Centre Number	Candidate Number

Candidate Name _____

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

SCIENCE : DOUBLE AWARD 0569/3

PAPER 3

OCTOBER/NOVEMBER SESSION 2001 2 hours

Candidates answer on the question paper.
No additional materials are required.

TIME 2 hours

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

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	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
TOTAL	

This question paper consists of 19 printed pages and 1 blank page.

MML 451 8/00 S07259

[Turn over

1 Fig. 1.1 shows a car of mass 500 kg moving from rest with constant acceleration of 10 m/s^2. Two forces act on it, a forward force and a friction force.

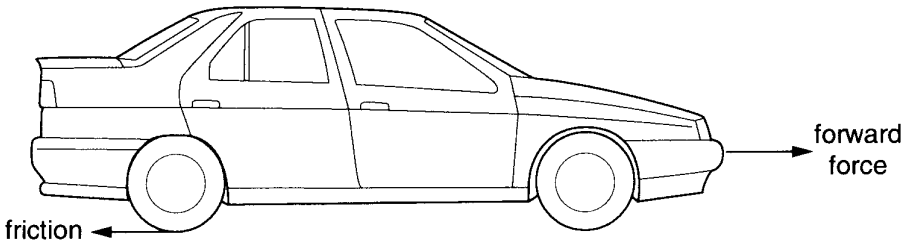


Fig. 1.1

(a) **(i)** Calculate the resultant force acting on the car. Show your working.

resultant force = ... [3]

(ii) If the friction force is 2000 N, calculate the forward force acting on the car. Show your working.

forward force = ... [2]

(b) After some time, the car reaches a velocity of 20 m/s.

How long did it take for the car to reach this velocity? Show your working.

time = ... [3]

2 Fig. 2.1 shows an electrician replacing a broken bulb on a lamp post. The lamp post is 20 m high.

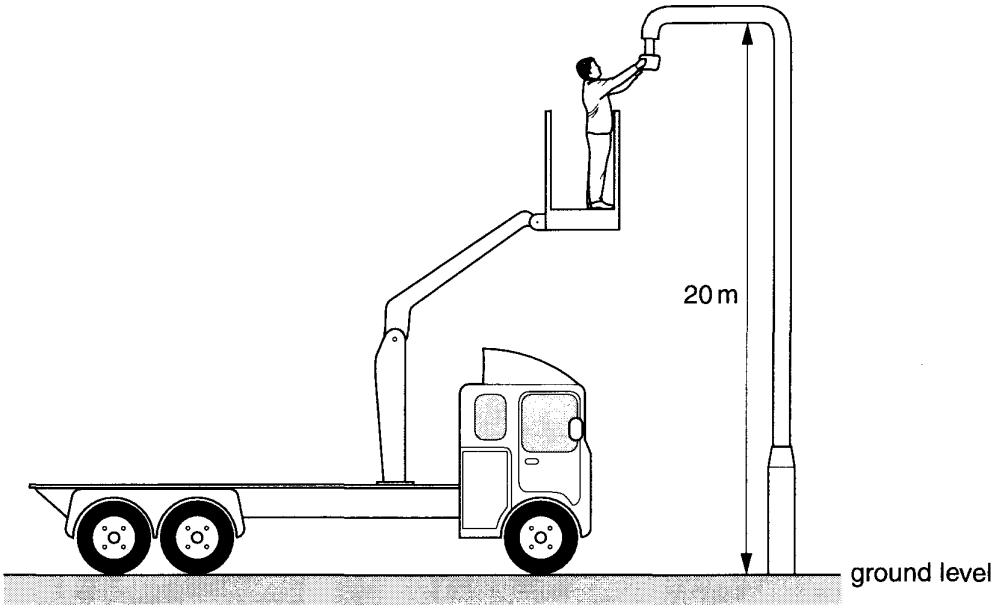


Fig. 2.1

(a) The bulb slips through the electrician's hand and falls to the ground. The mass of the bulb is 20 g. The gravitational force on a mass of 1 kg is 10 N.

Calculate the kinetic energy of the bulb just before it hits the ground.

kinetic energy = ... [3]

(b) What assumption did you make in your answer for **(a)**?

..... [1]

For Examiner's Use

3 Fig. 3.1 shows the temperature–time graph of a solid substance when heated.

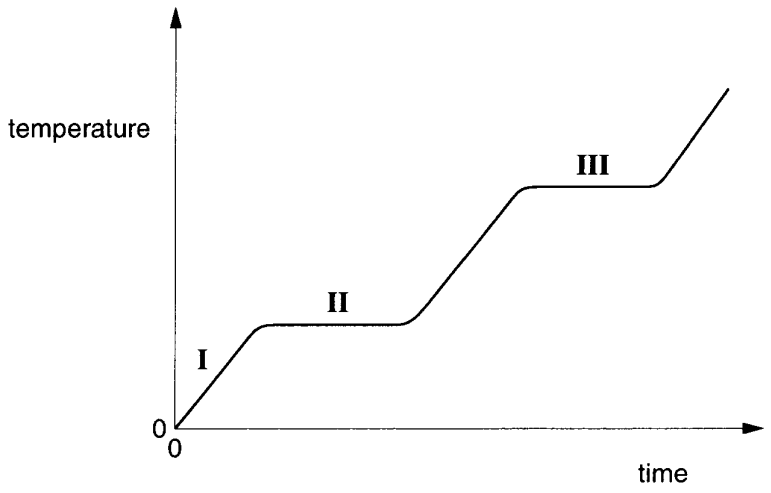


Fig. 3.1

State what happens at each stage.

Stage **I** .....

Stage **II** .....

Stage **III** ..... [3]

4 **(a)** Fig. 4.1 shows two lenses.

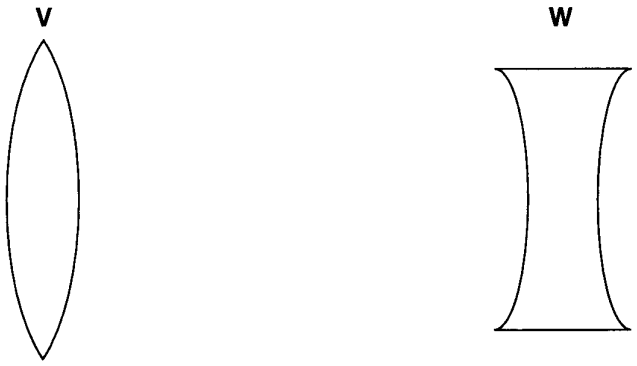


Fig. 4.1

(a) Write down the names of the lenses.

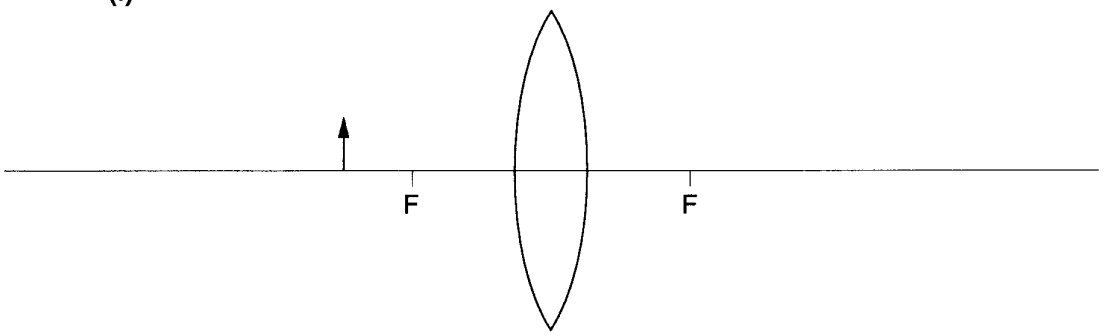
Lens **V** .....

Lens **W** ..... [2]

(b) Lens **V** is used to form images of objects.

Complete both diagrams to show the position of the images. Draw each image and label it **I**.

(i)



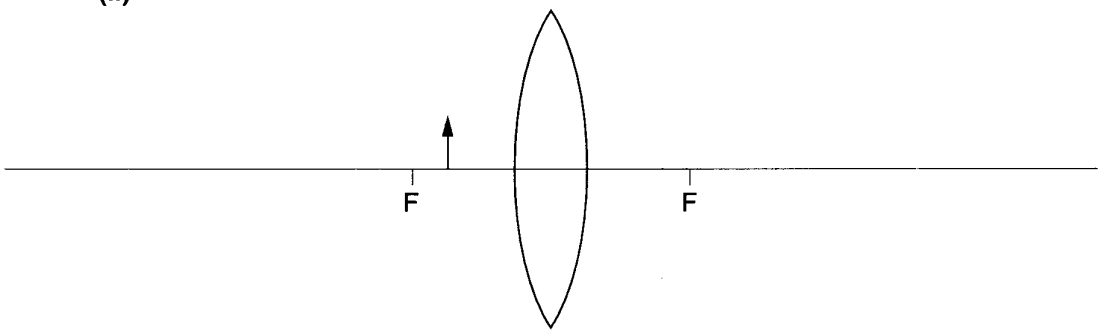
[2]

State two features of the image formed.

1. .....

2. ..... [2]

(ii)



[2]

State two features of the image formed.

1. .....

2. ..... [2]

5 Fig. 5.1 shows a transformer.

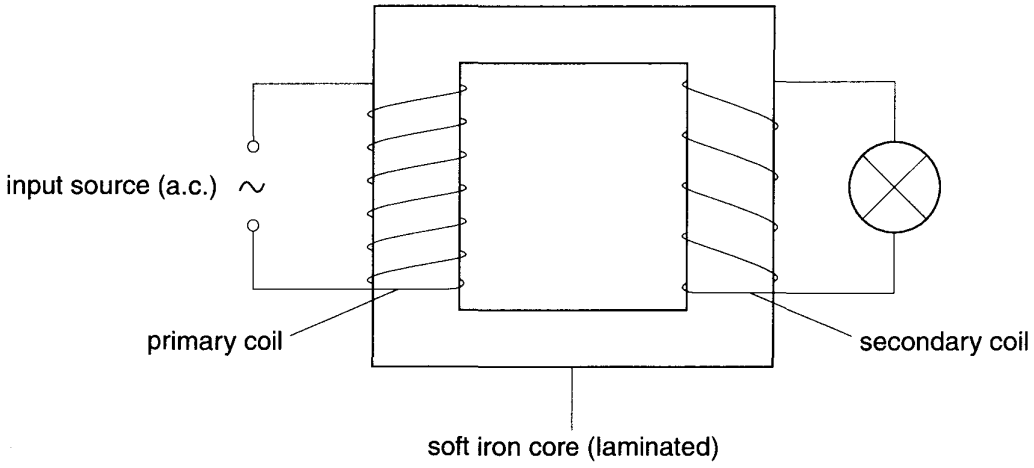


Fig. 5.1

(a) Name the type of transformer.

..... [1]

(b) The transformer is connected to a 240 V a.c. power supply. The bulb requires 12 V to operate normally. There are 100 turns in the secondary coil.

Calculate the number of turns in the primary coil.

number of turns in primary coil ..... [3]

For Examiner's Use

6 Fig. 6.1 shows a set up used to perform an experiment on electromagnetic effects. When the North pole of a magnet is pushed into the coil, the galvanometer deflects to the right and back to zero.

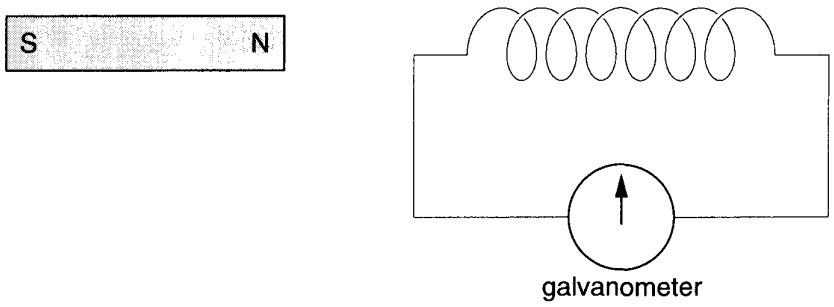


Fig. 6.1

(a) State what will happen if

(i) the magnet is now pulled out of the coil,

.....

..... [1]

(ii) the South pole of the magnet is pushed into the coil.

.....

..... [1]

(b) Write down three ways of increasing the size of the deflection.

1. .....

2. .....

3. ..... [3]

[Turn over

For Examiner's Use

7 Fig. 7.1 shows an apparatus used by Mpho to prepare a dry gas.

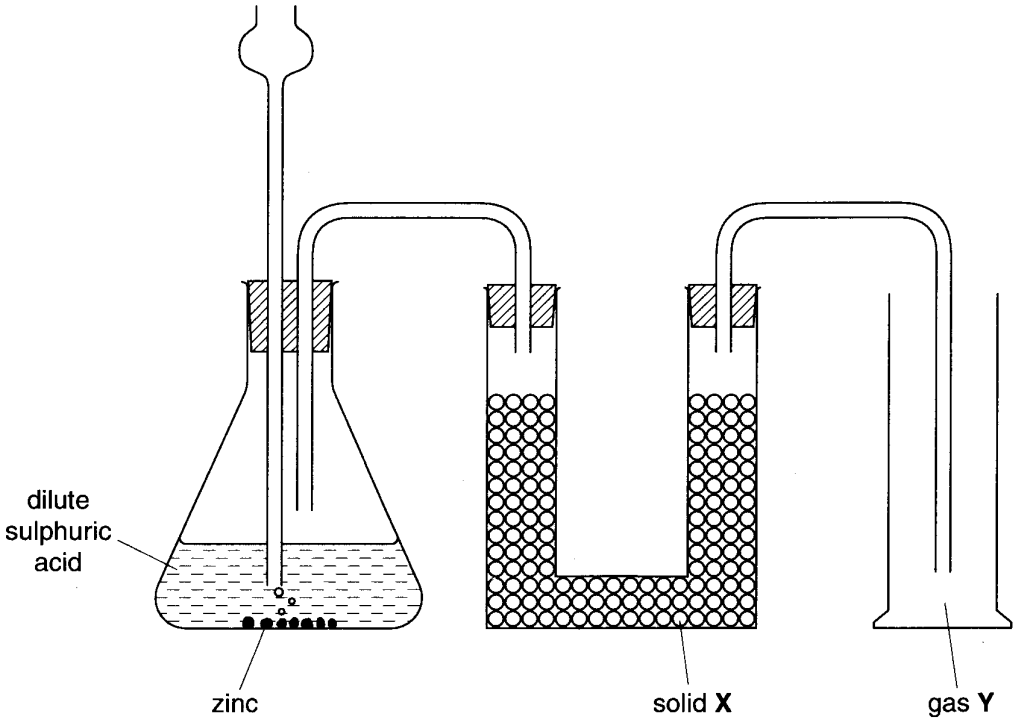


Fig. 7.1

(a) Name gas **Y**.

..... [1]

(b) Name a suitable solid **X** used for drying gas **Y**.

..... [1]

(c) There is an error in Mpho's method of collection.

(i) What is the error?

.....

..... [1]

(ii) How can the gas be collected?

.....

..... [1]

(d) Name the salt formed in the conical flask.

..... [1]

(e) **(i)** Name two other substances that can be reacted together to produce gas **Y**.

1. .....

2. ..... [2]

(ii) What is the other product of this reaction?

..... [1]

(f) State one chemical property of gas **Y**.

..... [1]

(g) Write an equation for the reaction between nitrogen and gas **Y**.

..... [2]

For Examiner's Use

8 A solution of copper(II) sulphate is electrolysed using two copper electrodes.

(a) Draw a diagram to show how the experiment is set up.

[2]

(b) What happens during the electrolysis

(i) at the anode,

.....

..... [1]

(ii) at the cathode,

.....

..... [1]

(iii) to the solution?

.....

..... [1]

(c) Give two practical uses of this method of electrolysis.

1. .....

.....

2. .....

..... [2]

For Examiner's Use

(d) What would happen if the copper electrodes are replaced with platinum electrodes,

(i) at the anode,

.....

..... [1]

(ii) at the cathode,

.....

..... [1]

(iii) to the solution?

.....

..... [1]

9 The major source of the world's energy supply is fossil fuels. The chemical energy stored in these fuels is converted to other forms of energy such as heat and electrical energy. There has been a considerable increase in demand for electrical energy in the last 50 years, and other energy sources for generating electrical energy are now being investigated urgently.

(a) (i) What is a fossil fuel?

.....

..... [1]

(ii) Name two fossil fuels in use at present.

1. .....

2. ..... [2]

(b) (i) Name two elements that are found in high proportions in fossil fuels.

1. .....

2. ..... [2]

(ii) Write an equation for the complete combustion of each of the elements in **(b)(i)**.

.....

..... [2]

(iii) Name another element found in fossil fuels that leads to the formation of acidic rain.

..... [1]

(c) Both reactions in part **(b)(ii)** are exothermic.

Draw an energy–level diagram to show the energy changes that take place when one of the elements is burnt in oxygen. Indicate clearly on the diagram the heat of combustion of the elements. Label this by ΔH and state whether it is positive or negative.

[3]

(d) Give one reason why urgent efforts are being made to find other sources of energy as an alternative to fossil fuels.

..... [1]

(e) State one source of energy, other than direct solar energy, which may be used as an alternative to fossil fuels.

..... [1]

For Examiner's Use

10 **(a)** After fertilisation and implantation in a mammal, the placenta and umbilical cord develop.

(i) What is the advantage of having a dense network of blood capillaries in the placenta?

.....

..... [1]

(ii) State the function of the umbilical cord.

..... [1]

(b) Describe a permanent method that can be used by a woman to prevent pregnancy.

.....

..... [1]

(c) Explain why this method cannot prevent HIV infection.

.....

..... [1]

(d) Give one way by which HIV/AIDS can be transmitted other than by sexual contact.

.....

..... [1]

For Examiner's Use

11 Fig. 11.1 shows part of the human skin.

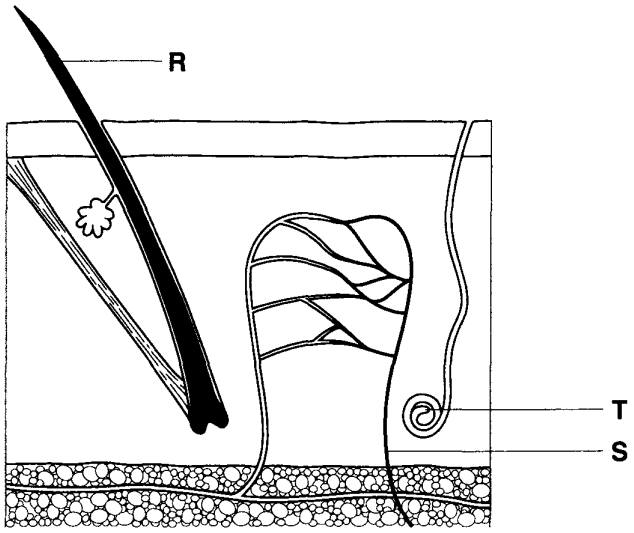


Fig. 11.1

(a) Identify the parts labelled **R** and **S**.

R ..... [1]

S ..... [1]

(b) Describe how **S** and **T** help in temperature regulation in hot conditions.

S .....

.....

T .....

.....

..... [4]

(c) Explain why the cooling effect of **T** will not be felt in hot humid weather.

.....

.....

..... [2]

[Turn over

For Examiner's Use

12 Fig. 12.1 shows the apparatus used to investigate the effect of a certain factor on the rate of transpiration.

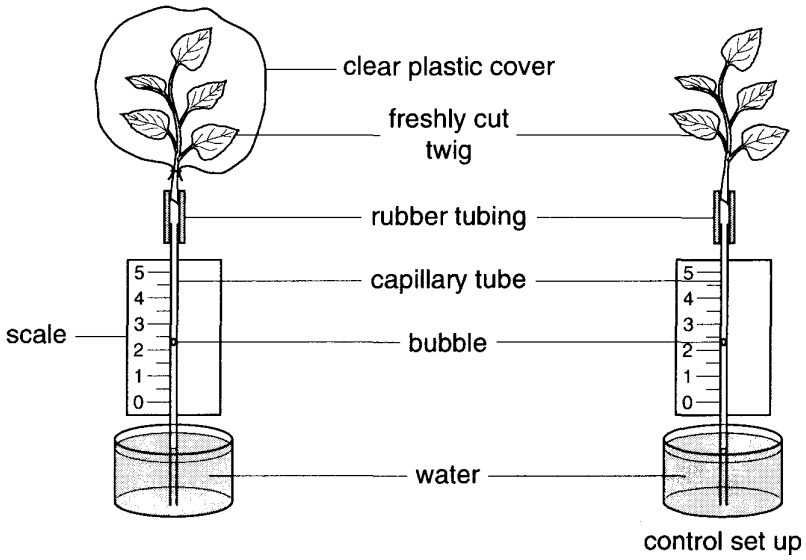


Fig. 12.1

(a) Name the factor being investigated.

..... [1]

(b) Define *transpiration*.

.....

.....

..... [2]

(c) Explain how the clear plastic cover affects the movement of water in the capillary tube.

.....

.....

.....

..... [3]

For Examiner's Use

13 Fig. 13.1 shows the urinary system of a human.

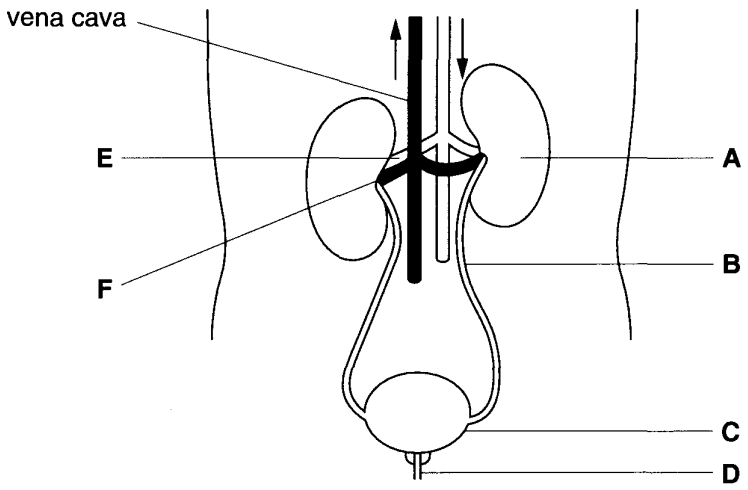


Fig. 13.1

(a) Name the structures labelled **A**, **B**, **E** and **F**.

A .....

B .....

E .....

F ..... [4]

(b) What is the function of structure **C**?

..... [1]

(c) How does the function of structure **D** in a woman differ from that in a man?

.....

..... [2]

(d) Suggest the medical assistance given to a person who has structure **A** failure.

.....

..... [1]

[Turn over

For Examiner's Use

14 Many human activities produce waste materials.

Using examples of **named** materials, suggest environmental reasons why these materials should be recycled.

.....

.....

.....

.....

.....

..... [5]

BLANK PAGE

DATA SHEET
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 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	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	226 Ra Radium 88	227 Ac Actinium 89 †															

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

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

Key: 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.).