



**BOTSWANA EXAMINATIONS COUNCIL**  
Botswana General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

\* 6691476519 \*

**SCIENCE : DOUBLE AWARD** **0569/04**  
 Paper 4 **October/November 2013**  
**1 hour 30 minutes**

Candidates answer on the Question Paper.  
 Additional Materials: 300 mm ruler.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name in the spaces provided at the top of this page.  
 Write in dark blue or black pen.  
 You may use a soft pencil for any diagrams, graphs or rough working.  
 Do **not** use staples, paper clips, highlighters, glue or correction fluid.  
 DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.  
 Write your answers in the spaces provided on the question paper.  
 The number of marks is given in brackets [ ] at the end of each question or part question.  
 You may use a calculator.

A copy of the Periodic Table is printed on page 16.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
Total	

This document consists of 16 printed pages.

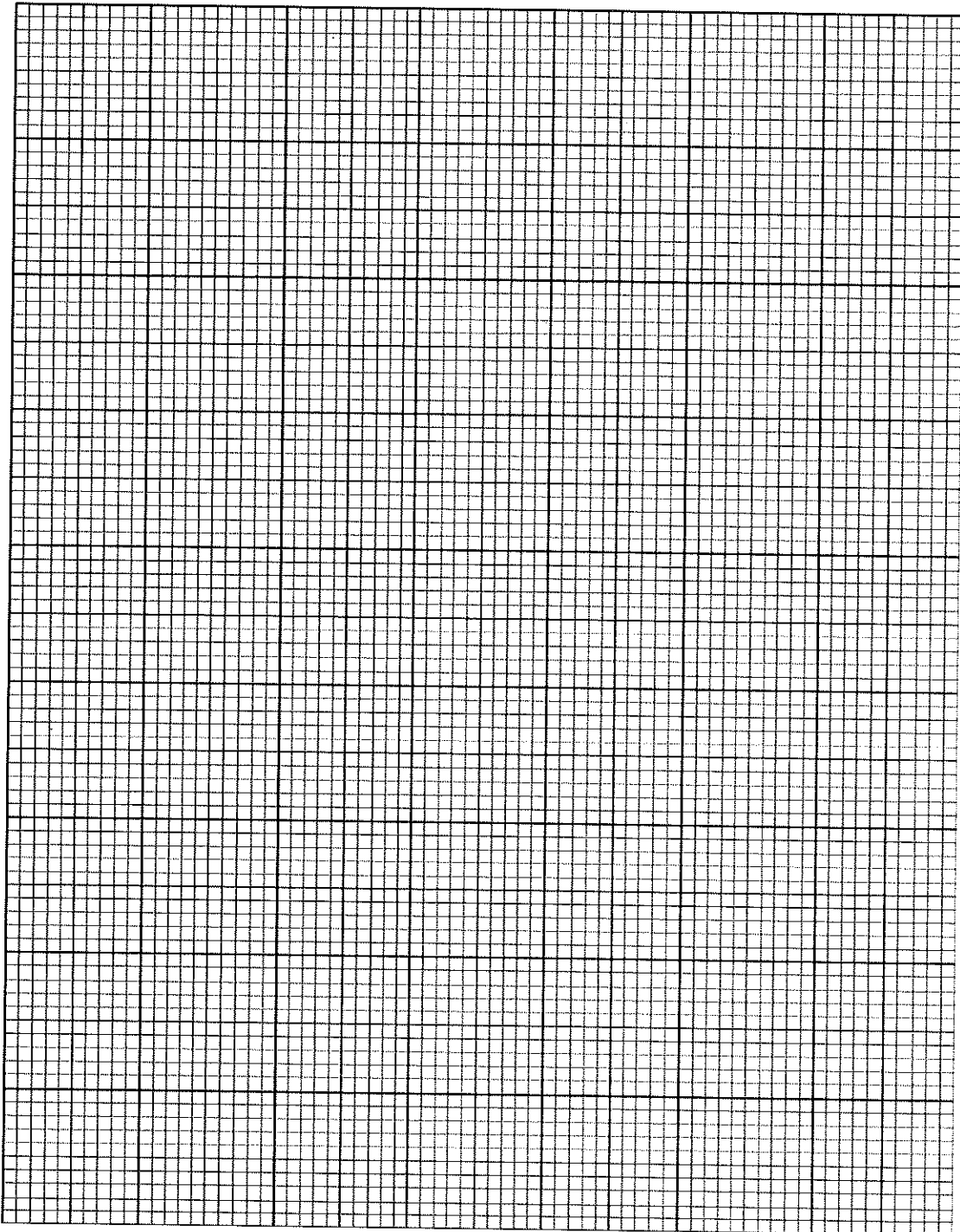


- 1 Table 1.1 shows the results of an experiment that was performed to find the relationship between load and extension for a rubber band.

**Table 1.1**

load/N	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5
extension/mm	0	22	45	71	73	81	86	89

- (a) On the grid provided, plot a graph of extension/mm against load/N. [4]



(b) Use your graph to

(i) determine the extension value which is not correct,

extension = ..... [1]

(ii) find the extension produced by a load of 2.75 N.

extension = ..... [1]

(c) Predict the result of adding a load of 100 N in this experiment.

.....

..... [1]



- 2 Fig. 2.1 shows the diagram of a circuit used to determine the resistance  $R$  of an unknown resistor, connected in series with a  $6\ \Omega$  resistor.

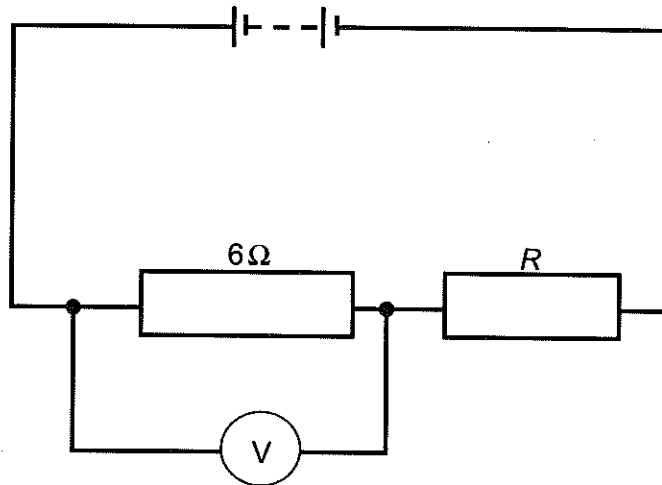


Fig. 2.1

Fig. 2.2 shows the readings of the voltmeter before it was connected and when it was connected across the  $6\ \Omega$  resistor.

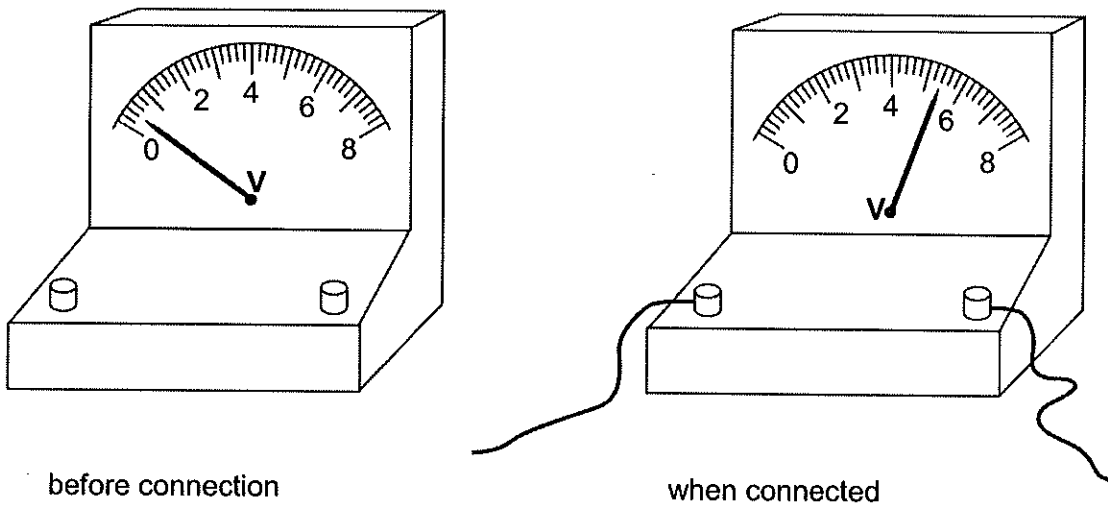


Fig. 2.2

- (a) What is the reading of the voltmeter

before it was connected,

reading = .....

when connected across the  $6\ \Omega$  resistor?

reading = ..... [1]



- 3 An experiment was performed to determine the density of three metal spheres **P**, **Q** and **R**. Fig. 3.1 shows the cross-sections of the metal spheres drawn to full scale.

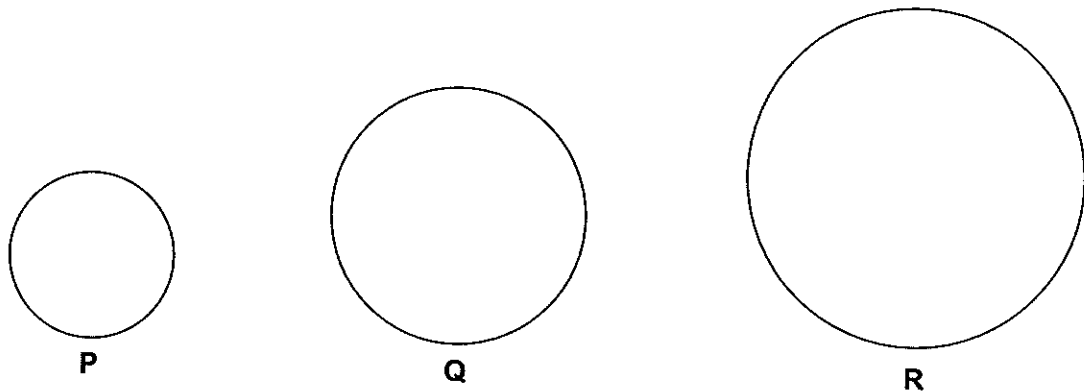


Fig. 3.1

Table 3.1 shows some of the results obtained when the experiment was performed.

Table 3.1

sphere	$d/\text{cm}$	$m/\text{g}$	$\rho/(\text{g}/\text{cm}^3)$
<b>P</b>		12.6	2.72
<b>Q</b>		48.6	2.70
<b>R</b>		114.8	

- (a) (i) Measure the diameter,  $d$ , of spheres **P**, **Q** and **R**.

Record the results in Table 3.1.

[2]

- (ii) Give **one** possible source of error when measuring length.

..... [1]

- (b) The density,  $\rho$ , of the metal spheres is given approximately by the equation below.

$$\rho = \frac{2m}{d^3}$$

Complete Table 3.1 for the density of sphere **R**.

[2]

- (c) Suggest **one** method of improving the results of the experiment.

.....

..... [1]

- 4 A student was asked to separate a mixture of cooking oil and water using the apparatus shown in Fig. 4.1.

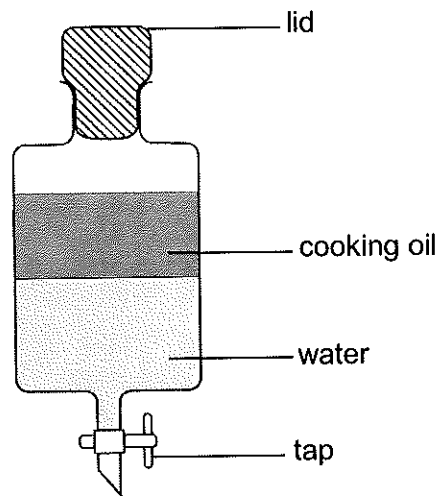


Fig. 4.1

- (a) (i) Name the apparatus shown in Fig. 4.1.

..... [1]

- (ii) Why is it possible to separate water and cooking oil using the apparatus shown in Fig. 4.1?

.....  
..... [1]

- (b) Describe **two** things the student needs to do to separate the mixture.

1 .....  
.....

2 .....  
..... [2]

- (c) Water and ethanol mix completely to form a clear solution. Suggest a method that could be used to separate this mixture. Give a reason for your answer.

method .....

reason ..... [2]



- 5 Fig. 5.1 shows the preparation of chlorine gas using concentrated hydrochloric acid and potassium permanganate.

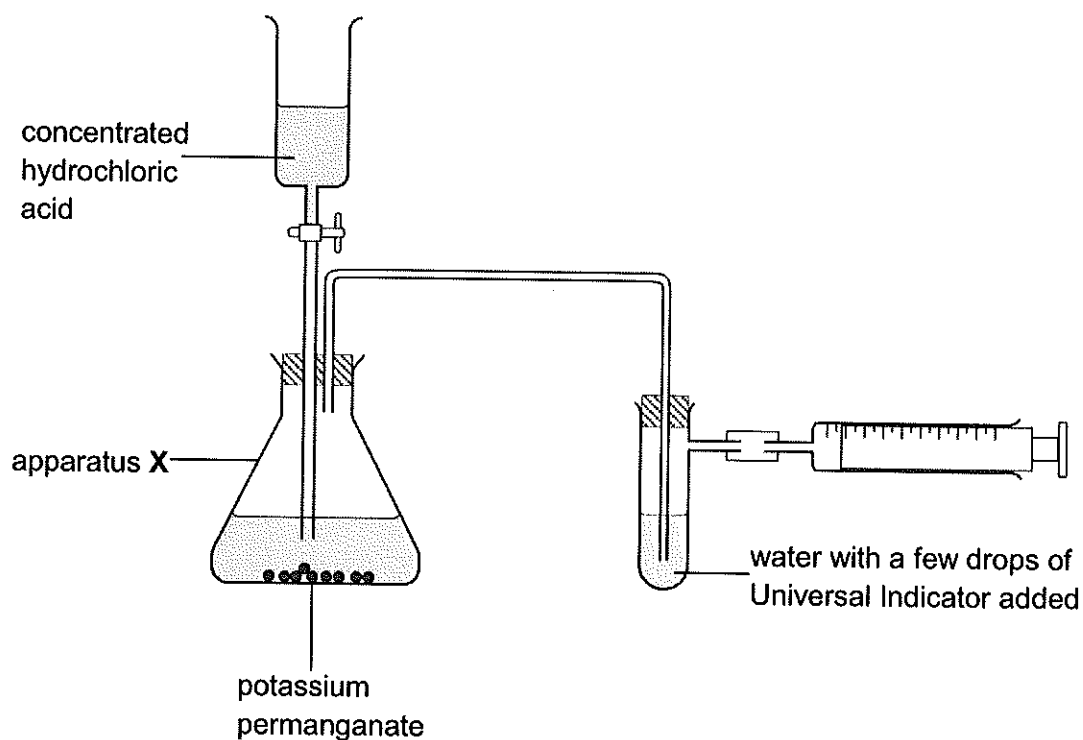


Fig. 5.1

- (a) What is the name of the apparatus X?

..... [1]

- (b) Describe what will be observed in the tube with the Universal Indicator solution.

.....  
 ..... [2]

- (c) The student decided to collect and measure the volume of the gas produced using a gas syringe.

Fig. 5.2 shows the readings on the syringe at 2 minutes, 4 minutes, 6 minutes and 8 minutes.

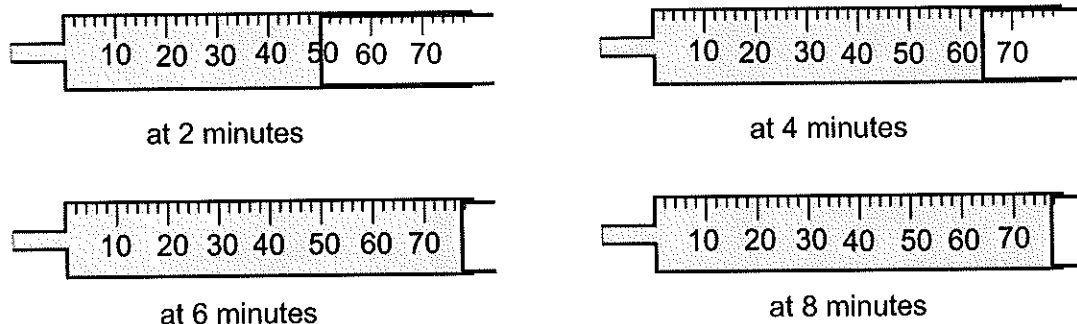


Fig. 5.2

- (i) Record the volume of gas at

2 minutes .....  $\text{cm}^3$ ,

4 minutes .....  $\text{cm}^3$ ,

6 minutes .....  $\text{cm}^3$ ,

8 minutes .....  $\text{cm}^3$ . [2]

- (ii) Suggest **one** possible explanation for the readings at 6 minutes and 8 minutes.

.....

..... [1]

- (d) Suggest **two** precautions that should be taken when doing this experiment.

1 .....

2 ..... [2]



- 6 An experiment was carried out to investigate the reaction between zinc metal and dilute hydrochloric acid as shown in Fig. 6.1.

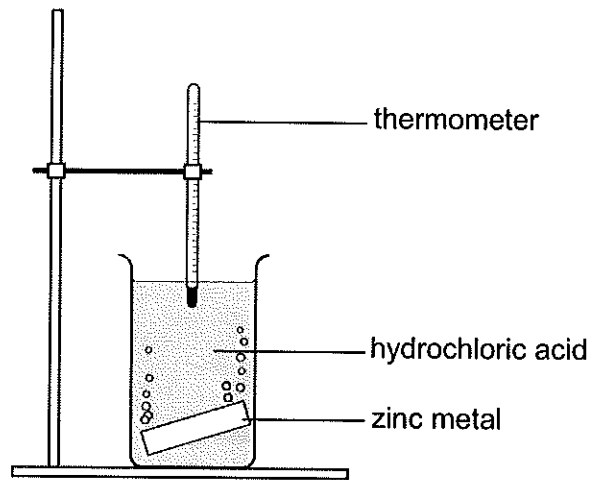


Fig. 6.1

- (a) State **two** observations that could be made that indicate a chemical change has taken place.

.....

..... [2]

(b) Fig. 6.2 shows the thermometer readings before and after the reaction.

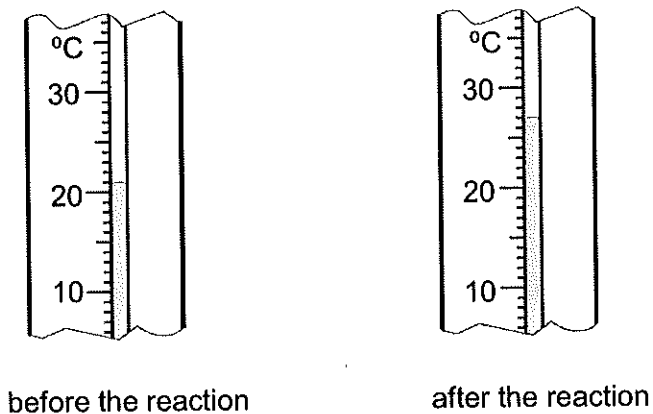


Fig. 6.2

(i) What is the temperature shown on the thermometer before and after the reaction?

before the reaction .....°C

after the reaction .....°C [1]

(ii) State the type of chemical change that produces a temperature change as in (i).

..... [1]

(c) The experiment was repeated using zinc metal powder of the same mass with dilute hydrochloric acid. This reaction was faster than the first one.

Suggest **two** other ways that can make the reaction faster than the first one.

1 .....

2 ..... [2]



- 7 Fig. 7.1 shows a cross-section of a pumpkin.

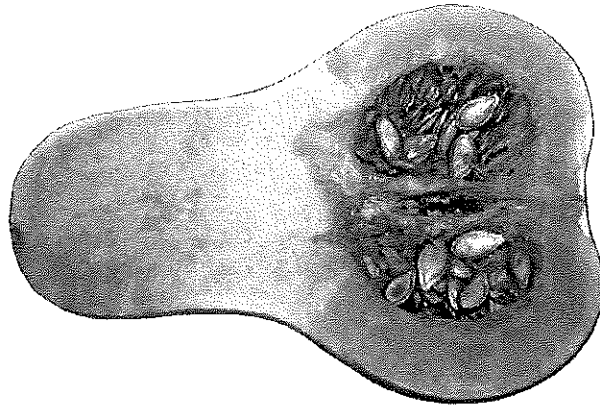


Fig. 7.1

- (a) Draw a large diagram of the pumpkin shown in Fig. 7.1 in the space below.

[4]

(b) (i) Measure the maximum length of the pumpkin in Fig. 7.1 and in your drawing.

length of pumpkin in Fig. 7.1 = .....

length of pumpkin in drawing = ..... [2]

(ii) Calculate the magnification of your drawing.

magnification = ..... [2]

(c) Describe an experiment that you could carry out to show that water is needed for the seed of a pumpkin to germinate. You may include diagrams to show how you would set-up your experiment.

.....

.....

.....

.....

.....

.....

..... [3]



- 8 Fig 8.1 show set-ups P, Q and R containing enzyme X at different temperatures. Enzyme X was left at these temperatures for 5 minutes. After 5 minutes, 5 cm<sup>3</sup> of starch solution was added to each test-tube. Enzyme X digests starch.

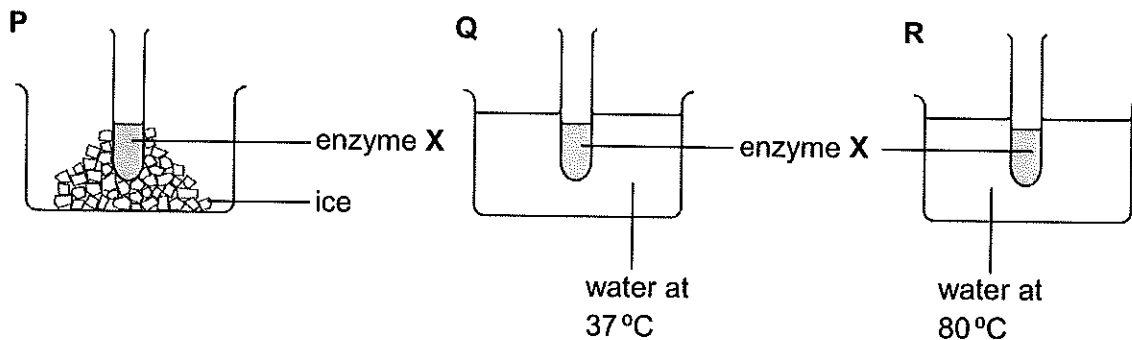


Fig. 8.1

- (a) Name enzyme X.

..... [1]

- (b) Explain why enzyme X was left for 5 minutes before adding starch solution.

.....  
 ..... [1]

- (c) After 20 minutes, samples were drawn from each test-tube using a syringe. Each sample was tested for starch and glucose.

- (i) Describe the test for glucose.

.....  
 .....  
 .....  
 .....  
 .....  
 ..... [3]

- (ii) Fill in the table below to show the expected results for both tests. Use a cross (x) to show the absence of a substance and a tick (√) to show its presence.

Set-up P has been done for you.

Table 2.1

set-up	test for starch	test for glucose
P	√	x
Q		
R		

[2]

- (d) Suggest and explain **one** way in which the experiment can be improved.

improvement .....

.....

explanation .....

..... [2]



**DATA SHEET**  
**The Periodic Table of the Elements**

I		II		Group										III	IV	V	VI	VII	0																																										
7 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4	23 <b>Na</b> Sodium 11	24 <b>Mg</b> Magnesium 12	39 <b>K</b> Potassium 19	40 <b>Ca</b> Calcium 20	45 <b>Sc</b> Scandium 21	48 <b>Ti</b> Titanium 22	51 <b>V</b> Vanadium 23	52 <b>Cr</b> Chromium 24	55 <b>Mn</b> Manganese 25	56 <b>Fe</b> Iron 26	59 <b>Co</b> Cobalt 27	59 <b>Ni</b> Nickel 28	64 <b>Cu</b> Copper 29	65 <b>Zn</b> Zinc 30	70 <b>Ga</b> Gallium 31	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	80 <b>Br</b> Bromine 35	84 <b>Kr</b> Krypton 36	11 <b>B</b> Boron 5	12 <b>C</b> Carbon 6	14 <b>N</b> Nitrogen 7	16 <b>O</b> Oxygen 8	19 <b>F</b> Fluorine 9	20 <b>Ne</b> Neon 10	27 <b>Al</b> Aluminium 13	28 <b>Si</b> Silicon 14	31 <b>P</b> Phosphorus 15	32 <b>S</b> Sulphur 16	35.5 <b>Cl</b> Chlorine 17	40 <b>Ar</b> Argon 18	1 <b>H</b> Hydrogen 1	4 <b>He</b> Helium 2																										
85 <b>Rb</b> Rubidium 37	88 <b>Sr</b> Strontium 38	133 <b>Cs</b> Caesium 55	137 <b>Ba</b> Barium 56	226 <b>Ra</b> Radium 88	227 <b>Ac</b> Actinium 89	89 <b>Y</b> Yttrium 39	91 <b>Zr</b> Zirconium 40	93 <b>Nb</b> Niobium 41	96 <b>Mo</b> Molybdenum 42	101 <b>Ru</b> Ruthenium 44	103 <b>Rh</b> Rhodium 45	106 <b>Pd</b> Palladium 46	108 <b>Ag</b> Silver 47	112 <b>Cd</b> Cadmium 48	115 <b>In</b> Indium 49	119 <b>Sn</b> Tin 50	122 <b>Sb</b> Antimony 51	128 <b>Te</b> Tellurium 52	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54	140 <b>Ce</b> Cerium 58	141 <b>Pr</b> Praseodymium 59	144 <b>Nd</b> Neodymium 60	147 <b>Pm</b> Promethium 61	150 <b>Sm</b> Samarium 62	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	162 <b>Dy</b> Dysprosium 66	165 <b>Ho</b> Holmium 67	167 <b>Er</b> Erbium 68	169 <b>Tm</b> Thulium 69	173 <b>Yb</b> Ytterbium 70	175 <b>Lu</b> Lutetium 71	232 <b>Th</b> Thorium 90	238 <b>Pa</b> Protactinium 91	238 <b>U</b> Uranium 92	238 <b>Np</b> Neptunium 93	238 <b>Pu</b> Plutonium 94	238 <b>Am</b> Americium 95	238 <b>Cm</b> Curium 96	238 <b>Bk</b> Berkelium 97	238 <b>Cf</b> Californium 98	238 <b>Es</b> Einsteinium 99	238 <b>Fm</b> Fermium 100	238 <b>Md</b> Mendelevium 101	238 <b>No</b> Nobelium 102	238 <b>Lr</b> Lawrencium 103	181 <b>Ta</b> Tantalum 73	184 <b>W</b> Tungsten 74	186 <b>Re</b> Rhenium 75	190 <b>Os</b> Osmium 76	192 <b>Ir</b> Iridium 77	195 <b>Pt</b> Platinum 78	197 <b>Au</b> Gold 79	201 <b>Hg</b> Mercury 80	204 <b>Tl</b> Thallium 81	207 <b>Pb</b> Lead 82	209 <b>Bi</b> Bismuth 83	210 <b>Po</b> Polonium 84	210 <b>At</b> Astatine 85	210 <b>Rn</b> Radon 86

\*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<sup>3</sup> at room temperature and pressure (r.t.p.).