



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE
NAME

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NUMBER

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PHYSICAL SCIENCE

0652/32

Paper 3 (Extended)

October/November 2012

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use a soft pencil for any diagrams, graphs, tables or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

A copy of the Periodic Table is printed on page 20.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
4	
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6	
7	
8	
9	
10	
Total	

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



- 1 Table 1.1 shows elements in a period of the Periodic Table.

Table 1.1

group	I	II	III	IV	V	VI	VII
element	Na	Mg	Al	Si	P	S	Cl

- (a) Describe how the electronic structure of successive elements differs across the period.

..... [1]

- (b) Complete Table 1.2 to show which of these elements are metals and which are non-metals.

Table 1.2

metals	non-metals

[1]

- (c) Calcium forms an ion Ca^{2+} . Chlorine form an ion Cl^- .

- (i) Deduce the formula for the ionic compound calcium chloride.

..... [1]

- (ii) Describe, in terms of electrons, how calcium and chlorine atoms form calcium chloride.

.....

 [3]

(d) Sulfur dioxide is a covalent molecule.

In the box below, draw a diagram to show the arrangement of all the outer electrons of the atoms in a molecule of sulfur dioxide.



[3]

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- 2 Fig. 2.1a shows a high jumper about to leave the ground. Fig. 2.1b shows the same high jumper at the top of his flight.

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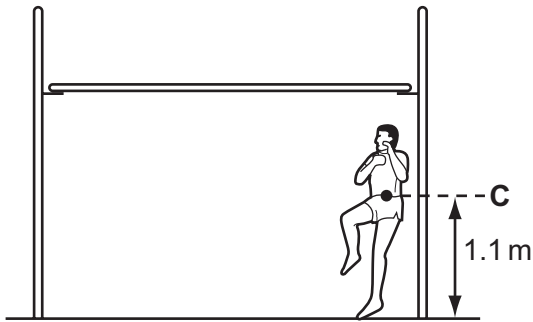


Fig. 2.1a

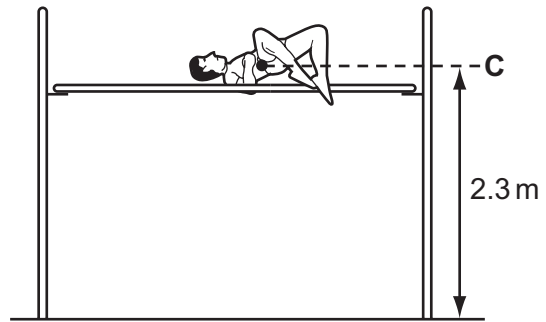


Fig. 2.1b

The high jumper has a mass of 75 kg. Point C shows the centre of mass of the high jumper.

- (a) Explain what is meant by the term *centre of mass*.

.....

 [2]

- (b) (i) Calculate the increase in the gravitational potential energy of the high jumper from when he leaves the ground to when he reaches the top of his flight.

[$g = 10 \text{ N/kg}$]

increase in gravitational potential energy = [2]

- (ii) State the minimum kinetic energy with which the high jumper must leave the ground.

kinetic energy = [1]

- (c) On a second jump the same high jumper leaves the ground with kinetic energy of 750 J.
Calculate the speed at which he leaves the ground.

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speed = [3]

- (d) The gain in potential energy of the high jumper is less than the work he does in his take off.

Suggest a reason for this.

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

3 Magnesium sulfate is a salt that is soluble in water.

It can be made in the laboratory from solid magnesium oxide, MgO, and dilute sulfuric acid, H₂SO₄.

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(a) Describe how you would make pure dry crystals of magnesium sulfate from solid magnesium oxide and dilute sulfuric acid.

.....

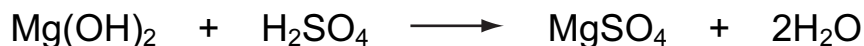
 [4]

(b) Write a balanced equation for the reaction between magnesium oxide and sulfuric acid.

Include state symbols in your equation.

..... [3]

(c) Magnesium sulfate can also be made from magnesium hydroxide and sulfuric acid.



What is the maximum mass of magnesium sulfate that could be made from 5.0g magnesium hydroxide?

[Relative atomic masses: A_r: H,1; Mg,24; O,16; S,32]

Show your working in the box.

mass of magnesium sulfate = g [3]

- 4 Fig. 4.1 shows a wind powered generator which has an efficiency of 30%.

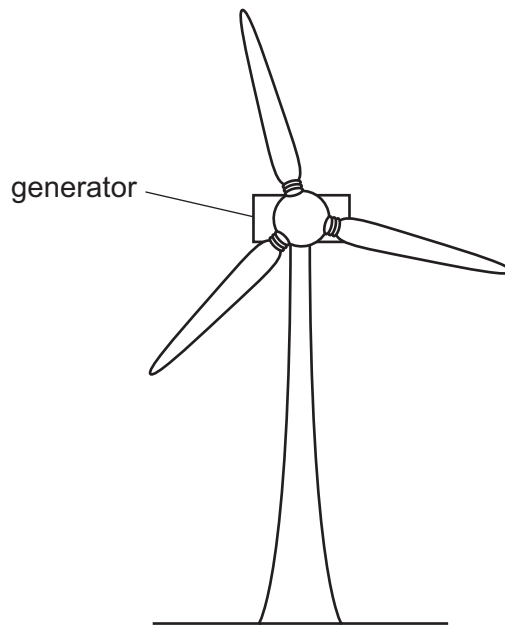


Fig. 4.1

For
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Use

- (a) The generator depends on a form of energy possessed by the wind.

Name this form of energy and briefly explain your answer.

.....

.....

..... [2]

- (b) Explain what is meant by the phrase *the generator has an efficiency of 30%*.

.....

.....

..... [2]

- (c) The generator has a maximum output of 4500W at 230V.

Calculate the maximum current that can be taken from the generator.

current = [2]

- 5 A student uses the apparatus shown in Fig. 5.1 to investigate the reaction between magnesium and hydrochloric acid.

For
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Use

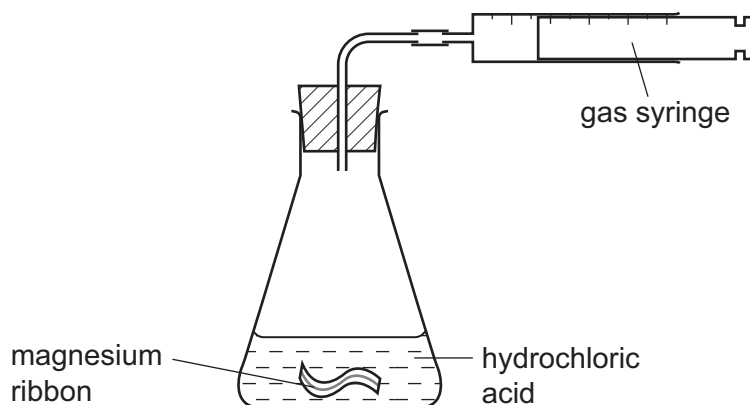
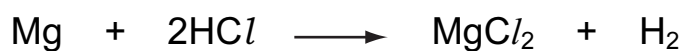


Fig. 5.1

She measures, at room temperature and pressure, the hydrogen given off when magnesium ribbon reacts with an excess of dilute hydrochloric acid.

Results of her investigation are shown in Fig. 5.2.

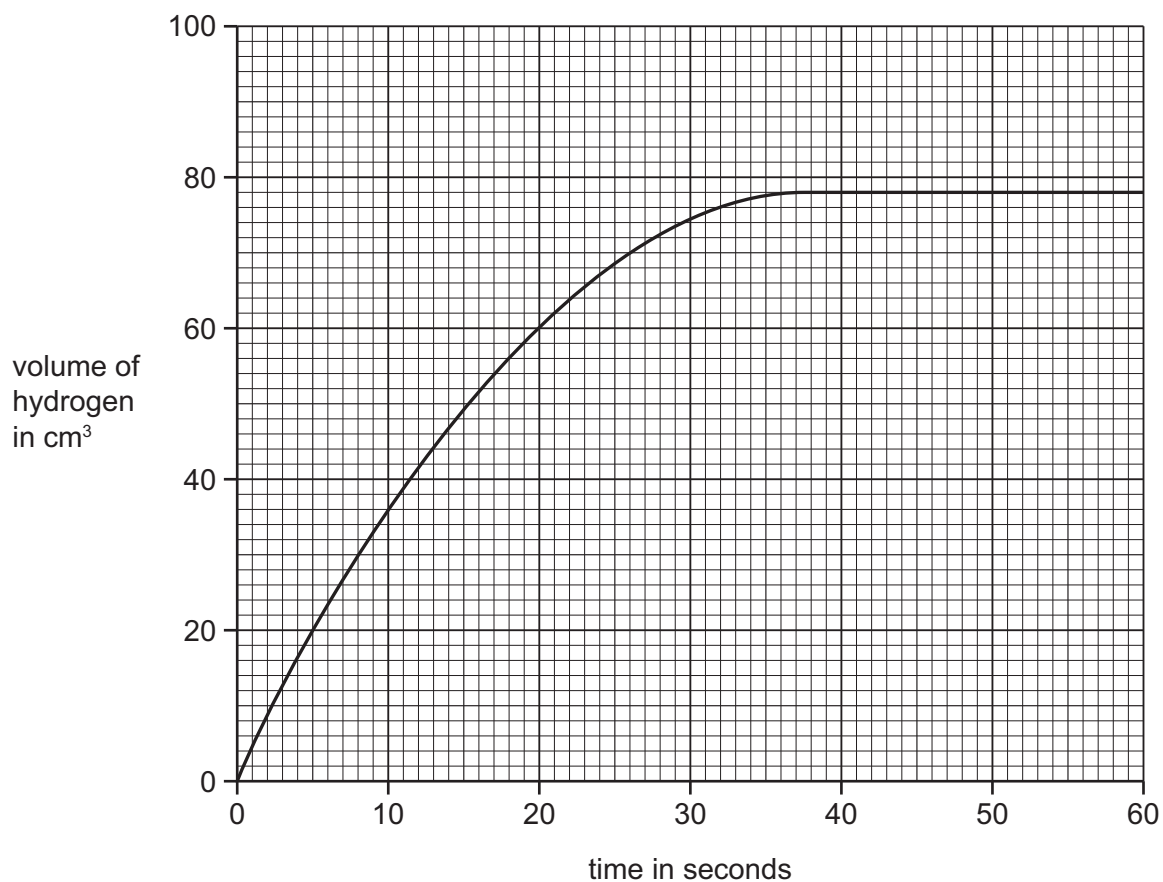


Fig. 5.2

- (a) (i) State the time at which the reaction stopped.

..... [1]

- (ii) Explain why the reaction stopped.

..... [1]

- (b) The experiment is repeated using the same mass of magnesium ribbon and a more concentrated solution of hydrochloric acid.

On Fig. 5.2, sketch the line you would expect for this second experiment. [2]

- (c) Calculate the mass of magnesium used in the reaction.

[Relative atomic masses: A_r : H, 1; Cl, 35.5; Mg, 24.]

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure.

Show your working in the box.

mass of magnesium = g [4]

6 (a) Fig. 6.1 shows a parallel beam of light incident on a converging lens.

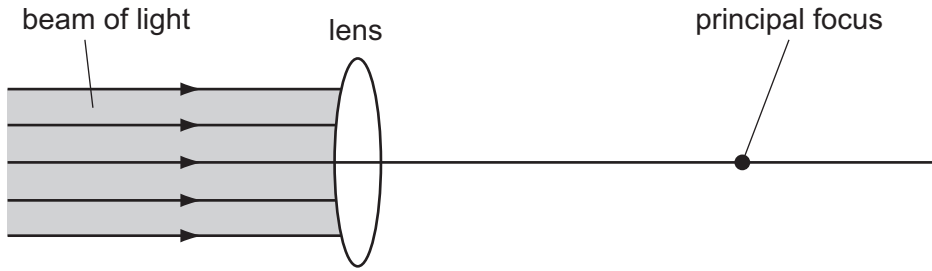


Fig. 6.1

(i) On Fig. 6.1, draw rays to show the path of the light after it passes through the lens. [3]

(ii) On Fig. 6.1, draw an arrow to show the focal length of the lens. [1]

(b) (i) Jan uses a converging lens of focal length 10.5 cm to study a small insect. Point P on the insect is 5.0 cm from the centre of the lens.

On Fig. 6.2, draw **two** rays from point P to show how and where the image of the insect is formed. [3]

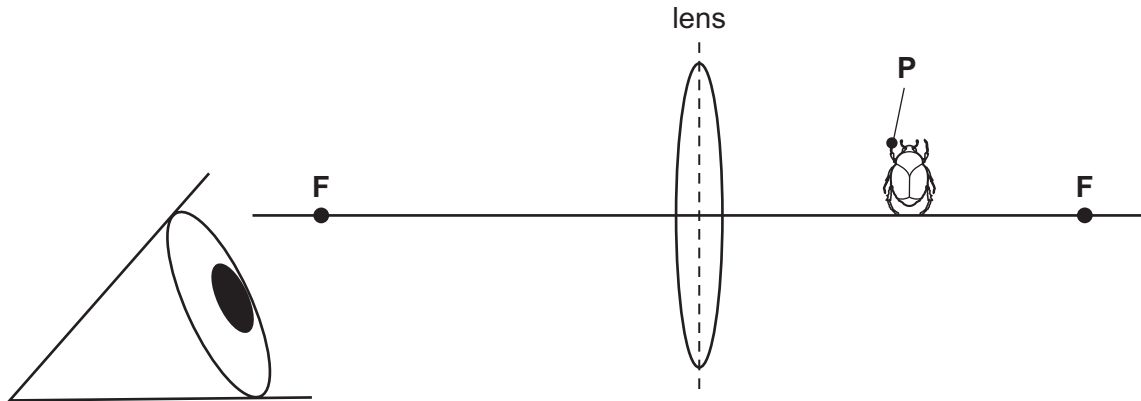


Fig. 6.2

(ii) Give a full description of the image.

..... [2]

7 Zinc and copper are two commonly used metals.

(a) Zinc is mixed with copper to make the alloy brass.

Brass is stronger than either pure metal. Explain why.

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

(b) Zinc is used to make galvanised steel.

(i) What is galvanised steel?

..... [1]

(ii) Explain how galvanised steel is more useful than steel that has not been galvanised.

..... [1]

(iii) Explain how zinc makes this improvement to steel.

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

(c) Copper is used to make saucepans.

State which property of copper makes it a good choice for this application.

..... [1]

- 8 Daniel is investigating the resistance of a length of nichrome wire. He builds the circuit shown in Fig. 8.1.

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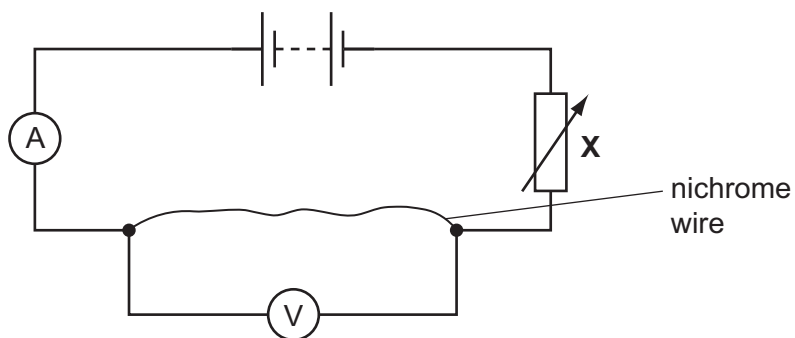


Fig. 8.1

- (a) He takes a series of readings of the current with different potential differences across the nichrome wire. He uses his results to draw the graph shown in Fig. 8.2.

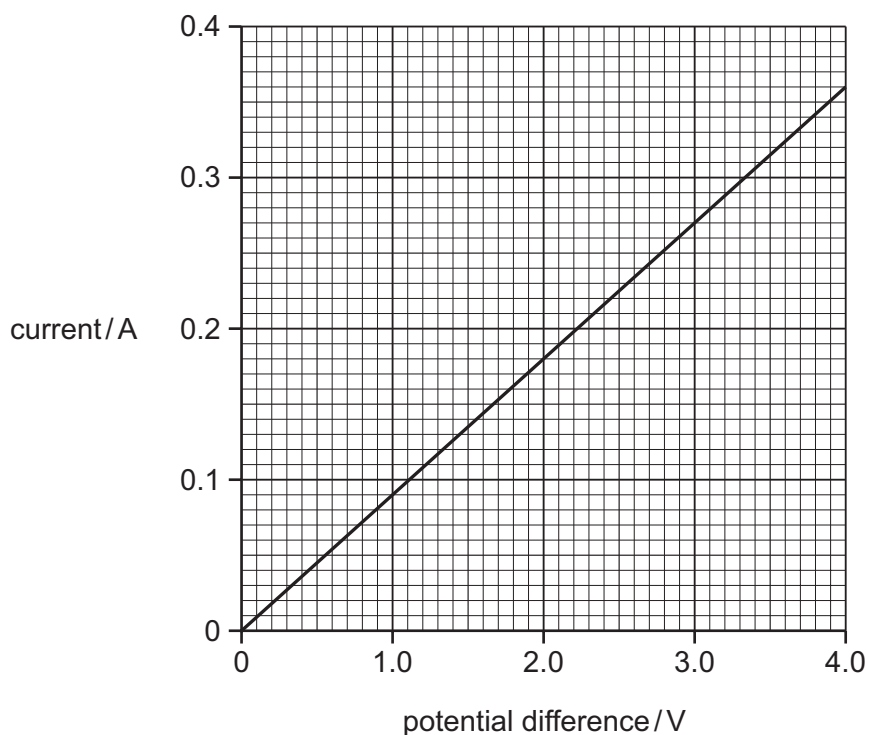


Fig. 8.2

- (i) Describe how he varies the potential difference across the nichrome wire.

.....
 [1]

(ii) Use the graph to determine the resistance of the nichrome wire.

Show your working.

resistance = [3]

(b) Daniel then uses a second piece of nichrome wire half the diameter of the original wire.

Calculate the resistance of this piece of wire.

resistance = [2]

*For
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9 Poly(ethene) is made from ethene, C₂H₄.

(a) Ethene is an unsaturated compound.

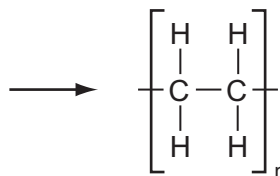
Explain the meaning of the term *unsaturated*.

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

(b) Describe how the ethene for this process is made.

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

(c) Complete this equation to show the formation of poly(ethene) from ethene.



[2]

Please turn over for Question 10.

10 Fig. 10.1 shows a transformer.

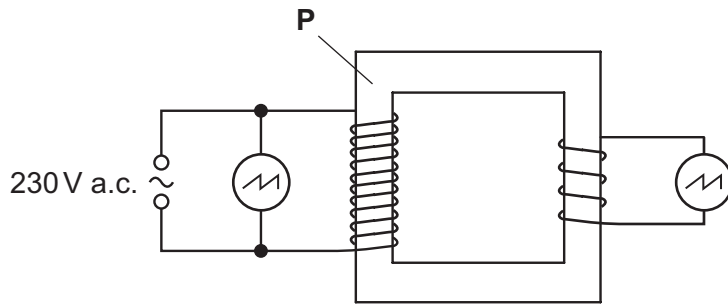


Fig. 10.1

The input is connected to a cathode ray oscilloscope (c.r.o.) and the output is connected to another c.r.o.

(a) (i) The transformer works by electromagnetic induction.

Explain what is meant by *electromagnetic induction*.

.....

 [2]

(ii) Explain why the input to the transformer must be an alternating voltage.

.....

 [2]

(iii) **P** is the transformer core.

Name the material that **P** is made from. [1]

(iv) Outline the role of **P** in the operation of the transformer. Your answer should include the properties of the material which make it suitable.

.....

 [2]

- (b) (i) This transformer allows an appliance designed to be used on a 115V supply to be used on a 230V supply.

For
Examiner's
Use

Calculate the turns ratio of the primary coil to the secondary coil ($N_{\text{primary}} : N_{\text{secondary}}$).

$$(N_{\text{primary}} : N_{\text{secondary}}) = \dots\dots\dots [1]$$

- (ii) Fig. 10.2 shows the screen of the c.r.o. that is connected to the input.

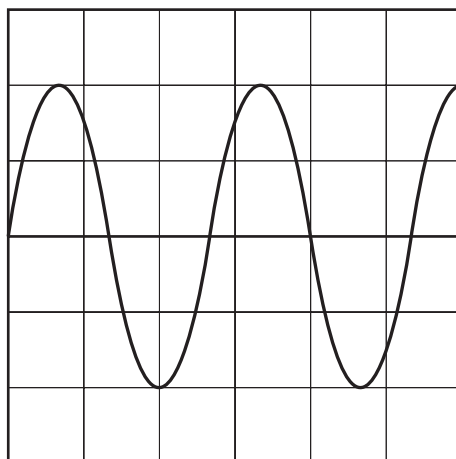


Fig. 10.2

On Fig. 10.2, draw the trace that would be obtained on the c.r.o. connected to the output.

You should assume that the time base and y-gain settings of the two cathode ray oscilloscopes are the same. [2]

DATA SHEET
The Periodic Table of the Elements

		Group																	
		I	II	III	IV	V	VI	VII	0										
		1 H Hydrogen 1																	
7	9	Li Lithium 3	Be Beryllium 4																
23	24	Na Sodium 11	Mg Magnesium 12																
39	40	K Potassium 19	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	88	Rb Rubidium 37	Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	101 Ru Ruthenium 44	101 Rh Rhodium 45	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	137	Cs Caesium 55	Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	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	210 Rn Radon 86	
87	226	Fr Francium 87	Ra Radium 88	227 Ac Actinium 89															
		*58-71 Lanthanoid series †90-103 Actinoid series																	
Key	a	X	b									a = relative atomic mass X = atomic symbol b = proton (atomic) number							
	140	141	144	150	152	157	159	162	165	167	169	173	175						
	Ce Cerium 58	Pr Praseodymium 59	Nd Neodymium 60	Sm Samarium 62	Eu Europium 63	Gd Gadolinium 64	Tb Terbium 65	Dy Dysprosium 66	Ho Holmium 67	Er Erbium 68	Tm Thulium 69	Yb Ytterbium 70	Lu Lutetium 71						
	232	238	238	238	238	238	238	238	238	238	238	238	238						
	Th Thorium 90	Pa Protactinium 91	U Uranium 92	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						

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

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