



BOTSWANA EXAMINATIONS COUNCIL
 in collaboration with
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
 Botswana General Certificate of Secondary Education

CANDIDATE
NAME

CENTRE
NUMBER

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NUMBER

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SCIENCE : DOUBLE AWARD

0569/03

Paper 3

October/November 2011

2 hours

Candidates answer on the Question Paper.

No Additional Materials are required.



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 20.

For Examiner's Use	
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Total	

This document consists of **18** printed pages and **2** blank pages.

1 Fig. 1.1 shows the speed-time graph for a part of a car journey.

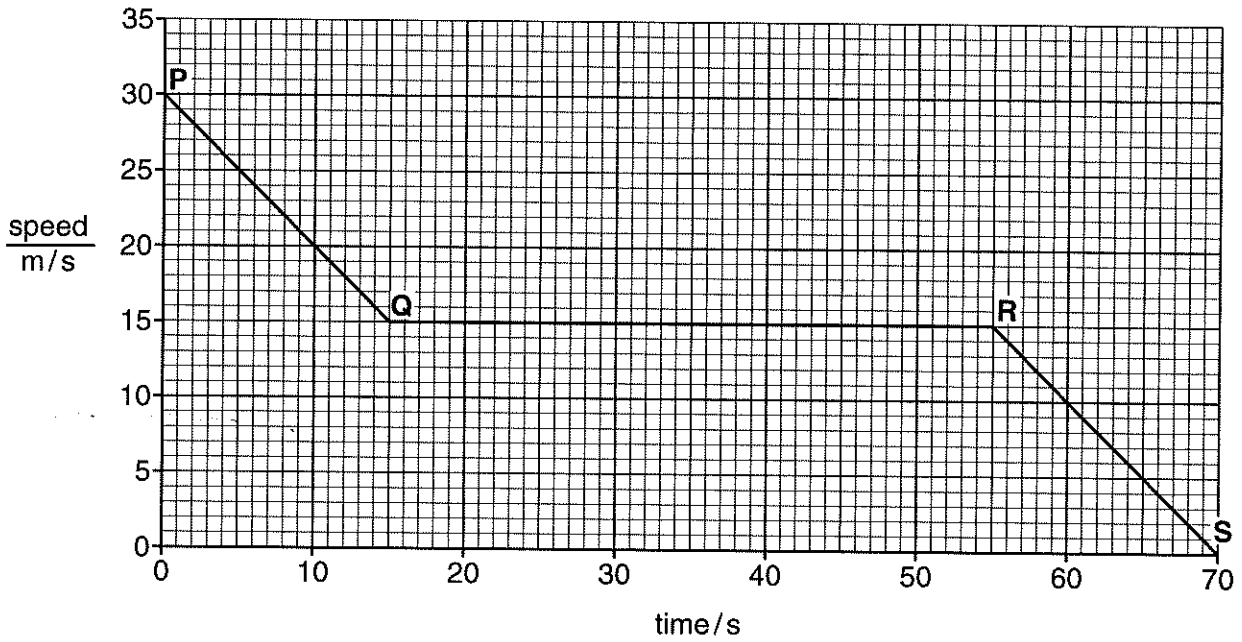


Fig. 1.1

(a) Describe the motion of the car between **P** and **Q**.

..... [1]

(b) How long did the car take to move from **Q** to **R**?

..... [1]

(c) Calculate the distance between **P** and **Q**.

distance = [2]

(d) Find the acceleration of the car between **R** and **S**.

acceleration = [2]

2 A copper rod and a perspex rod are each rubbed with a cloth. The perspex rod becomes positively charged and the copper rod remains uncharged.

(a) Explain why copper **cannot** be charged by rubbing.

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

(b) What happens during the rubbing of the perspex that makes it to be charged.

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

(c) Fig. 2.1 shows the charged perspex rod placed close to a suspended polystyrene sphere.

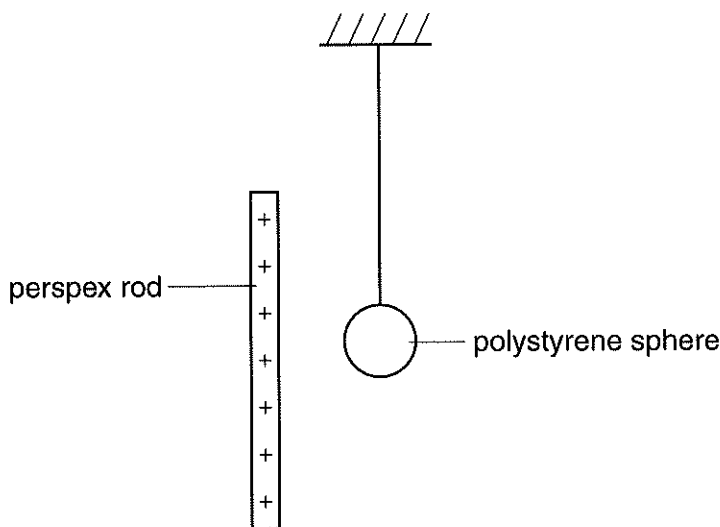


Fig. 2.1

State and explain what will be observed.

observation
explanation
..... [2]

(d) The sphere touches the perspex rod and is then repelled by the rod.

Explain why the sphere is repelled.

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

- 3 Fig. 3.1 shows a circuit diagram containing three resistors **P**, **Q** and **R**.

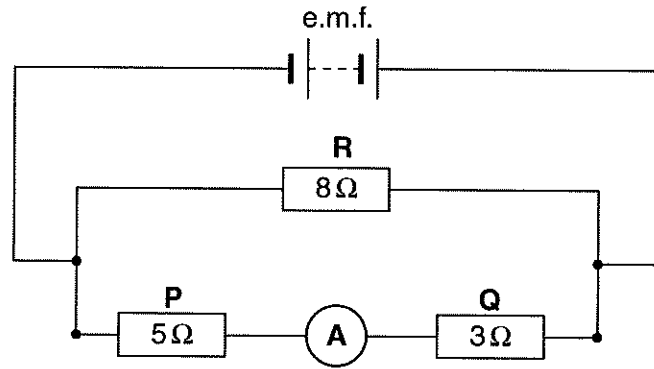


Fig. 3.1

The ammeter reading is 1.5 A.

- (a) Find the resistance provided by **P** and **Q** in this arrangement.

resistance = [1]

- (b) The total resistance of the three resistors in the arrangement shown.

resistance = [2]

- (c) The current through **R**.

current = [1]

- (d) The electromotive force (e.m.f.) provided by the battery.

e.m.f. = [2]

- 4 Fig. 4.1 shows lines that represent the peaks of water waves produced when a stone is dropped into a pond.

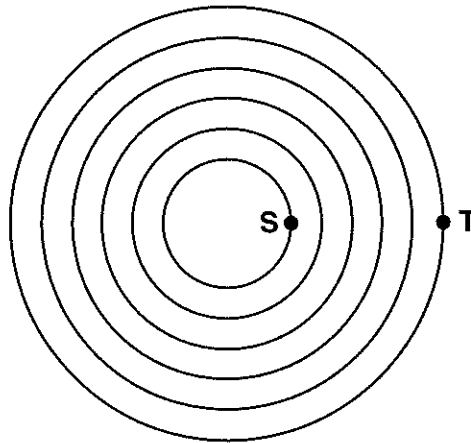


Fig. 4.1

- (a) What type of wave is the water wave formed in the pond?

..... [1]

- (b) The distance between point **S** and point **T** is 1.0 m.

- (i) Calculate the wavelength of the waves.

wavelength = [1]

- (ii) The wave peak at point **S** takes 2 seconds to reach point **T**.

Determine the speed of the waves.

speed = [2]

- (c) Bats use ultra-sound of frequency 70 000 Hz to find their path.
Sound travels at a speed of 330 m/s in air.

- (i) Calculate the wavelength of the sound waves.

wavelength = [2]

- (ii) State **one** other use of ultra-sound.

..... [1]

- (d) Fig. 4.2(a) and Fig. 4.2(b) show the waveforms of two musical notes. The time scales shown on both graphs are identical.

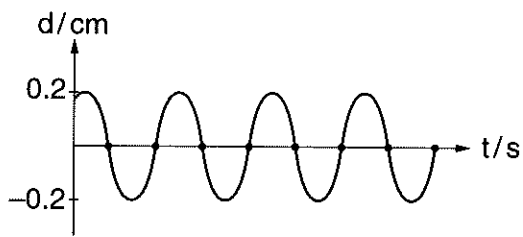


Fig. 4.2(a)

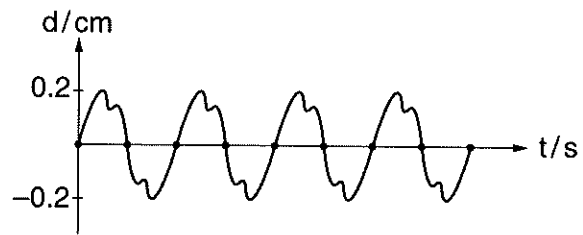


Fig. 4.2(b)

- (i) Give **two** characteristics which are similar in both notes.

1

2 [2]

- (ii) State **one** way in which the sound waves are different.

..... [1]

- 5 Fig. 5.1 shows the effect of an electric field on the radioactive emissions **P** and **Q** given out by a natural radioactive source.

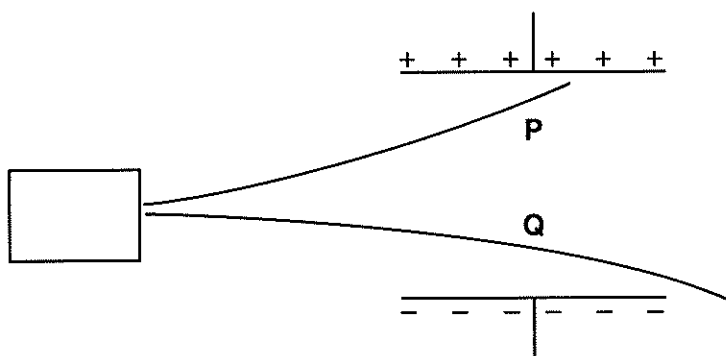


Fig. 5.1

- (a) Identify emissions **P** and **Q**.

P

Q [2]

- (b) Suggest a reason why;

- (i) both emissions are deflected by the electric field,

.....
 [1]

- (ii) emission **Q** is deflected less than emission **P**.

..... [1]

- (c) On Fig. 5.1, draw electric field lines between the two plates.

[2]

- 6 Fig. 6.1 shows hydrogen gas being passed over heated copper(II) oxide to produce copper.

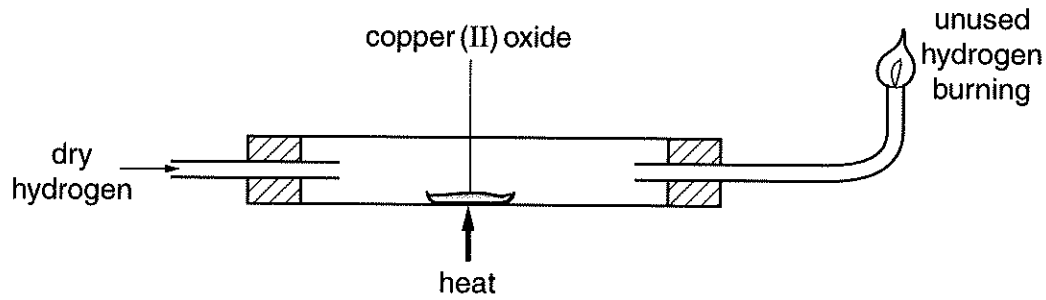


Fig. 6.1

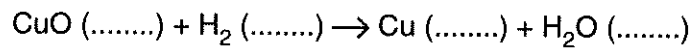
- (a) Name the type of reaction that takes place in Fig. 6.1.

..... [1]

Explain your answer.

..... [1]

- (b) An incomplete equation representing the reaction taking place in Fig. 6.1 is shown.



- (i) Complete the equation by writing the state symbols of the reactants and the products. [1]

- (ii) One of the products of the reaction is water.
Describe the chemical test for water.

test

result [2]

- (c) Other than the method used in Fig. 6.1, state another method of producing copper.

..... [1]

- 7 Table 7.1 shows physical properties of substances **V**, **W**, **X**, **Y** and **Z**.

Table 7.1

substance	melting point/°C	boiling point/°C	electrical conductivity	
			as solid	as liquid
V	3720	4827	conducts	does not
W	-95	69	does not	does not
X	327	1760	conducts	conducts
Y	3550	4827	does not	does not
Z	776	1500	does not	conducts

- (a) Which of the substances could be sodium chloride?

..... [1]

Explain your answer.

..... [1]

- (b) Which substance consists of small covalent molecules?

..... [1]

Explain your answer.

..... [1]

- (c) Use the kinetic theory of matter to describe the arrangement and movement of particles in substance **W** at room temperature.

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

- 9 Fig. 9.1 shows the electrolysis of concentrated sodium chloride using graphite electrodes.

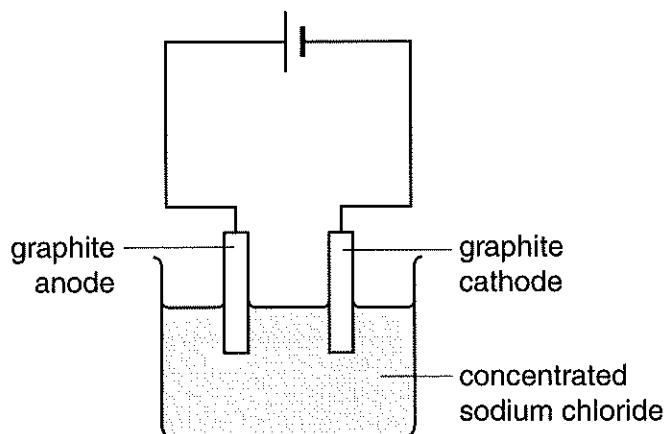


Fig. 9.1

- (a) Explain why graphite is used as an electrode.

.....
 [2]

- (b) (i) Write the formulae of **two** of the ions that are present in the electrolyte.

..... [2]

- (ii) State whether the solution would be alkaline, neutral or acidic after the experiment is complete.

..... [1]

Explain your answer.

.....
 [1]

- (c) During the electrolysis, 0.025 g of hydrogen gas was produced at the cathode.

- (i) Calculate the number of moles in 0.025 g of hydrogen gas.

moles of gas = [2]

- (ii) Use your answer to (c)(i) to calculate the volume of the hydrogen gas produced at room temperature and pressure. 1 mole of gas = 24 dm³.

volume of gas = [2]

- (d) When a damp blue litmus paper is placed in chlorine gas, it changes colour to red and is then bleached.

Explain the colour changes observed.

.....

.....

.....

..... [3]

10 (a) (i) Name the process by which plants lose water vapour through the leaves into the atmosphere.

..... [1]

(ii) State **two** environmental factors that **increase** the rate of water loss through plant leaves.

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

(b) What are the uses of nitrogen and magnesium in plants?

nitrogen

magnesium [2]

(c) Describe how plants absorb nitrates from the soil.

.....
.....
.....
.....
.....
.....
.....
..... [4]

- 11 Fig. 11.1 shows three identical strips **K**, **L** and **M**, cut from the stem of a balsam plant. The outer layer contains cells with stiff cell walls.

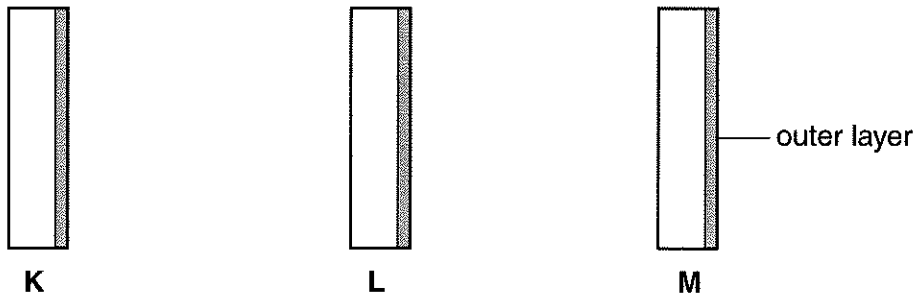


Fig. 11.1

The three strips were placed into solutions **A**, **B** and **C**, which had different concentrations. Fig. 11.2 shows the shape of the strips after they had been in the solutions for 15 minutes.

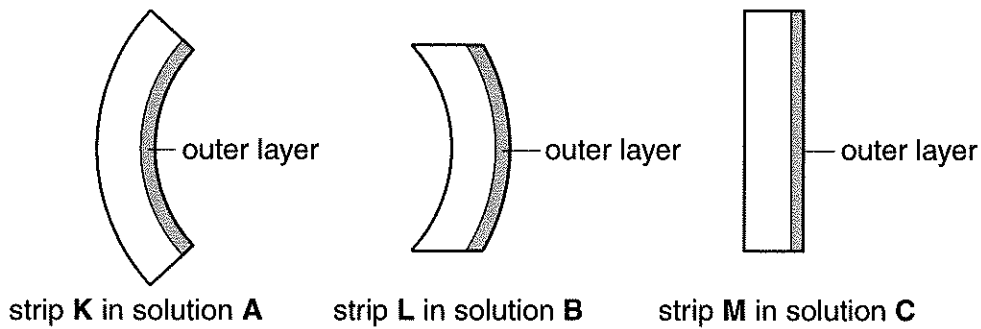


Fig. 11.2

- (a) Name the process that caused the changes observed.
 [1]
- (b) Explain why strip **K** bends outwards.

 [3]
- (c) The concentrations of the three solutions are 0.01 mol per dm³, 0.5 mol per dm³ and 2.0 mol per dm³.
 Identify the concentrations of the solutions **A**, **B** and **C**.
 concentration of **A**
 concentration of **B**
 concentration of **C** [2]

12 Fig. 12.1 shows a diagram of a kidney dialysis machine.

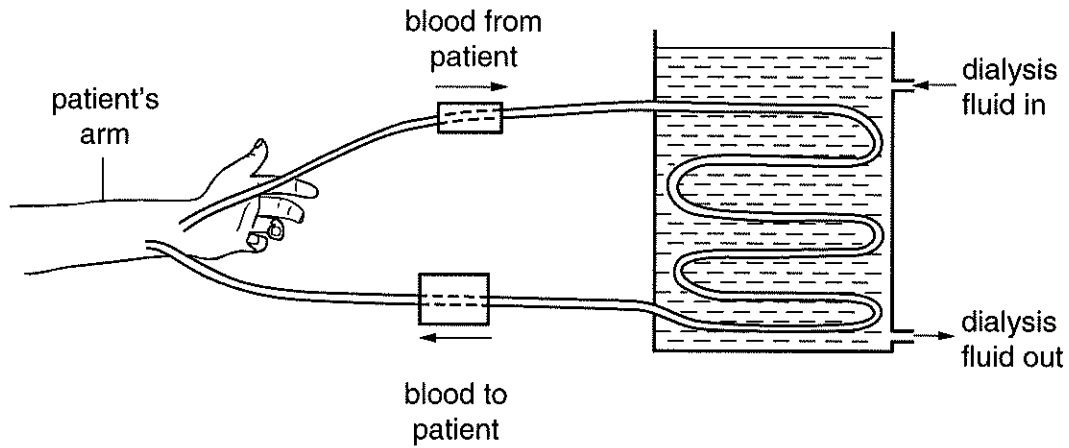


Fig. 12.1

Blood from a patient with kidney failure is passing through the kidney dialysis machine.

(a) (i) Name **one** substance other than water that should be present in the dialysis fluid.
 [1]

(ii) Explain why the substance named in (a)(i) should be in the dialysis fluid.

 [1]

(b) Explain why
 (i) blood proteins will not diffuse through dialysis tubing,

 [1]

(ii) the dialysis tubing is coiled in the dialysis machine.

 [1]

(c) Suggest the dietary advice that should be given to the patient in between treatments.

 [1]

13 Fig. 13.1 shows areas **W**, **X** and **Z** around a lake.

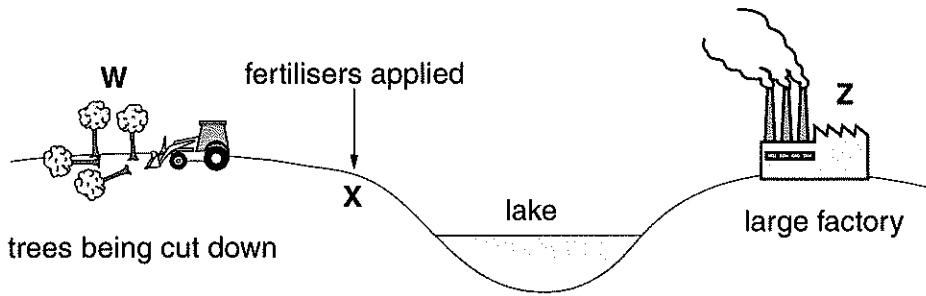


Fig. 13.1

(a) Name a gas that is released at area **Z** which can cause air pollution.

..... [1]

(b) Explain how the agricultural practice at area **X** could affect life in the lake.

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

(c) Suggest **two** consequences of carrying out the activity shown at area **W** on a large scale.

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

14 Fig. 14.1 shows the female part of a flower after pollination.

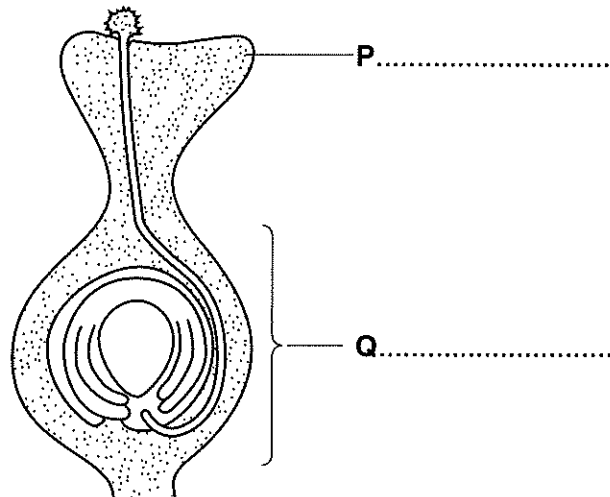


Fig. 14.1

(a) On Fig. 14.1, label structures **P** and **Q**. [2]

(b) On Fig. 14.1, mark with an **X** the position where the female gamete is found. [1]

(c) Describe the process that occurs after pollination and finishes when fertilisation takes place.

.....

.....

.....

..... [3]

(d) What does part **Q** become after fertilisation?

..... [1]

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DATA SHEET
The Periodic Table of the Elements

Group																																																																																																															
I	II	III	IV	V	VI	VII	O																																																																																																								
7 Li Lithium 3	9 Be Beryllium 4	11 B Boron 5	12 C Carbon 6	13 Al Aluminium 13	14 N Nitrogen 7	15 O Oxygen 8	16 F Fluorine 9	17 Ne Neon 10	19 K Potassium 19	20 Ca Calcium 20	21 Sc Scandium 21	22 Ti Titanium 22	23 V Vanadium 23	24 Cr Chromium 24	25 Mn Manganese 25	26 Fe Iron 26	27 Co Cobalt 27	28 Ni Nickel 28	29 Cu Copper 29	30 Zn Zinc 30	31 Ga Gallium 31	32 Ge Germanium 32	33 As Arsenic 33	34 Se Selenium 34	35 Br Bromine 35	36 Kr Krypton 36	37 Rb Rubidium 37	38 Sr Strontium 38	39 Y Yttrium 39	40 Zr Zirconium 40	41 Nb Niobium 41	42 Mo Molybdenum 42	43 Tc Technetium 43	44 Ru Ruthenium 44	45 Rh Rhodium 45	46 Pd Palladium 46	47 Ag Silver 47	48 Cd Cadmium 48	49 In Indium 49	50 Sn Tin 50	51 Sb Antimony 51	52 Te Tellurium 52	53 I Iodine 53	54 Xe Xenon 54	55 Cs Caesium 55	56 Ba Barium 56	57 La Lanthanum 57	58-71 Lanthanoid series	72 Hf Hafnium 72	73 Ta Tantalum 73	74 W Tungsten 74	75 Re Rhenium 75	76 Os Osmium 76	77 Ir Iridium 77	78 Pt Platinum 78	79 Au Gold 79	80 Hg Mercury 80	81 Tl Thallium 81	82 Pb Lead 82	83 Bi Bismuth 83	84 Po Polonium 84	85 At Astatine 85	86 Rn Radon 86	87 Fr Francium 87	88 Ra Radium 88	89 Ac Actinium 89	90-103 Actinoid series	91 Th Thorium 90	92 Pa Protactinium 91	93 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	133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	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	226 Ra Radium 88	227 Ac Actinium 89	232 Th Thorium 90	238 U Uranium 92	238 Np Neptunium 93	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

*58-71 Lanthanoid series
†90-103 Actinoid series

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

Key

a	X	b
---	---	---

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