Name : _____ ( ) **Class : 4E1**

Greenridge Secondary School
Mid–year Examination 2009

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

Date : 13 May 2009 (Wed) **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

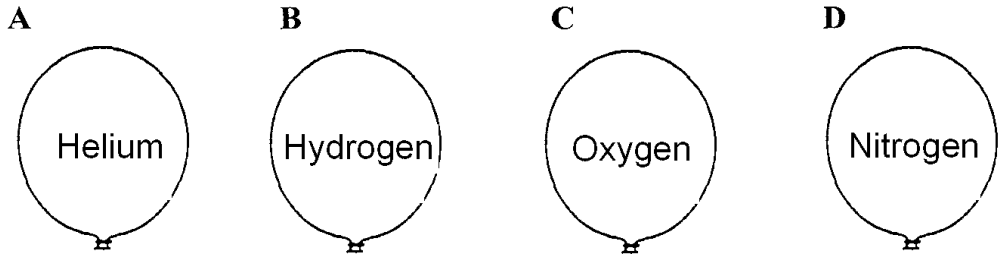
This question paper consists of **12** printed pages including this cover page

Answer <u>all</u> questions on the OTAS provided using only soft 2B pencil.

1. Which of the following substances has a fixed boiling point?
A aqueous sodium chloride
B diesel
C propanol
D petroleum

2. In 2007, scientists discovered a planet known as Gliese 581d in the Gliese 581 star system. It has a lot more in common with Earth than astronomers first thought. In 2009, new measurements of the planet's orbit place it firmly in a region where conditions would be right for liquid water, and thus life as we know it. What do you think the temperature on the surface of Gliese 581d that led to the scientists' prediction?
A Below 0ºC
B Above 100ºC
C Between 0ºC and 100ºC
D Between –20ºC and 150ºC

3. Four balloons are each filled with different gases to different sizes and left untouched for sometime under room temperature and pressure condition. The diagram below shows the sizes after a day. Which balloon was the largest initially?



4. Excess dilute sulfuric acid and aqueous lead (II) nitrate were mixed together and stirred. Two products, **P** and **Q**, are obtained from the reaction. The mixture is then filtered to obtain **P** as a filtrate and **Q** as a residue. Which of these is/are correct?
1 **P** is a pure substance.
2 **P** is a mixture of 3 compounds
3 **Q** is a pure substance.
4 **Q** is a mixture of 2 compounds

A 1 and 3 only
B 2 and 3 only
C 1 and 4 only
D 2 and 4 only

5. Which one of these pairs of elements would react together most violently when mixed together?

A hydrogen and oxygen
B potassium and oxygen
C sodium and water
D uranium and water

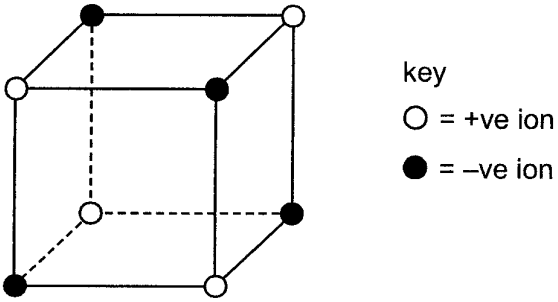
6. Which of the following consists of an element, a compound and a mixture?

A bronze, water, sodium
B ethane, water, ethanol
C iron, sulfur, iron (II) sulfide
D bronze, steel, silicon

7. An element **X** forms a negative ion with the electronic structure 2,8. What is the proton number of **X**?

A 9
B 10
C 11
D 12

8. The diagram shows the arrangement of the ions in an ionic crystal.



Which compound **cannot** have this arrangement of its ions?

A copper (II) oxide
B sodium sulfate
C potassium chloride
D sodium nitrate

9. Covalent bonds are formed when atoms share electrons.
How many electrons are provided by each of the atoms of the elements oxygen, nitrogen and hydrogen when they form covalent compounds?

	oxygen	nitrogen	hydrogen
A	1	2	1
B	1	3	2
C	2	2	2
D	2	3	1

10. Which substance(s) sublime(s) when heated in their solid state?

1 ammonium chloride
2 potassium chloride
3 iodine

A 1 only
B 1 and 2 only
C 1 and 3 only
D 3 only

11. Alkynes is another homologous series of unsaturated hydrocarbon. When 10 cm^3 of a gaseous alkyne burns in an excess of oxygen, 20 cm^3 of carbon dioxide are formed. Both volumes are measured at r.t.p. What is the formula of the alkyne?

A CH_4
B C_2H_2
C C_2H_4
D C_2H_6

12. Which volume of 0.15 mol / dm^3 nitric acid is required to react completely with 20 cm^3 of 0.3 mol /dm^3 aqueous sodium carbonate?

A 160 cm^3
B 80 cm^3
C 40 cm^3
D 20 cm^3

13. Which of the following salts **cannot** be prepared by reaction between a dilute acid and a metal?

A copper (II) chloride
B iron (II) sulfate
C zinc nitrate
D magnesium chloride

14. A colourless solution **X** formed a white precipitate with aqueous lead (II) nitrate. When dilute nitric acid is added, it dissolves completely to give a colourless solution. What could solution **X** possibly contain?

A copper (II) sulfate
B copper (II) carbonate
C sodium sulfate
D sodium carbonate

15. Which of the following substances can be added to reduce the acidity in the soil?

A ammonium sulfate
B ammonium nitrate
C calcium hydroxide
D calcium chloride

16. Both zinc oxide and zinc carbonate react with dilute sulfuric acid.
In what way are both these reactions the same?
A a colourless gas is produced
B neutralization reaction has taken place
C sulfuric acid is acting as an oxidizing agent
D water is a product

17. A redox reaction will occur when aqueous iron(II) sulfate is added to
A aqueous hydrochloric acid.
B aqueous copper (II) sulfate.
C aqueous iron (II) nitrate.
D acidified potassium manganate (VII).

18. A large volume of copper(II) sulfate solution is left in an iron container overnight. The part of the container in contact with the solution turn pink brown.
Which statement describes what happens?
A Iron has been oxidised by copper to iron (III) oxide which is brown in colour.
B Copper (II) ion has been reduced to copper metal by iron.
C Copper has been oxidised by iron (II) ions.
D The iron container contains impurity that reacts with oxygen to given the colour.

19. A white powder **X** when heated strongly, produces a colourless gas and a yellow solid. When the product cools, it turns from yellow to white. What is **X**?
A lead (II) oxide
B zinc oxide
C lead (II) carbonate
D zinc carbonate

20. Metal **X** lies between zinc and copper in the reactivity series. Which of the following statements is correct about **X**?
A It reacts readily with hot water to produce hydrogen gas.
B It displaces zinc from an aqueous zinc nitrate.
C It displaces copper from aqueous copper (II) sulfate.
D It forms a hydroxide which dissolves in water.

21. Which statement about the metals zinc, lead and copper is correct?
A They react with dilute hydrochloric acid to produce a salt.
B Their chlorides are soluble in water.
C All their compounds are coloured.
D Their oxides can be reduced to the metal by heating with carbon.

22. A metal knife is to be electroplated with silver. Which of the following setup should be used?

	anode	cathode	electrolyte
A	silver	knife	aqueous silver nitrate
B	knife	silver	aqueous silver nitrate
C	silver	knife	molten silver chloride
D	knife	silver	molten silver chloride

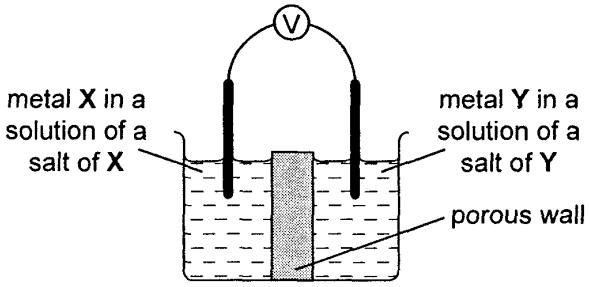
23. In a series of experiments, the following quantities of ions were discharged in electrolysis. Which required the largest quantity of electricity?

A one mole of Fe^{2+} ions
B two moles of Al^{3+} ions
C three moles of F^{-} ions
D four moles of O^{2-} ions

24. In an electrolysis experiment, the same quantity of electricity deposited 16g of copper and 6g of titanium. What was the charge on the titanium ion?

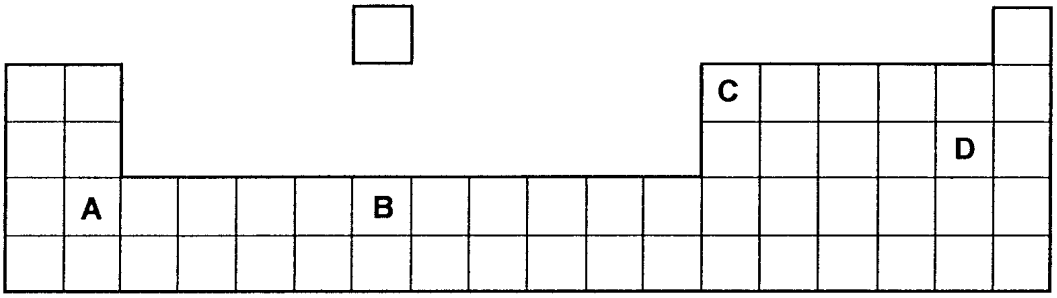
A +1
B +2
C +3
D +4

25. **X** and **Y** are metals used as electrodes in a simple cell. Which pair of metals **X** and **Y** will produce the highest voltage with current flowing from **X** to **Y**?



	metal X	metal Y
A	zinc	copper
B	magnesium	silver
C	copper	iron
D	iron	zinc

26. The positions of four elements are shown on the outline of part of the Periodic Table. Element **X** has a high melting point and is a good conductor of electricity. It forms coloured compounds. Which element is **X**?



27. **W, X**, **Y** and **Z** are consecutive members of the periodic table with **W** having the smallest atomic number. **Y** does **not** form any compounds with any element. From the information given, it can be predicted that

1 **X** is the most likely to form a negative ion among the four elements.
2 **Z** is the most likely to form an oxide which dissolves in water.
3 **W** and **Z** combines to form an ionic compound.
4 **X** and **Z** combines to form an ionic compound.

A 1 and 2 only
B 1 and 3 only
C 2, 3 and 4 only
D 1, 2, 3 and 4.

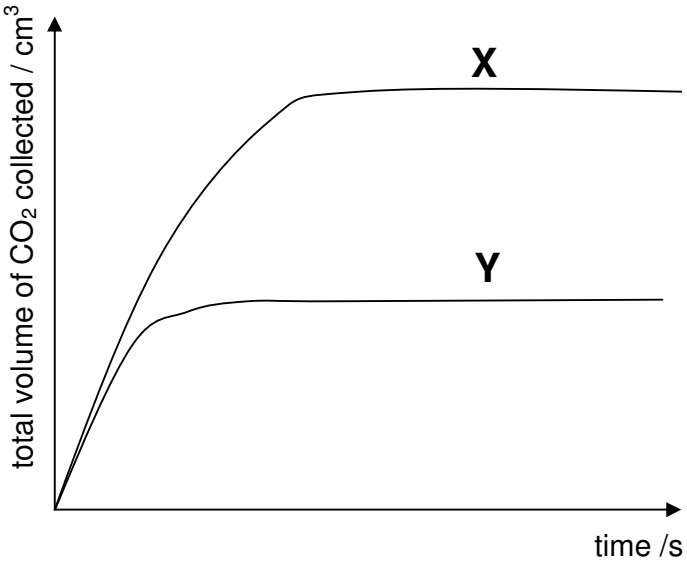
28. Which of the following statements is true about an exothermic process?

A A catalyst is required to start a chemical reaction.
B Heat and light energy is always given out in the process.
C The total energy content of the reactants is less than that of the products.
D The total energy content of the reactants is more than that of the products.

29. When a magnesium strip is dropped into dilute hydrochloric acid, an exothermic reaction occurs. Why does the rate of this reaction increase during the first few seconds?

A The solution is becoming hotter.
B The magnesium is acting as a catalyst.
C The amount of magnesium is decreasing.
D The surface area of the magnesium is increasing.

30. Some lumps of sodium carbonate were added to an excess of sulfuric acid at room temperature. The volume of carbon dioxide produced was measured over a period of time. The results are shown in graph **X**. The experiment was repeated and graph **Y** was obtained.



Which one change was used to obtain the results shown in graph **Y**?

A Acid of half the original concentration was used.
B A lower temperature was used.
C Half the amount of sodium carbonate was used.
D Powdered sodium carbonate were used.

31. Which set of conditions will make calcium carbonate react most quickly with excess acid to form a colourless solution?

A marble chips and dilute sulfuric acid at 40℃
B marble chips and dilute hydrochloric acid at 40℃
C marble chips and dilute sulfuric acid at 60℃
D marble chips and dilute hydrochloric acid at 60℃

32. Which of the following is/are a property of ammonia?

1 It is highly soluble in water.
2 It turns red litmus blue.
3 It is a reducing agent.
4 It reacts with oxygen to form nitrogen and water.

A 1 and 2 only
B 1 and 3 only
C 1, 2 and 3 only
D 2 and 4 only

33. A catalytic converter in a car exhaust system converts pollutants into less harmful products. Which changes occur in a catalytic converter?

1 carbon dioxide → carbon
2 carbon monoxide → carbon dioxide
3 nitrogen oxides → nitrogen
4 unburned hydrocarbons → carbon dioxide and water

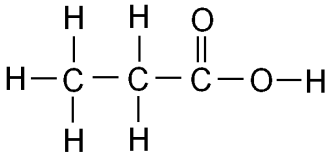
A 1 and 2 only
B 2 and 3 only
C 2, 3 and 4 only
D 1, 2, 3 and 4

34. Which of the following gases **cannot** be removed from the exhaust gases of a petrol powered car by its catalytic converter?

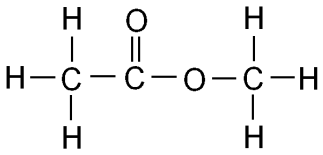
A carbon dioxide
B carbon monoxide
C hydrocarbons
D nitrogen dioxide

35. Which of the following is a product of ethanoic acid?

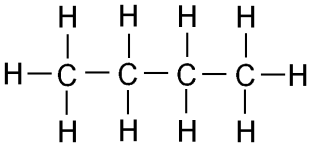
A



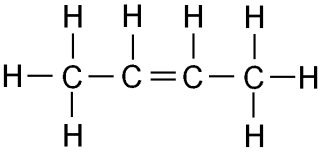
B



C

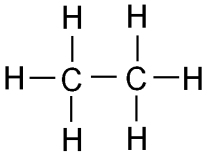


D

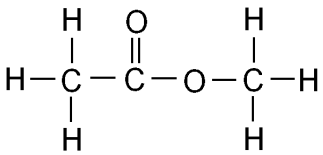


36. An organic compound **X** reacts both with sodium hydroxide and with sodium carbonate. What could the structure of **X** be?

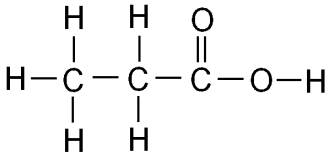
A



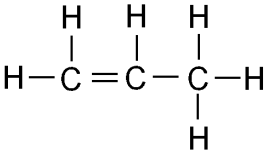
B



C



D

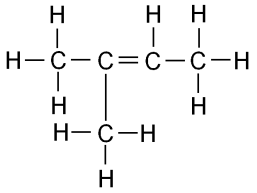


37. Which statement is true about propanoic acid?

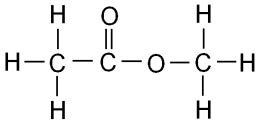
A It is formed by the catalytic addition of steam to propene.
B It is formed by the oxidation of propanol.
C It is formed by the addition reaction of propene.
D It reacts ethanoic acid to form ethyl propanoate.

38. The structures of four organic compounds are shown.

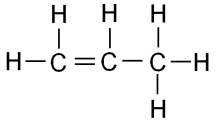
1



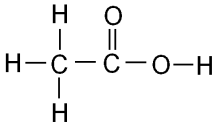
2



3



4



Which of the compound(s) decolourise aqueous bromine rapidly?

A 1 and 2 only
B 1 and 3 only
C 3 only
D 2 and 4 only

39. Why are large alkane molecules cracked to form smaller molecules?

A Alkanes with large molecules are not useful.
B Small alkane molecules can be used to make plastics.
C Large alkanes can be easily obtained from crude oil.
D To meet the high demand for small alkane molecules.

40. In the polymerisation of ethene to form poly(ethene), there is **no** change in

1 density.
2 mass.
3 empirical formula.
4 molecular formula.

A 1 and 2 only
B 2 and 3 only
C 2 and 4 only
D 3 only

~ 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 sulfur 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	– Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	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	– Ra radium 88	– 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.).

Colours of Some Common Metal Hydroxides

Calcium hydroxide	white
Copper(II) hydroxide	light blue
Iron(II) hydroxide	green
Iron(III) hydroxide	red-brown
Lead(II) hydroxide	white
Zinc hydroxide	white

Answer Sheet

1C
2C
3B
4B
5C
6A
7A Proton number of a negative ion must be less than its electron.
8B Na_2SO_4 means 2 Na^+ to 1 SO_4^{2-}
9D how many electrons they need is how many they will provide for sharing
10C
11B By elimination, A and D are alkanes while C is alkene.
12B $2HNO_3 + Na_2CO_3 \rightarrow 2NaNO_3 + H_2O + CO_2$
$0.15xV=2x\ 20x0.3$, $V=80cm^3$
13A Copper is unreactive so it will react with dilute HCl
14D Copper (II) sulfate is blue in colour and copper (II) carbonate is a green solid. Sodium sulfate will form lead (II) sulfate which is insoluble in acids, while sodium carbonate will form lead (II) carbonate which reacts with nitric acid to give a colourless solution, lead (II) nitrate and a colourless gas, CO_2.
15C
16D
17D
18B
19D
20C
21D
22A
23D
24D
25C
26B
27D
28D
29A
30C
31D
32C
33C
34A
35B
36C
37B
38B
39D
40B