

Centre Number	Candidate Number	Name
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MINISTRY OF EDUCATION, BOTSWANA

in collaboration with

UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

Botswana General Certificate of Secondary Education

SCIENCE : DOUBLE AWARD

0569/02

Paper 2

October/November 2005

2 hours

Candidates answer on the Question Paper
No additional materials are required

Read the following carefully before you start.

Write your centre number, candidate number and name in the spaces provided at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

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

The number of marks is given in brackets [] at the end of each question or part question.

You may use a calculator.

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

For Examiner's Use	
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TOTAL	

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

- 1 Fig. 1.1 shows a horse pulling a cart of mass 200 kg.

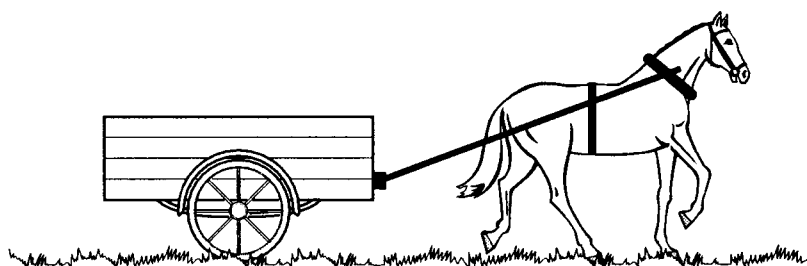


Fig. 1.1

- (a) The cart moved 150 m in 30 s. Calculate the average speed of the cart.

speed = m/s [2]

- (b) Fig. 1.2 shows how the speed of the cart changed as it approached an intersection.

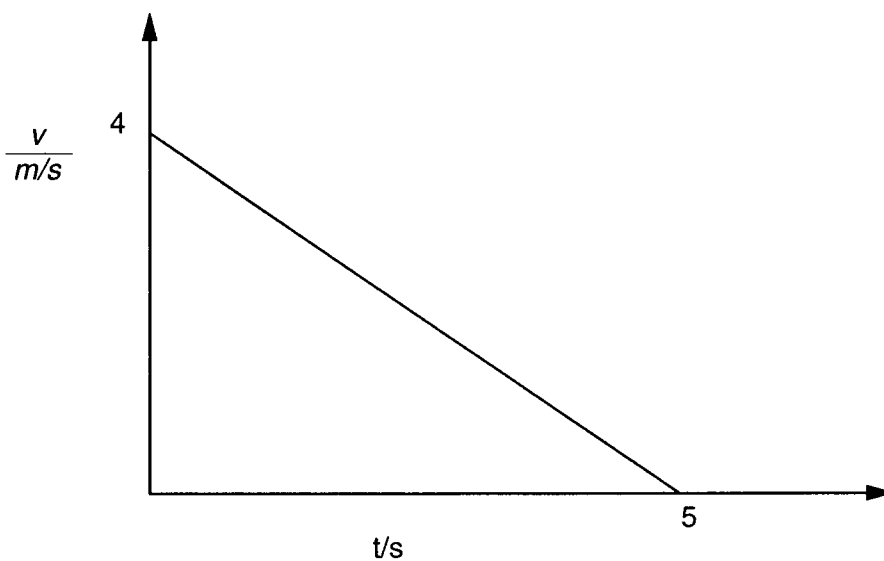


Fig. 1.2

- (i) Describe the motion of the cart during the 5 s.

.....
[1]

- (ii) Calculate the distance covered by the cart during the 5 s.

distance = m [2]

- (c) The horse started pulling with a force of 200 N.

Calculate the acceleration of the cart.

acceleration = m/s^2 [2]

- (d) Fig. 1.3 shows a car on a moving recovery truck.

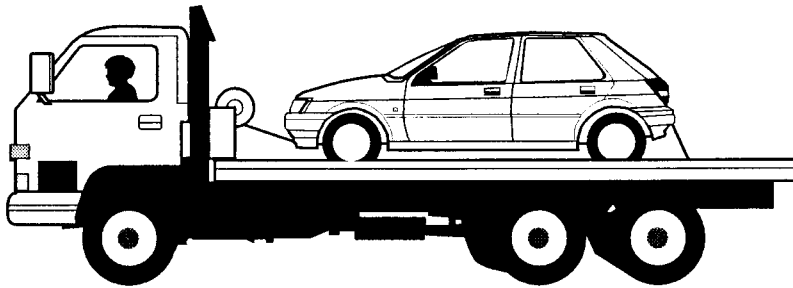


Fig. 1.3

Use words from the following list to complete the sentence below.

weight forward backward inertia friction

If the car is not securely tied down on the back of the recovery truck, when the truck brakes suddenly the car moves because of its

[2]

- 2 Fig. 2.1 shows a solar panel used to run an electric motor.

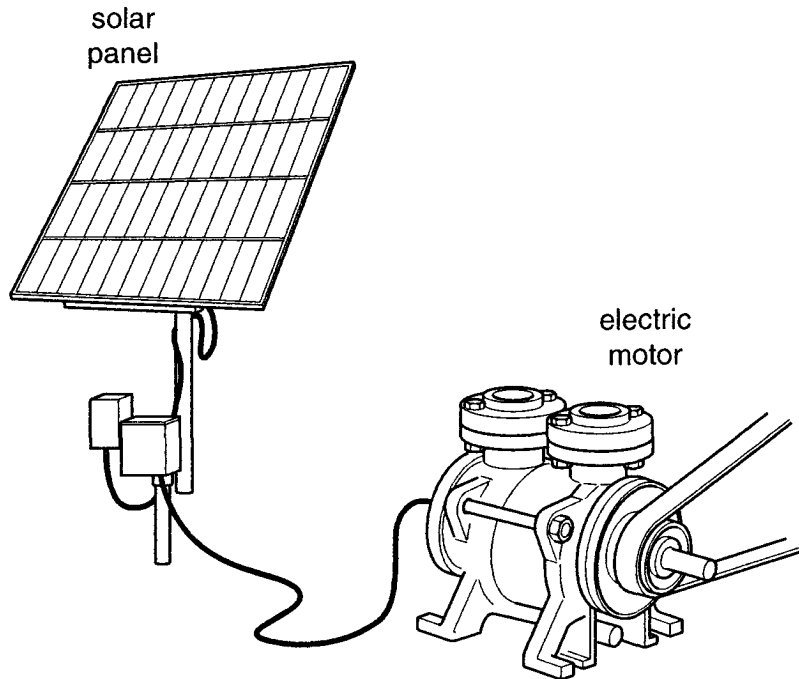


Fig. 2.1

- (a) What is the energy change in the solar panel?

..... → [2]

- (b) The motor raises a load of 0.2 N to a height of 3 m in 5 s.

- (i) What form of energy does the load gain as it rises?

..... [1]

- (ii) Calculate the work done by the motor to raise the load.

work done = J [2]

- (iii) Define power

..... [1]

- (iv) Calculate the power output of the motor.

power = W [2]

- 3 Fig. 3.1 shows two rays from an object incident on a convex lens of focal length of 15 cm.

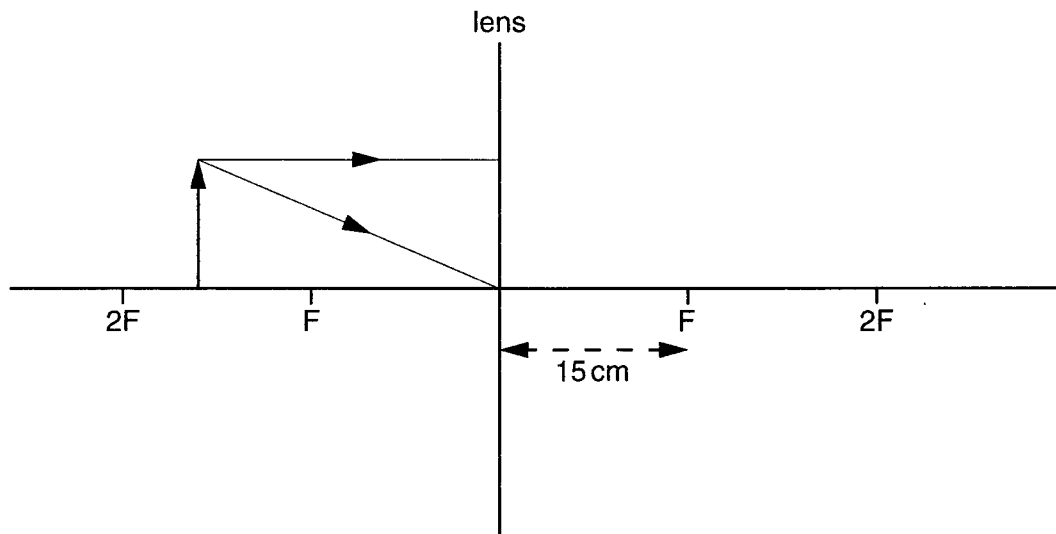


Fig. 3.1

- (a) On the diagram draw the paths of the rays after refraction by the lens. [2]
- (b) On the diagram draw the image formed. [2]
- (c) The object is moved back to a distance of 34 cm from the lens.

State two properties of the image formed.

1.
2.[2]

- 4 (a) Fig. 4.1 shows two kettles with equal volumes of water heated to boiling.

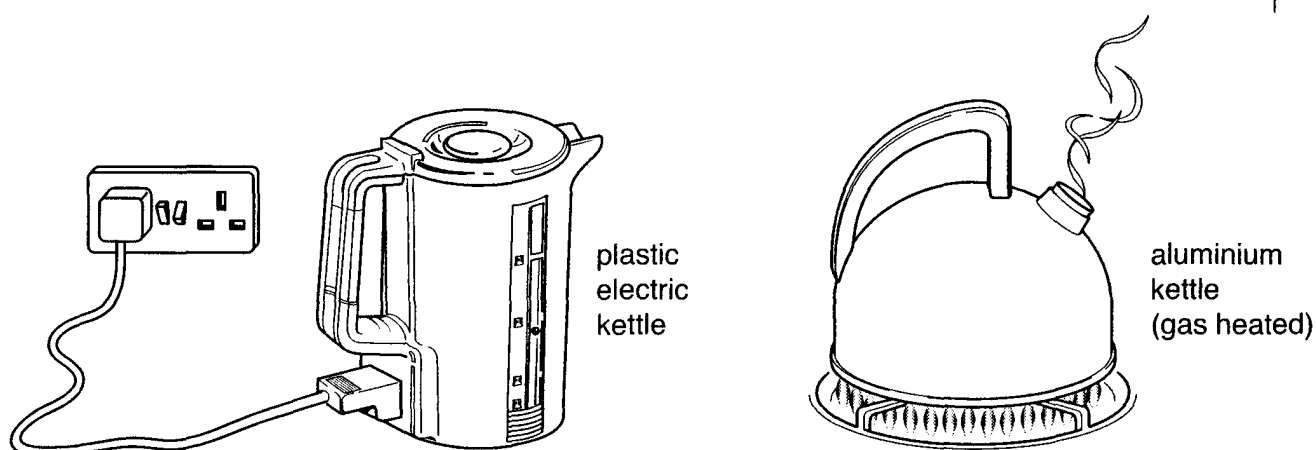


Fig. 4.1

By which process does heat energy

- (i) reach the water in the aluminium kettle?

.....[1]

- (ii) spread in the water?

.....[1]

- (iii) In which kettle will the water cool faster when heating stops?

kettle

explanation

.....

.....[3]

- (b) Fig. 4.2 shows two flasks inverted in beakers containing water. The flasks are left in the sun.

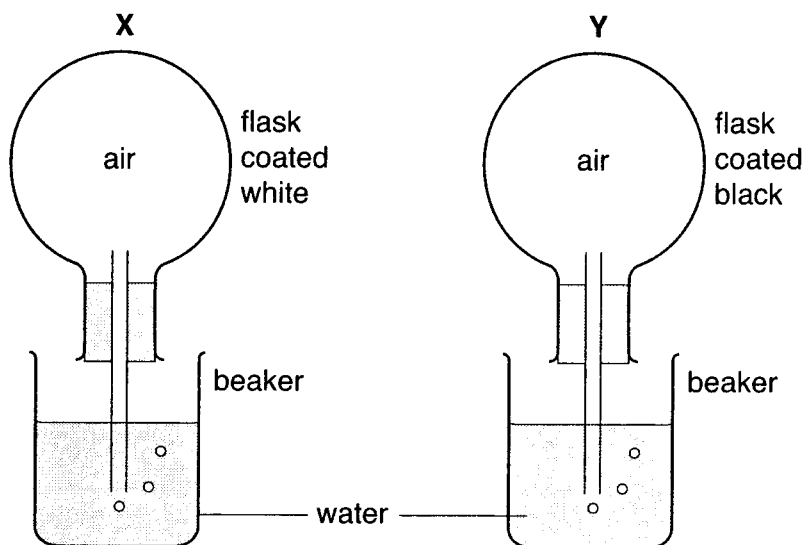


Fig. 4.2

In which set up will bubbles be produced more rapidly?

set up

explanation

.....

.....[3]

- 5 (a) Name the type of radioactive emission that has the greatest penetrating power.

.....[1]

- (b) State **one** use of beta radiation.

.....[1]

- 6 The table gives some information about the structure of atoms of some elements.

element	number of protons	arrangement of electrons	Group in the Periodic Table	metal or non metal
P		2, 7	7	non-metal
Q	12	2, 8, 2	2	
R	16		6	non-metal
S	18	2, 8, 8	0	non-metal

- (a) Complete the table by filling the blank spaces.

[3]

- (b) Element **P** reacts with **Q** to form a crystalline salt.

- (i) Write the formula of the crystalline salt formed.

.....[1]

- (ii) Which is the least reactive element in the table?

.....

Explain your answer.

.....

.....[2]

- (c) Element **P** exists as a diatomic molecule. What is meant by diatomic?

.....[1]

7 A list of dilute aqueous solutions is given.

sulphuric acid	lead(II) nitrate	copper(II) chloride	Iron(II) sulphate
iron(III) nitrate	ammonia	nitric acid	sodium carbonate

(a) Name a solution in the list that

(i) gives a white precipitate with aqueous silver nitrates

.....[1]

(ii) has a pH value of approximately 10

.....[1]

(iii) is coloured

.....[1]

(iv) would react with magnesium to form hydrogen.

.....[1]

(b) (i) Which solution in the list gives a blue precipitate with aqueous sodium hydroxide?

.....[1]

(ii) Name the blue precipitate formed from the reaction in (b)(i).

.....[1]

- 8 Fig. 8.1 shows how pieces of zinc were reacted with dilute hydrochloric acid to form hydrogen and zinc chloride.

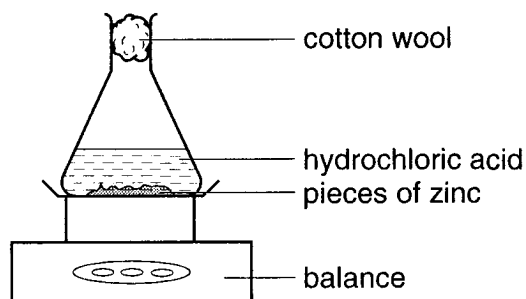


Fig. 8.1

- (a) Write a balanced chemical equation for this reaction.

.....[2]

- (b) The experiment was carried out at 20 °C. The table shows the loss in mass of the mixture at 50 second intervals during the reaction.

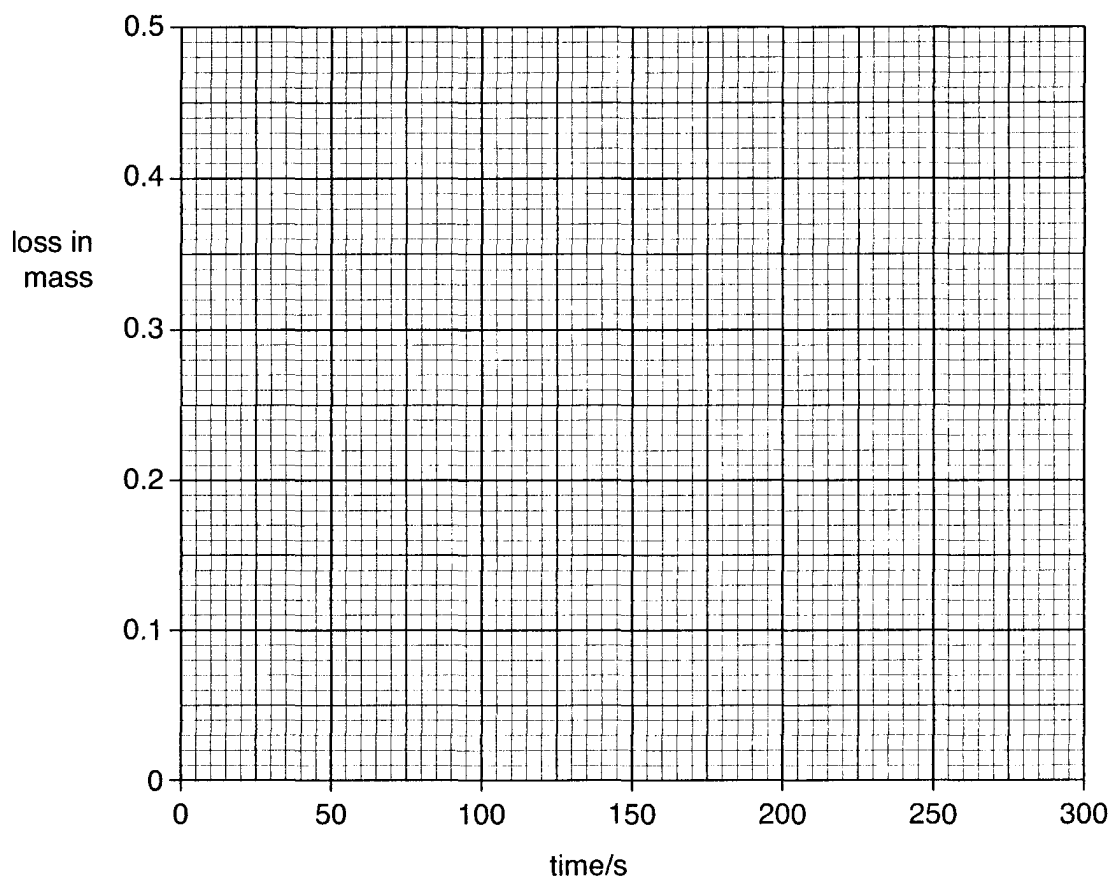
time/s	50	100	150	200	250	300
loss in mass/g	0.20	0.35	0.41	0.44	0.45	0.45

- (i) Explain why the mass of the mixture decreased.

.....[1]

- (ii) Draw a graph of the mass lost against time on the grid below.

[2]



- (c) The same experiment was repeated using hydrochloric acid warmed to 40 °C.

- (i) On the same grid, sketch the graph you would obtain from the second experiment. Label it **X**. [2]

- (ii) In terms of particles, explain why graph **X** is different from that obtained using hydrochloric acid of the same concentration at 20 °C.

.....

.....

.....

.....[3]

- 9 Over 50 million tonnes of chlorine are produced in the world each year. It is made by the electrolysis of concentrated aqueous sodium chloride.

(a) Name two sources of concentrated aqueous sodium chloride.

1.

2.[2]

(b) Describe a chemical test for chlorine.

test

observation[2]

(c) Chlorine has many industrial uses.

(i) Why is chlorine added to drinking water?

.....[1]

(ii) Name **one** organic product of the reaction between methane and chlorine.

.....[1]

- 10 Ethanol and propanol are members of the same homologous series.

(a) What is meant by a homologous series?

.....

.....[2]

(b) Draw the structural formula of ethanol, showing all atoms and bonds.

[2]

- 11 Fig. 11.1 shows a food web in a pond near an arable farm.

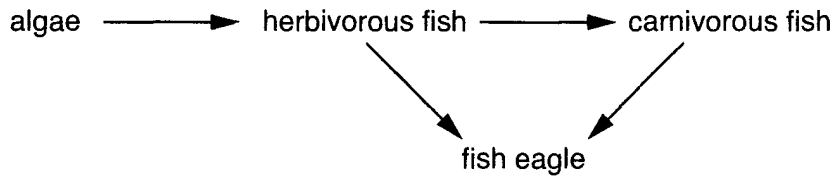


Fig. 11.1

- (a) (i) Which organisms would multiply rapidly as a result of application of fertilisers?
[1]
- (ii) What is this rapid growth called?
[1]
- (b) A farmer sprayed a pesticide onto the crop in the farm, to kill insects which were damaging the crop.
- (i) Explain how this pesticide could enter the pond.

[2]
- (ii) After several months, some fish eagles had died from the effects of the pesticide.
 Explain how this could have happened.

[2]

12 Match the following terms with their correct descriptions:

drug enzyme excretion fertilisation photosynthesis respiration

	description	term
(i)	biological catalyst which is protein in nature	
(ii)	production of food by plants	
(iii)	removal of metabolic waste products from the body	
(iv)	release of energy from food by living organisms	
(v)	the fusion of male and female sex cells	
(vi)	externally administered substance that affects chemical reactions in the body	

[6]

13 Fig. 13.1 shows a flower.

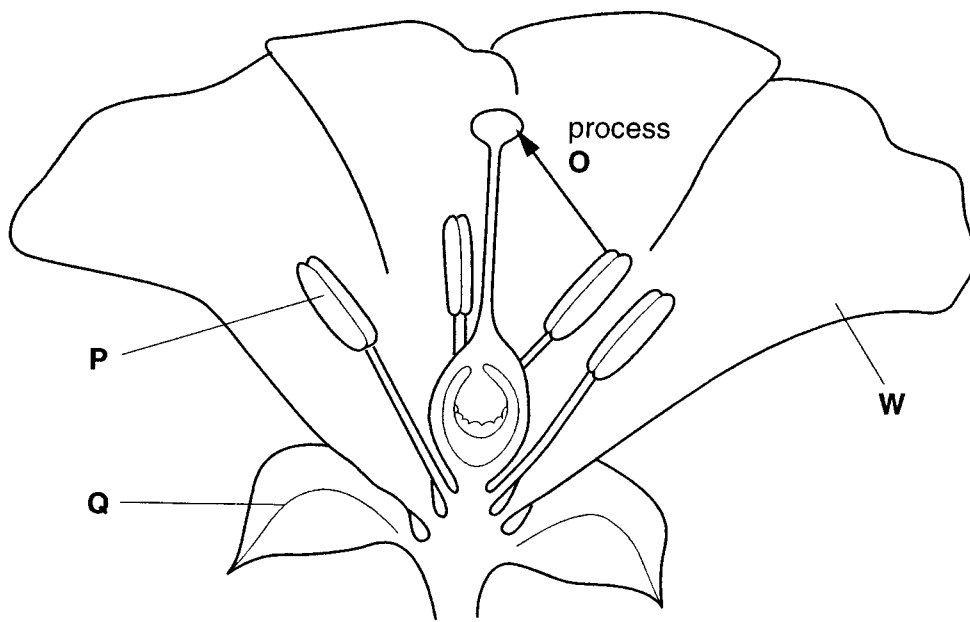


Fig. 13.1

(a) Name the structures labelled **P** and **Q**.

P

Q[2]

(b) Name process **O**.

.....[1]

(c) State **two** ways by which **W** may attract insects.

1

2[2]

14 Fig. 14.1 shows the male reproductive system.

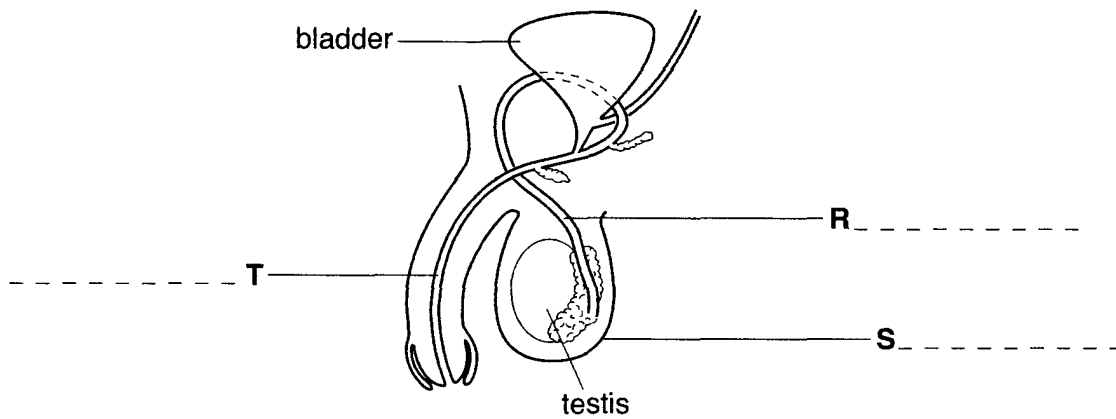


Fig. 14.1

(a) On the diagram, label the structures **R**, **S** and **T**. [3]

(b) State the functions of the bladder and testis.

bladder

testis[2]

(c) Structure **T** becomes infected with gonorrhoea bacteria.

State **two** signs or symptoms of gonorrhoea.

1.

2.[2]

(d) State how gonorrhoea is treated.

.....[1]

15 Fig. 15.1 shows energy requirements of three people of the same sex.

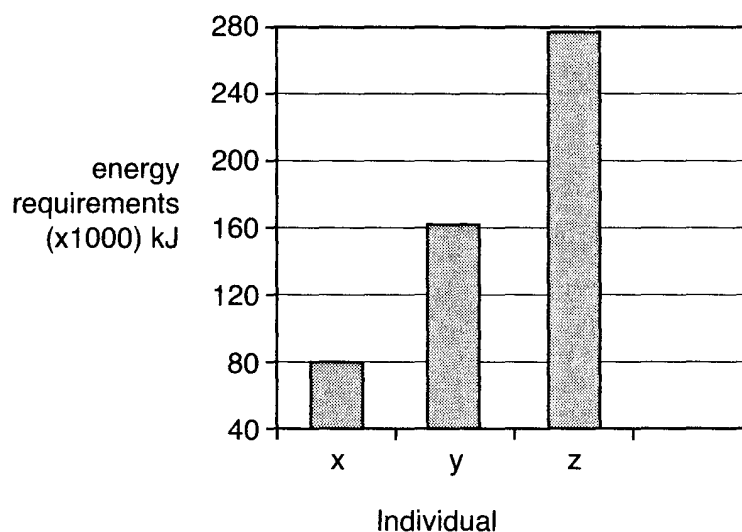


Fig. 15.1

(a) Which individual is most likely to be:

(i) a manual worker doing 8 hours work per day?

.....

(ii) a tailor doing 8 hours work per day?

.....

(iii) a six year old student?

.....[2]



(b) State the simplest form of food that is used by body cells to provide energy.

.....[1]

(c) State what happens when the energy intake of an individual is greater than the daily energy requirements.

.....[1]

- 16** The table shows some information about three types of specialised cells. Complete the table by filling in the missing information. [5]

structure	name of cell	function
	phagocyte
	transport impulses to the central nervous system


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DATA SHEET

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

a **X** **b**

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