Centre Number	Candidate Number

Candidate Name _____

CAMBRIDGE INTERNATIONAL EXAMINATIONS

General Certificate of Education Ordinary Level

COMBINED SCIENCE 5129/2

PAPER 2

MAY/JUNE SESSION 2002

2 hours 15 minutes

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

TIME 2 hours 15 minutes

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.

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

FOR EXAMINER'S USE	
TOTAL	

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

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

[Turn over

1 A boy runs at 6.0 m/s and his dog runs at 10.0 m/s.

(a) Calculate the distance travelled in 15.0 s by

(i) the boy,

.....[1]

(ii) the dog.

.....[1]

(b) The boy races his dog, as shown in Fig. 1.1.

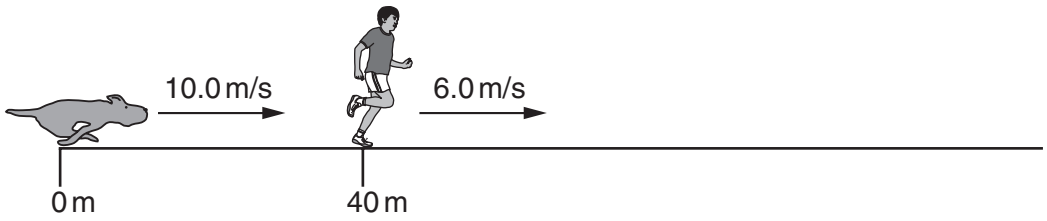


Fig. 1.1

The boy starts 40 m ahead of the dog. They start running at the same time.
Fig. 1.2 shows a distance – time graph for the dog and the boy.

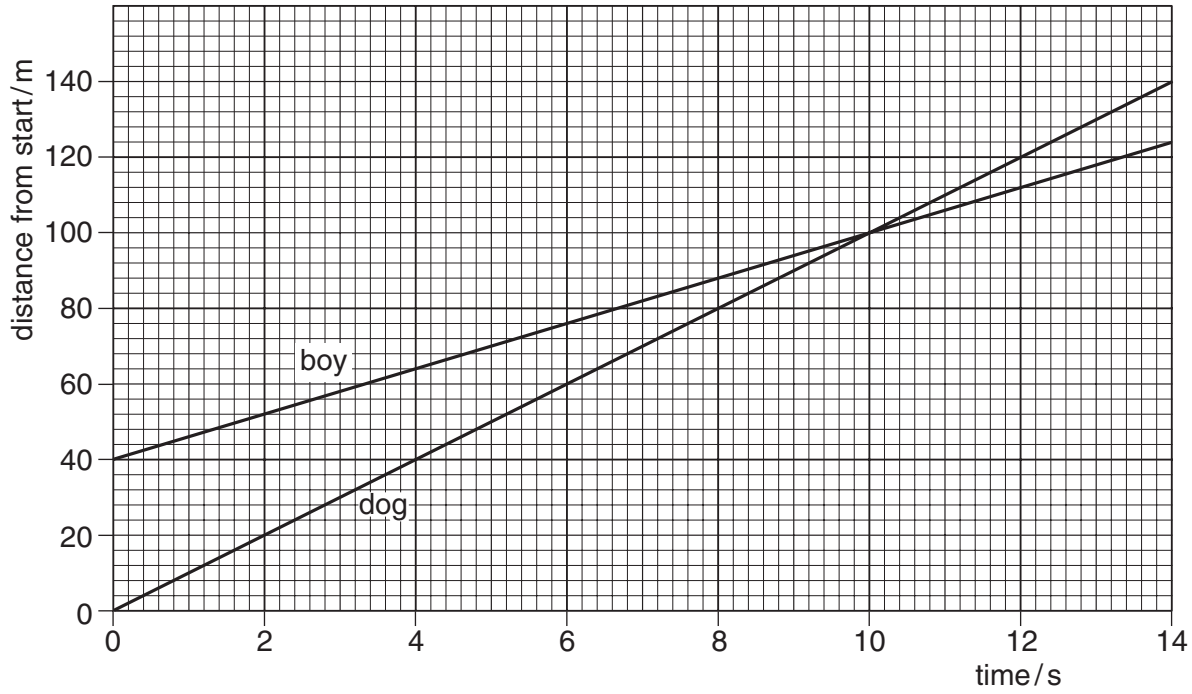


Fig. 1.2

(i) How can you tell from Fig. 1.2 that the dog is moving faster than the boy?

.....

.....[1]

(ii) How far has the dog run when it catches up with the boy?

.....

.....[1]

2 The most common isotope of phosphorus has the symbol $^{31}_{15}P$.

(a) How many protons and neutrons are there in one atom of this isotope?

number of protons .....

number of neutrons ..... [2]

(b) What is the difference between this isotope and the other isotopes of phosphorus?

.....

.....[1]

(c) Complete Fig. 2.1 to show the electronic structure of $^{31}_{15}P$. [2]

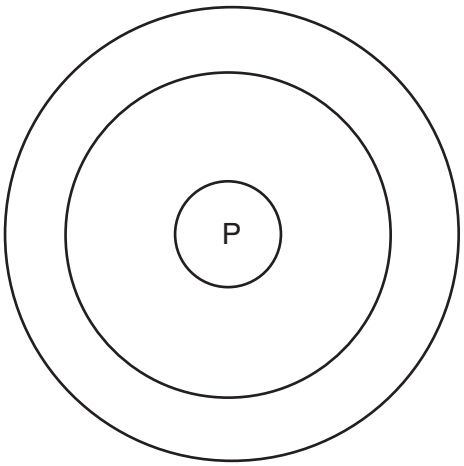


Fig. 2.1

(d) Name another element that has the same number of outer shell electrons as phosphorus.

.....[1]

3 Fig. 3.1 shows side views of two human teeth.

A **B**

Fig. 3.1

(a) Suggest a different use for each type of tooth.

A .....

.....

B .....

.....[2]

(b) Explain the part played by teeth in digestion.

.....

.....[1]

(c) **(i)** State three causes of dental decay.

1. .....

2. .....

3. .....[3]

(ii) State two ways in which dental decay can be reduced other than by cleaning the teeth.

1. .....

2. .....[2]

4 Fig. 4.1 shows some elements in the reactivity series.

element	K	Na	Ca	Al	C	Fe	H	Cu
	decreasing reactivity ⟶							

Fig. 4.1

(a) Use Fig. 4.1 to explain fully

(i) why water pipes made of copper last longer than those made of iron,

.....

.....[2]

(ii) why iron is extracted by heating its ore with carbon but aluminium is not.

.....

.....[2]

(b) Name **one** non-metal, other than carbon, shown in Fig. 4.1.

.....[1]

5 **(a)** Waves are either transverse or longitudinal.

(i) Explain the difference between a *transverse* wave and a *longitudinal* wave.

.....

.....

.....

.....[3]

(ii) Give **one** example of a longitudinal wave. .....[1]

(b) Ripples on the surface of a pond have a frequency of 10 Hz. One ripple travels 80 cm in a time of 5.0 s.

(i) What is meant by *frequency*?

.....

.....[1]

(ii) Calculate

1. the speed of the ripples,

.....[2]

2. the wavelength of the ripples.

.....[2]

6 Study the reaction scheme in Fig. 6.1.

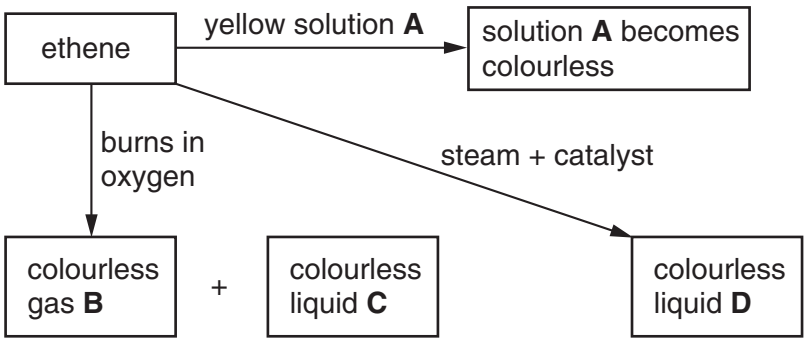


Fig. 6.1

(a) Identify the substances **A**, **B**, **C** and **D**.

yellow solution **A** .....

colourless gas **B** .....

colourless liquid **C** .....

colourless liquid **D** ..... [4]

(b) Ethene is an unsaturated hydrocarbon.

Explain the terms *unsaturated* and *hydrocarbon*.

unsaturated .....

.....

hydrocarbon .....

.....[2]

(c) Name the **type** of reaction that occurs between ethene and yellow solution **A**.

.....[1]

7 Fig. 7.1 shows a section through an eye.

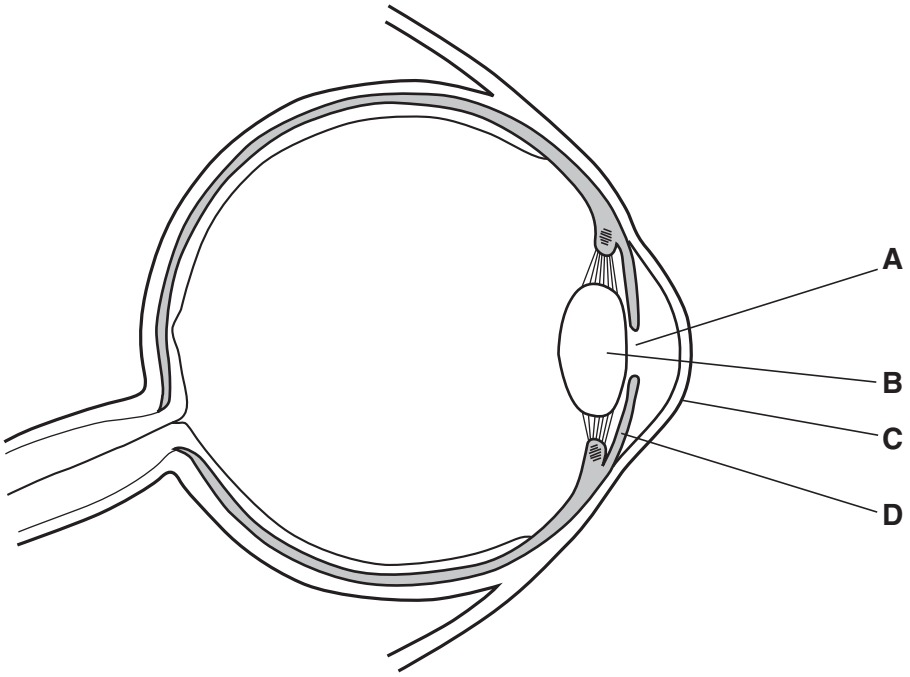


Fig. 7.1

(a) Name the parts labelled **A** to **D**.

A .....

B .....

C .....

D .....[4]

(b) Name the part of the eye that changes light energy to nerve impulses.

.....[1]

(c) State and explain how the ciliary muscles help to produce a focused image when looking at a near object.

.....

.....

.....

.....[3]

(d) (i) State how the muscles of the part labelled **D** respond when you enter bright light.

.....

.....[1]

(ii) State how this affects part **A**.

.....

.....[1]

(iii) Explain how this is an advantage.

.....

.....

.....[1]

8 A stone on Earth has a mass of 80 g. On Earth, the acceleration due to gravity $g = 10\,\text{N/kg}$.

(a) Explain the difference between mass and weight.

.....

.....

.....

.....[2]

(b) Calculate

(i) the mass of the stone in kg,

.....[1]

(ii) the weight of the stone on Earth.

.....[1]

9 An excess of dilute sulphuric acid is added to 6.2 g of copper(II) carbonate.

The equation for the reaction is

$$CuCO_3 + H_2SO_4 \longrightarrow CuSO_4 + H_2O + CO_2$$

(a) (i) How do you know when the reaction is complete?

.....

.....[1]

(ii) How can you show that carbon dioxide is given off during the reaction?

.....

.....[2]

(b) (i) Calculate the relative molecular mass, M_r, of copper(II) carbonate.

(A_r: Cu, 64; C, 12; O, 16.)

.....

.....[1]

(ii) Calculate the relative molecular mass, M_r, of carbon dioxide.

.....[1]

(iii) Use your answers to **(b)(i)** and **(b)(ii)** to calculate the mass of carbon dioxide produced from 6.2 g of copper(II) carbonate.

.....

.....

.....[2]

[Turn over

10 Fig. 10.1 shows a refrigerator that has the freezer compartment at the top. Heat is removed from the freezer compartment. This makes it the coldest part of the refrigerator.

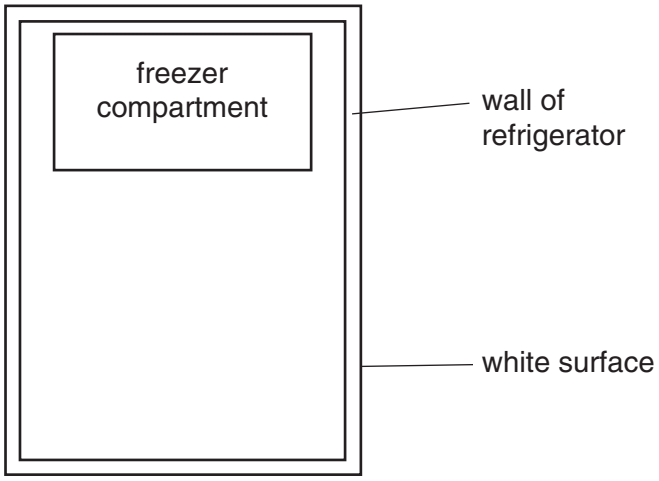


Fig. 10.1

(a) Explain fully how the rest of the refrigerator is cooled by convection currents.

.....

.....

.....

.....

.....[3]

(b) Explain why the white surface helps to keep the refrigerator cool.

.....

.....

.....[2]

11 **(a)** Gonorrhoea and AIDS are sexually transmitted diseases.
What is meant by a *sexually transmitted* disease?

.....[1]

(b) **(i)** State two signs of gonorrhoea in a male.

1. .....

2. .....[2]

(ii) How is gonorrhoea treated?

.....

.....[1]

(c) Explain why AIDS is much more dangerous than gonorrhoea.

.....

.....

.....[2]

(d) State a way, other than that in **(a)**, by which AIDS may be transmitted.

.....

.....[1]

[Turn over

12 Fig. 12.1 shows burning sodium being lowered into a gas jar of carbon dioxide.

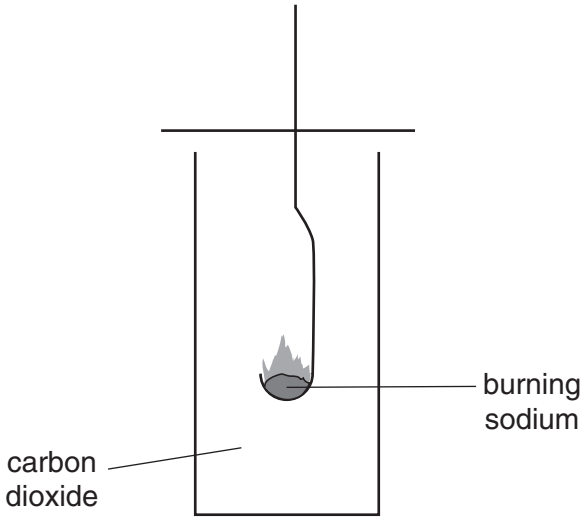


Fig. 12.1

The sodium burns to give a white solid and a black solid.

(a) Suggest the identity of the

white solid, ...

black solid. ..... [2]

(b) What type of reaction does the sodium undergo?

.....[1]

(c) When water is added to the products of the reaction, the white solid dissolves but the black solid does not dissolve.

(i) Suggest the type of bonding present in the white solid.

.....[1]

(ii) What process can be used to separate the black solid from the solution?

.....[1]

13 Liquid-in-glass thermometers may contain alcohol or mercury. Fig. 13.1 gives information about these liquids.

liquid	melting point/°C	boiling point/°C
alcohol	–117	78.5
mercury	–39	365

Fig. 13.1

(a) A liquid-in-glass thermometer is used to measure a temperature of –42 °C.

Which liquid is used in this thermometer? Give a reason for your choice.

.....

.....[1]

(b) Fig. 13.2 shows the structure of a liquid-in-glass thermometer.

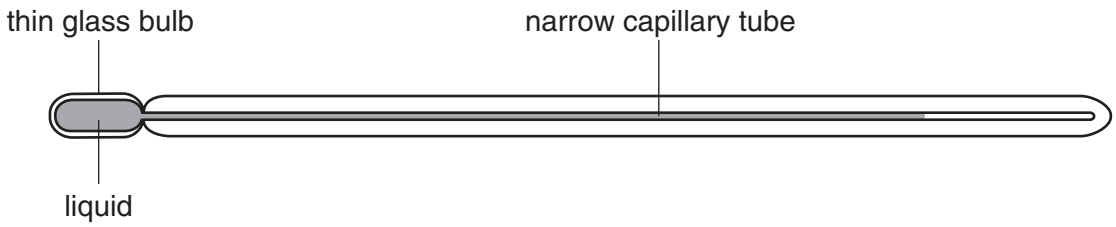


Fig. 13.2

(i) State why the glass wall of the bulb is thin.

.....

.....[1]

(ii) State why the capillary tube is narrow.

.....

.....[1]

(c) A thermometer must have a scale.

Explain why a mercury-in-glass thermometer is placed in melting ice and then placed in boiling water.

.....

.....

.....[2]

14 **(a)** State three conditions that are required for seeds to germinate.

1. .....

2. .....

3. .....[3]

(b) In an experiment to investigate the growth of pea seeds, two seed trays were prepared.
In tray 1, 10 seeds were planted in sand.
In tray 2, 10 seeds were planted in soil.

Both trays were watered regularly and kept under the same conditions for six weeks.

(i) Explain why the pea seeds in both trays grew equally well for the first two weeks.

.....

.....[1]

(ii) After six weeks, the seedlings growing in tray 2 were bigger than those in tray 1.
Explain why the soil in tray 2 was more fertile than the sand in tray 1.

.....

.....[1]

(iii) Suggest **one** way in which the seedlings in the sand could be made to grow better.

.....

.....[1]

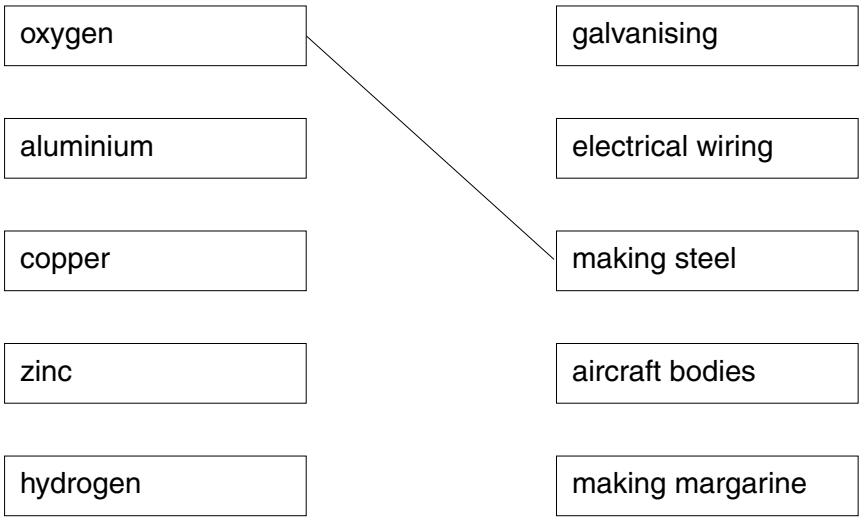
(c) Explain the importance of nitrogen-containing ions to the growing plants.

.....

.....[1]

15 In Fig. 15.1, the boxes on the left give the names of some elements and the boxes on the right show some uses of elements.

Draw a line between the boxes to link each element to its correct use. One of the lines has been drawn for you.



[4]

Fig. 15.1

16 Fig. 16.1 shows a battery of e.m.f. 6.0 V in series with two resistors. One of these resistors has a fixed resistance of 4.0 Ω.

(a) On Fig. 16.1, draw the symbol for a voltmeter, connected to measure the potential difference across the **fixed** resistor. [2]

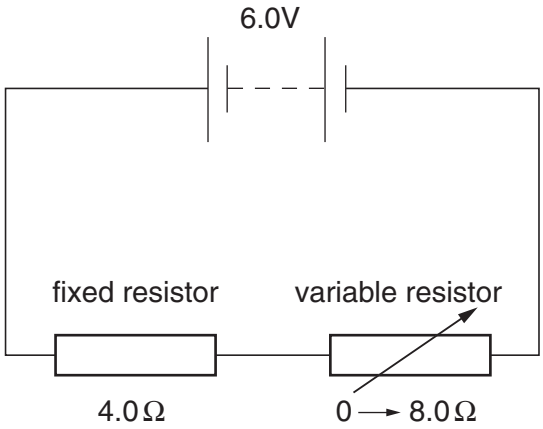


Fig. 16.1

(b) The variable resistor is adjusted until the voltmeter across the **fixed** resistor reads 4.0 V.

Calculate the potential difference across the variable resistor.

.....[1]

(c) The variable resistor can be changed from zero to 8.0 Ω. It is adjusted to give the **smallest** current in the circuit.

Calculate the value of this current.

.....[3]

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 Radius 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	a = relative atomic mass
X	X = atomic symbol
b	b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).