol/dm³

9. A 0.1 mol/dm^3 aqueous solution of sulphuric acid is mixed with a 0.05 mol/dm^3 solution of potassium hydroxide. Which one of the following mixtures will **react completely** to form the salt K_2SO_4 without having either reagent in excess??

	<i>volume of 0.1 mol/dm^3 sulphuric acid</i>	<i>volume of 0.05 mol/dm^3 potassium hydroxide</i>
A.	10ml	40ml
B.	10ml	20ml
C.	10ml	10ml
D.	10ml	5ml

10. What is the ratio of the volume of 4 g of hydrogen to the volume of 16 g of methane, both volumes at room temperature and pressure?

- A. 4 to 1
B. 1 to 2
C. 2 to 1
D. 1 to 1

11. Which of the following **does not** produce hydrogen at the cathode and oxygen at the anode?

	Electrolyte	Anode	Cathode
I.	aqueous copper(II) sulphate	copper	platinum
II.	aqueous copper(II) sulphate	platinum	copper
III.	aqueous silver nitrate solution	graphite	platinum
IV.	dilute sulphuric acid	copper	graphite

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

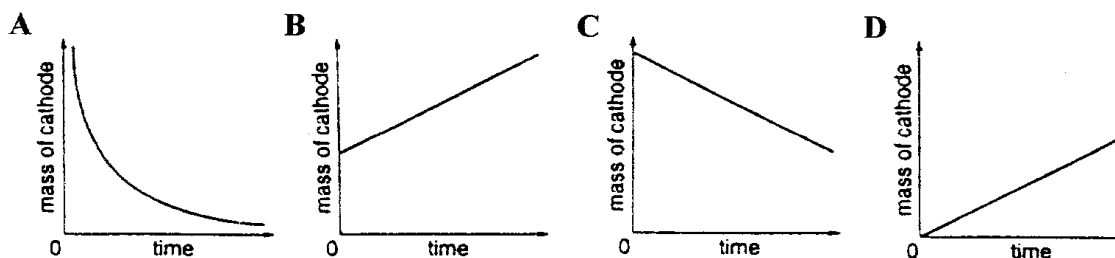
12. Which of the following involves the largest amount of electrons for complete discharge during electrolysis?

- A. 5 mol of Al^{3+} ions
B. 6 mol of Cu^{2+} ions
C. 7 mol of OH^- ions
D. 8 mol of O^{2-} ions

13. Which of the following is a good conductor of electricity due to the movement of ions?

- A. Graphite
B. An alloy of brass
C. Mixture of sodium chloride and water
D. Mixture of silver chloride and water

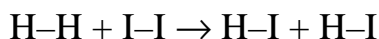
14. Aqueous copper(II) sulphate is electrolysed using copper electrodes. The current is constant and the cathode (negative electrode) is weighed at regular intervals. Which graph is obtained when the mass of the cathode is plotted against time?



15. When steam is passed through white-hot coke, a reaction occurs and the temperature of the coke falls. What does this indicate?
- Coke is an oxidising agent.
 - The reaction is endothermic.
 - Coke contains impurities.
 - The reaction is exothermic.

16. Which statement is correct for *all* exothermic reactions?
- A catalyst is needed for the reaction to take place.
 - Light or heat is absorbed during the reaction.
 - The products of the reaction have less energy than the reactants.
 - They are reactions which require heat to start.

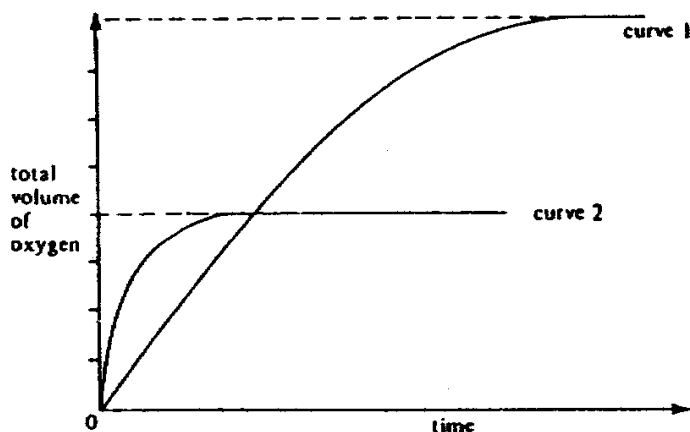
17. The formation of hydrogen iodide from hydrogen and iodine is an *endothermic* reaction.



What may be deduced from this information?

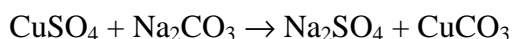
- The formation of H-I bonds absorbs energy.
 - The products possess less energy than the reactants.
 - The number of bonds broken is greater than the number of bonds formed.
 - The total energy change in bond formation is less than that in bond breaking.
18. Which industrial process uses enzymes as a catalyst?
- conversion of ethene to ethanol
 - catalytic cracking of hydrocarbons
 - fermentation of sugar solution
 - production of sulphur trioxide gas in Contact process
19. 20 g of zinc were placed in a beaker. Which one of the following would be added to produce 4.8dm³ of hydrogen gas (measurements at r.t.p.) as quickly as possible?
- 150 cm³ of 2 mol dm⁻³ sulphuric acid
 - 100 cm³ of 3 mol dm⁻³ hydrochloric acid
 - 200 cm³ of 1 mol dm⁻³ sulphuric acid
 - 150 cm³ of 1.5 mol dm⁻³ hydrochloric acid

20. Manganese(IV) oxide catalyses the decomposition of aqueous hydrogen peroxide into water and oxygen. In order to follow the rates of this reaction for two different solutions of hydrogen peroxide the total volumes of oxygen evolved were recorded at regular time intervals and the results were plotted. In each experiment, the same mass of catalyst was used and the temperature was the same.



- If curve 1 corresponds to 20 cm³ of a 4.0 mol/dm³ solution, curve 2 corresponds to
- 5 cm³ of a 4.0 mol/dm³ solution.
 - 5 cm³ of a 8.0 mol/dm³ solution.
 - 10 cm³ of a 4.0 mol/dm³ solution.
 - 10 cm³ of a 8.0 mol/dm³ solution.
21. An oxidizing agent was observed to change from purple to a faint pink colour. What is it most likely to be?
- Acidified potassium manganate(VII) solution
 - Bromine water
 - Iron(III) chloride solution
 - Manganese(IV) oxide
22. Chlorine gas is added in small amounts to drinking water to kill harmful bacteria. If too much chlorine is added then the excess is removed by adding sulphur dioxide. The reaction is:
- $$\text{Cl}_{2(\text{g})} + 2\text{H}_2\text{O}_{(\text{l})} + \text{SO}_{2(\text{g})} \rightarrow 2\text{HCl}_{(\text{aq})} + \text{H}_2\text{SO}_{4(\text{aq})}$$
- Which one of these statements is **incorrect**?
- Chlorine gas has been reduced.
 - Sulphur dioxide has been oxidised.
 - The oxidizing agent is chlorine gas.
 - Water has been oxidized.
23. Which one of the following is **not** a redox reaction?
- $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$
 - $\text{MgO} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2\text{O}$
 - $\text{Cu} + 4\text{HNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{H}_2\text{O} + 2\text{NO}_2$
 - $\text{Cu} + \text{S} \rightarrow \text{CuS}$

24. Which of the following does **not** react with dilute sulphuric acid?
- A. zinc hydroxide
 - B. zinc metal
 - C. zinc nitrate
 - D. zinc oxide
25. In an experiment, 4.0cm^3 of 1.0 mol/dm^3 aqueous copper (II) sulphate was mixed with 8 cm^3 of 1.0 mol/dm^3 aqueous sodium carbonate.



What did the reaction vessel contain when the reaction was complete?

- A. a colourless solution only
 - B. a green precipitate and a blue solution
 - C. a green precipitate and a colourless solution
 - D. a white precipitate and a blue solution
26. Which of the following salts can be crystallized from aqueous solution?
- A. Barium sulphate
 - B. Barium chloride
 - C. Lead(II) hydroxide
 - D. Silver iodide
27. A white compound produces a mixture of gases when heated. This mixture turns moist Universal Indicator paper red and relights a glowing splint. What does this mixture contain?
- A. an acidic gas and hydrogen
 - B. an acidic gas and oxygen
 - C. an alkaline gas and hydrogen
 - D. an alkaline gas and oxygen
28. When X is added to aqueous potassium iodide, a reddish brown solution and black precipitate is obtained.
- X could be
- A. sulphur dioxide gas.
 - B. hydrochloric acid.
 - C. acidified potassium manganate(VII).
 - D. carbon monoxide gas.
29. When a metal ion becomes an atom, 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.

30. Metal M is placed between zinc and iron in the reactivity series.
Which one of the statements about metal M below is mostly likely to be true?
- A. Metal M can only be extracted by electrolysis.
 - B. Metal M reacts with boiling water to produce hydrogen gas.
 - C. Metal M forms an oxide that can be reduced by coke.
 - D. Metal M is deposited at the cathode when aqueous solution of M is electrolysed using inert electrodes.
31. Underground iron pipes are buried with pieces of magnesium attached at regular intervals to prevent rusting. Which of the following is true?
- A. No corrosion of metals will occur.
 - B. Magnesium has to be replaced regularly.
 - C. Caesium can replace magnesium to achieve the same purpose.
 - D. Magnesium is a stronger oxidising agent than iron.
32. Ammonia gas decomposed according to the equation below.
- $$2\text{NH}_{3(\text{g})} \rightarrow \text{N}_{2(\text{g})} + 3\text{H}_{2(\text{g})}$$
- Which volume of hydrogen would be formed if 400cm^3 ammonia were decomposed?
(measurements at r.t.p.)
- A. 300cm^3
 - B. 400cm^3
 - C. 500cm^3
 - D. 600cm^3
33. Which of the following could be added to potassium chloride to produce a mixture providing the principal elements needed for plant growth?
- A. ammonium sulphate
 - B. ammonium phosphate
 - C. calcium phosphate
 - D. phosphoric acid
34. A factory was allowing its acid waste to drain into a nearby lake. The result was that the aquatic life were killed. Which of the following substances should be added to the acid waste to help prevent this water pollution?
- A. Aqueous sodium hydroxide
 - B. Limewater
 - C. Marble chips
 - D. Powdered limestone
35. 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 industrial plants.

36. Which of the following best describes the similarities and differences of compounds which are isomers?

	<i>the same</i>	<i>different</i>
A.	chemical formulae	molecular formulae
B.	molecular formulae	chemical formulae
C.	molecular formulae	structural formulae
D.	structural formulae	molecular formulae

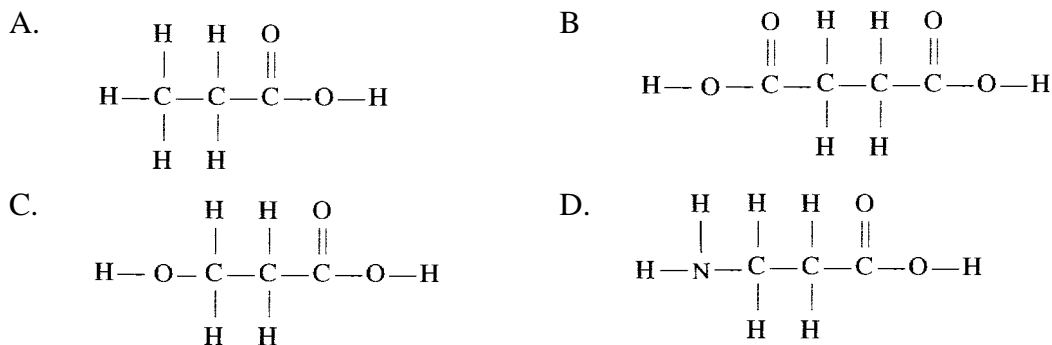
37. What do all polymers have in common?

- A. They have strong covalent bonds between polymer chains.
- B. They are plastics which can be either transparent or opaque.
- C. They have high melting and boiling points.
- D. They have high relative molecular masses.

38. Poly(propene) and propene

- A. have similar chemical properties.
- B. have similar physical properties.
- C. have same empirical formula.
- D. are allotropes of each other.

39. Which one of the following compounds **cannot** be a monomer for making a polymer?



40. Which of the following pairs of substances would react with one another to form an ester with the formula $\text{CH}_3\text{CH}_2\text{COOCH}_2\text{CH}_3$?

- A. $\text{CH}_3\text{CO}_2\text{H}$ and $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- B. $\text{CH}_3\text{CH}_2\text{CO}_2\text{H}$ and $\text{CH}_3\text{CH}_2\text{OH}$
- C. $\text{CH}_3\text{CO}_2\text{H}$ and $\text{CH}_3\text{CH}_2\text{CO}_2\text{H}$
- D. $\text{CH}_3\text{CH}_2\text{COH}$ and $\text{CH}_3\text{CH}_2\text{CO}_2\text{H}$

~ The End ~

The Periodic Table of the Elements

Group																																			
I	II	III	IV	V	VI	VII	0																												
7 Li Lithium 3	9 Be Beryllium 4	<table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="text-align: center;">I</td> <td style="text-align: center;">H Hydrogen 1</td> </tr> </table>																I	H Hydrogen 1	11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10										
I	H Hydrogen 1																																		
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	55 Mn Manganese 25	52 Cr Chromium 24	59 Co Cobalt 27	56 Fe Iron 26	65 Zn Zinc 30	64 Cu Copper 29	59 Ni Nickel 27	106 Pd Palladium 47	103 Rh Rhodium 45	101 Ru Ruthenium 44	112 Cd Cadmium 48	119 Sn Tin 50	122 Sb Antimony 51	131 Xe Xenon 54																		
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	96 Mo Molybdenum 42	93 Nb Niobium 41	103 Rh Rhodium 45	101 Ru Ruthenium 44	112 Cd Cadmium 48	108 Ag Silver 47	106 Pd Palladium 47	195 Pt Platinum 78	192 Ir Iridium 77	190 Os Osmium 76	201 Hg Mercury 80	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	222 Rn Radon 86																	
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium 72	184 W Tungsten 74	181 Ta Tantalum 73	192 Ir Iridium 77	190 Os Osmium 76	201 Hg Mercury 80	197 Au Gold 79	195 Pt Platinum 78	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	210 Rn Radon 86																				
87 Fr Francium	88 Ra Radium	89 Ac Actinium																																	

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

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

Key

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	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	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 dm³ at room temperature and pressure (r.t.p.)