Centre Number	Candidate Number	Candidate Name

NAMIBIA SENIOR SECONDARY CERTIFICATE

PHYSICAL SCIENCE ORDINARY LEVEL

4323/2

PAPER 2

2 hours

Marks 100

2017

Additional Materials: Non-programmable calculator
Ruler

INSTRUCTIONS AND INFORMATION TO CANDIDATES

- Candidates answer on the Question Paper in the spaces provided.
- Write your Centre Number, Candidate Number and Name in the spaces 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 correction fluid.
- You may use a non-programmable calculator.
- Do not write in the margin *For Examiner's Use*.
- Answer **all** questions.
- The number of marks is given in brackets [ ] at the end of each question or part question.
- You will lose marks if you do not show your working or if you do not use appropriate units.
- Take the weight of 1 kg to be 10 N (i.e. acceleration of free fall g = 10 m/s^2).
- The Periodic Table is printed on page 17.

For Examiner's Use	
1	
2	
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11	
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13	
Total	

Marker	
Checker	

This document consists of **17** printed pages and **3** blank pages.

Republic of Namibia

MINISTRY OF EDUCATION, ARTS AND CULTURE

[Turn over

For Examiner's Use

1 Fig. 1.1 shows the electronic structures of substances **X**, **Y** and **Z**.

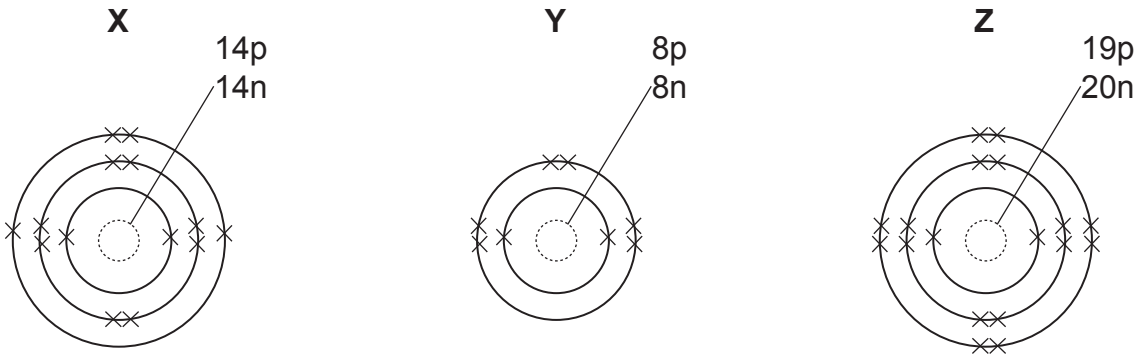


Fig. 1.1

(a) Write down

(i) the name of element **Y**.

..... [1]

(ii) the formula of ion **Z**.

..... [1]

(b) Atom **X** forms only covalent compounds when it is combined with other elements. Atom **Y** can form ionic compounds.

State the difference between the covalent and ionic compounds, in terms of the

(i) melting point.

.....

..... [1]

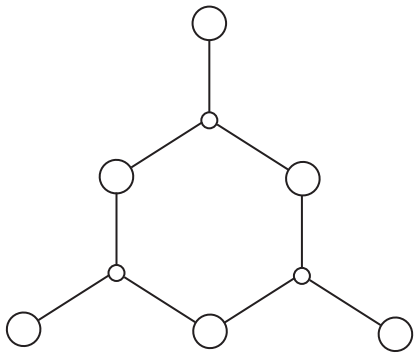
(ii) electric conductivity.

.....

..... [1]

(c) Sand, a macromolecule, is formed when atom **X** and atom **Y** are reacted.

Fig. 1.2 shows the structure of sand.



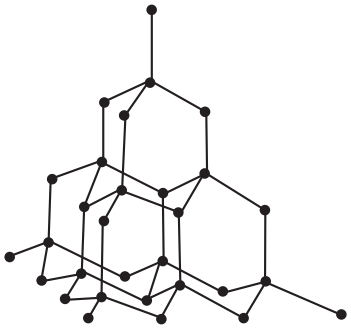
sand

Fig. 1. 2

Give the chemical name of sand.

..... [1]

(d) Diamond is another macromolecule. Fig. 1.3 shows the structure of diamond.



diamond

Fig. 1.3

(i) State **one** similarity and **one** difference between the structure of sand and diamond.

Similarity.....

.....

Difference.....

..... [2]

(ii) State **one** reason why diamond does not conduct electricity.

.....

..... [1]

[8]

2 **(a)** State what is meant by the term *moment of a force about a point*.

.....

..... [1]

(b) Fig. 2.1 shows a gate of a farm.

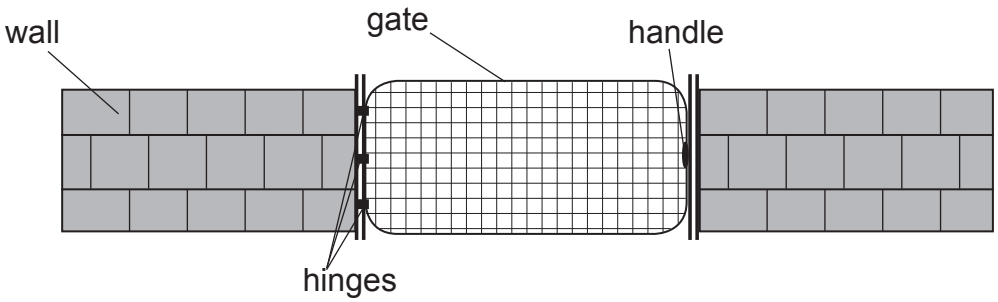


Fig. 2.1

A force of 100 N is applied to the gate at a distance *d* from the hinges.

This force produces a moment of 250 N m about the hinges.

Calculate the distance *d*.

d = ...unit..... [3]

(c) State how the moment of the force changes when the force applied in **(b)** is reduced by half and the distance kept the same.

..... [1]

(d) Describe the difference between moment and work.

.....

.....

.....

..... [2]

[7]

3 In an experiment, aqueous lead nitrate reacts with aqueous potassium iodide to form a soluble and an insoluble salt.

The equation for the reaction is shown.

$$Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$$

(a) State which salt formed is soluble.

..... [1]

(b) Describe how an insoluble salt can be separated from a mixture.

.....

.....

.....

..... [3]

(c) A volume of 1.66 dm^3 of potassium iodide with a concentration of 10 g/dm^3 reacted in the experiment.

Calculate

(i) the mass of potassium iodide reacted.

Mass ..... g [2]

(ii) the number of moles of potassium iodide reacted.

Number of moles .....mol [2]

(iii) the mass of lead iodide produced in the experiment. Show your working.

Mass ..... g [2]

[10]

4 Fig. 4.1 shows a solar geyser system for a house.

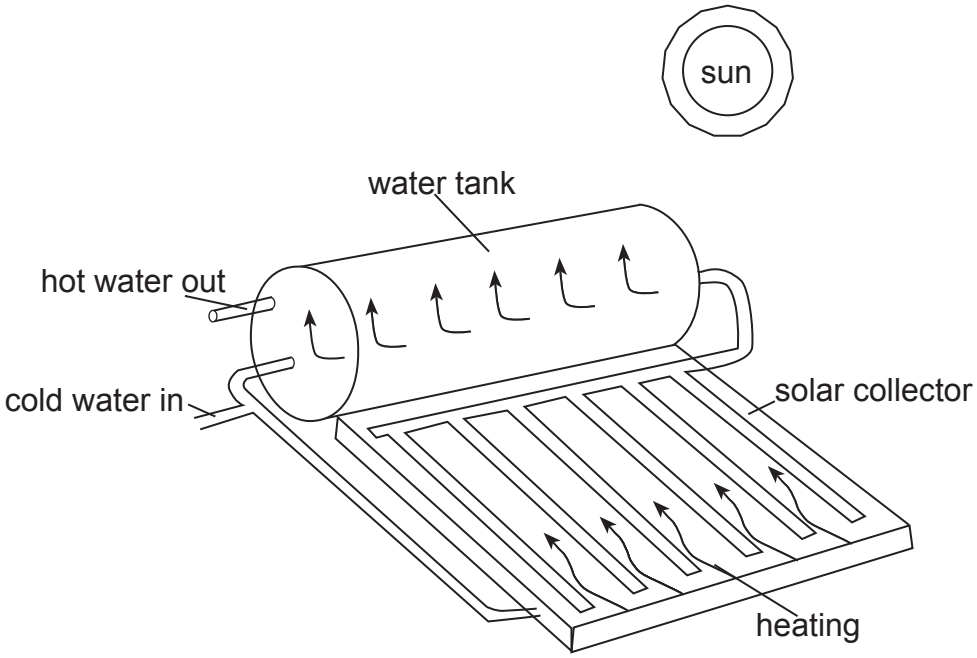


Fig. 4.1

(a) State the main method by which heat energy is transferred from the sun to the solar collector.

..... [1]

(b) Name and explain the process of heat transfer through the water inside the tank.

Name .....

Explanation .....

.....

.....

.....

..... [3]

(c) The inside part of the geyser is painted silver.

State with a reason the advantage of painting the geyser silver.

Advantage.....

.....

Reason.....

..... [2]

(d) The geyser is fitted with a thermostat that ensures that the hot water in the house is kept at the required temperature.

Device **P**, shown in Fig. 4.2, is the main part of the thermostat.

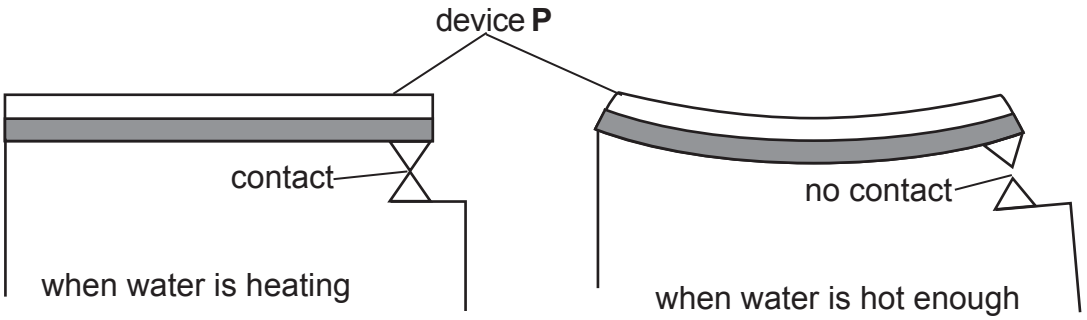


Fig. 4.2

(i) State the name of the device **P**.

..... [1]

(ii) Explain why device **P** bends when it gets hot.

.....

.....

.....

..... [2]

[9]

For Examiner's Use

5 When fuels burn, heat energy is produced. Natural gas is a common fuel, and methane, CH_4, is its main constituent.

$$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g) + \text{energy}$$

(a) Name any other fuel.

..... [1]

(b) The burning of methane, CH_4, is an exothermic reaction.

(i) Describe the meaning of *exothermic reaction*.

.....

..... [1]

(ii) Explain why bond breaking is described as endothermic.

.....

..... [1]

(c) The chemical reaction showing the burning of methane is a redox reaction.

(i) State, giving a reason, which substance is oxidised.

Substance .....

Reason.....

..... [2]

(ii) Identify the oxidising agent.

..... [1]

[6]

6 Fig. 6.1 shows wave fronts in a ripple tank.

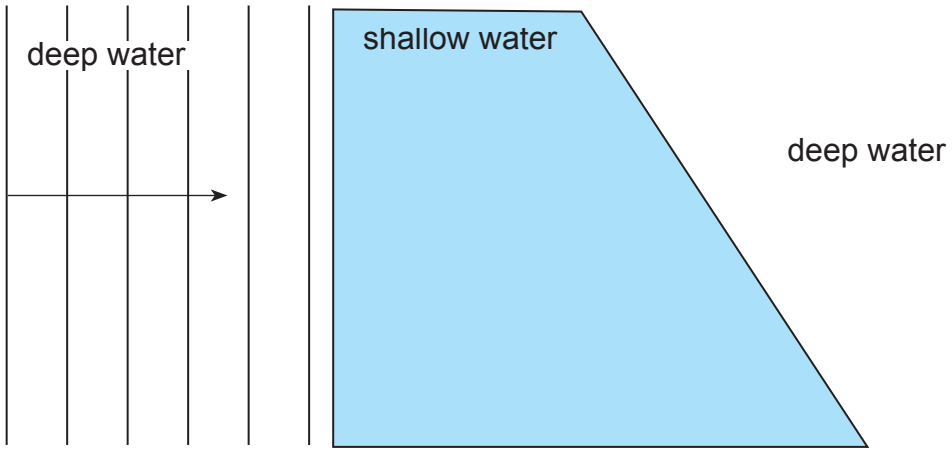


Fig. 6.1

(a) **(i)** Complete Fig. 6.1 to show the water waves in the shallow water region. [2]

(ii) State the property of waves that this experiment demonstrates.

..... [1]

(iii) Describe what happens to the water waves as they re-enter the deep water from the shallow water.

.....

.....

.....

..... [2]

(b) The wave fronts are 3 cm apart.

The frequency of the wave is 0.25 Hz.
Calculate the average speed at which the waves are travelling. State the unit.

Speed.....unit ..... [3]

[8]

7 Fig. 7.1 shows the reactivity series of some metals.

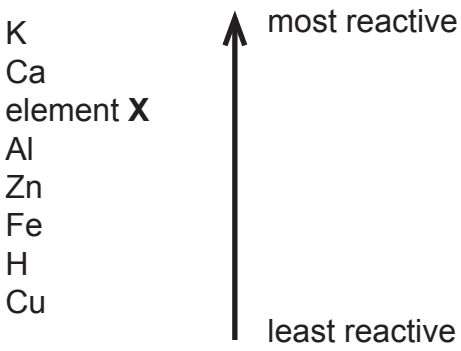


Fig. 7.1

(a) Identify element **X**.

..... [1]

(b) When steam is passed over a red-hot iron wool, hydrogen gas is produced. Outline the chemical test for hydrogen gas.

Test ..... [1]

Result.....

..... [1]

(c) **(i)** Name the process by which aluminium is extracted from its ore.

..... [1]

(ii) Explain why this process is used.

.....

..... [1]

(d) Zinc is used to protect steel from corrosion.

(i) Name the process of coating steel with zinc.

..... [1]

(ii) Suggest what makes zinc suitable for the process named in **(d) (i)**.

.....

..... [1]

[7]

For Examiner's Use

8 (a) Fig. 8.1 shows the instrument used to detect electrostatic charges.

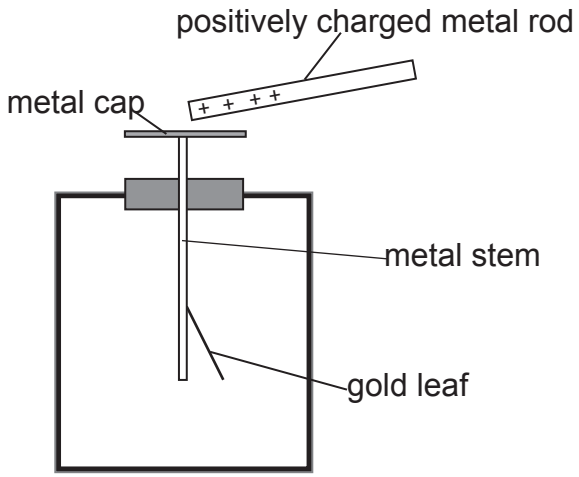


Fig. 8.1

(i) State the name of the instrument shown in Fig. 8.1.

..... [1]

(ii) The positively charged rod is touched onto the metal cap and removed.

On Fig. 8.1 draw the distribution of charges on the metal stem and gold leaf. [1]

(b) Calculate the amount of charge flowing through a conductor to produce 0.04 A in the time of 45 s. Show your working and state the unit.

Charge..... unit ..... [3]

(c) Static electricity can be dangerous, such as in lightning.

Explain the phenomenon of lightning.

.....

.....

.....

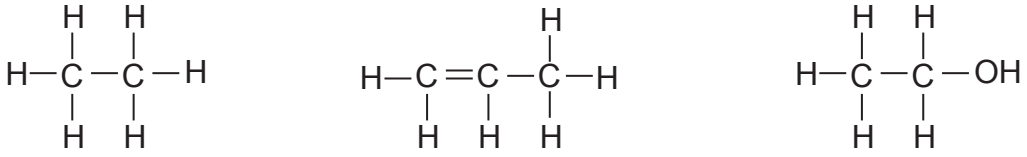
..... [2]

[7]

For Examiner's Use

9 Organic chemistry is a branch of chemistry that deals with carbon containing compounds.

Fig. 9.1 show the structures of different organic compounds.



A **B** **C**

Fig. 9.1

(a) **(i)** Name compound **C**. [1]

(ii) Describe a test to distinguish between compound **A** and compound **B**.

Test:.....

Results: .....

.....

.....

..... [3]

(b) Fig. 9.2 shows the structure of ethyl ethanoate.

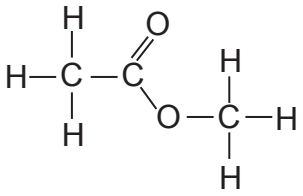


Fig. 9.2

(i) Describe how ethyl ethanoate is formed.

.....

..... [1]

(ii) State the functional group to which ethyl ethanoate belongs.

..... [1]

(iii) State **two** uses of ethyl ethanoate.

1 .....

2 ..... [2]

[8]

For Examiner's Use

10 Transformers are devices that step up and step down the voltage during electrical transmission.

Fig. 10.1 shows a transformer.

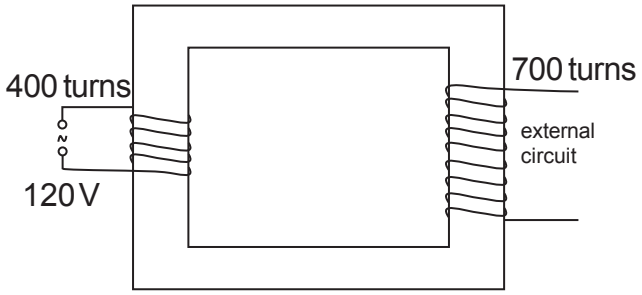


Fig. 10.1

(a) (i) Describe the features of the transformer in Fig. 10.1 that show that it is a step-up transformer.

.....

..... [1]

(ii) The efficiency of the transformer in Fig. 10.1 is 100%.

State what is meant by the *efficiency of the transformer is 100%*.

.....

..... [1]

(iii) Use the information given on the transformer in Fig. 10.1 to calculate the voltage across the secondary coil.

Voltage..... V [2]

(b) The current through the secondary coil is 0.75 A.

Calculate the current through the primary coil. Show your working.

Current..... A [3]

[7]

For Examiner's Use

11 Fig. 11.1 shows a water purification system.

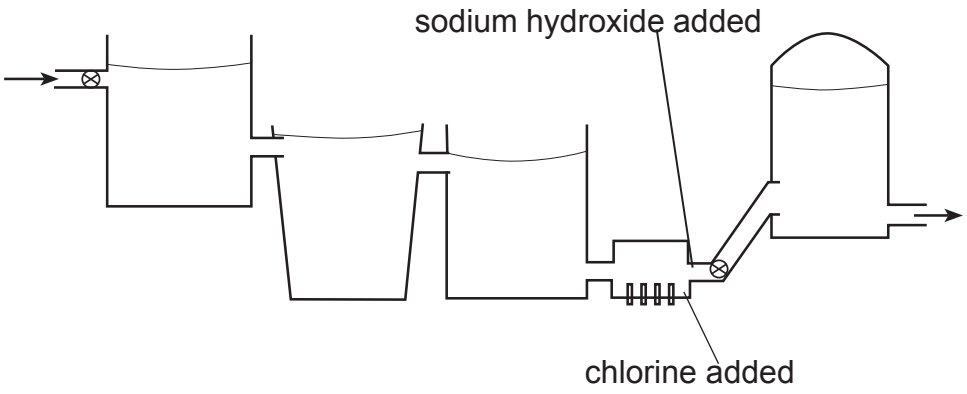


Fig. 11.1

(a) One of the major steps involved is chlorination, where chlorine is added.

(i) Explain why chlorine is added.

.....

..... [1]

(ii) After chlorination, a little sodium hydroxide is added.

Explain the importance of adding sodium hydroxide.

.....

.....

..... [2]

(iii) Apart from chlorination, give another major process involved in water purification.

..... [1]

(b) Water obtained at the end of the purification process is not pure but it is clean.

Describe the physical test of pure water.

Test .....

Result.....

..... [2]

(c) Name and explain the process that can be used to purify water in the laboratory.

Process .....

Explanation .....

..... [2]

[8]

12 **(a)** Describe the nature of β-particles.

.....

[1]

(b) Fig. 12.1 shows an incomplete path of β-particles as they approach a magnetic field.

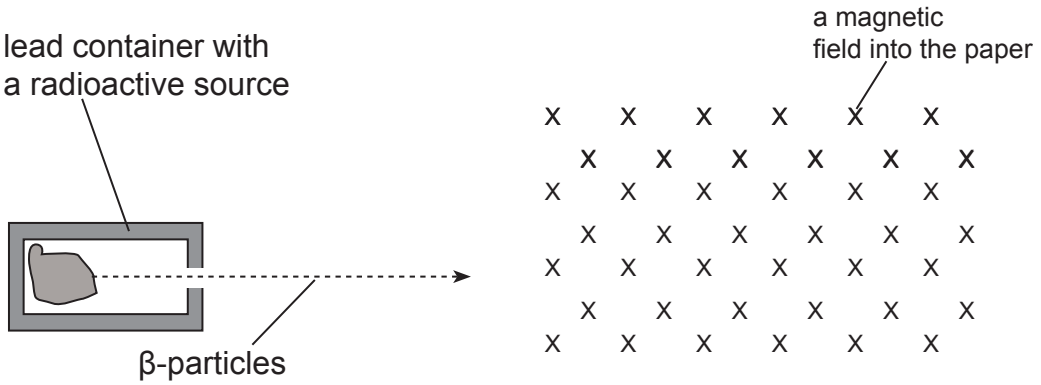


Fig. 12.1

On Fig. 12.1 complete the path of the β-particles as they travel through the magnetic field. [1]

(c) When a polonium-210 nucleus spontaneously emits an alpha particle, it forms a new substance.

(i) Complete the equation.

Polonium-201 nucleus → alpha particle +.....nucleus [1]

(ii) A sample contains 600 μg (micrograms) of a radioactive isotope.

Calculate the mass of this isotope remaining in the sample after a time equal to 4 half-lives has elapsed. Show your working.

Mass ..... μg [2]

(d) Describe **one** precaution that should be taken when storing radioactive materials.

.....

[1]

[6]

For Examiner's Use

13 Pollution is one of the biggest problems in the world today.

(a) Define the term *pollution.*

.....

..... [1]

(b) Air pollution is one type of pollution due to fast growing number of industries in the world.

(i) Name **one** pollutant gas from the industries.

..... [1]

(ii) Describe the effect of your chosen gas on the environment.

.....

..... [2]

(c) (i) Nitrogen, phosphorus and potassium are major constituents of chemical fertilisers.

Give the importance of each element in the fertiliser.

Nitrogen.....

.....

Phosphorus .....

.....

Potassium .....

..... [3]

(ii) Fertiliser is another common pollutant of soil.

One way to minimise the effect of fertiliser on the environment is to use organic fertilisers.

Give **one** advantage of using organic fertilisers.

.....

..... [1]

(iii) Discuss the dangers of over use of fertilisers with reference to water resources.

.....

.....

.....

..... [2]

[10]

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 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	226 Ra Radius 88	227 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.).

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