



BOTSWANA EXAMINATIONS COUNCIL  
Botswana General Certificate of Secondary Education

**SCIENCE : DOUBLE AWARD**

**0569/01**

Paper 1 Multiple Choice

**October/November 2018**

**1 hour 30 minutes**

Additional Materials: Multiple Choice Answer Sheet  
Soft Clean Eraser  
Soft Pencil (type B or HB)

**READ THESE INSTRUCTIONS FIRST**

**Do not open this booklet until you are told to do so.**

**Read the instructions on the separate Answer Sheet very carefully.**

Write your name, Centre number and candidate number in the spaces provided on the Answer Sheet unless this has already been done for you.

Sign your name in the space provided on the Answer Sheet.

There are **sixty** questions in this paper. Answer **all** questions. For each question, there are four possible answers **A, B, C** and **D**. Choose the **one** you consider correct and record your choice using a **soft pencil** on the separate Answer Sheet.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

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

You may use a calculator.

A copy of the Periodic Table is printed on page 24.

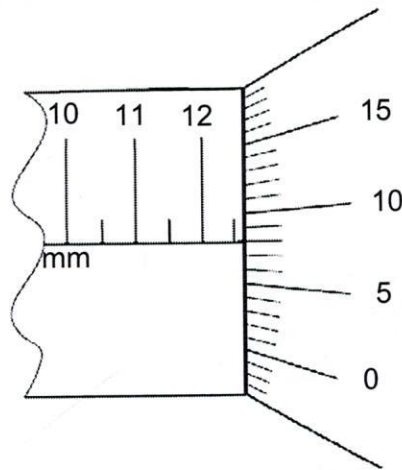
365

A018



This document consists of **22** printed pages and **2** blank pages.

- 1 The diagram shows part of a micrometer screw gauge scale that was used to measure the thickness of an iron rod.



What is the thickness of the iron rod?

- A 2.58 mm
  - B 12.58 mm ✓
  - C 13.30 mm
  - D 20.50 mm
- 2 Which quantity is measured in newton metres?
- A force ✓
  - B moment
  - C power
  - D speed
- 3 A bucket falls into a well from the ground level.  
The bucket takes 2.5 s to reach the water surface.

What is the distance moved by the bucket to the water surface?  
( $g = 10 \text{ m/s}^2$ )

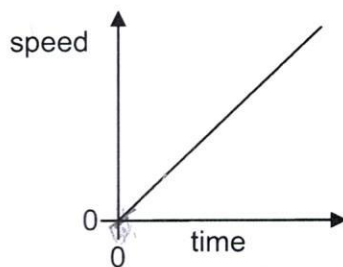
- A 12.50 m
- B 25.00 m
- C 31.25 m
- D 62.50 m



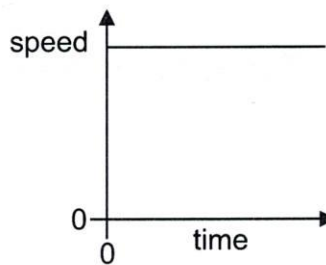
- 4 The diagrams show the speed-time graphs of some cars.

Which graph is for a car accelerating from rest?

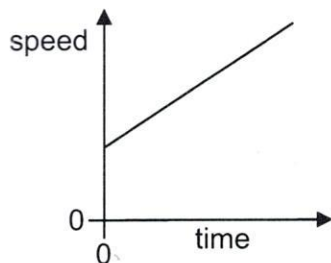
A



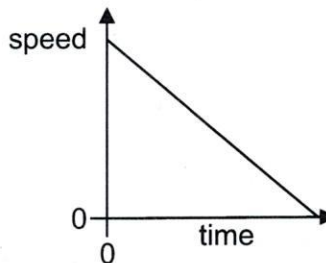
B



C



D



- 5 A solid is heated and it expands.

Which statement explains the change taking place in the solid?

- A the mass of particles increases
- B the number of particles increases
- C the particles increase in size
- D the space between particles increases

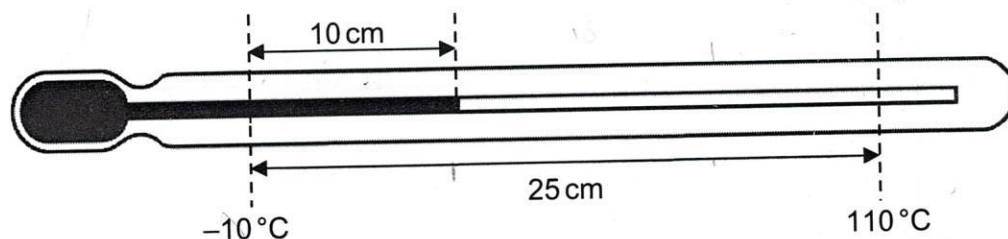
- 6 Methylated spirit is poured into an open container.  
After some time all the spirit has disappeared into the air.

Which process describes what has happened to the spirit?

- A boiling
- B condensation
- C evaporation
- D melting



- 7 The diagram shows a liquid-in-glass thermometer. The distance between  $-10^{\circ}\text{C}$  and  $110^{\circ}\text{C}$  is 25 cm.



What is the temperature when the end of the liquid thread is 10 cm from the  $-10^{\circ}\text{C}$  mark?

- A  $38^{\circ}\text{C}$   
 B  $40^{\circ}\text{C}$   
 C  $44^{\circ}\text{C}$   
 D  $48^{\circ}\text{C}$
- 8 What are the characteristics of an image formed by a magnifying glass?
- A real and erect  
 B real and inverted  
 C virtual and erect  
 D virtual and inverted
- 9 The diagram represents the electromagnetic wave spectrum with three components given.

radio waves	microwaves	1	2	3	4	gamma rays
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Which components are represented by the numbers 2 and 3?

	2	3
A	visible light	ultraviolet
B	visible light	infra-red
C	ultraviolet	visible light
D	ultraviolet	infra-red



- 10 A soldier fires a gun and hears an echo from a nearby cliff 2.5 s later. The speed of sound in air is 320 m/s.

How far is the cliff from the soldier?

- A 256 m
- B 400 m
- C 800 m
- D 1600 m

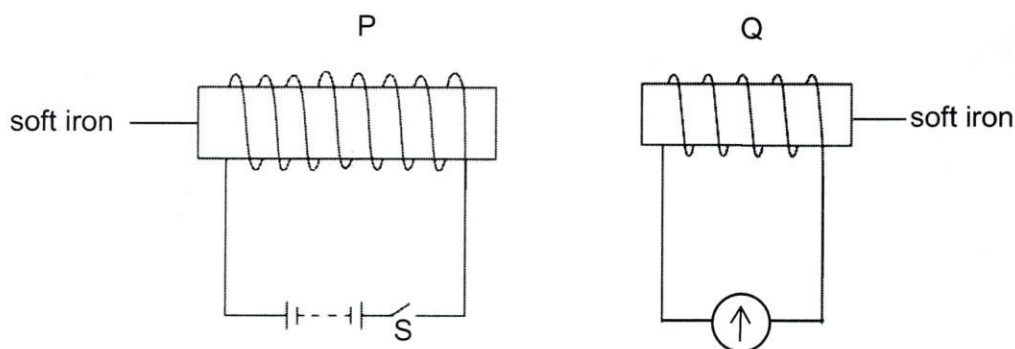
- 11 The list shows the stages of charging a suspended metallic sphere by induction. The stages are not in the correct order.

- (i) touch the sphere with a finger for a short period of time and remove the finger
- (ii) place a charged rod next to the sphere
- (iii) remove the rod

What is the correct order of the stages?

- A (ii), (i), (iii)
- B (iii), (i), (ii)
- C (ii), (iii), (i)
- D (iii), (ii), (i)

- 12 The diagram shows two coils, P and Q, wound around soft iron cores and placed next to each other. Coil P is connected to a battery and coil Q is connected to a centre zero galvanometer.

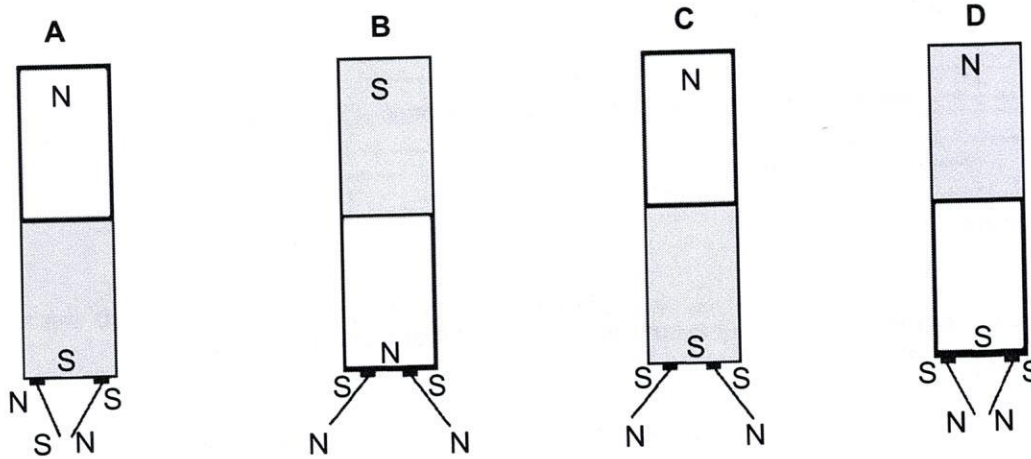


What observation would be made on the centre zero galvanometer when switch S is closed?

- A it deflects and returns to zero
- B it deflects continuously back and forth
- C it deflects to one end and remains there
- D it remains at the centre



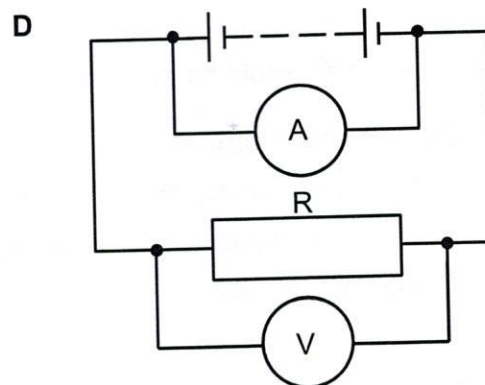
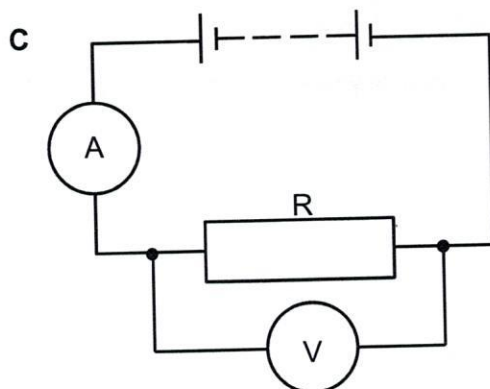
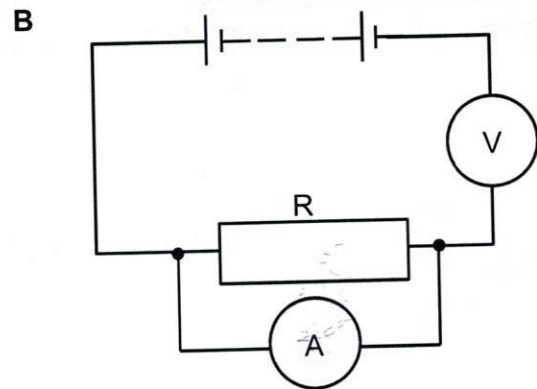
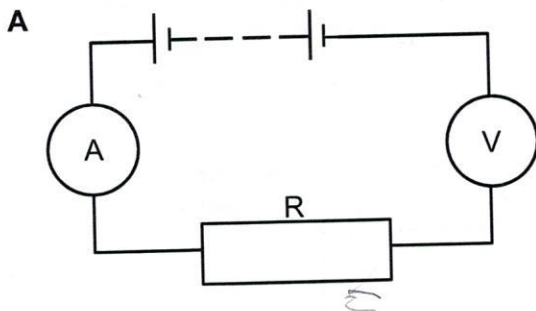
- 13 Which diagram correctly shows the standpoint and the polarities of two iron pins hanging from one end of a bar magnet?



- 14 Which electrical quantity is defined as "the rate of flow of electric charge"?

- A current
- B electromotive force
- C potential difference
- D power

- 15 Which circuit diagram shows the correct connection of an ammeter and a voltmeter in a circuit to determine the resistance of resistor R?



16 Which unit is equivalent to a volt?

- A joule/coulomb
- B joule/second
- C ohm/ampere
- D watt/coulomb

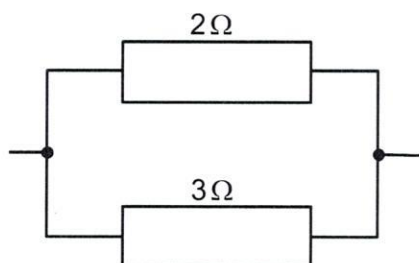
17 What is the most suitable fuse rating for an electric iron rated 2000W, 240V?

- A 5A
- B 7A
- C 8A
- D 10A

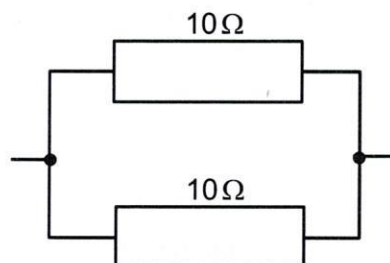
18 Some resistors are connected to give a total resistance of  $5.0\Omega$ .

Which diagram shows the arrangement of the resistors?

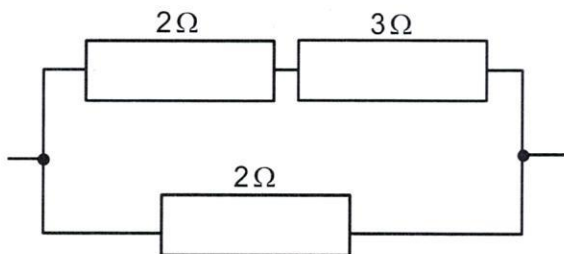
A



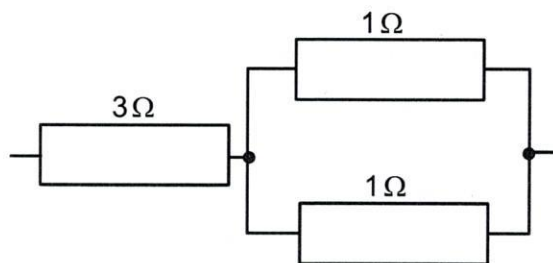
B



C



D

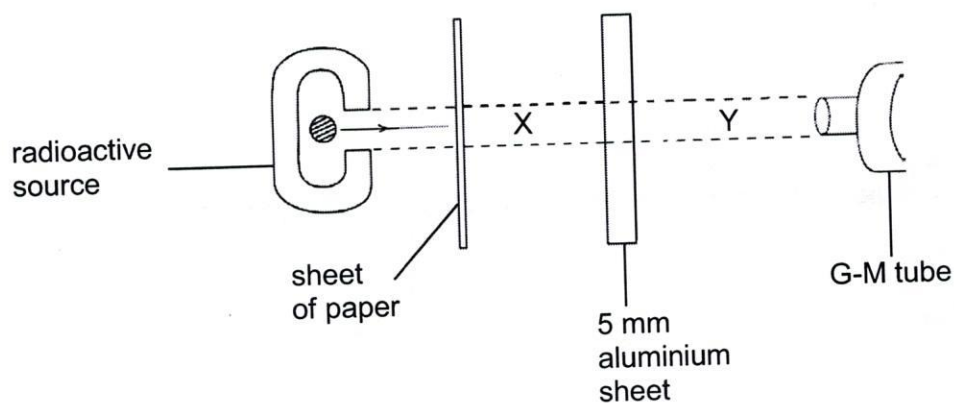


19 Which radioactive emissions are deflected by an electric field?

- A alpha and beta
- B alpha and gamma
- C alpha, beta and gamma
- D beta and gamma



- 20 A radioactive source that emits alpha, beta and gamma radiations is placed in front of a G-M tube. A sheet of paper and a 5 mm aluminium sheet are placed between the source and the G-M tube as shown in the diagram.



Which radiations are detected at positions X and Y?

	position X	position Y
<b>A</b>	alpha, gamma	gamma
<b>B</b>	beta, gamma	gamma
<b>C</b>	alpha, beta	beta
<b>D</b>	alpha, beta	alpha

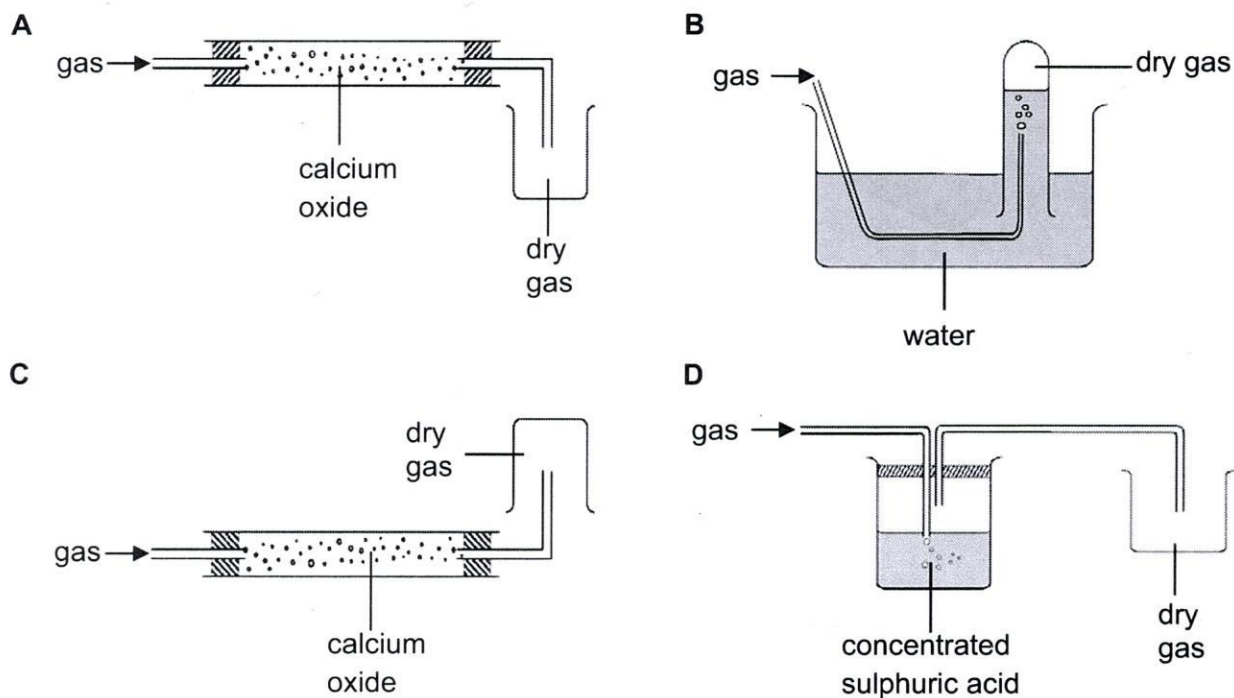
- 21 What does the nucleus of rhodium,  $^{103}_{45}\text{Rh}$  contain?

- A** 58 electrons and 45 neutrons
- B** 58 electrons and 58 protons
- C** 45 protons and 58 neutrons
- D** 45 protons and 103 neutrons





- 22 Which method is suitable for collecting an alkaline gas that is more dense than air and soluble in water?



- 23 Sodium nitrate can be prepared by titrating dilute nitric acid against sodium carbonate solution.

Which conclusion can be drawn from this information?

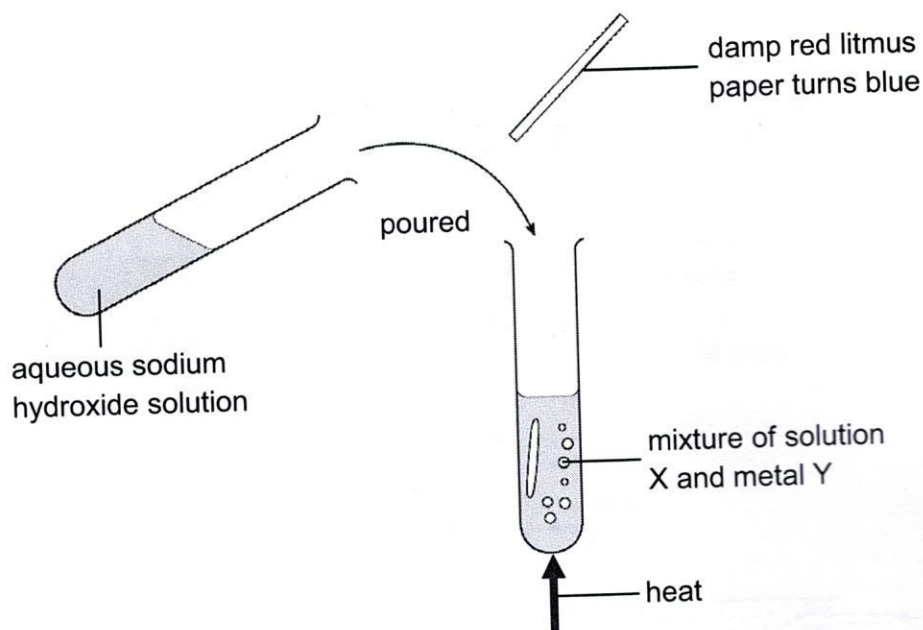
- A Sodium carbonate is a base.
  - B Sodium carbonate is soluble in water.
  - C Sodium nitrate is a base.
  - D Sodium nitrate is insoluble in water.
- 24 Metal X can be obtained from its ore by heating a mixture of the ore and carbon.

What could be metal X?

- A calcium
- B gold
- C sodium
- D zinc



- 25 Aqueous sodium hydroxide solution is added to a mixture of solution X and metal Y as shown.



What could solution X and metal Y be?

	solution X	metal Y
<b>A</b>	ammonium chloride	aluminium
<b>B</b>	ammonium chloride	zinc
<b>C</b>	sodium nitrate	aluminium
<b>D</b>	sodium nitrate	zinc

- 26 What is the mass of aluminium in 204 g of aluminium oxide,  $\text{Al}_2\text{O}_3$ ?

- A** 27 g
- B** 54 g
- C** 106 g
- D** 108 g

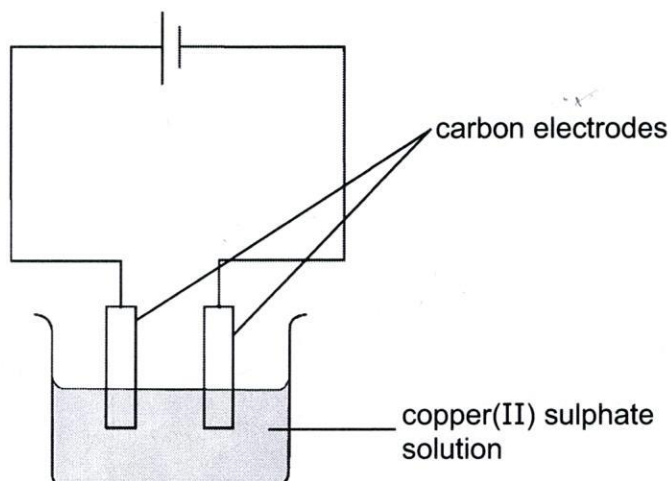
- 27 Which gas would diffuse most slowly?

- A** ammonia,  $\text{NH}_3$
- B** methane,  $\text{CH}_4$
- C** oxygen,  $\text{O}_2$
- D** sulphur dioxide,  $\text{SO}_2$



28 The diagram shows the electrolysis of copper(II) sulphate solution using carbon electrodes.

What is produced at the anode?



- A copper metal
- B copper(II) ions
- C hydrogen gas
- D oxygen gas

29 A sample of water forms some scum with soap solution before and after boiling.

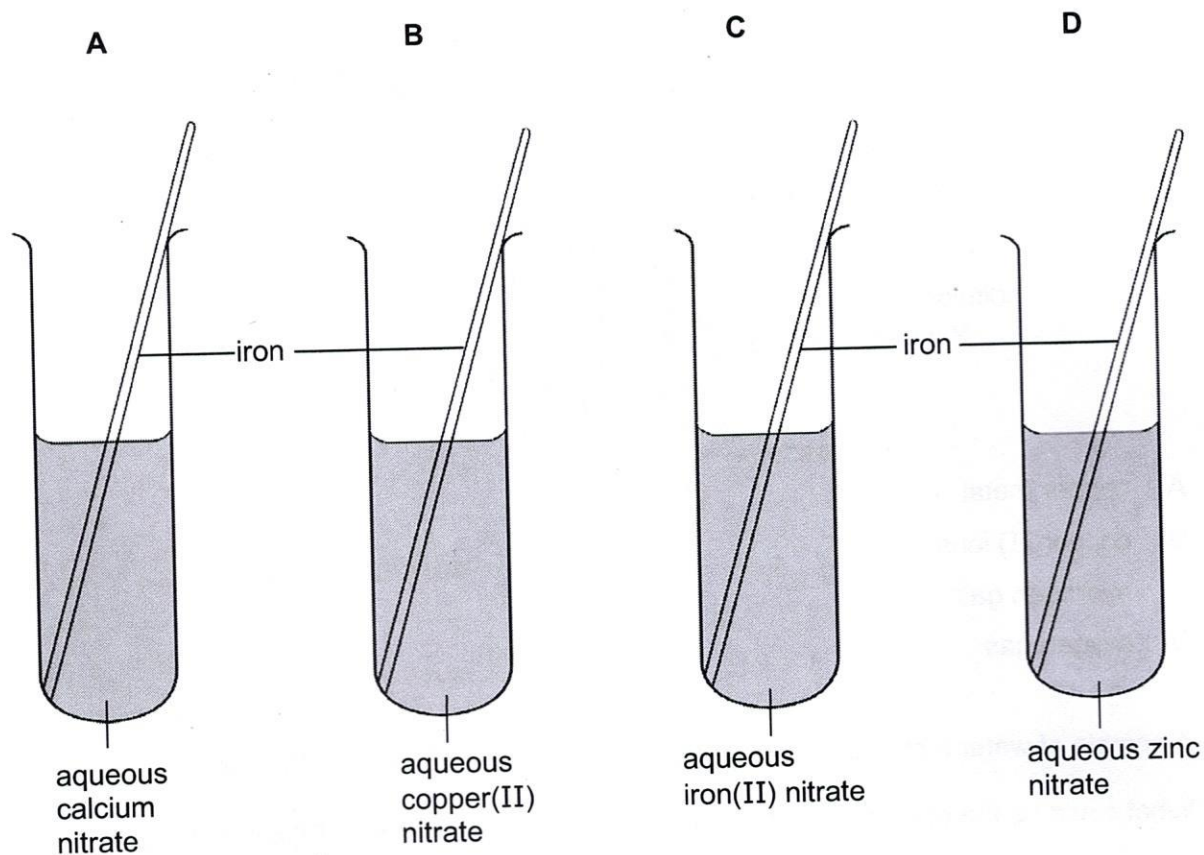
What could be the correct type of hardness and the salt present in the sample?

	type of hardness	salt present
A	permanent	calcium hydrogen carbonate
B	permanent	calcium sulphate
C	temporary	calcium hydrogen carbonate
D	temporary	calcium sulphate



- 30 A strip of iron is placed in each of the four test-tubes, with a solution of a different metal nitrate in each tube, as shown.

In which test-tube will a reaction take place?



- 31 The equation for the reaction of ethanol and oxygen is shown.



Which values of  $x$ ,  $y$  and  $z$  balance this equation?

	$x$	$y$	$z$
A	2	2	1
B	2	2	3
C	3	2	2
D	3	2	3



32 Which process is endothermic?

- A combustion
- B condensation
- C neutralization
- D photosynthesis

33 The equation for the reaction between calcium carbonate and  $0.2 \text{ mol/dm}^3$  hydrochloric acid is shown.



Which change will increase the rate of the reaction?

- A increasing the pressure
- B increasing the volume of the acid
- C using larger pieces of calcium carbonate
- D using powdered calcium carbonate

34 Why is magnesium **less electronegative** than chlorine?

Magnesium has fewer

- A electrons.
- B electrons in the outer shell.
- C number of shells.
- D protons.

35 What is the bonding type of sodium chloride and the bonding type of graphite?

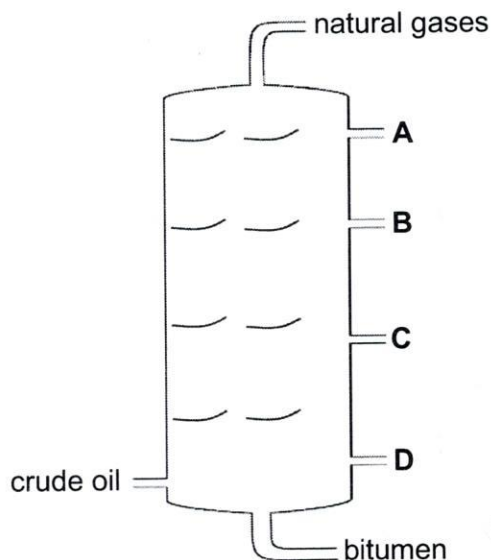
	sodium chloride	graphite
A	covalent	ionic
B	covalent	covalent
C	ionic	covalent
D	ionic	ionic





- 36 The diagram shows a fractionating column used to separate the components in crude oil.

Which fraction could be petrol?



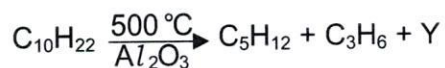
- 37 Which air pollutant **cannot** be controlled by the use of catalytic convertors?

- A carbon monoxide
- B oxides of nitrogen
- C sulphur dioxide
- D unburnt hydrocarbons

- 38 In which industrial process is chlorine used?

- A manufacturing of cement
- B manufacturing of glass
- C manufacturing of plastics
- D softening of hard water

- 39 An incomplete equation for the reaction of an alkane is shown.



What is the name of the reaction and the identity of Y?

	name of the reaction	identity of Y
A	cracking	$\text{C}_2\text{H}_4$
B	combustion	$\text{C}_2\text{H}_4$
C	oxidation	$\text{C}_8\text{H}_{18}$
D	reduction	$\text{C}_8\text{H}_{18}$



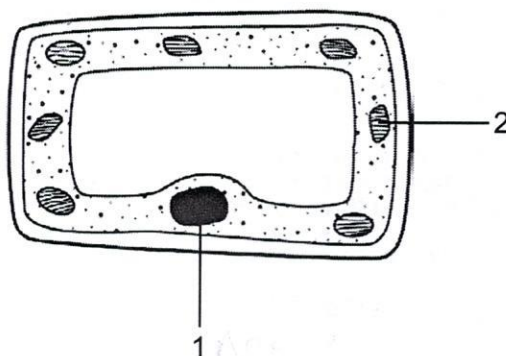
40 The equation for the reaction between zinc and hydrochloric acid is shown.



What is the ionic equation for the reaction between zinc and hydrochloric acid?

- A  $\text{Zn(s)} + 2\text{H(aq)} \longrightarrow \text{Zn}^{2+}\text{(aq)} + \text{H}_2\text{(g)}$   
 B  $\text{Zn(s)} + 2\text{H}^+\text{(aq)} \longrightarrow \text{Zn}^{2+}\text{(aq)} + \text{H}_2\text{(g)}$   
 C  $\text{Zn(s)} + \text{H}^+\text{(aq)} \longrightarrow \text{Zn}^+\text{(aq)} + \text{H}_2\text{(g)}$   
 D  $\text{Zn(s)} + \text{H}_2^+\text{(aq)} \longrightarrow \text{Zn}^{2+}\text{(aq)} + \text{H}_2\text{(g)}$

41 The diagram shows a plant cell.

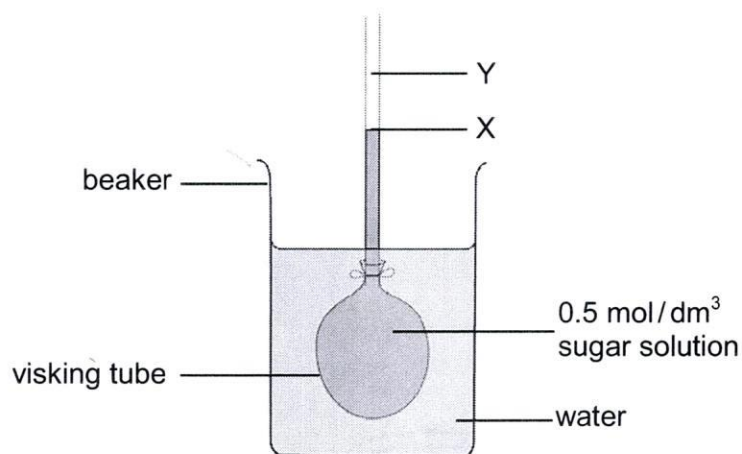


What are the functions of the numbered parts in the cell?

	1	2
A	controls activities of a cell	site for photosynthesis
B	controls activities of a cell	protein synthesis
C	protein synthesis	controls activities of a cell
D	site for respiration	site for photosynthesis



- 42 The diagram shows a set-up of an experiment done by a student. The liquid in the glass tube rose from point X to point Y.



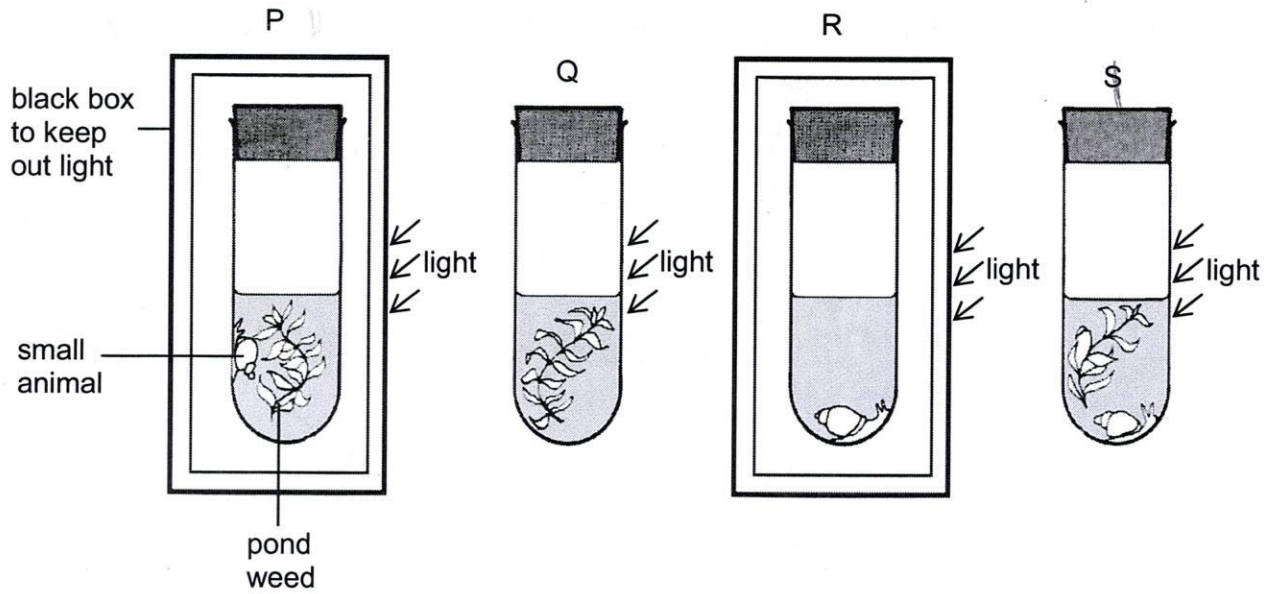
Which change can cause the liquid to rise higher than Y?

- A using 0.2 mol/dm<sup>3</sup> sugar solution in the beaker
  - B using 0.2 mol/dm<sup>3</sup> sugar solution in the Visking tube
  - C using 1.0 mol/dm<sup>3</sup> sugar solution in the beaker
  - D using 1.0 mol/dm<sup>3</sup> sugar solution in the Visking tube
- 43 By which process do green plants lose water through their leaves?
- A photosynthesis
  - B respiration
  - C translocation
  - D transpiration
- 44 Which word equation represents anaerobic respiration in yeast?

- A glucose  $\longrightarrow$  ethanol + carbon dioxide + energy
- B glucose  $\longrightarrow$  ethanol + water + energy
- C glucose  $\longrightarrow$  lactic acid + energy
- D glucose  $\longrightarrow$  lactic acid + water + energy



45 The diagrams show set-ups used to investigate photosynthesis and respiration.



In which **two** set-ups are both photosynthesis and respiration taking place?

- A P and R
- B P and S
- C Q and R
- D Q and S

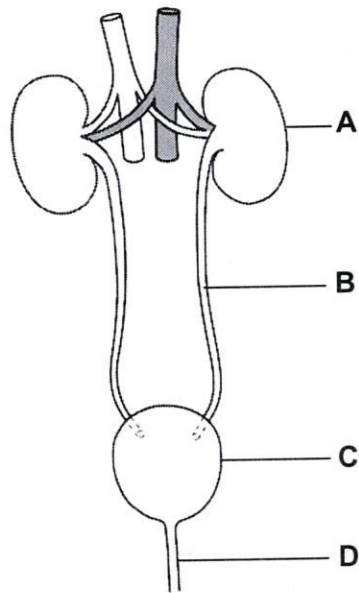
46 Which of the following is **not** an effect of adrenaline?

- A increased breathing rate
- B increased digestion
- C increased heart rate
- D increased sweating



47 The diagram shows part of the urinary system.

Which part of the system removes urea from the blood?



48 Which conditions are needed for seeds to germinate?

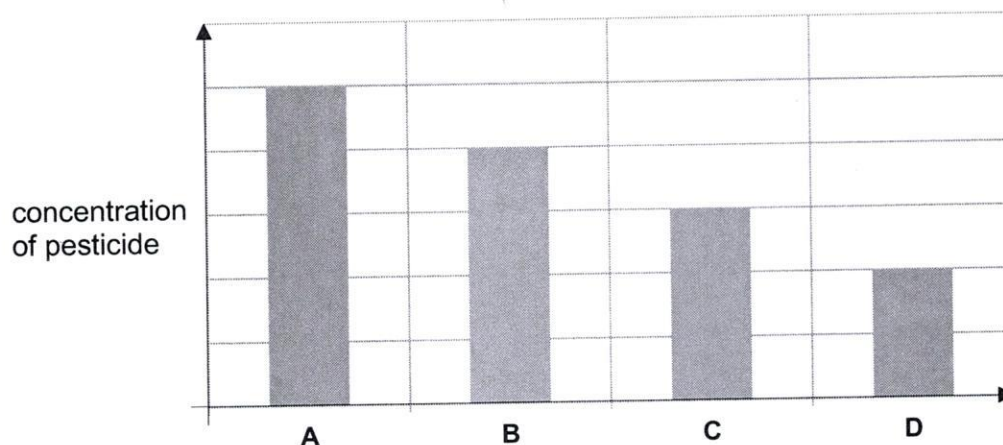
- A carbon dioxide and light
- B carbon dioxide and water
- C light and suitable temperature
- D water and suitable temperature

49 A food chain is shown. A farmer treated the cabbages with a pesticide.

cabbages → caterpillars → swallows → vultures

The bar chart represents the concentration of the pesticide in the bodies of each organism in the chain.

Which bar represents the concentration of the pesticide in the swallows?





- 50 A woman has a 28 day menstrual cycle. She starts her menstruation on 10 October.

On which date is the woman most likely to fall pregnant?

- A 14 October
- B 24 October
- C 5 November
- D 10 November

- 51 In which part of the female reproductive system does implantation take place?

- A ovary
- B oviduct
- C uterus
- D vagina

- 52 Which row shows sexually transmitted infections that can be treated and that cannot be treated with antibiotics?

	gonorrhoea	HIV/AIDS	syphilis	<b>key</b> ✓ = can be treated with antibiotics x = cannot be treated with antibiotics
<b>A</b>	x	✓	✓	
<b>B</b>	✓	x	✓	
<b>C</b>	✓	x	x	
<b>D</b>	x	✓	x	

- 53 The table shows changes in the concentrations of blood components as the blood flows in and out of an organ.

blood component	blood into the organ	blood out of the organ
CO <sub>2</sub>	low	high
O <sub>2</sub>	high	low
urea	low	high

Which organ has the blood passed through?

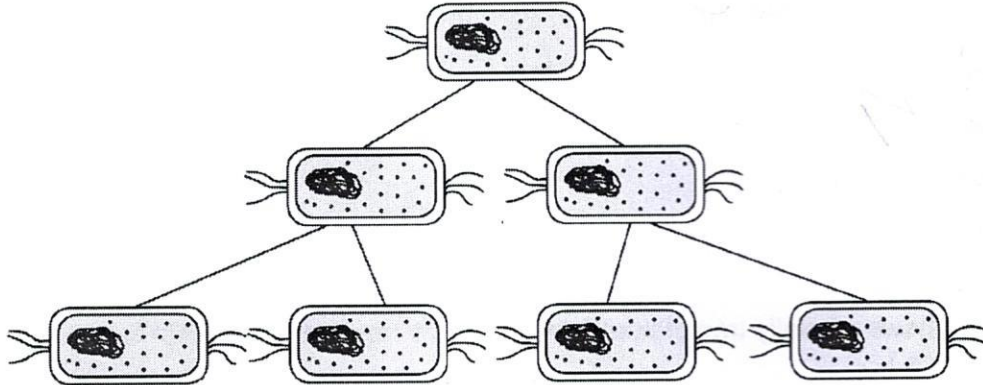
- A kidney
- B liver
- C lungs
- D stomach



54 Which of the following elements are found in carbohydrates?

- A carbon, hydrogen, oxygen
- B carbon, oxygen, nitrogen
- C carbon, phosphorus, nitrogen
- D carbon, hydrogen, phosphorus

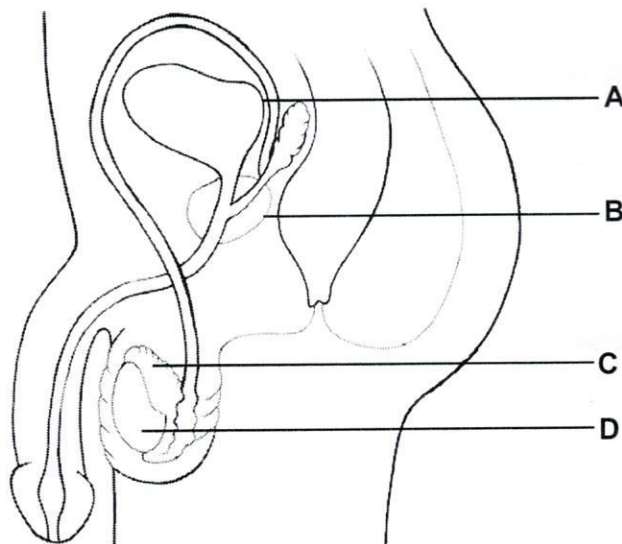
55 The diagram shows an example of asexual reproduction.



Which method of asexual reproduction is shown in the diagram?

- A binary fission
- B budding
- C grafting
- D spore formation

56 Which part on the diagram produces a fluid that enables sperm cells to swim?



57 A person walks from a cold room into a warm room.

Which of these reactions is the first to occur?

- A dilation of arterioles under the skin
- B more warm blood flowing close to the skin surface
- C stimulation of receptors in the skin
- D sweating

58 Which type of organism is used industrially to make bread?

- A algae
- B bacteria
- C fungus
- D virus

59 Which component of blood has a nucleus?

- A platelets
- B plasma
- C red blood cells
- D white blood cells

60 Which type of birth control is the most effective?

- A hormonal
- B mechanical
- C natural
- D surgical



# DATA SHEET

## The Periodic Table of the Elements

Group									
I	II	III	IV	V	VI	VII	0		
1 <b>H</b> Hydrogen									4 <b>He</b> Helium
3 <b>Li</b> Lithium	4 <b>Be</b> Beryllium							10 <b>Ne</b> Neon	2 <b>He</b> Helium
11 <b>Na</b> Sodium	12 <b>Mg</b> Magnesium	13 <b>Al</b> Aluminium	14 <b>Si</b> Silicon	15 <b>P</b> Phosphorus	16 <b>S</b> Sulphur	17 <b>Cl</b> Chlorine	18 <b>Ar</b> Argon	10 <b>Ne</b> Neon	2 <b>He</b> Helium
19 <b>K</b> Potassium	20 <b>Ca</b> Calcium	21 <b>Sc</b> Scandium	22 <b>Ti</b> Titanium	23 <b>V</b> Vanadium	24 <b>Cr</b> Chromium	25 <b>Mn</b> Manganese	26 <b>Fe</b> Iron	27 <b>Co</b> Cobalt	28 <b>Ni</b> Nickel
37 <b>Rb</b> Rubidium	38 <b>Sr</b> Strontium	39 <b>Y</b> Yttrium	40 <b>Zr</b> Zirconium	41 <b>Nb</b> Niobium	42 <b>Mo</b> Molybdenum	43 <b>Tc</b> Technetium	44 <b>Ru</b> Ruthenium	45 <b>Rh</b> Rhodium	46 <b>Pd</b> Palladium
55 <b>Cs</b> Caesium	56 <b>Ba</b> Barium	57 <b>La</b> Lanthanum	58 <b>Ce</b> Cerium	59 <b>Pr</b> Praseodymium	60 <b>Nd</b> Neodymium	61 <b>Pm</b> Promethium	62 <b>Sm</b> Samarium	63 <b>Eu</b> Europium	64 <b>Gd</b> Gadolinium
87 <b>Fr</b> Francium	88 <b>Ra</b> Radium	89 <b>Ac</b> Actinium	90 <b>Th</b> Thorium	91 <b>Pa</b> Protactinium	92 <b>U</b> Uranium	93 <b>Np</b> Neptunium	94 <b>Pu</b> Plutonium	95 <b>Am</b> Americium	96 <b>Cm</b> Curium
83 <b>Bi</b> Bismuth	84 <b>Po</b> Polonium	85 <b>At</b> Astatine	86 <b>Rn</b> Radon	87 <b>Fr</b> Francium	88 <b>Ra</b> Radium	89 <b>Ac</b> Actinium	90 <b>Th</b> Thorium	91 <b>Pa</b> Protactinium	92 <b>U</b> Uranium
151 <b>Lu</b> Lutetium	152 <b>Hf</b> Hafnium	153 <b>Ta</b> Tantalum	154 <b>W</b> Tungsten	155 <b>Re</b> Rhenium	156 <b>Os</b> Osmium	157 <b>Ir</b> Iridium	158 <b>Pt</b> Platinum	159 <b>Au</b> Gold	160 <b>Hg</b> Mercury
173 <b>Yb</b> Ytterbium	174 <b>Lu</b> Lutetium	175 <b>Hf</b> Hafnium	176 <b>Ta</b> Tantalum	177 <b>W</b> Tungsten	178 <b>Re</b> Rhenium	179 <b>Os</b> Osmium	180 <b>Ir</b> Iridium	181 <b>Pt</b> Platinum	182 <b>Au</b> Gold
103 <b>Lr</b> Lawrencium	104 <b>No</b> Nobelium	105 <b>Md</b> Mendelevium	106 <b>Fm</b> Fermium	107 <b>Es</b> Einsteinium	108 <b>Cf</b> Californium	109 <b>Bk</b> Berkelium	110 <b>Cm</b> Curium	111 <b>Bk</b> Berkelium	112 <b>Cf</b> Californium
71 <b>Lu</b> Lutetium	72 <b>Hf</b> Hafnium	73 <b>Ta</b> Tantalum	74 <b>W</b> Tungsten	75 <b>Re</b> Rhenium	76 <b>Os</b> Osmium	77 <b>Ir</b> Iridium	78 <b>Pt</b> Platinum	79 <b>Au</b> Gold	80 <b>Hg</b> Mercury
101 <b>Md</b> Mendelevium	102 <b>No</b> Nobelium	103 <b>Lr</b> Lawrencium	104 <b>Lu</b> Lutetium	105 <b>Hf</b> Hafnium	106 <b>Ta</b> Tantalum	107 <b>W</b> Tungsten	108 <b>Re</b> Rhenium	109 <b>Os</b> Osmium	110 <b>Ir</b> Iridium
100 <b>Fm</b> Fermium	101 <b>Md</b> Mendelevium	102 <b>No</b> Nobelium	103 <b>Lr</b> Lawrencium	104 <b>Lu</b> Lutetium	105 <b>Hf</b> Hafnium	106 <b>Ta</b> Tantalum	107 <b>W</b> Tungsten	108 <b>Re</b> Rhenium	109 <b>Os</b> Osmium
69 <b>Tm</b> Thulium	70 <b>Yb</b> Ytterbium	71 <b>Lu</b> Lutetium	72 <b>Hf</b> Hafnium	73 <b>Ta</b> Tantalum	74 <b>W</b> Tungsten	75 <b>Re</b> Rhenium	76 <b>Os</b> Osmium	77 <b>Ir</b> Iridium	78 <b>Pt</b> Platinum
86 <b>Rn</b> Radon	87 <b>Fr</b> Francium	88 <b>Ra</b> Radium	89 <b>Ac</b> Actinium	90 <b>Th</b> Thorium	91 <b>Pa</b> Protactinium	92 <b>U</b> Uranium	93 <b>Np</b> Neptunium	94 <b>Pu</b> Plutonium	95 <b>Am</b> Americium
54 <b>Xe</b> Xenon	55 <b>Cs</b> Caesium	56 <b>Ba</b> Barium	57 <b>La</b> Lanthanum	58 <b>Ce</b> Cerium	59 <b>Pr</b> Praseodymium	60 <b>Nd</b> Neodymium	61 <b>Pm</b> Promethium	62 <b>Sm</b> Samarium	63 <b>Eu</b> Europium
131 <b>Xe</b> Xenon	132 <b>Ba</b> Barium	133 <b>Cs</b> Caesium	134 <b>La</b> Lanthanum	135 <b>Ce</b> Cerium	136 <b>Pr</b> Praseodymium	137 <b>Nd</b> Neodymium	138 <b>Pm</b> Promethium	139 <b>Sm</b> Samarium	140 <b>Eu</b> Europium
84 <b>Kr</b> Krypton	85 <b>Br</b> Bromine	86 <b>Rn</b> Radon	87 <b>Fr</b> Francium	88 <b>Ra</b> Radium	89 <b>Ac</b> Actinium	90 <b>Th</b> Thorium	91 <b>Pa</b> Protactinium	92 <b>U</b> Uranium	93 <b>Np</b> Neptunium
36 <b>Kr</b> Krypton	37 <b>Br</b> Bromine	38 <b>Kr</b> Krypton	39 <b>Y</b> Yttrium	40 <b>Zr</b> Zirconium	41 <b>Nb</b> Niobium	42 <b>Mo</b> Molybdenum	43 <b>Tc</b> Technetium	44 <b>Ru</b> Ruthenium	45 <b>Rh</b> Rhodium
18 <b>Ar</b> Argon	19 <b>F</b> Fluorine	20 <b>Ne</b> Neon	21 <b>Sc</b> Scandium	22 <b>Ti</b> Titanium	23 <b>V</b> Vanadium	24 <b>Cr</b> Chromium	25 <b>Mn</b> Manganese	26 <b>Fe</b> Iron	27 <b>Co</b> Cobalt
10 <b>Ne</b> Neon	11 <b>Na</b> Sodium	12 <b>Mg</b> Magnesium	13 <b>Al</b> Aluminium	14 <b>Si</b> Silicon	15 <b>P</b> Phosphorus	16 <b>S</b> Sulphur	17 <b>Cl</b> Chlorine	18 <b>Ar</b> Argon	19 <b>F</b> Fluorine
2 <b>He</b> Helium	3 <b>Li</b> Lithium	4 <b>Be</b> Beryllium	5 <b>B</b> Boron	6 <b>C</b> Carbon	7 <b>N</b> Nitrogen	8 <b>O</b> Oxygen	9 <b>F</b> Fluorine	10 <b>Ne</b> Neon	11 <b>Na</b> Sodium

\*58-71 Lanthanoid series  
†90-103 Actinoid series

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

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