

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.

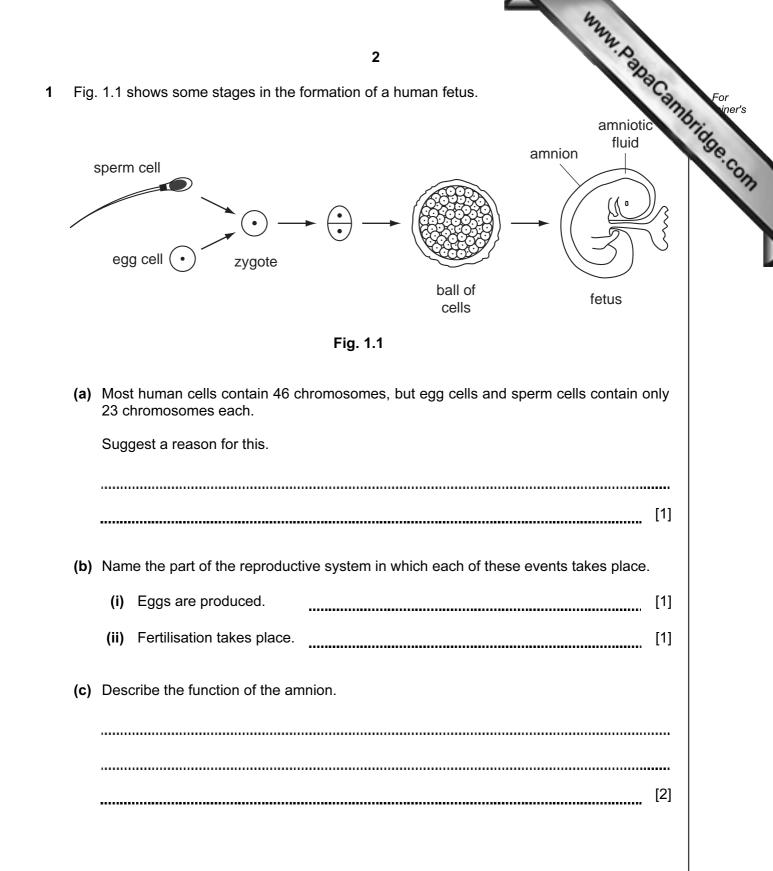
A copy of the Periodic Table is printed on page 20.

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 Exam	iner's Use
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

This document consists of 20 printed pages.





www.papaCambridge.com 3 (d) A disease called thalassaemia is caused by a person's genes. The haemoglobin gene has two alleles, T and t. A person with the alleles tt ha thalassaemia, but a person with alleles Tt does not. (i) State which allele, **T** or **t**, is dominant. Explain your answer. allele explanation -----[1] ..... (ii) Complete the genetic diagram to show how two parents who do not have thalassaemia could have a child with thalassaemia. phenotypes of parents man without woman without thalassaemia thalassaemia genotypes of parents Tt gametes and and gametes from woman gametes from man [4] (iii) Thalassaemia reduces the amount of normal haemoglobin in a person's blood. Explain why someone with thalassaemia often does not have the energy to do vigorous exercise. ..... [2] .....

www.papacambridge.com (a) Fig. 2.1 shows apparatus used in the electrolysis of copper chloride solution. 2

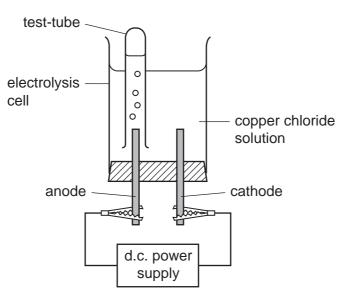


Fig. 2.1

- (i) Describe what is observed at the cathode.

[1]

(ii) Chloride ions have a single negative electrical charge,  $Cl^{-}$ .

For every copper ion in the solution, two chloride ions are present.

Deduce the electrical charge of a copper ion.

Show how you obtained your answer.

[2] .....

(iii) Fig. 2.2 shows diagrams of two particles, L and M. Each of these particle 17 protons in their nucleus.

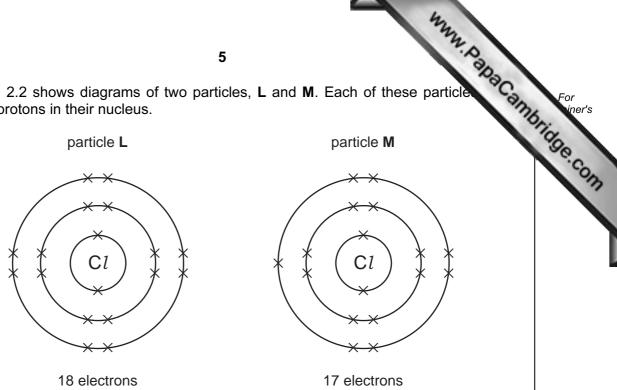


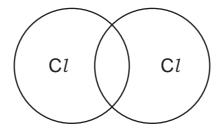
Fig. 2.2

State and explain which one of these particles, L or M, moves towards the anode during electrolysis.

particle	
explanation	
	[2]

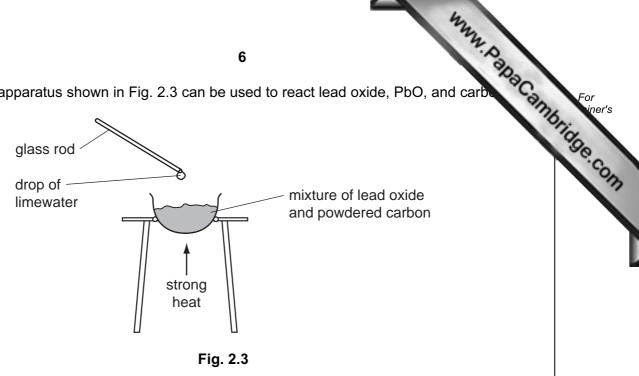
(iv) The bubbles of gas which rise from the anode contain diatomic molecules of chlorine.

Complete the bonding diagram below to show how the outer electrons are arranged in a chlorine molecule.



[2]

(b) The apparatus shown in Fig. 2.3 can be used to react lead oxide, PbO, and carba



When the mixture is heated, a redox reaction occurs in which lead oxide is reduced.

The drop of limewater suspended on the glass rod turns cloudy.

- (i) Name the gas which is produced in this redox reaction.
- (ii) Suggest the balanced symbolic equation for the redox reaction between lead oxide and carbon.

## [2] ......

.....

[1]

i) Complet	e Table 3.1 to show	7 v the properties Table 3.1	s of alpha, beta and	gamma radiati	acamp.
		Table 3.1			"THB
	description	charge	range in air	ionising ability	
alpha		positive	5 cm	very strong	
beta	electron		50 cm		
gamma	electromagnetic wave		many kilometres	weak	

[4]

(ii) Many people have smoke detectors in their houses.

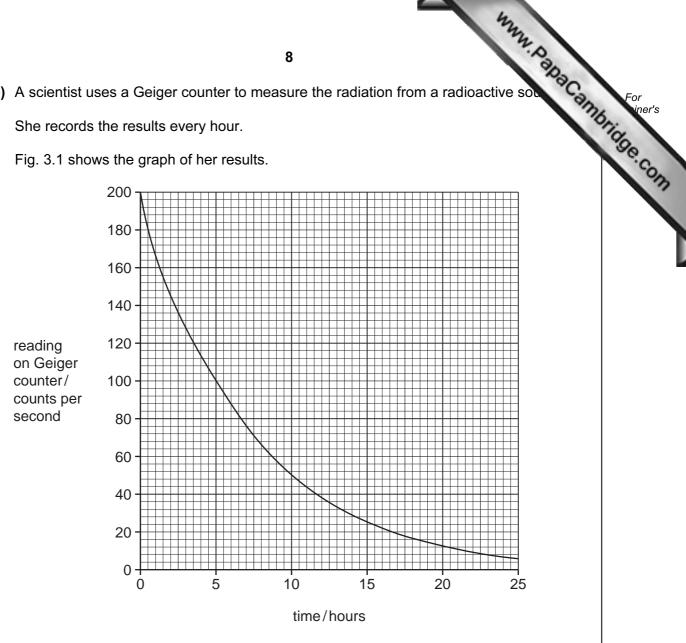
Smoke detectors contain a radioactive source which emits alpha radiation.

Explain why the alpha radiation from the smoke detector is not dangerous to people living in the house.

••••
[1]

(b) A scientist uses a Geiger counter to measure the radiation from a radioactive solution She records the results every hour.

Fig. 3.1 shows the graph of her results.



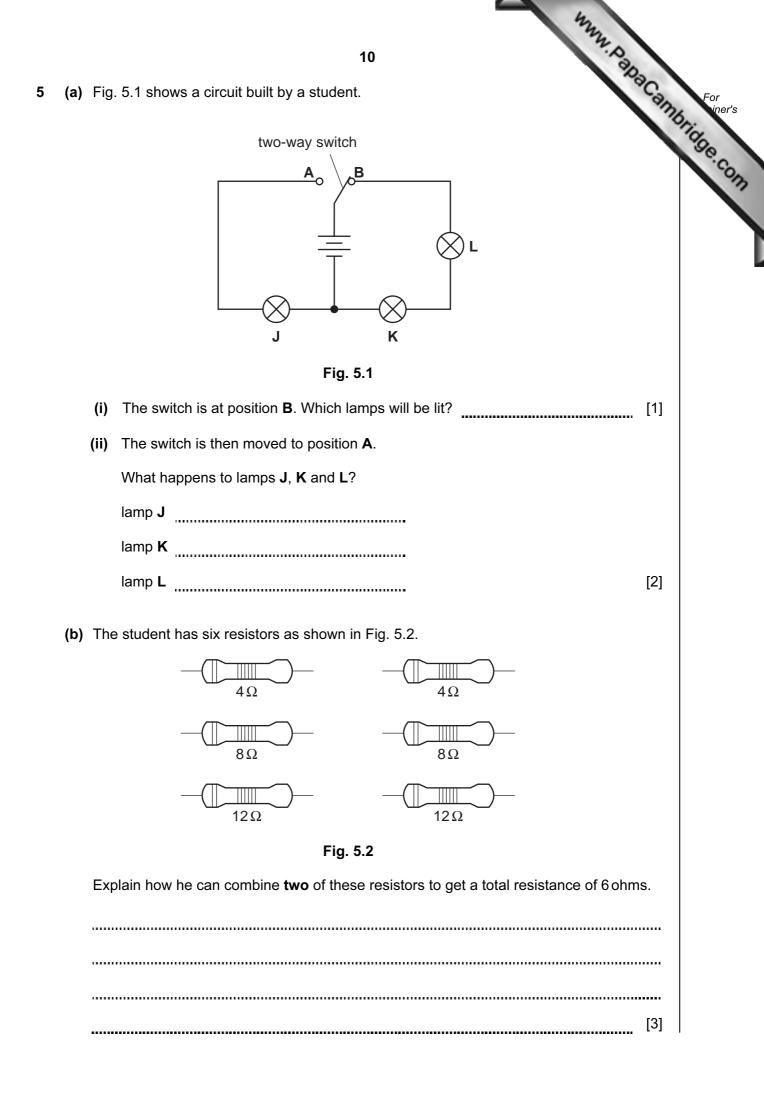


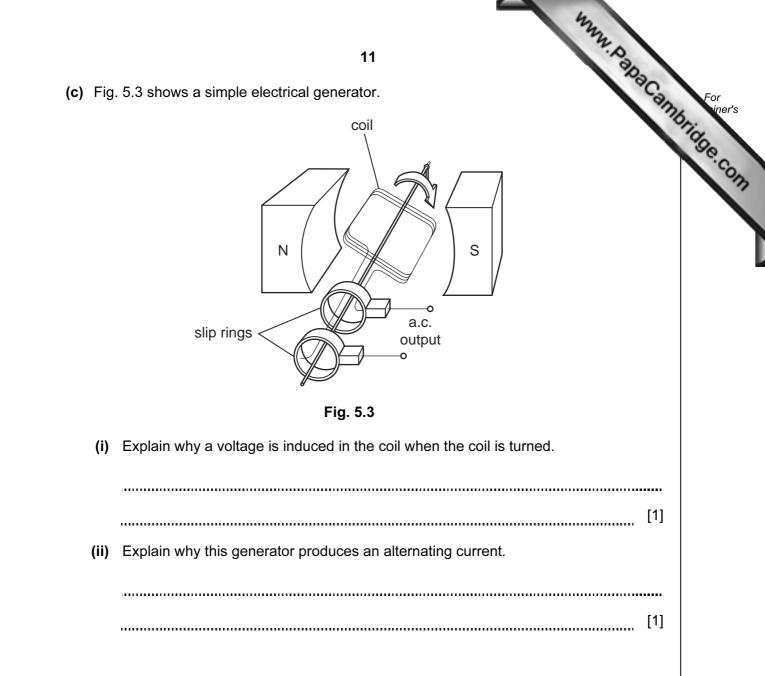
Calculate the half-life of the radioactive source.

Show your working.

[2] .....

		9	
		9 eans are an important crop in many tropical and subtropical countries, becaus a lot of protein. armer grows soya beans in a field on a steep slope. scribe <b>two</b> things the farmer could do to reduce the risk of soil erosion.	-ali
(a)	A fa	armer grows soya beans in a field on a steep slope.	
	Des	scribe <b>two</b> things the farmer could do to reduce the risk of soil erosion.	
	1		
	Ζ	[	 2]
(b)	Soy	a beans and other crops are often attacked by aphids and other insect pests.	
	Far	mers may use pesticides or biological control to kill the pests.	
	(i)	Describe <b>one</b> advantage and <b>one</b> disadvantage of using pesticides, rather tha biological control, to control pests of crops.	n
		advantage	
		disadvantage	
		[	2]
	(ii)	State what is meant by a <i>systemic pesticide</i> and explain <b>one</b> advantage of using systemic pesticide rather than a contact pesticide.	а
		meaning	
		advantage	
		[	2]





www.papaCambridge.com A solution of sodium chloride is produced when sodium hydroxide solution, an an 6 neutralised by dilute hydrochloric acid. Fig. 6.1 shows apparatus which can be used to out this neutralisation.

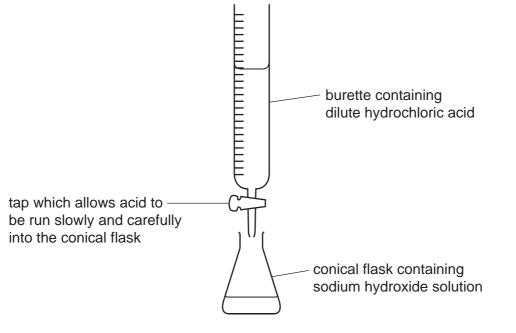


Fig. 6.1

(a) Complete the balanced symbolic equation, involving ions and molecules, for the neutralisation reaction between an aqueous acid and an aqueous alkali.

> H<sup>+</sup> + \_\_\_\_\_ [2] .....

(b) A student adds a few drops of litmus solution, an indicator, to the sodium hydroxide solution.

Suggest what the student should then do in order to produce a neutral solution of sodium chloride, using only the apparatus shown in Fig. 6.1.

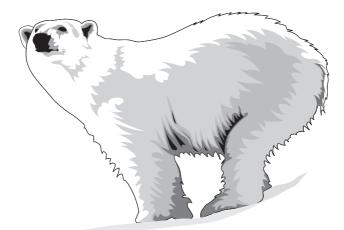
[2] ------

(c) Suggest how the student could use information gained from the experiment in (b) to obtain a sample of dry, colourless sodium chloride crystals which do not contain any litmus.

[3] .....

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7 (a) Polar bears live in the cold, arctic region. They have thick, white fur.



(i) Describe how fur keeps a polar bear warm.
[2]
(ii) Explain why white fur will keep a polar bear warmer than black fur.
[2]

- (b) An elephant can communicate with other elephants using infra-sound. This is low frequency vibration, which is usually impossible for a human to hear.
  - (i) Suggest a possible frequency for this vibration and explain how you chose your answer.

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	n elephant can communicate with other elephants using infra-sound. This is with other elephants using infra-sound. This is with the frequency vibration, which is usually impossible for a human to hear.	For iner's
(i)	Suggest a possible frequency for this vibration and explain how you chose your answer.	e.co.
	frequency Hz	137
	explanation	
	[1]	
(ii)	State the meaning of the term <i>frequency</i> .	

[1] .....

(iii) Fig. 7.1 shows an oscilloscope trace for a low frequency sound which the human ear can just hear.

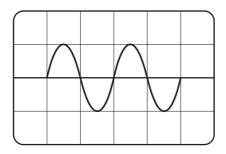
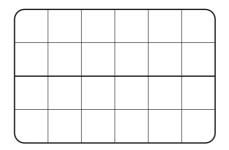


Fig. 7.1

On Fig.7.2 draw the trace of an infra-sound wave of the same amplitude.



[2]

Fig. 7.2

www.papacambridge.com 15 (c) Fig. 7.3 shows a magnifying glass being used to look at a caterpillar. magnifying glass 1.6 cm 0.8 cm 1.0 cm Fig. 7.3 State the focal length of the lens. (i) [1] ..... (ii) Complete the ray diagram to show how the eye sees an enlarged image of the caterpillar. [2] (iii) This image is called a virtual image. Explain the meaning of the term *virtual image*.

[1]

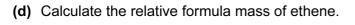
8 Carbon and hydrogen combine to form hydrocarbons.

Ethene,  $C_2H_4$ , is a gaseous, unsaturated hydrocarbon, which is of industrial importance.

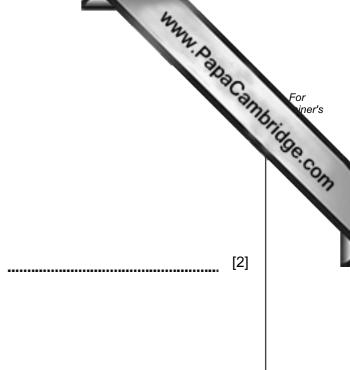
www.papacambridge.com (a) Complete the displayed formula of the ethene molecule which has been started below.

	H   C
	[2]
(b)	Unsaturated hydrocarbons are made in industry from fractions obtained by the fractional distillation of oil (petroleum).
	Name the process which is used to make unsaturated hydrocarbons, and describe briefly how it is done.
	name of process
	description
	[3]
(c)	Describe, in terms of changes to chemical bonds, what happens when ethene molecules react to form molecules of poly(ethene).

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



Show your working.



9 A healthy plant growing in a pot was watered and placed in a sunny window. A trans plastic bag was placed over the plant, as shown in Fig. 9.1.

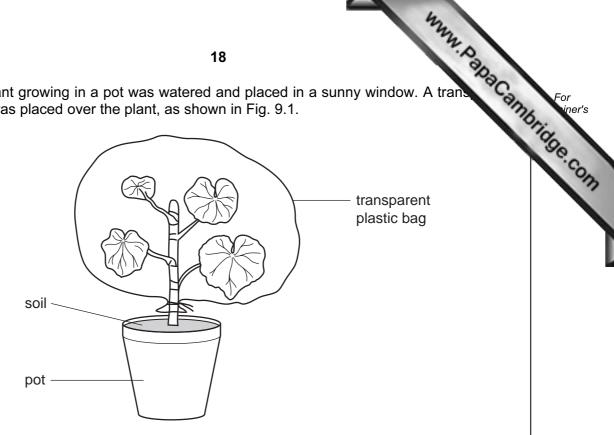


Fig. 9.1

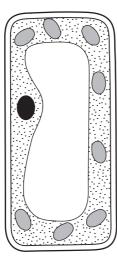
(a) The temperature near the window fell overnight. The next morning, small droplets of water were visible on the inside of the plastic bag.

Explain why the droplets of water appeared on the inside of the plastic bag.

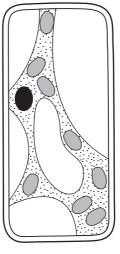
..... [4] 

www.papaCambridge.com (b) The plastic bag was then removed from the plant. The next day was warm and and by the end of the day the plant had lost so much water that it wilted.

Fig. 9.2 shows a cell from a leaf before and after the plant wilted.



before wilting



after wilting

Fig. 9.2

- (i) On the diagram of the cell before wilting in Fig. 9.2, label and name two structures that would **not** be present in an animal cell. [2]
- (ii) Using your knowledge of osmosis, explain what happened to the plant cell to cause its appearance after the plant wilted.

\_\_\_\_\_ ..... [3] .....

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$ \begin{array}{c c c c c c c } \hline & & & & & & & & & & & & & & & & & & $	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$ \begin{array}{cccccc} 140 & 141 & 144 & 160 & 157 & 159 & 167 & 168 & 167 \\ \mathbf{Ce} & \mathbf{Pr} & \mathbf{Nd} & \mathbf{Pm} & \mathbf{Sm} & \mathbf{Eu} & \mathbf{Gd} & \mathbf{Tb} & \mathbf{Dy} & \mathbf{Ho} & \mathbf{Er} & 167 \\ \mathbf{Ferium} & \mathbf{Paseodymium} & $	$ \begin{array}{cccccc} 140 & 141 & 144 & 160 & 157 & 159 & 167 & 168 & 167 \\ \mathbf{Ce} & \mathbf{Pr} & \mathbf{Nd} & \mathbf{Pm} & \mathbf{Sm} & \mathbf{Eu} & \mathbf{Gd} & \mathbf{Tb} & \mathbf{Dy} & \mathbf{Ho} & \mathbf{Er} & 167 & \mathbf{Hor} \\ \mathbf{Sm} & \mathbf{Furdium} & \mathbf{Praecofmium} &$	Actinium 89	+																	
Certure     Preseedormune     Neodymune     Recordination     Preseedormune     Not month       58     59     60     60     60     60     60       58     59     60     60     61     60     60       mass     232     238     60     63     60     60       mass     232     238     60     60     60     60	Certum       Preservormium       Readomium       Prementium       Expression       Entitime       Entitime       Entitime       Entitime       Entitem       <	Certum       Praseodymiun       Perseodymiun       Perse	SectionPreservormiunPrenetiumPrenetiumEurophium <td>Certion       Preservoimiun       Preservoimiun</td> <td>*58-71 Lanthanoid series</td> <td></td> <td></td> <td>140 <b>Ce</b></td> <td>141 <b>Pr</b></td> <td></td> <td></td> <td></td> <td></td> <td>157 Gd</td> <td>159 <b>Tb</b></td> <td><sup>162</sup></td> <td>165 HO</td> <td>167 Er</td> <td>169 <b>Tm</b></td> <td>173 <b>Yb</b></td> <td>175</td> <td></td>	Certion       Preservoimiun	*58-71 Lanthanoid series			140 <b>Ce</b>	141 <b>Pr</b>					157 Gd	159 <b>Tb</b>	<sup>162</sup>	165 HO	167 Er	169 <b>Tm</b>	173 <b>Yb</b>	175		
Th Pa U Np Pu Am Cm Bk Cf Es Fm	232     238     238     238     Np     Put     Am     Cm     Bk     Cf     Es     Fm       Thorium     Protactinium     Uranium     Veranium     Neprunium     Petuonium     Americium     Curium     Bk     Cf     Es     Fm       90     91     92     93     94     95     96     97     98     99     100       The volume of one mole of any gas is 24 dm <sup>3</sup> at room temperature and pressure (r.t.p.).	232 Thofum       238 by antioun       238 by antioun       238 by antioun       Du       Du       Am       Am       BK       Cf       Es       Fm       Me         Thofum       Pretactinum       U       Napturlum       Napturlum       Napturlum       Americium       BK       Cf       Es       Fm       Me         90       91       92       0       93       94       Curium       Berkelium       Earlienium       Me       Me<	222 Thofum       238 by Protection       238 by Protection       238 by Publicity       PU Publicity       Am Publicity       Am Brite       BK Brite       Cf       ES       Fm       Me         7hofum       Protectinium       U       Napudum       Matrix       Americium       Buselium       Biselium       Ensteinum       Me       Me         90       Protectinium       92       Curium       Biselium       Biselium       Ensteinum       Me	221 Thorium       238 by Protection       238 by Protection       238 by Publicity       ND Publicity       Am Protection       Am Protection       BK Protection       Cf       Es       Fm       Me         100       Protection       92       Ontion       96       Ontion       96       Protection       96       100       100       100         The volume of one mole of any gas is 24 dm <sup>3</sup> at room temperature and pressure (r.t.p.).       24 dm <sup>3</sup> at room temperature and pressure (r.t.p.).       100       100       100       100       100	190-103 Actinoid series		56	Cerium		Neodymium 60			89	Gadolinium 64	Terbium 65	Dysprosium 66	Holmium 67	Erbium 68	Thulium 69	Ytterbium 70	Lutetium 71		
	notum Protactinum Uranium Uranium Neptunium Putonium 94. Americium 96. Curium 97. Carliornium Einsteinum 100 Fermium Ne The volume of one mole of any gas is 24 dm <sup>3</sup> at room temperature and pressure (r.t.p.).	The volume of one mole of any gas is 24 dm <sup>3</sup> at room temperature and pressure (r.t.p.).	The volume of one mole of any gas is 24 dm <sup>3</sup> at room temperature and pressure (r.t.p.).     Definition of the volume of one mole of any gas is 24 dm <sup>3</sup> at room temperature and pressure (r.t.p.).	The volume of one mole of any gas is 24 dm <sup>3</sup> at room temperature and pressure (r.t.p.).     Design mode of temperature and pressure (r.t.p.).	lative a	a = relative atomic mas X = atomic symbol		232 Th	Ра					в С	BK	đ	Es	E	PM	Ň	5		
Thorium         Protactinium         Uranium         Neptunium         Plutonium         Plutonium         Americium         Californium         Earlier         Fermium         Me           90         91         92         93         94         95         96         97         98         99         100         100         101					oton (at	omic) nu	6	horium	Protactinium 31	ranium	Neptunium 93	ő	Americium 95	Curium 96	Berkelium 97	Californium 98	Einsteinium 99	Fermium 100	Mendelevium 101	Nobelium 102	Lawrencium 103	2.	

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