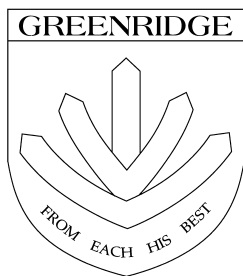


Name : _____ () Class : 3E1



GreenRidge Secondary School

End-of-Year Examination 2002

Subject : Chemistry (5068)
Secondary Three Express
Paper 1

Date : 15 Oct 2002

Duration : 1 h

GREENRIDGESECONDARYSCHOOL GREENRIDGESECONDARYSCHOOL GREENRIDGESECONDARYSCHOOL GREENRIDGESECONDARYSCHOOL GREENRIDGE
GREENRIDGESECONDARYSCHOOL GREENRIDGESECONDARYSCHOOL GREENRIDGESECONDARYSCHOOL GREENRIDGESECONDARYSCHOOL GREENRIDGE

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 paper. 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 12.

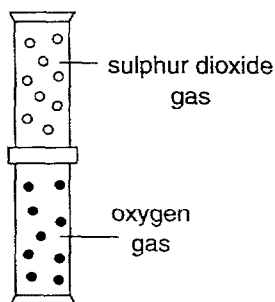
This paper consists of 12 printed pages, including this page.

- When 50 cm^3 of alcohol is mixed with 70 cm^3 of water, the volume of the mixture was found to be 115 cm^3 . Assuming that no evaporation has taken place, which of the following gives the best explanation for the above observation?
 - Some alcohol molecules escape as a gas into the atmosphere.
 - Alcohol and water react to form a gas, which escapes into the atmosphere.
 - The particles of alcohol occupy the spaces between the water molecules.
 - Alcohol and water react to form some solid particles.

- Which statement explains why the compounds propane (C_3H_8) and carbon dioxide (CO_2) diffuse at the same rate at r.t.p.?
 - Their molecules contain carbon.
 - They have the same relative molecular mass.
 - Both are denser than air.
 - Both molecules contain covalent bonds.

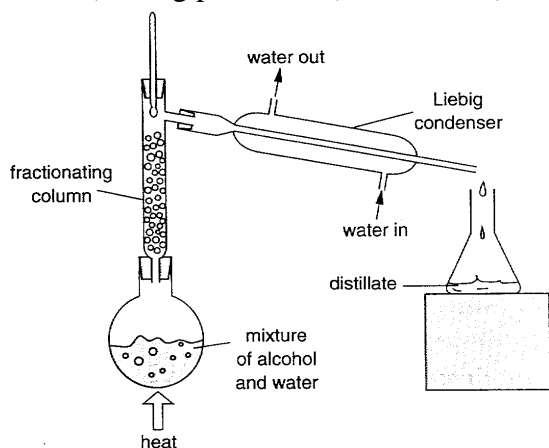
- Which one of these statements about particles is **incorrect**?
 - A compound is made up of particles called atoms.
 - A molecule always contains only one type of atom.
 - An element is made up of only one type of particle.
 - An atom is the smallest particle of an element which can take part in a chemical reaction.

- Sulphur dioxide gas (SO_2) is twice as heavy as oxygen gas (O_2). A gas jar of sulphur dioxide was placed on top of a gas jar of oxygen. The lid between the two gas jars was removed. After one hour which one of these statements would be true?

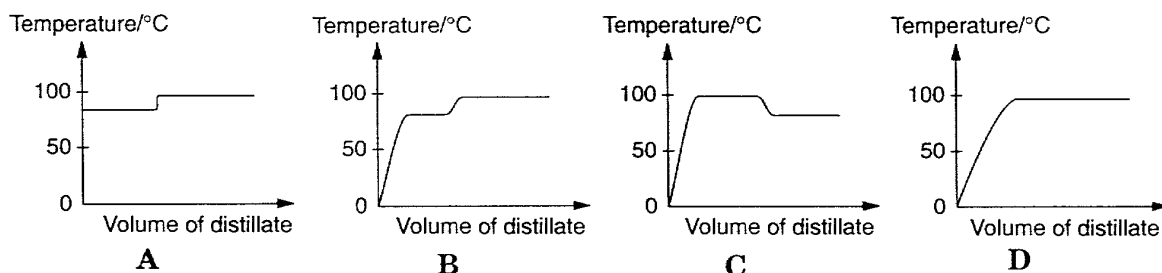


- The top gas jar contained oxygen gas only.
 - Both gas jars contained sulphur trioxide gas.
 - Some of each gas would have moved into the other gas jar.
 - Most of the heavy sulphur dioxide would have sunk into the bottom gas jar.
-
- 100 cm^3 of a gas called ethane (C_2H_6) diffused through a porous pot in 100 seconds. How long would it take 100 cm^3 of nitrogen monoxide (NO) to diffuse under the same conditions of temperature and pressure?
 - 25 seconds
 - 50 seconds
 - 100 seconds
 - 400 seconds

6. A solid is likely to be pure if it
- is neutral with a pH of 7.
 - is crystalline with an exact melting point.
 - melts on heating to form a colourless liquid.
 - has a high melting point.
7. The diagram shows the fractional distillation apparatus which was used to separate alcohol (boiling point 78°C) and water (boiling point 100°C).

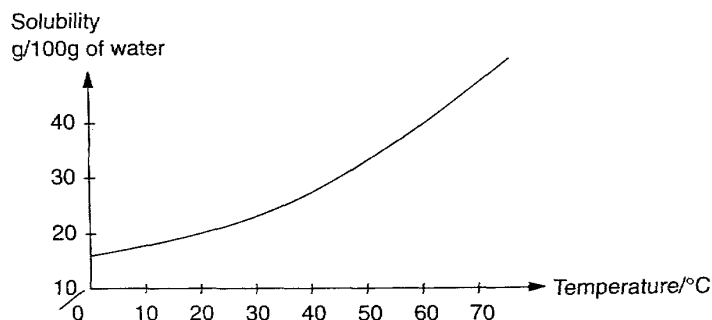


Which one of the following graphs best shows how the temperature varied with the volume of distillate collected?



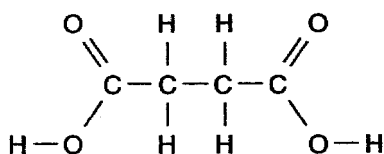
8. When distilling a liquid it is sometimes advisable to place tiny glass beads in the distillation flask. The reason for this is that the glass beads
- ensure smooth boiling.
 - can remove any impurities present.
 - do not allow the liquid to boil dry.
 - provide large surface area for vapour to condense on.
9. A flask contains the liquids trichloroethane and water. They can be separated using a separating funnel. Which deduction can be made from this observation alone?
- Trichloroethane and water have different boiling points.
 - Trichloroethane has a higher density than water.
 - Trichloroethane and water do not mix.
 - Trichloroethane and water have different relative molecular masses.

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



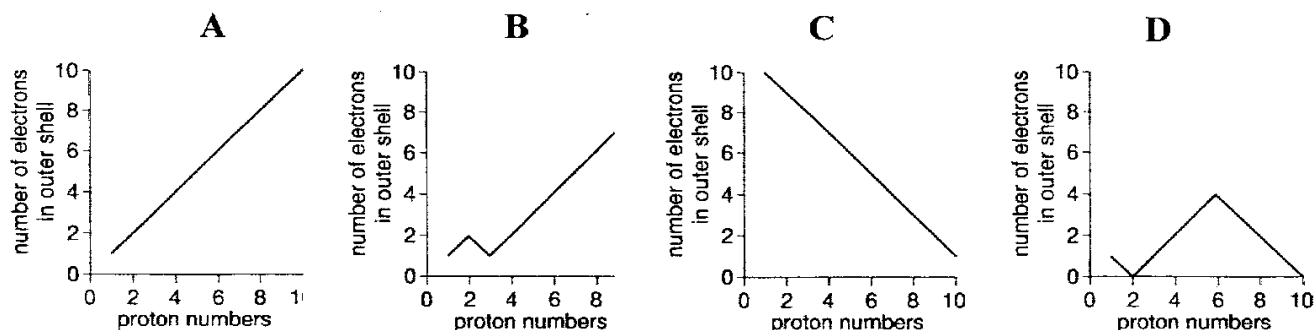
If 25 cm³ of a saturated solution of copper(II) sulphate was cooled from 60°C to 20°C, what would be observed?

- 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.
11. The structural formula of butanedioic acid is



Which statement about butanedioic acid is **not** true?

- A. Its molecular formula is C₄H₆O₄.
 B. It contains three elements.
 C. Its molecular formula and empirical formula are the same.
 D. One molecule contains 14 atoms.
12. 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?



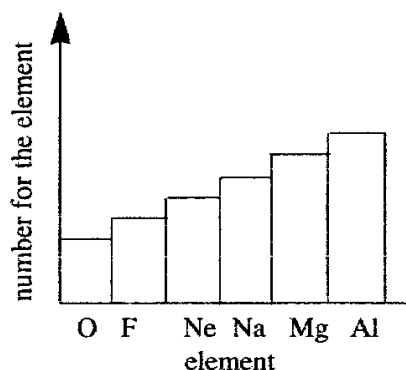
13. Which compound has **both** ionic and covalent bonds?
- Ammonium chloride
 - Carbon dioxide
 - Ethanol
 - Sodium chloride
14. The formulae of the ions of some elements are shown below.



- Which statement about these ions is correct? They all have
- the same number of electrons in their outermost shells.
 - the same electronic structure as a noble gas.
 - the same number of neutrons in their nuclei.
 - more electrons than protons.

15. What is the number of protons in one molecule of sulphur trioxide?
- 32
 - 40
 - 64
 - 80
16. Chlorine atoms and chloride ions
- have same chemical properties.
 - have the same number of electrons.
 - have the same number of protons.
 - have the same physical properties.

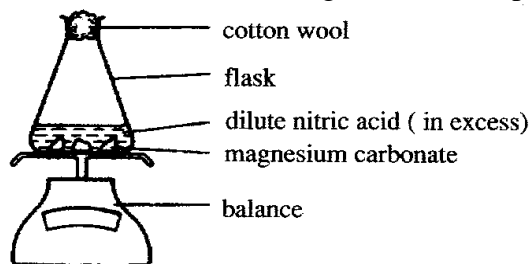
17. A number for the elements from oxygen to aluminium changes as shown.



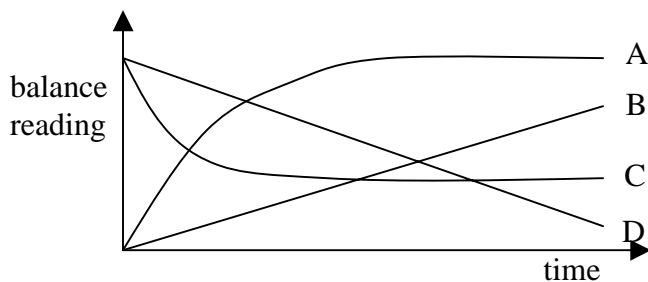
- What is this number?
- the Group number of the element in the Periodic Table
 - the number of electron shells in an atom
 - the number of electrons in the outer shell of an atom
 - the number of protons in an atom

18. 20 cm³ of 1.5M sulphuric acid required 30 cm³ of sodium hydroxide solution for complete neutralization. What is the concentration of sodium hydroxide solution?
- A. 0.50M
 B. 1.00M
 C. 1.50M
 D. 2.00M
19. What volume of water vapour (measured at r.t.p.) will be formed when 50.0g of copper(II) sulphate crystals, CuSO₄.5H₂O, are strongly heated?
- A. 4.80dm³
 B. 12.0dm³
 C. 22.4 dm³
 D. 24.0dm³
20. A 0.1 mol/dm³ aqueous solution of sulphuric acid is mixed with a 0.05 mol/dm³ solution of potassium hydroxide. Which one of the following mixtures will **react completely** to form the salt K₂SO₄ without having either reagent in excess?
- | | <i>volume of 0.1 mol/dm³
sulphuric acid</i> | <i>volume of 0.05 mol/dm³
potassium hydroxide</i> |
|----|--|--|
| A. | 10ml | 40ml |
| B. | 10ml | 20ml |
| C. | 10ml | 10ml |
| D. | 10ml | 5ml |
21. What is the ratio of the volume of 4g of hydrogen to the volume of 8g of methane (CH₄), both volumes measured at room temperature and pressure?
- A. 4 to 1
 B. 1 to 2
 C. 2 to 1
 D. 1 to 1
22. A solution contains 4.20 g/dm³ of the alkali XO₂. In a titration, 25.0 cm³ of the alkaline solution required 15.6 cm³ of 0.12 mol/dm³ hydrochloric acid for reaction. What is metal X?
- A. lithium (proton number 3)
 B. sodium (proton number 11)
 C. potassium (proton number 19)
 D. rubidium (proton number 37)

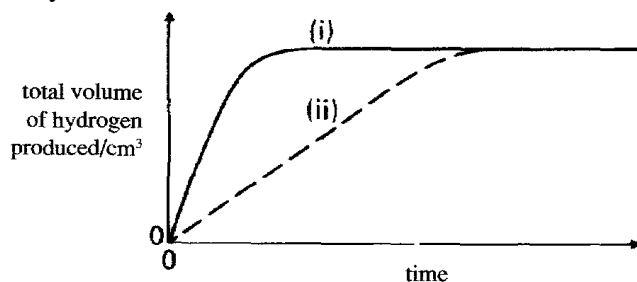
23. The experiment shown in the diagram was set up and the balance was read at intervals.



A graph of the balance readings against time was plotted. Which curve was obtained?

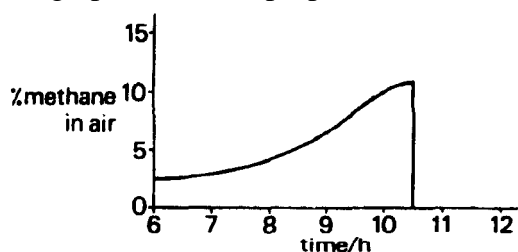


24. In the graph, curve (ii) was obtained when 1g of granulated zinc reacted with an excess of hydrochloric acid at 30°C.



Which of the following changes to this reaction would give curve (i)?

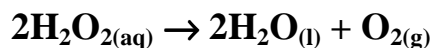
- A. using 0.5 g of granulated zinc
 - B. warming the acid to 40°C
 - C. keeping the reactants well stirred
 - D. adding water to dilute the acid
25. The graph shows the proportion of methane in a coal mine during a working day.



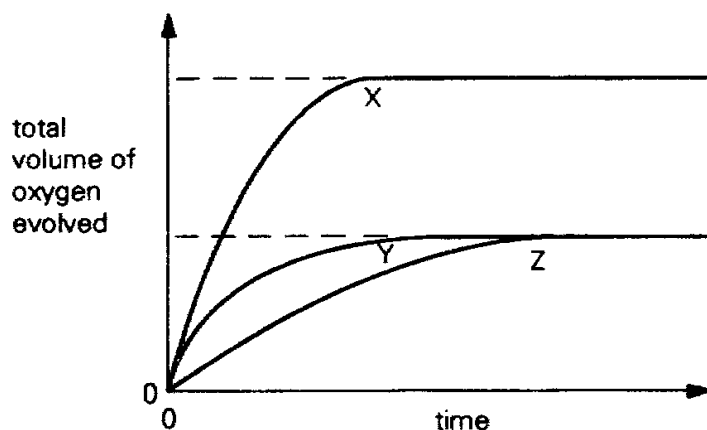
What is most likely to have caused the sudden fall in the methane percentage shown on the graph?

- A. The temperature in the mine was lowered.
- B. An explosive mixture of methane and air ignited.
- C. The ventilator fans were switched on.
- D. Methane stopped seeping into the mine.

26. Hydrogen peroxide solution is catalytically decomposed by manganese(IV) oxide according to the equation below:



Three experiments were performed using different solutions but a fixed mass of catalyst. The graph shows the results.



The solutions used were:

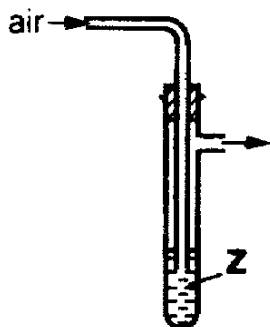
- (i) 50 cm³ of 2.0 mol/dm³ hydrogen peroxide;
- (ii) 100 cm³ of 1.0 mol/dm³ hydrogen peroxide;
- (iii) 100 cm³ of 2.0 mol/dm³ hydrogen peroxide;

Which curve corresponds to which solution?

- | | (i) | (ii) | (iii) |
|----|-----|------|-------|
| A. | X | Y | Z |
| B. | X | Z | Y |
| C. | Y | Z | X |
| D. | Y | X | Z |

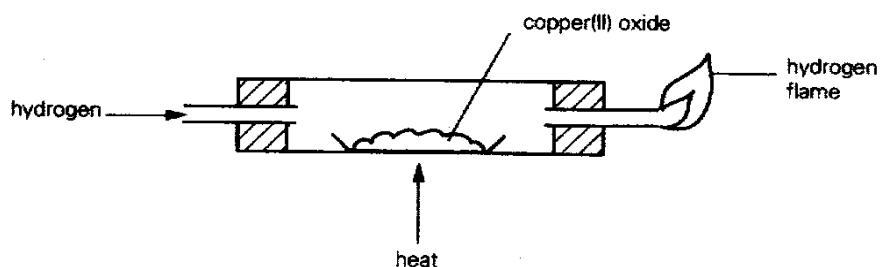
27. In which of the following experiments will a redox reaction occur?
- A. Adding lead to magnesium chloride solution
 - B. Adding copper turnings to dilute hydrochloric acid.
 - C. Adding copper turnings to silver nitrate solution
 - D. Adding calcium chloride solution to copper(II) nitrate solution
28. Which one of the following is **not** a redox reaction?
- A. $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$
 - B. $\text{MgO} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2\text{O}$
 - C. $\text{Mg} + \text{CuSO}_4 \rightarrow \text{MgSO}_4 + \text{Cu}$
 - D. $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$

29. Air polluted by sulphur dioxide was passed through the apparatus shown in the diagram.



Which of the following solutions could be used as Z to show the presence of sulphur dioxide?

- A. acidified potassium dichromate(VI)
 - B. aqueous iron(II) sulphate
 - C. aqueous potassium iodide
 - D. concentrated sulphuric acid
30. The diagram shows apparatus used in the reduction of copper(II) oxide to copper.



After the reduction is complete, hydrogen is passed through the apparatus until it is cold. This is to prevent

- A. copper reacting with oxygen from the air.
 - B. copper reacting with water vapour from the air.
 - C. copper(II) oxide reacting with nitrogen from the air.
 - D. copper(II) oxide reacting with water vapour from the air.
31. Which of the following solutions will give a precipitate when mixed?
- (1). zinc chloride solution and sodium hydroxide solution
 - (2). calcium chloride solution and sodium carbonate solution
 - (3). silver nitrate solution and sodium chloride solution
- A. (1) and (2) only
 - B. (1) and (3) only
 - C. (2) and (3) only
 - D. (1), (2) and (3)

32. Ammonium nitrate fertiliser has just been added to the soil. Which of the following substances can be added in **excess** to decrease the acidity in soil?
- Ammonium hydroxide
 - Calcium hydroxide
 - Magnesium sulphate
 - Calcium carbonate
33. Which of the following does **not** react with dilute sulphuric acid?
- sodium hydroxide
 - magnesium nitrate
 - zinc metal
 - copper (II) oxide
34. Which of the following salts **cannot** be prepared by the reaction between a dilute acid and a metal?
- calcium chloride
 - copper(II) chloride
 - iron(II) chloride
 - zinc sulphate
35. What does a solution of hydrogen chloride in methylbenzene (organic solvent) contain?
- methylbenzene ions, hydrogen ions and chloride ions
 - methylbenzene molecules and hydrogen chloride molecules
 - methylbenzene molecules, hydrogen molecules and chloride molecules
 - methylbenzene molecules, hydrogen ions and chloride ions.
36. The following observations were made with the nitrate of metal M.
- A colourless gas and a white solid were formed when the solid nitrate was heated strongly.
 - No reaction was observed when an iron nail was placed in a solution of the nitrate of M.
- From the above information, where would you place M in the reactivity series?
- above calcium
 - between calcium and iron
 - between iron and copper
 - below copper
37. Aluminium metal does **not** corrode easily because
- it is low down in the reactivity series.
 - it reacts with water to form a protective layer of hydrogen.
 - an oxide layer protects the metal.
 - it forms an amphoteric oxide.

38. Which one of the following oxides is most easily reduced to the metal by heating it in hydrogen gas?
- A. calcium oxide
 - B. lead(II) oxide
 - C. iron(III) oxide
 - D. zinc oxide

39. Element P is found in the ground as the uncombined element; element Q is obtained by heating its oxide with coke (carbon); element R is obtained by electrolysis of its molten chloride. What is the correct order of reactivity of metals P, Q and R?

	most reactive	→	least reactive
A.	P	Q	R
B.	Q	R	P
C.	Q	P	R
D.	R	Q	P

40. Three methods of preventing iron from rusting are:

coating with zinc
coating with tin
connecting to blocks of magnesium

Which metal is most commonly used to prevent rusting of the following steel objects?

	roofing sheets	cans of food	underground pipelines
A.	zinc	tin	magnesium
B.	magnesium	zinc	tin
C.	magnesium	tine	zinc
D.	tin	zinc	magnesium

~ 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	4 He Helium 2										
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	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 27	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	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	127 I Iodine 53	131 Xe Xenon 54																					
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium * 72	184 W Tungsten 74	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																					
87 Fr Francium	88 Ra Radium	89 Ac Actinium	+																																	

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

a	X	b
Key		
a = relative atomic mass		X = atomic symbol

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	94 Pu Plutonium 94	95 Am Americium 95	96 Cm Curium 96	97 Bk Berkelium 97	98 Cf Californium 98	99 Es Einsteinium 99	100 Fm Fermium 100	101 Md Mendelevium 101	102 No Nobelium 102	103 Lr Lawrencium 103

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