



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

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PHYSICAL SCIENCE

0652/32

Paper 3 (Core)

October/November 2018

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 an HB pencil for any diagrams, graphs, tables or rough working.

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

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

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

Electronic calculators may be used.

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.

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

1 A floating platform is made from several large blocks.

(a) One of the blocks is shown in Fig. 1.1.

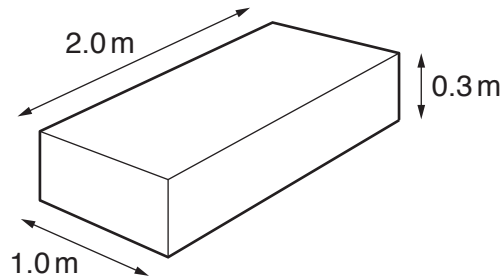


Fig. 1.1

(i) Use information from Fig. 1.1 to calculate the volume of the block.

volume = m³ [1]

(ii) The mass of the block shown in Fig. 1.1 is 9.0 kg.

Calculate the weight of the block. State the unit.

[gravitational field strength $g = 10.0 \text{ N/kg}$]

weight = unit [2]

(iii) Calculate the density of the block.

density = kg/m³ [2]

(b) A boat enters the harbour.

It approaches the floating platform and then stops.

A speed time graph is shown for this journey in Fig. 1.2.

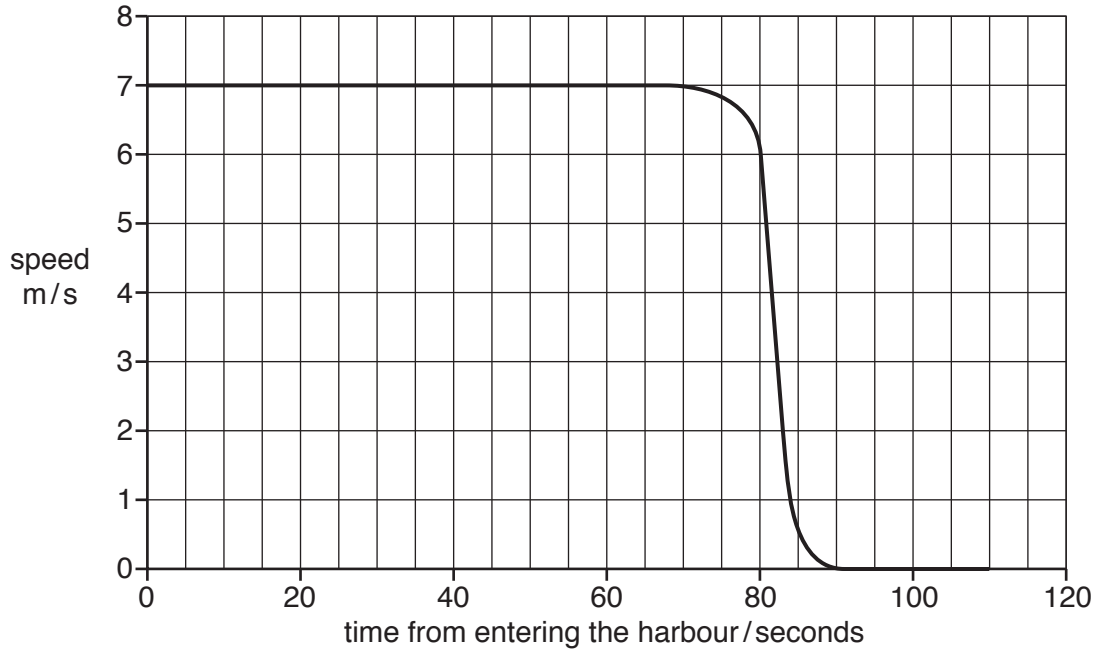


Fig. 1.2

Use the information in Fig. 1.2 to determine

(i) the speed of the boat when it is travelling at constant speed,

..... m/s [1]

(ii) the time taken from when the boat starts slowing down to when it stops.

..... s [1]

[Total: 7]

2 Chlorine is an element in Period 3 of the Periodic Table.

(a) Name the group which contains chlorine.

..... [1]

(b) Name **two** metals in Period 3.

1

2

[2]

(c) Name **one** non-metal in Period 3 that is a solid at room temperature.

..... [1]

(d) Name **one** non-metal in Period 3 that is a gas at room temperature.

..... [1]

(e) (i) Name **one** element in Period 3 which forms an acidic pollutant when combined with oxygen and water.

..... [1]

(ii) Name this pollutant.

..... [1]

[Total: 7]

Question 3 starts over the page

3 A worker is using a drill on a road surface.

The drill causes sound waves in the ground, as shown in Fig. 3.1.

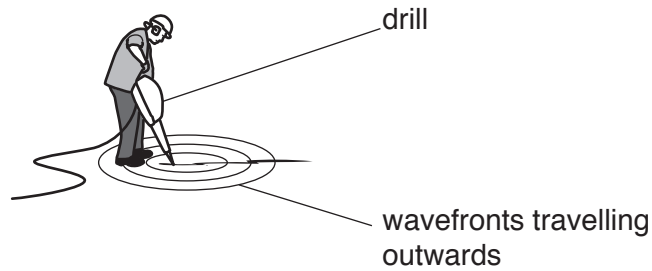


Fig. 3.1

(a) Fig. 3.2 shows a diagram of a wave travelling outwards.

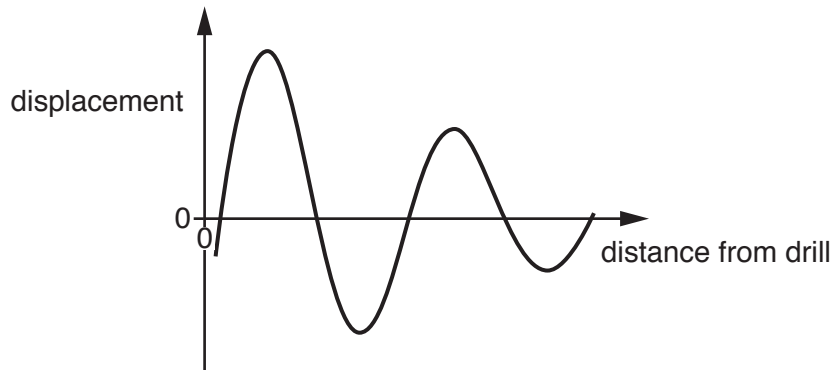


Fig. 3.2

(i) On Fig. 3.2, draw an arrow on the graph to show an **amplitude** of the wave.

Label this arrow with an **A**.

[1]

(ii) On Fig. 3.2, draw an arrow on the graph to show the **wavelength** of the wave.

Label this arrow with a **W**.

[1]

(b) The drill makes a loud noise.

(i) State how the sound is produced.

..... [1]

(ii) Suggest the range of sound frequencies that humans can hear.

Include the unit in your answer.

..... to unit [3]

(iii) Sound waves cannot travel in a vacuum.

Suggest why.

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

(c) The drill is connected to an electrical supply using a lead of length 10 m as shown in Fig. 3.3.
The drill motor operates at its normal speed.

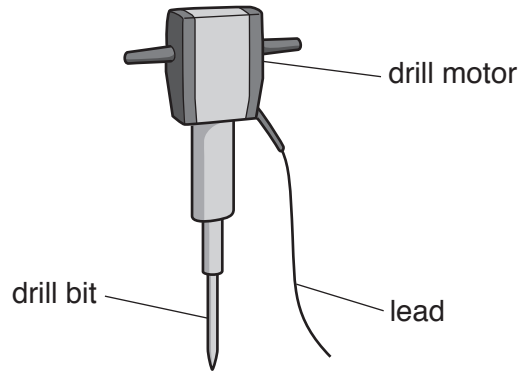


Fig. 3.3

(i) The lead is replaced by a lead of length 50 m and the drill operates more slowly.

State the effect on the current in the drill motor of using the longer lead.

Explain your answer.

effect
explanation
..... [2]

(ii) The insulation of the lead is damaged.

State **one** hazard due to damaged insulation.

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

[Total: 10]

4 Chlorine forms ionic and covalent compounds.

(a) Complete Table 4.1 which gives information about two compounds of chlorine. [2]

Table 4.1

name of compound	type of bonding	formula
hydrogen chloride	covalent
.....	ionic	NaCl

(b) Give the formulae of the ions present in NaCl.

ion 1

ion 2

[2]

(c) Draw a dot and cross diagram to show the electron arrangement in a molecule of hydrogen chloride.

Show the outer electrons only.

[2]

(d) Describe the formation of positive ions and negative ions.

positive ions

.....

negative ions

.....

[2]

[Total: 8]

5 Fig. 5.1 is a section through a torch. The torch contains two cells in series, a lamp and component P.

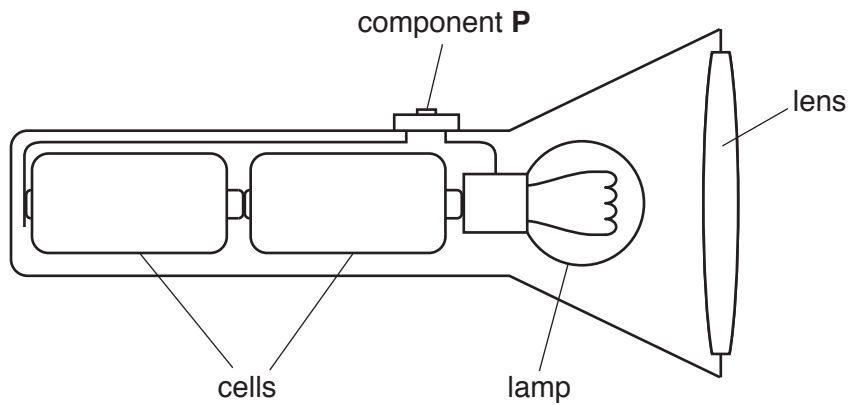


Fig. 5.1

(a) (i) Component P allows the torch to be turned on and off.

Name component P.

..... [1]

(ii) Complete the circuit diagram of the torch shown in Fig. 5.2.

Use the correct symbols.

[3]

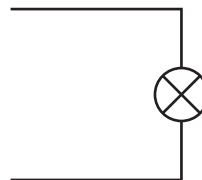


Fig. 5.2

(b) Another torch contains an arrangement with a lens, as shown in Fig. 5.3.

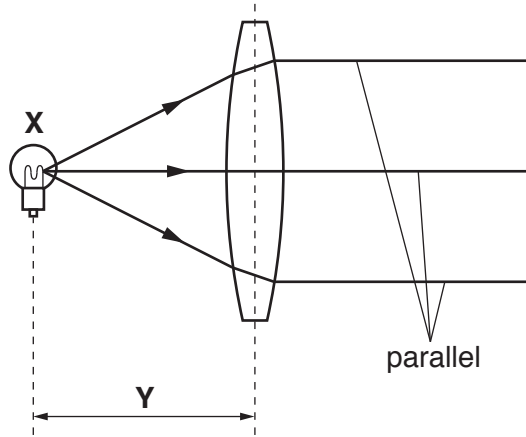


Fig. 5.3

A lamp is placed at point **X** at a distance **Y** from the centre of the lens.

Light from the lamp passes through the lens to form a parallel beam.

(i) The rays of light change direction as they enter and leave the lens.

Name this process and explain why it occurs.

name of process

explanation

.....

[2]

(ii) State the name of

point **X**,

distance **Y**.

[2]

(c) Fig. 5.4 shows the electromagnetic spectrum.

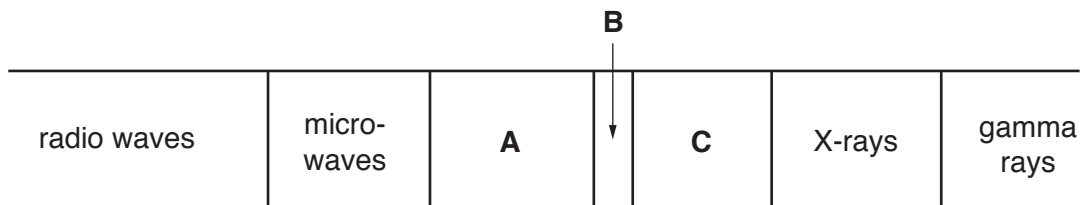


Fig. 5.4

Name the regions **A** and **B**.

A

B

[2]

- 6 Hydrogen peroxide decomposes to form oxygen and water.

Fig. 6.1 shows the apparatus used to decompose hydrogen peroxide.

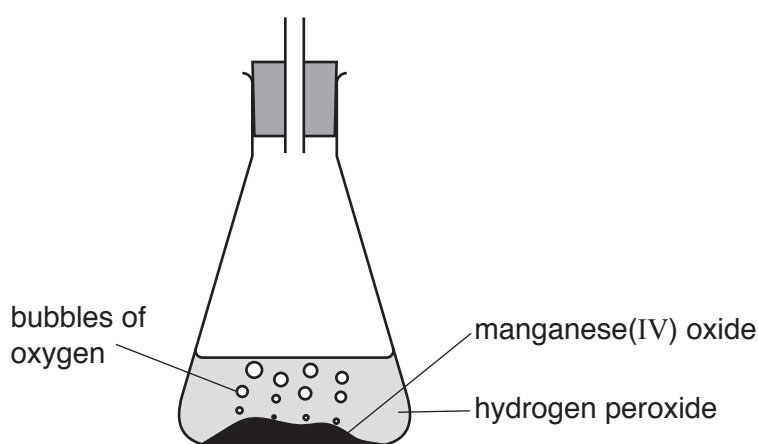


Fig. 6.1

- (a) Complete Fig. 6.1 to show how the oxygen is collected and its volume measured. [2]

- (b) Balance the equation for the decomposition of hydrogen peroxide.



- (c) The decomposition reaction is very slow without added manganese(IV) oxide.

Manganese(IV) oxide acts as a catalyst and speeds up the reaction.

State **one** other observation that shows that manganese(IV) oxide is a catalyst in this reaction.

.....
 [1]

- (d) State a name for organic compounds acting as organic catalysts.

..... [1]

[Total: 5]

7 (a) State **two** properties of a metal.

1

2 [2]

(b) Copper(II) oxide reacts with sulfuric acid to make a salt.

(i) Name this salt and the other product of the reaction.

salt

other product [2]

(ii) Explain how this reaction shows that copper(II) oxide is basic.

.....

.....

..... [2]

[Total: 6]

8 Fig. 8.1 shows a cathode-ray oscilloscope (c.r.o.).

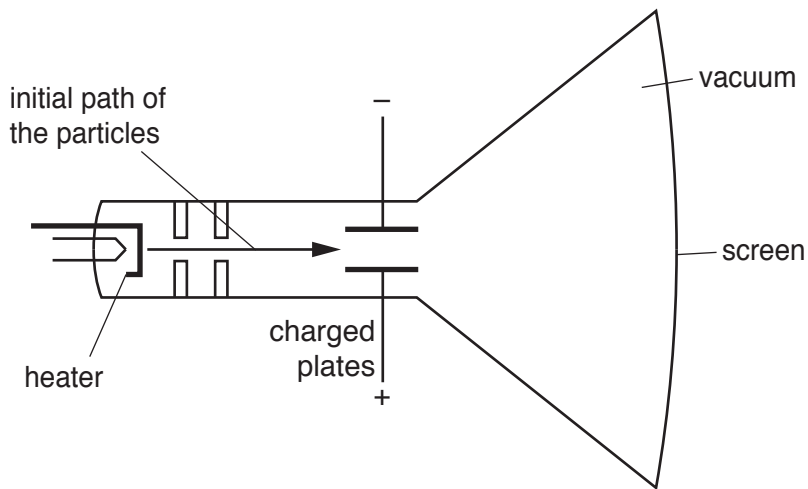


Fig. 8.1

(a) The heater emits particles by thermionic emission.

Name the particles emitted.

..... [1]

(b) Particles move from the heater to the screen. They pass between the charged plates.

The initial path of the particles is shown on Fig. 8.1.

On Fig. 8.1, complete the path of a particle until it hits the screen. [2]

(c) The particles are stopped by the screen.

Energy conversions take place.

Complete the diagram in Fig. 8.2 to show

(i) the form of energy of the moving particles **before** the particles hit the screen, [1]

(ii) the two energy forms of this energy **after** the particles hit the screen. [2]

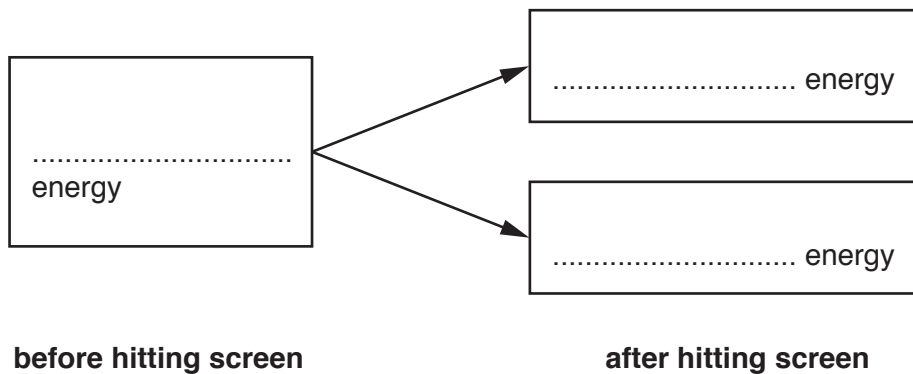


Fig. 8.2

[Total: 6]

- 9 Calcium oxide (lime) and calcium hydroxide (slaked lime) are made from calcium carbonate, as shown in Fig. 9.1.

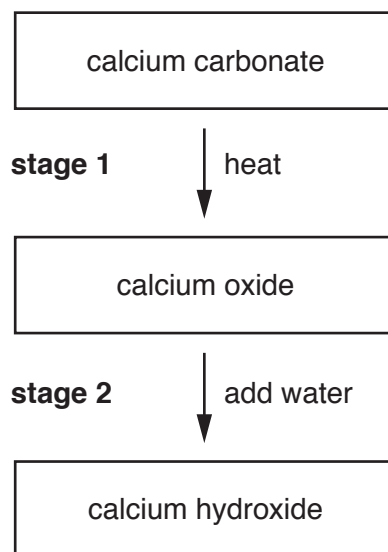


Fig. 9.1

- (a) Name a raw material which contains calcium carbonate.

..... [1]

- (b) State why farmers add slaked lime to soil.

.....
 [1]

- (c) **Stage 1**, shown in Fig. 9.1, is an endothermic process.

Describe the meaning of *endothermic*.

.....
 [1]

- (d) Explain how a reaction can be *exothermic* even though energy is needed to break chemical bonds during the reaction.

.....

 [2]

- (e) Lime mortar is a mixture of slaked lime, sand and water. It is used to build brick walls as shown in Fig. 9.2.

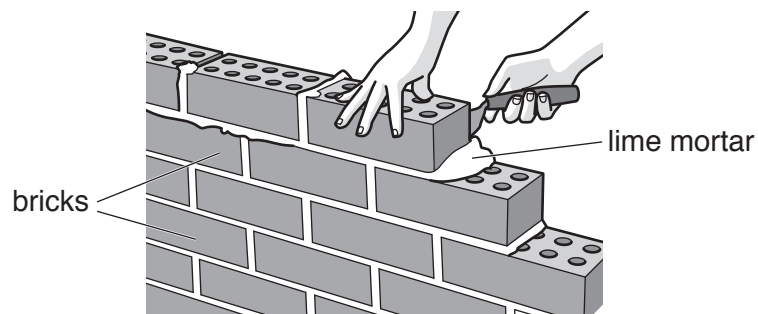


Fig. 9.2

The lime mortar becomes hard by reacting with carbon dioxide from the air. This process is very slow and takes many years to complete.

Suggest why this reaction is very slow.

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

[Total: 6]

10 Tritium is a radioactive isotope of hydrogen.

The symbol for tritium is ${}^3_1\text{H}$.

(a) (i) Determine the number of protons in a tritium nucleus.

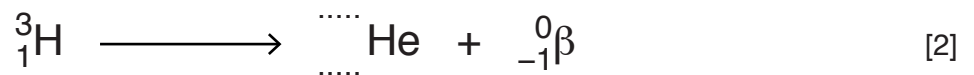
..... [1]

(ii) Determine the number of neutrons in a tritium nucleus.

..... [1]

(b) Tritium decays by the emission of a beta-particle (${}^0_{-1}\beta$).

Complete the equation to show the radioactive decay of tritium.



(c) Tritium is used in watches to make them glow in the dark.

The half-life of tritium is about 10 years.

Describe changes to the brightness of the watch over 50 years.

Explain your answer.

.....

 [2]

(d) Describe how radioactive materials used in schools are stored in a safe way.

.....
 [1]

[Total: 7]

11 Ethene, C_2H_4 , forms poly(ethene) by addition polymerisation.

(a) Name the feature of ethene which allows addition polymerisation.

..... [1]

(b) Draw the structure of a repeating monomer unit of poly(ethene).

[2]

(c) Propene also forms a polymer by addition polymerisation.

Suggest the name for this polymer.

..... [1]

(d) (i) Ethene and propene are hydrocarbons.

State what is meant by a *hydrocarbon*.

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

(ii) State the name and formula of the hydrocarbon which is the main constituent of natural gas.

name

formula [2]

[Total: 8]

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The Periodic Table of Elements

		Group									
I	II	III	IV	V	VI	VII	VIII				
		1 H hydrogen 1									
3 Li lithium 7	4 Be beryllium 9	Key atomic number atomic symbol name relative atomic mass									
11 Na sodium 23	12 Mg magnesium 24	5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20				
19 K potassium 39	20 Ca calcium 40	13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40				
37 Rb rubidium 85	38 Sr strontium 88	29 Cu copper 64	30 Zn zinc 65	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84				
55 Cs caesium 133	56 Ba barium 137	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131				
87 Fr francium —	88 Ra radium —	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —				
57 La lanthanum 139	58 Ce cerium 140	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70				
89 Ac actinium —	90 Th thorium 232	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115				
		25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65				
		43 Tc technetium —	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112				
		75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201				
		73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195				
		105 Db dubnium —	106 Sg seaborgium —	107 Bh bohrium —	108 Hs hassium —	109 Mt meitnerium —	110 Ds darmstadtium —				
		91 Zr zirconium 91	92 Nb niobium 93	93 Mo molybdenum 96	94 Tc technetium —	95 Ru ruthenium 101	96 Rh rhodium 103				
		21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56				
		89-103 actinoids	89-103 actinoids	89-103 actinoids	89-103 actinoids	89-103 actinoids	89-103 actinoids				
		57-71 lanthanoids	57-71 lanthanoids	57-71 lanthanoids	57-71 lanthanoids	57-71 lanthanoids	57-71 lanthanoids				

lanthanoids

actinoids

67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
99 Es einsteinium —	100 Fm fermium —	101 Md mendelevium —	102 No nobelium —	103 Lr lawrencium —
114 Fl flerovium —	115 Lv livermorium —	116 Lv livermorium —	117 Ts tennessine —	118 Og oganesson —

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