Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Practical skills

Time allowed: 1 hour 45 minutes

Subject code **0610**

Biology

Questions from Paper 3 and Paper 6

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.

Total marks

/ 71

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.

Information

- This paper has 9 questions worth 71 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 Recycling rates in one country were monitored every ten years.

The percentages of different types of recycled materials were recorded.

Fig. 5.1 shows the results.

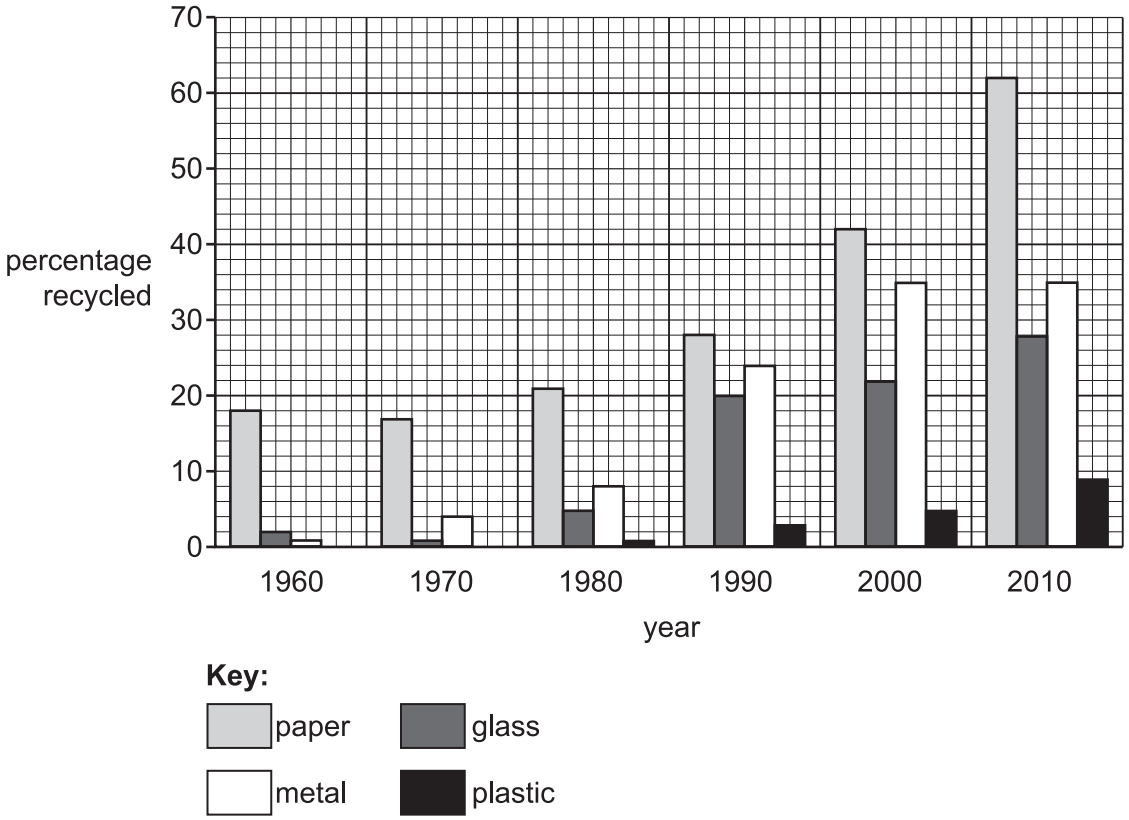


Fig. 5.1

(a) Complete the sentences using the data shown in Fig. 5.1.

The general trend shows that between 1970 and 2000 the percentage of materials recycled has ..... . The most commonly recycled material is ..... .

In 1970 ..... was **not** recycled.

The percentage of ..... recycled did not change between 2000 and 2010.

[4]

(b) Calculate the increase in the percentage of glass recycled between 1960 and 1990.

..... % [1]

[Total: 5]

Measurements, tables, graphs and conclusions Click for more variations

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1(a)	increased / AW ; paper ; plastic ; metal ;	**4**	
1(b)	18(%) ;	**1**	

2 Plan an investigation to find out how the volume of water added to germinating seeds affects the rate of germination.

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..... [6]

Seeds and germination Click for more variations

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2	*independent variable:* 1 at least two different volumes of water added **;** *dependent variable:* 2 number of seeds germinated / time taken for seeds to germinate **;** *3, 4, 5 method **;;;*** • method of maintaining temperature • watering at regular intervals • reference to placing seeds in trays / petri dish / test-tube / planting in soil • check seeds at regular intervals / at a set time period • AVP, e.g. calculation of rate described *6, 7 constant variables **;;*** • temperature • type of seeds • oxygen concentration • pH • type / amount of, soil / growing medium • light (intensity) 8 repeat at least two times (three trials) **;**	**6**	

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3 In plants, water moves up the stem in xylem vessels as a column of water molecules as a result of transpiration.

A celery stalk that still has its leaves attached can be used to investigate the movement of water in a plant, as shown in Fig. 2.1.

Fig. 2.2 shows dye in the xylem vessels of a celery stalk.



Fig. 2.1



not to scale

Fig. 2.2

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Plan an investigation to determine the effect of temperature on the rate of movement of a coloured dye through celery stalks.

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..... [6]

Planning investigations: variables, controls and safety Click for more variations

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3	*independent variable:* **1** at least two different temperatures **;** *dependent variable:* **2** time for dye to reach the leaves or a set distance **or** distance moved by dye in a set time **or** number of cut sections containing dye **;** **3 and 4** *detail of method – max two from* **;;** • method of maintaining (at least one) air temperature • *idea of* slicing the end off the celery before immersion • cutting sections (with a, knife / scalpel) **5, 6 and 7** *variables kept constant - max three from* **;;;** • wind-speed • humidity • light intensity • length / height / size, of, celery / stalk • number of leaves / surface area of leaves • species / type / age, of, celery • (named) colour / concentration / volume, of dye • time (in dye) / time stated • thickness of cut sections / sections cut in the same plane / AW **8** two or more replicates at each temperature / repeat the investigation at least two more times **;** **9** suitable safety precaution **;**	**6**	e.g. cutting sections on a flat or stable surface / cut away from body / gloves / goggles

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4 Amylase is an enzyme that catalyses the breakdown of starch to form reducing sugars.

Plan an investigation to determine the effect of pH on the activity of amylase.

Use iodine solution in your method.

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..... [6]

Planning investigations: variables, controls and safety Click for more variations

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4	*total of six from:* **1** *independent variable* at least two pH values **,** tested / stated **;** **2** *dependent variable* time for iodine solution to stay yellow-brown / time for disappearance of starch/colour of iodine (solution) after a set period of time **;** **3, 4 + 5** *variables kept constant* **;;;** • concentration of amylase / enzyme (solution) • volume of amylase / enzyme (solution) • temperature • volume of starch (suspension) • concentration of starch (suspension) • sampling interval time, stated / described • buffer / pH (solution) volume • iodine concentration / volume / number of drops **6 & 7** *method* **;;** • equilibration (both solutions in the water bath before mixing) • take samples • use of, spotting / white, tile • use of buffer **8** repeat investigation twice more / at least two replicates **;** **9** relevant safety precaution **;**	**6**	

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5 Plan an investigation to determine the effect of exercise intensity on heart rate in humans.

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..... [6]

Heart and circulation Click for more variations

Reduced to 77% to fit the page (wider than A4).

5	**1** *independent variable* different intensities of exercise / different exercises / exercise for different lengths of time ; **2** *dependent variable* after / during, exercise measure, heart rate / pulse rate ; **3 and 4** *detail of method* ;; • description of named exercise of different intensities • ensuring heart rate returns to resting rate • use of a heart rate monitor **5, 6 and 7** *constant variables* ;;; • same speed / distance / time, of exercise • same age of people • same sex of people • same, person / fitness level / mass of person / height of person / BMI • same, place / time of day / temperature / weather **8** at least three trials / two more repeats ; **9** relevant safety precaution ;	6	

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6 **(a)** Milk contains fats. The enzyme lipase catalyses the breakdown of fats to form fatty acids and glycerol. The fatty acids cause the pH of the milk to decrease.

Plan an investigation to determine the effect of lipase concentration on the breakdown of fats in milk.

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..... [6]

(b) The emulsion test is used to test a sample of food for fat.

Describe the method you would use to do the emulsion test.

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..... [2]

[Total: 8]

Planning investigations: variables, controls and safety Click for more variations

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6(a)	*independent variable:* **1** (at least) two different, enzyme / lipase, concentrations **;** *dependent variable:* **2** measuring pH after a set time OR measuring time to reach a certain pH **;** *detail of method:* **3** use of pH meter / pH paper / (named) indicator **;** **4** measure / same, initial pH / initial colour **;** **5** control **and** description of the control e.g. using boiled enzyme / water instead of enzyme **;** **6 & 7** *variables kept constant – max two from* **;;** • volume of milk • type of milk / same milk / fat content of milk • volume of, lipase / enzyme • temperature • volume of indicator **8** two or more repeats / total of three or more trials **;** **9** relevant safety precaution e.g. use of goggles / gloves **;**	**6**	
6(b)	add ethanol and (then) water **;** shake **;**	**2**	

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7 Fig. 3.1 shows a male and a female fly of the same species.

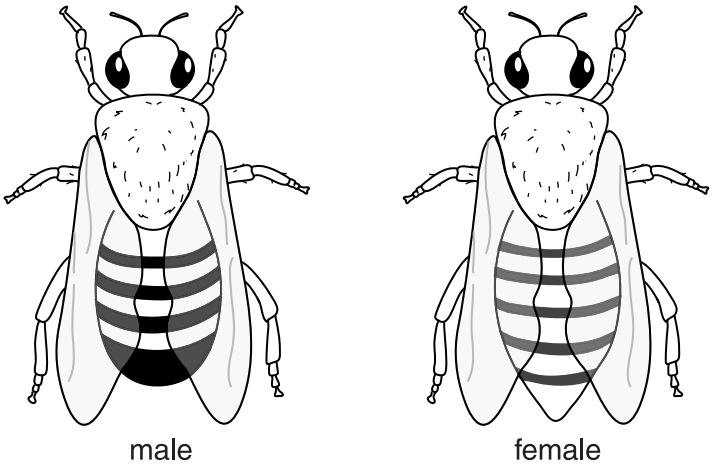


Fig. 3.1

(a) Describe **two** differences, **visible** in Fig. 3.1, between the male and female fly.

Complete Table 3.1 to record these differences.

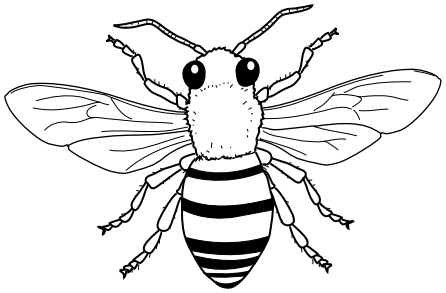
Table 3.1

feature	male	female

[3]

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(b) Fig. 3.2 shows a different type of insect, a bee.



not drawn to scale

Fig. 3.2

Insects can be recognised by having three parts to the body and three pairs of legs, amongst other features.

Describe **two other** features, visible in Fig. 3.1 **and** Fig. 3.2 that show that the fly and the bee are both identified as insects.

1 .....

2 .....[2]

(c) Both flies and bees are attracted to coloured flowers.

Suggest how you could find out which colours attract more bees than flies.

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.....[5]

[Total: 10]

Planning investigations: variables, controls and safety Click for more variations

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7 **(a)**	<table><tr><th>feature</th><th>male</th><th>female</th></tr><tr><td rowspan="3">(end of) abdomen / body /AW</td><td>rounded / blunt / AW</td><td>pointed / AW;</td></tr><tr><td>black / dark / AW</td><td>white / light / AW;</td></tr><tr><td>short / AW</td><td>long / AW;</td></tr><tr><td rowspan="3">bands / stripes (on abdomen / body) /AW</td><td>wide / AW</td><td>thin / AW;</td></tr><tr><td>three or four / less</td><td>six or five / more;</td></tr><tr><td>dark / black / AW</td><td>white / light /grey / AW;</td></tr></table> two correct features in first column; correct descriptions in each row, one mark each for any two descriptions;;	**max 3**	**A.** comparative answers / presence or absence of features **A.** round vs oval
(b)	one pair of antennae; wings;	**2**	**A** compound eyes
(c)	independent variable: different colours (of flowers / paper / AW); controlled variables: (max 2) similar flowers for shape / size / AW; same type of attraction mechanism / scent / honey guides / nectar / same plant species; same area (in open) / same number of bees and flies (if in enclosed chamber) / AW; same time / period; method: count / observe / video / film / record the number of visits / AW; repeats / AW; handling of data: calculate average / tally chart / graph / table / AW; AVP; e.g. a safety point with reference to bees	**max 5**	**A** only two different colours / named colours **A** same paper flowers /shapes
		[Total: 10]	

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8 A protease enzyme digests the white protein in milk to form a clear soluble product.

Some students carried out an investigation to find the effect of temperature on this process.

5 cm^3 of milk and a few drops of enzyme were warmed separately to 40 °C and then mixed together. The time taken for the white mixture to clear was recorded. This procedure was repeated two more times at this temperature.

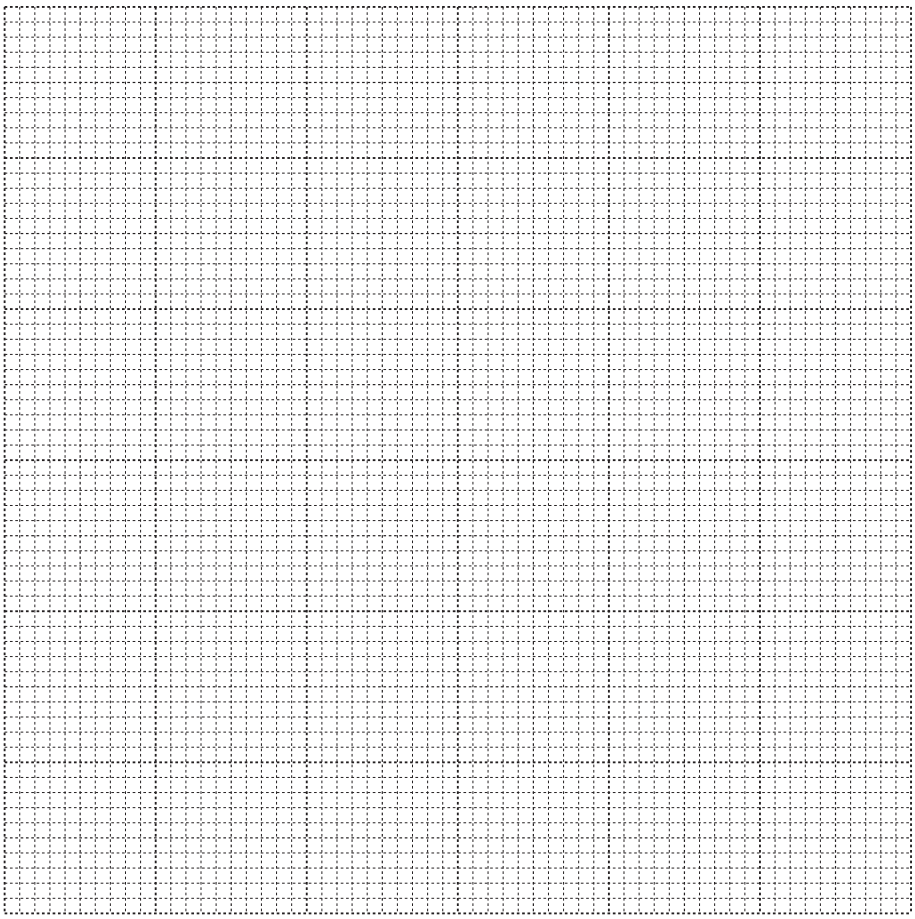
The whole procedure was repeated for a range of temperatures and all the results were recorded in Table 3.1.

Table 3.1

temperature / °C	time for milk to clear / seconds			
	1st test	2nd test	3rd test	mean
20	120	110	115	115
30	60	55	59	58
40	30	35	28	31
50	19	25	22	22
60	80	75	76	77

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(a) (i) Plot the data to show the effect of temperature on the mean time for the milk to clear.



[4]

(ii) Describe **and** explain the effect of temperature on the time taken for the milk to clear.

.....

.....

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..... [4]

STEM | Exam Builder

(b) (i) Suggest **and** explain why each test was carried out three times.

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..... [2]

(ii) In this investigation, temperature was varied.

Suggest **and** explain **one** variable that needs to be controlled.

.....

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.....

..... [2]

[Total: 12]

Measurements, tables, graphs and conclusions Click for more variations

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8 **(a)** **(i)** **A –** axes;
S – size;
P – correct plots;
L – line; [4]

(ii) line falls;
rate of activity increases / enzyme works faster / more collisions of molecules (as temperature rises) (or vice versa);
line rises;
rate of activity decreases / enzyme denatured (as temperature rise above 50°C);
figures quoted in support;

reference to optimum/best temperature;
AVP; [Max: 4]

(b) **(i)** increased reliability;
identify / reduce errors / anomalies;
identify the end point clearly;
to check method / technique;
AVP; [Max: 2]

(ii) *suggest and explain*

variable	explanation
milk concentration	will alter time to end point
milk freshness	pH can be changed – alters enzymes activity
type of milk	alters enzyme activity /substrate conc.
volume / conc. enzyme	alter amount of reactions vary enzyme rate
pH	vary activity of enzyme

[2]

[Total: 12]

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9 Fig. 2.1 is a photomicrograph of some blood cells.

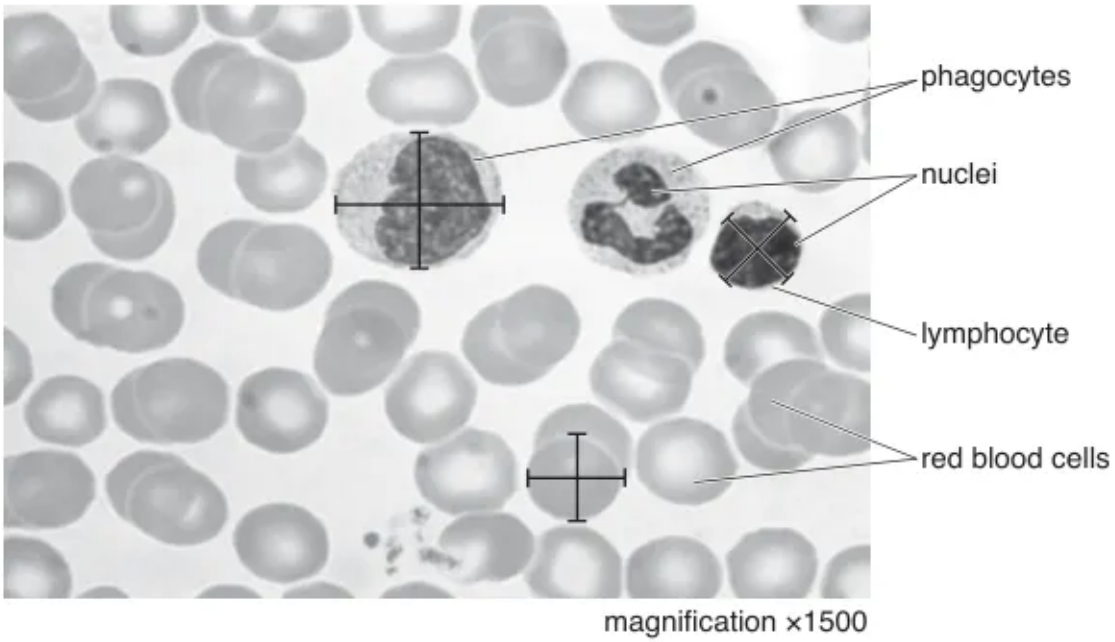


Fig. 2.1

(a) **(i)** State **two** visible differences between the red blood cells and the white blood cells (phagocytes and lymphocytes) in Fig. 2.1.

1 .....

.....

2 .....

.....

[2]

(ii) Make a large drawing of the two cells labelled **phagocytes** in Fig. 2.1.

[4]

(b) (i) Measure the diameters of the three marked blood cells, along both the lines drawn on each of the cells, in Fig. 2.1. Record these measurements in Table 2.1.

Add the missing units to Table 2.1.

Calculate the average diameter for each type of blood cell and write your results in Table 2.1.

Table 2.1

type of blood cell	diameter 1 /	diameter 2 /	average diameter / .....
red blood cell			
lymphocyte			
phagocyte			

[3]

(ii) Calculate the actual average diameter of the red blood cell using your answer in **2(b)(i)** and the following equation.

$$\text{magnification} = \frac{\text{average diameter of the red blood cell in Fig. 2.1}}{\text{actual average diameter of the red blood cell}}$$

Give your answer in micrometres (μm) to the nearest whole number. 1 mm = 1000 μm

Show your working.

.....μm
[3]

[Total: 12]

Biological drawings Click for more variations

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9(a)(i)	red blood cells do not have a nucleus / white blood cells have a nucleus **;** red blood cells, have a light area in the centre / are biconcave **;** there are more red blood cells / fewer white blood cells **;** red blood cells contents not granular AW / white blood cells contents granular **;** red blood cells smaller than phagocytes / **ora** **;** red blood cells are overlapping / white blood cells do not overlap **;**	**2**	
9(a)(ii)	**O** single clear lines on both cell membranes <u>and</u> no shading in the nucleus **;** **S** monocyte larger than 2.5 cm and neutrophil larger than 2 cm provided **;** **D1** monocyte is larger than the neutrophil **;** **D2** neutrophil nucleus has two distinct parts joined by a narrow section, larger part at least twice the size of the smaller part **;**	**4**	
9(b)(i)	<table><tr><th>type of blood cell</th><th>diameters / mm</th><th>average diameter / mm</th></tr><tr><td>red blood cell</td><td>13±1 12±1</td><td>12.5±1</td></tr><tr><td>lymphocyte</td><td>12±1 11±1</td><td>11.5±1</td></tr><tr><td>phagocyte</td><td>22±1 18±1</td><td>20.0±1</td></tr></table> **;;;**	**3**	mp1 for header units mp2 for six measurements mp3 for three correct averages from candidates results
9(b)(ii)	8 or 9 (μm) **;;;**	**3**	**A** ecf from **2(b)(i)**

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