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5129/02

May/June 2007

2 hours 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 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

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

- 1 A nucleus of ${}_{11}^{24}\text{Na}$ emits a beta-particle to form a nucleus of magnesium, Mg.

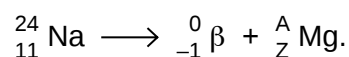
(a) For the ${}_{11}^{24}\text{Na}$ nucleus,

(i) state the number of protons,

(ii) calculate the number of neutrons.

[2]

(b) The decay of ${}_{11}^{24}\text{Na}$ is described by the equation



Calculate the values of A and Z.

A =

Z =

[2]

- 2 Sound and light are both waves. Sound is a longitudinal wave.

Complete the following sentences.

Light waves are not longitudinal but are

In a vacuum, light travels at a speed of m/s.

The distance between one crest of a wave and the next crest is called the
..... of the wave.

The number of complete waves produced in one second is called the
..... of the wave.

[4]

- 3 Fig. 3.1 shows an experiment about the rusting of iron filings. As the iron rusts, the level of the water rises in the inverted test-tube.

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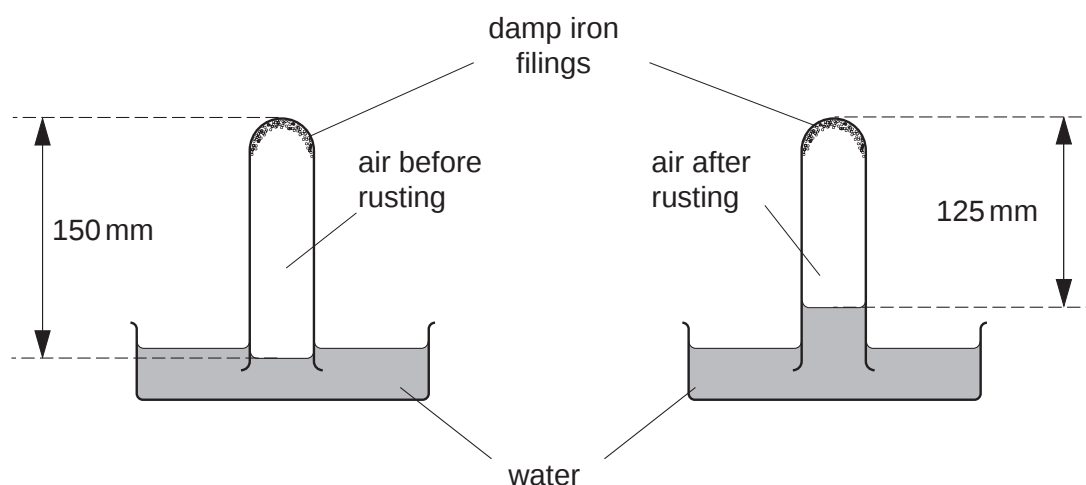


Fig. 3.1

- (a) Use Fig. 3.1 to calculate how far up the test-tube the water rises.

..... [1]

- (b) Which gas in the air is used up during rusting?

..... [1]

- (c) In addition to this gas, what other substance is required for iron to rust?

..... [1]

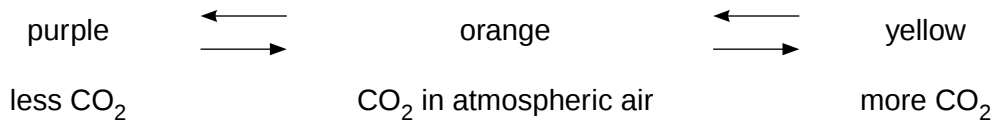
- (d) (i) Iron may be prevented from rusting by galvanising.
Explain the meaning of the term *galvanising*.

..... [2]

- (ii) State **one** other way by which iron may be prevented from rusting.

..... [1]

- 4 Hydrogen carbonate indicator solution is used to show the amount of carbon dioxide, CO_2 , passed through it. The solution changes colour as shown below.



- (a) Fig. 4.1 shows a bottle containing hydrogen carbonate indicator solution.

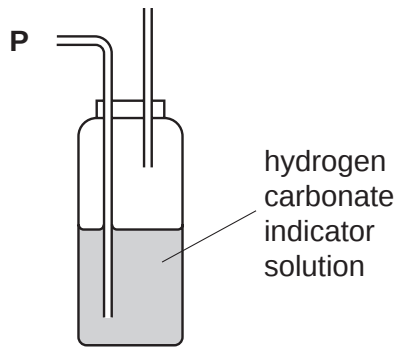


Fig. 4.1

A person breathes out through tube **P** five or six times.

What colour does the indicator solution become? [1]

- (b) Fig. 4.2 shows apparatus used in an experiment.

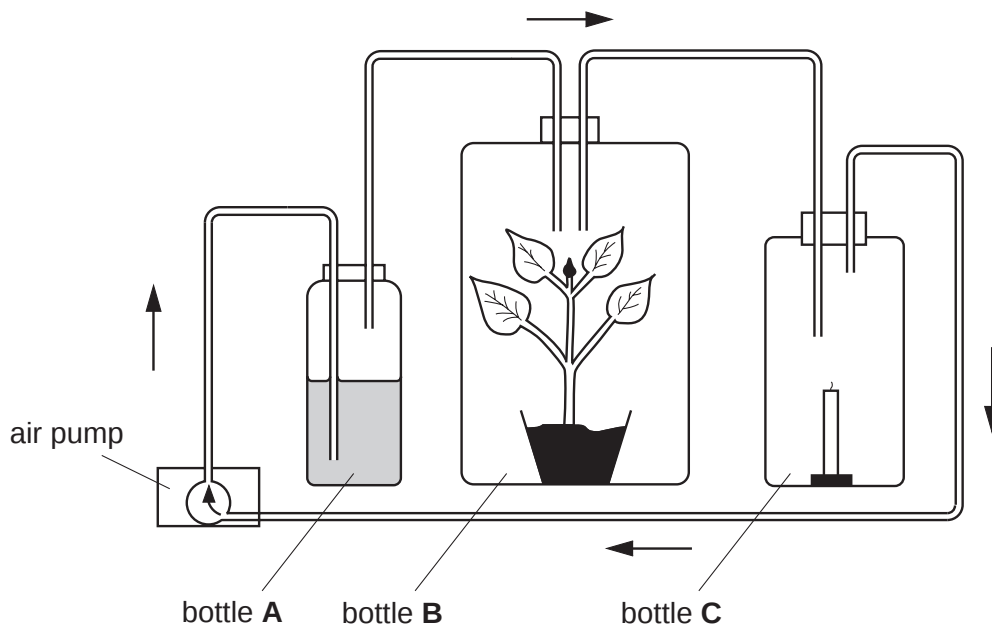


Fig. 4.2

Bottle **A** contains hydrogen carbonate indicator solution.
 Bottle **B** contains a green plant.
 Bottle **C** contains a candle.

The candle is lit and a black cloth is placed over bottle **B**.

The air pump moves air through all three bottles in the direction shown by the arrows.

The hydrogen carbonate indicator solution is orange at the start of the experiment.

- (i) State the colour change that will occur in the indicator solution in bottle **A** during the experiment.

..... [1]

- (ii) The candle in bottle **C** is extinguished and the black cloth is removed from bottle **B**. The air continues to circulate.

1. Name the process that starts when the plant is in the light.

..... [1]

2. Write a word or symbol equation for this process.

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

3. What colour change now occurs slowly in the indicator solution?

..... [1]

- (iii) The process named in **(b)(ii)** has a waste product that may be excreted.

1. State what is meant by *excretion*.

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

2. Name the waste product and explain why it may **not** be excreted.

name

explanation

..... [2]

5 Fig. 5.1 shows a lighting circuit.

For
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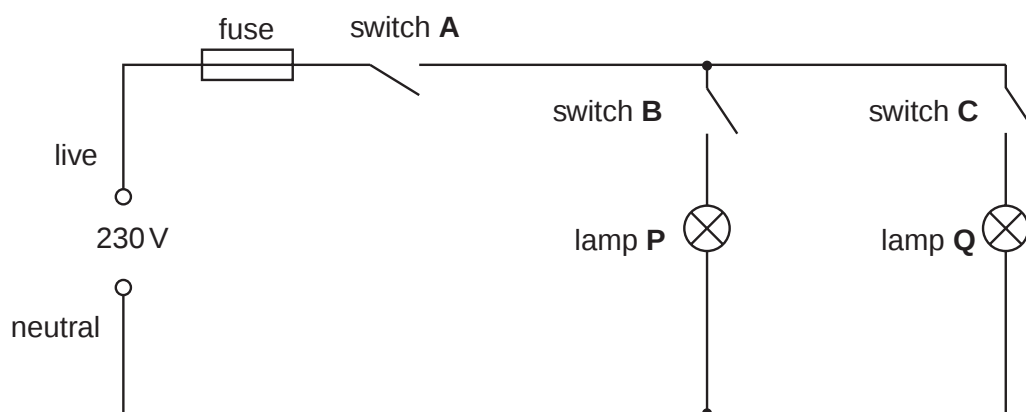


Fig. 5.1

- (a) Switches **A** and **B** are closed. Switch **C** remains open.

State which lamp or lamps, if any, are lit. [1]

- (b) When all the switches are closed, the voltage across lamp **Q** is 230 V and the current through it is 0.5 A.

- (i) Calculate the resistance of lamp **Q**.

[3]

- (ii) State the voltage across lamp **P**. [1]

- (iii) Lamps **P** and **Q** are identical and are at normal brightness.
Calculate the current through the fuse.

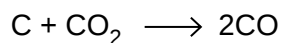
..... A [1]

- (c) State the energy changes taking place inside a lamp at normal brightness.

..... energy is being changed into

..... and [2]

- 6 When carbon dioxide and carbon are heated together, carbon monoxide is produced. The equation for the reaction is



For
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- (a) Calculate the relative molecular mass of

(i) carbon dioxide,

(ii) carbon monoxide. [2]

- (b) Calculate the mass of carbon monoxide produced from 2.2 g of carbon dioxide.

.....

..... [2]

- (c) Carbon monoxide is a pollutant of the air.

(i) Explain how carbon monoxide gets into the air.

..... [1]

(ii) Why is pollution of the air by carbon monoxide harmful?

..... [1]

7 Fig. 7.1 is a diagram of a plant cell.

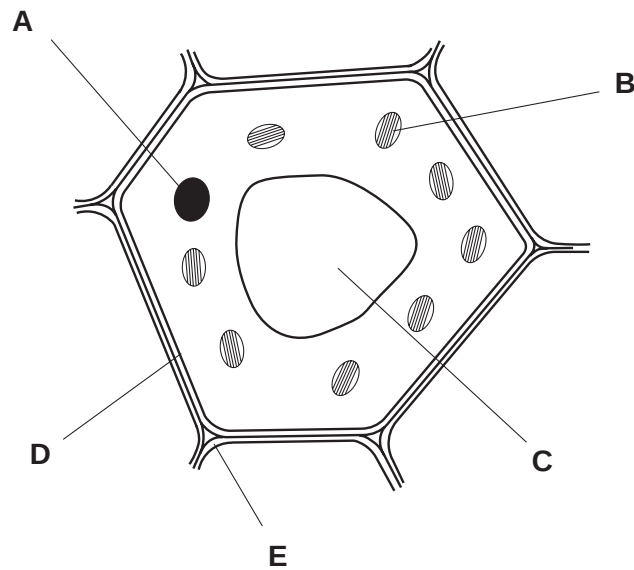


Fig. 7.1

(a) (i) State the letters of **two** parts of the cell in Fig. 7.1 that show it is a plant cell.

..... and [2]

(ii) State the names of these two parts.

..... and [2]

(b) State the names of three parts that are found in **both** plant cells **and** animal cells.

1.

2.

3. [3]

- 8 Fig. 8.1 shows a pin in front of a plane mirror. The position of the image of the pin is also shown.

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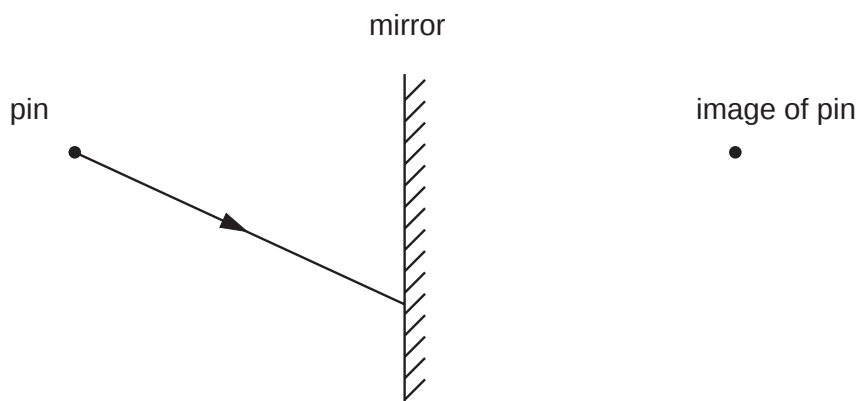


Fig. 8.1

Fig. 8.1 also shows a ray of light incident on the mirror.

- (a) On Fig. 8.1, draw the reflected ray. [2]
- (b) Fig. 8.2 shows a ray of light entering a block of plastic.

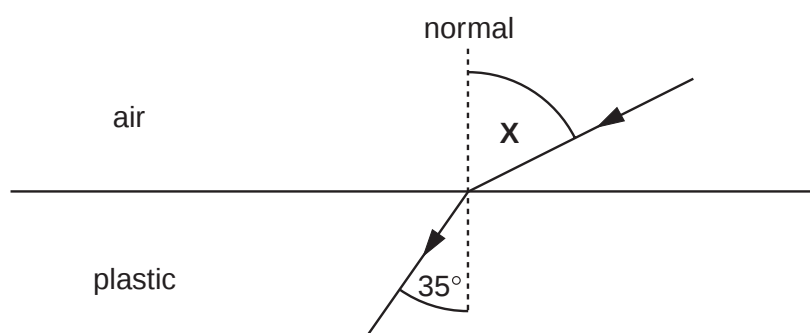


Fig. 8.2

The angle of incidence is **X** and the angle of refraction is 35°.

- (i) State the equation used to calculate refractive index.

[1]

- (ii) The plastic has a refractive index of 1.45.
Calculate angle **X**.

angle = [2]

- 9 (a) In Fig. 9.1, the boxes on the left give the names of some fractions obtained from the fractional distillation of petroleum (crude oil). The boxes on the right show the uses of these fractions. Draw lines between the boxes to link each fraction with its correct use.

fractions	uses
paraffin	making roads
bitumen	jet aircraft fuel
heavy oils	fuel for cars
petrol	waxes and polishes

Fig. 9.1

[4]

- (b) The fractions obtained from crude oil contain hydrocarbons from the homologous series called alkanes.

- (i) State **one** characteristic of a homologous series.

..... [1]

- (ii) Octane is an alkane with eight carbon atoms.

State the molecular formula of octane. [1]

- 10 Fig. 10.1 shows a bar magnet pushed slowly into a coil of wire. The ammeter measures a very small current in the positive direction.

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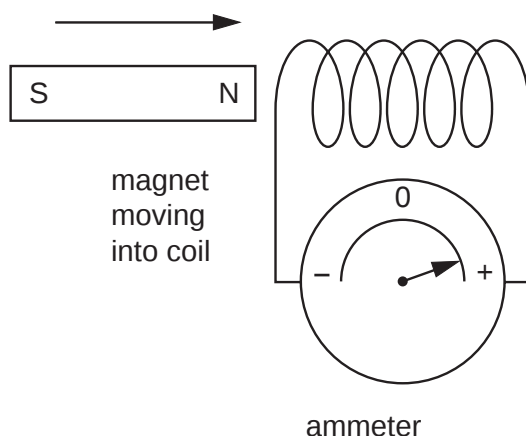


Fig. 10.1

Use the following phrases when answering the questions below.

larger current smaller current no current current in opposite direction

(a) State what happens when

- (i) the North pole of the magnet is pushed **more quickly** into the coil,

.....

- (ii) the South pole of the magnet is pushed into the coil,

.....

- (iii) the magnet is inside the coil but is **not** moving.

..... [3]

(b) The number of turns of wire on the coil is decreased.

The North pole of the magnet is pushed slowly into the coil.

How is the ammeter reading different from that shown in Fig. 10.1?

..... [1]

- 11** Equal volumes of the same hydrochloric acid solution are placed into three separate test-tubes. Equal sized pieces of the metals, copper, iron and magnesium, are dropped into the test-tubes.

The results are shown in Fig. 11.1.

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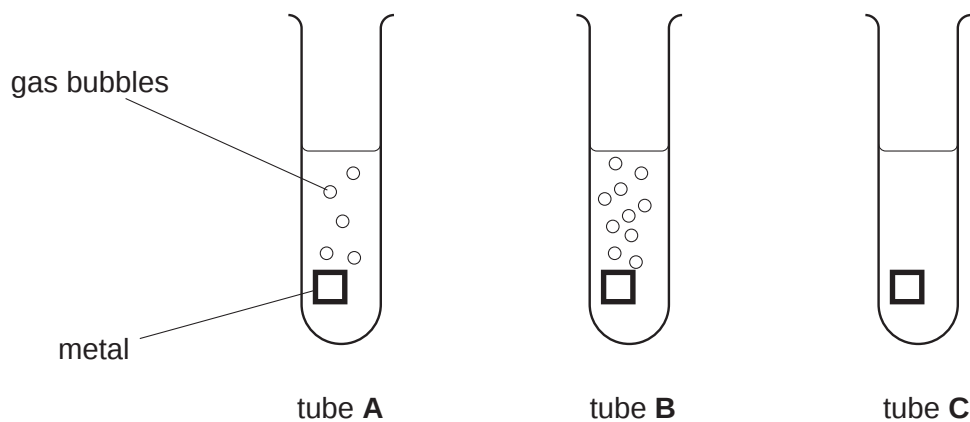


Fig. 11.1

(a) Name the gas produced in tubes **A** and **B**. [1]

(b) Describe a test which shows that hydrochloric acid is acidic.

test

result [2]

(c) (i) Which tube contains copper?

(ii) Which tube contains magnesium? [2]

- 12 (a) Fig. 12.1 represents blood flowing from the heart to the lungs and back to the heart.

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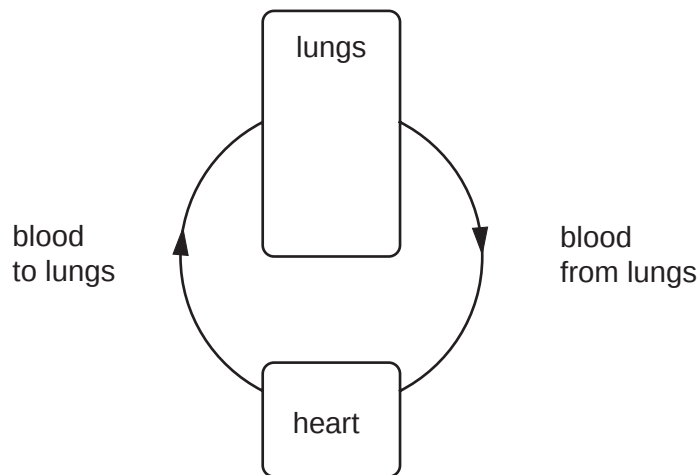


Fig. 12.1

- (i) State the type of blood vessel that carries blood from the heart to the lungs.

..... [1]

- (ii) Describe two changes that take place in the blood as it passes through the lungs.

1.

.....

2.

..... [4]

- (b) A sharp stone cuts a person's foot, which then bleeds.

Explain the role of each of the following components of blood, as a result of the cut.

platelets

.....

white blood cells

..... [4]

- 13** Fig. 13.1 shows two bar magnets and a piece of iron. One of the bar magnets has its two poles marked.

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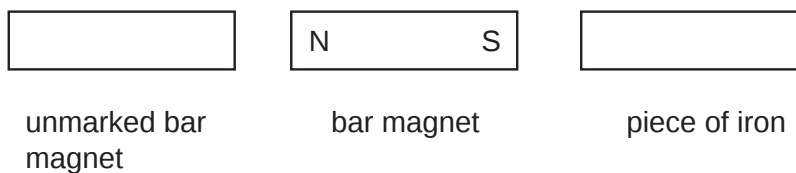


Fig. 13.1

- (a) (i) The two bar magnets are repelling each other.
On Fig. 13.1, mark the two poles of the unmarked bar magnet.
- (ii) The iron becomes magnetised and is attracted to the bar magnet next to it.
On Fig. 13.1, mark the two poles of the piece of iron. [2]

- (b) Iron is a magnetic material.

Name another magnetic material. [1]

- (c) Electromagnets are sometimes used instead of bar magnets.
State two ways in which the strength of an electromagnet may be changed.

1.

2. [2]

- 14** Potassium is a metal in Group I of the Periodic Table. It reacts violently with chlorine to produce potassium chloride.

- (a) How many electrons are in the outer shell of a potassium atom?

..... [1]

- (b) Write a balanced equation for the reaction between potassium and chlorine.

..... [2]

- (c) State the type of bonding present in potassium chloride.

..... [1]

- (d) Potassium reacts with carbon dioxide producing a white solid and a black solid.
Suggest the products of the reaction.

white solid

black solid

[2]

- 15** A student carries out an experiment using a spring to produce the load-extension graph of Fig. 15.1.

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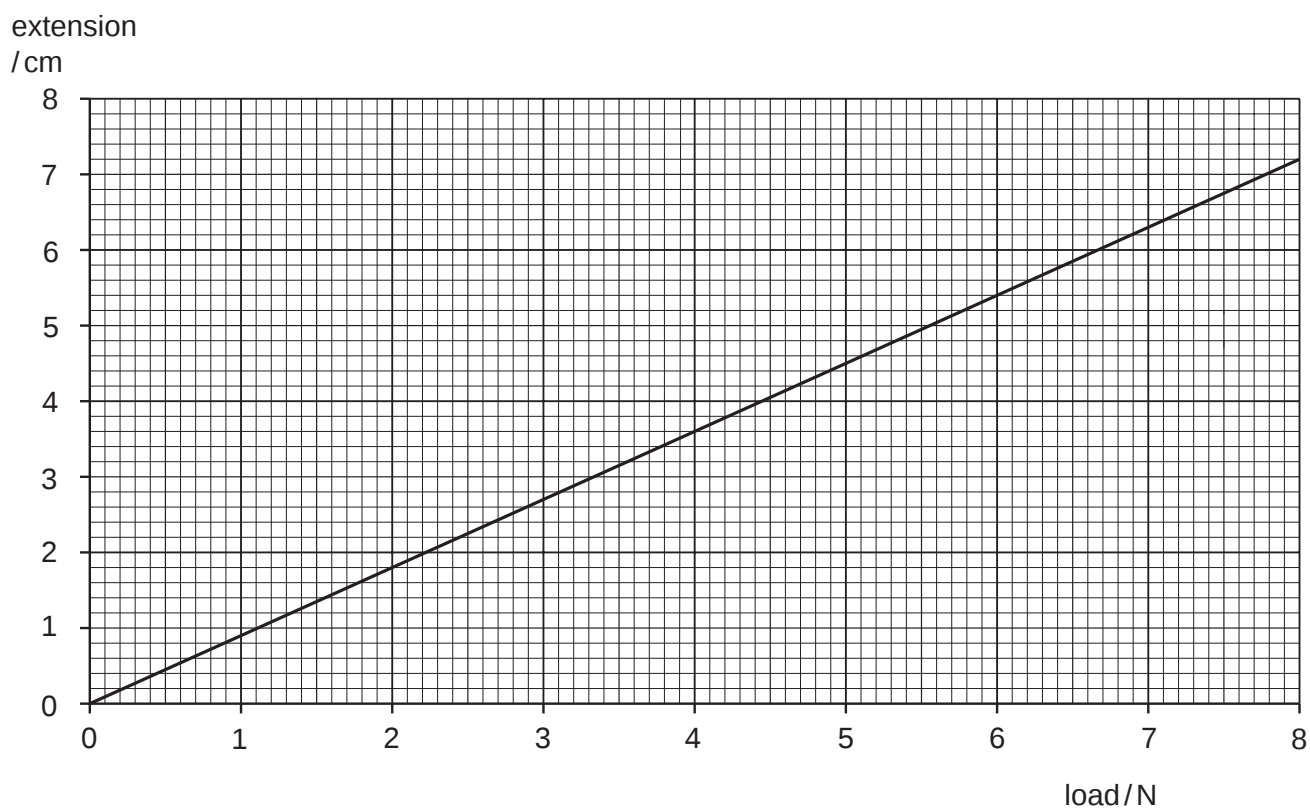


Fig. 15.1

- (a)** Use Fig. 15.1 to find the extension of the spring for a load of 5.0 N.

..... cm [1]

- (b)** Before the spring is stretched, its length is 10.2 cm.
Calculate the length of the spring when the load is 5.0 N.

[1]

- (c)** State the apparatus that may be used in the experiment to measure

(i) the length of the spring,

(ii) the load on the spring.

[2]

16 Atoms of ^{10}B and ^{11}B have different nucleon numbers.

(a) What name is given to atoms of the same element with different nucleon numbers?

..... [1]

(b) Fig. 16.1 represents the nucleus of a ^{11}B atom.

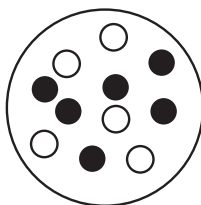


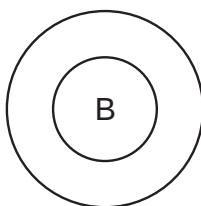
Fig. 16.1

(i) Name the particles represented by ●

○

[2]

(ii) Complete the diagram below to represent the electronic structure of boron.



[1]

- 17 Fig. 17.1 shows changes in the thickness of the wall of the uterus during the human menstrual cycle.

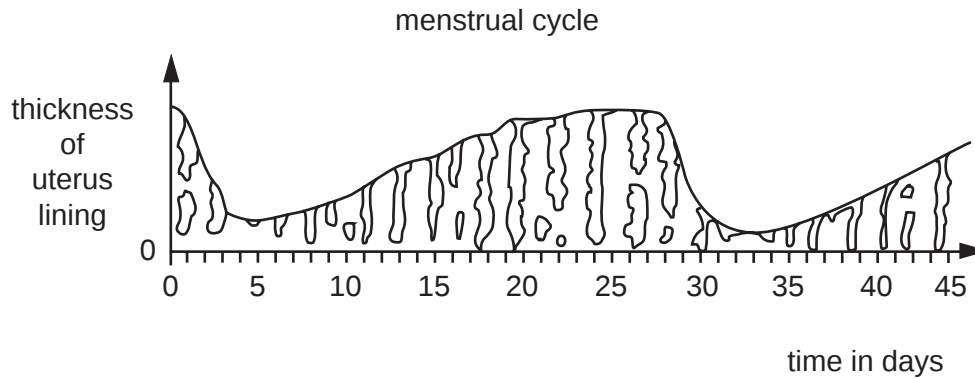


Fig. 17.1

- (a) How long is the menstrual cycle in humans?

..... [1]

- (b) On Fig. 17.1, write

(i) **O** at the time when ovulation is likely to occur,

(ii) **M** at the time when menstruation is likely to occur. [2]

- (c) Use words from the following list to complete the sentences below.
Each word may be used once, or not at all.

abstinence condoms hormones infertility
sperm vagina vasectomy

A natural method of contraception is

A mechanical method of contraception is using which

prevent from entering the [4]

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DATA SHEET

The Periodic Table of the Elements

Group																																																																																																																																																																																					
I	II							III	IV	V	VI	VII	0																																																																																																																																																																								
7 Li Lithium 3	9 Be Beryllium 4	1 H Hydrogen 1										19 F Fluorine 9	2 He Helium 2																																																																																																																																																																								
23 Na Sodium 11	24 Mg Magnesium 12											16 O Oxygen 8	20 Ne Neon 10																																																																																																																																																																								
39 K Potassium 19	40 Ca Calcium 20											32 S Sulphur 16	40 Ar Argon 18																																																																																																																																																																								
85 Rb Rubidium 37	88 Sr Strontium 38											79 Se Selenium 34	84 Kr Krypton 36																																																																																																																																																																								
133 Cs Caesium 55	137 Ba Barium 56											128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54																																																																																																																																																																							
87 Fr Francium 87	226 Ra Radium 88											84 Po Polonium 84	85 At Astatine 85	86 Rn Radon 86																																																																																																																																																																							
*58-71 Lanthanoid series †90-103 Actinoid series																																																																																																																																																																																					
140 Ce Cerium 58													141 Pr Praseodymium 59													144 Nd Neodymium 60													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													238 U Uranium 92													238 Pa Protactinium 91													238 Pu Plutonium 94													238 Np Neptunium 93													238 Am Americium 95													238 Cm Curium 96													238 Bk Berkelium 97													238 Cf Californium 98													238 Es Einsteinium 99													238 Fm Fermium 100													238 Md Mendelevium 101													238 No Nobelium 102													238 Lr Lawrencium 103												
a													X													b													a = relative atomic mass X = atomic symbol b = proton (atomic) number																																																																																																																																														

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

Key

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

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