

Class	Register Number	Name
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南洋女子中学校
NANYANG GIRLS' HIGH SCHOOL

End-of-Year Examination 2016
Secondary Three

BIOLOGY

Paper 2

Monday

Theory Paper
3 October 2016

1 hour 45 minutes
1045 - 1230

Additional materials: 3 writing papers and 1 graph paper

READ THESE INSTRUCTIONS FIRST

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

Write your name, register number and class in the spaces at the top of this page and on any separate answer paper used.

Write in dark blue or black pen on both sides of the paper.

Do not use staples, paper clips, highlighters or correction tape.

Section A (40 marks)

Answer **all** questions.

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

Section B (30 marks)

Answer **all** questions including questions **7, 8** and **9 Either** or **9 Or**.

Write your answers on the separate writing paper provided.

At the end of the examination,

1. fasten all your work securely together;
2. tick **9 Either** (for *Either*) or **9 Or** (for *Or*) next to the question number 9 in the grid below to indicate which question you have answered.

INFORMATION FOR CANDIDATES

You are advised to spend no longer than one hour on Section A and no longer than 45 minutes on Section B.

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

The use of an approved scientific calculator is expected, where appropriate.

Examiner's Use	
Section A	
Section B	
7	
8	
9 <i>Either</i>	
9 <i>Or</i>	
Total	

This document consists of **13** printed pages.

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NANYANG GIRLS' HIGH SCHOOL

[Turn over

Section A

Answer **all** questions.

Write your answers in the spaces provided.

- 1 (a) Fig. 1.1 shows a diagram of a mitochondrion.

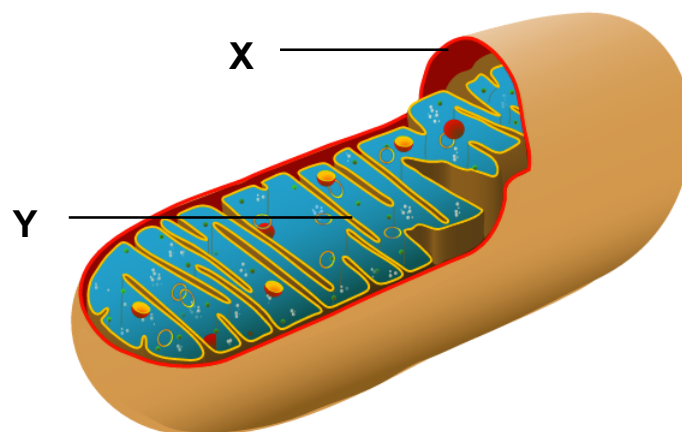


Fig. 1.1

(https://commons.wikimedia.org/wiki/File:Animal_mitochondrion_diagram_unlabelled.svg)

- (i) Describe the role of a mitochondrion. [2]

- (ii) Compare membrane X and membrane Y in terms of structure and function. [2]

1 (b) Fig 1.2 shows a diagram of a Golgi apparatus.

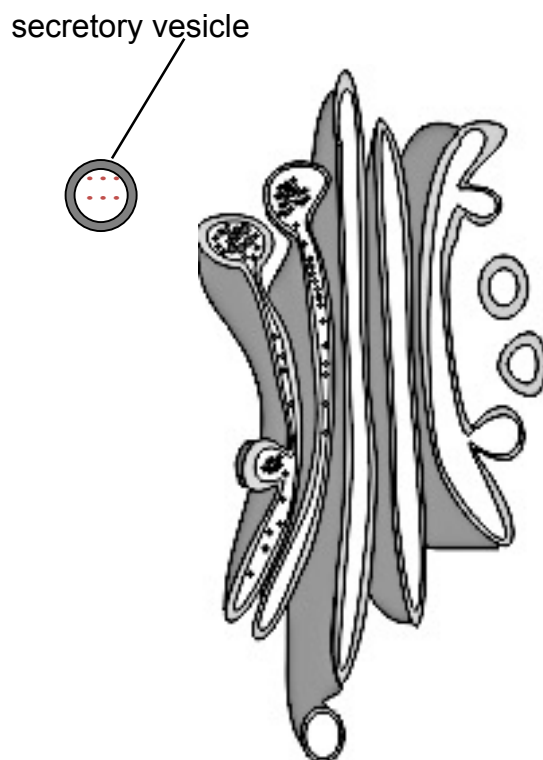


Fig. 1.2

(https://commons.wikimedia.org/wiki/File:Golgi_secretions.png)

Draw and label cell surface membrane and rough endoplasmic reticulum on Fig. 1.2.
Indicate using arrows the direction of transport of substances. [3]

[Total: 7]

- 2** In the ileum, glucose has to move from intestinal lumen to the intestinal epithelial cells in order to be absorbed into the body.
However, glucose does not normally move across the cell membrane directly by simple diffusion.
In the ileum, the transport of glucose into the epithelial cell is achieved by a carrier protein.

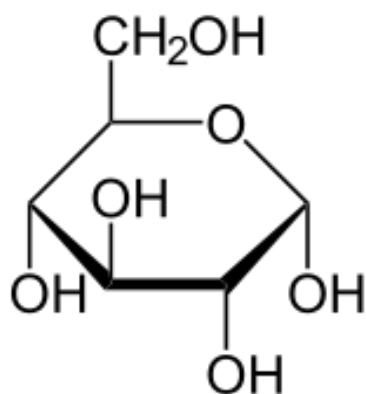
- (a)** Explain why glucose molecules will not move through the cell membrane directly by simple diffusion. [2]

- (b)** The carrier protein transports glucose independent of the concentration of glucose. [2]

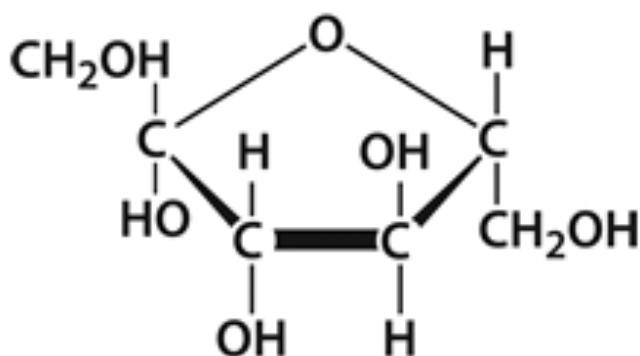
State the transport process carried out by carrier protein and the conditions required for this process to take place.

[Total: 4]

- 3 Fig. 3.1 shows a glucose molecule and Fig. 3.2 shows a fructose molecule.



glucose molecule



fructose molecule

Fig. 3.1

Fig. 3.2

(<https://commons.wikimedia.org/wiki/Glucose#/media/File:Alpha-D-Glucopyranose.svg>)
(<http://www.nsta.org/publications/press/extras/morechemistry.aspx>)

- (a) A student suspected that fructose might be a reducing sugar. Describe how she can conduct a food test to confirm her suspicion. [3]

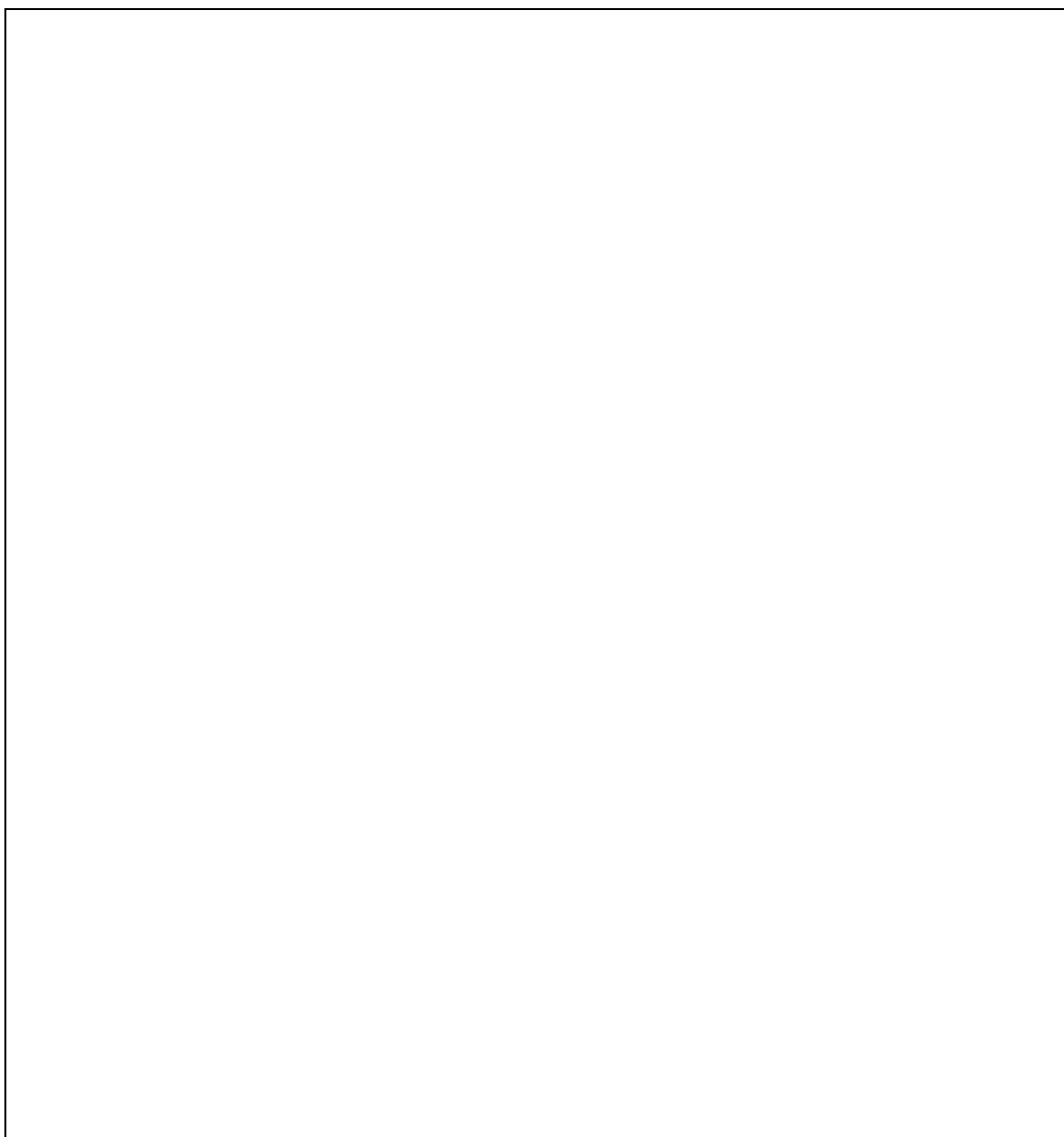
- (b) Using Fig. 3.1 and 3.2, draw and label the products formed by condensation reaction between one glucose molecule and one fructose molecule. [2]

[Total: 5]

- 4** Carbon dioxide is reduced to carbohydrate in the chloroplast with the help of hydrogen ions.

(a) Describe the stage of photosynthesis that yields hydrogen ions. [1]

(b) Reduction of carbon dioxide to carbohydrate by hydrogen ions needs [4]
enzymes.
Draw and label a lock and key model to show how this occurs.



- 4 (c) Predict and explain what will happen to the rate of photosynthesis when the plant is exposed to sudden cold weather. [2]

[Total: 7]

- 5 Fig. 5.1 shows two processes in a plant.

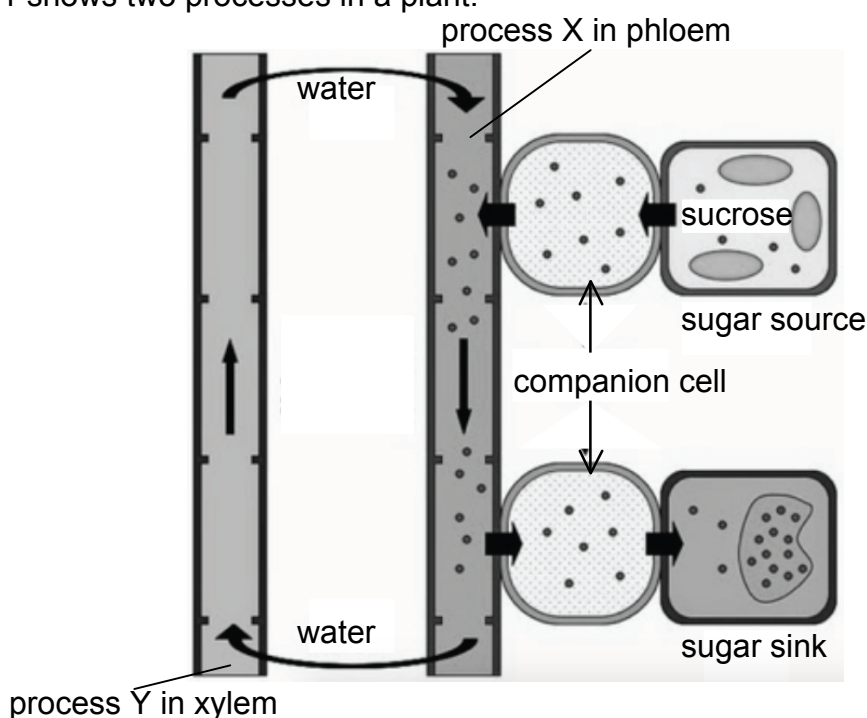


Fig. 5.1

- (a) Identify processes X and Y. [2]

Process X:

Process Y:

- (b) Name one cell for sugar source and one cell for sugar sink. [2]

One cell for sugar source:

One cell for sugar sink:

- (c) Explain how the structure and functions of a companion cell supports process X. [5]

[Total: 9]

- 6 (a) Explain how the loss of blood from a small cut is stopped naturally. [3]

- 6 (b)** Fig. 6.1 shows the mean heart rate of two groups of rats at different ages. Rats in group A were given electric shocks to the heart muscle, while rats in group B were injected with a drug that blocks electrical impulses to the heart muscle.

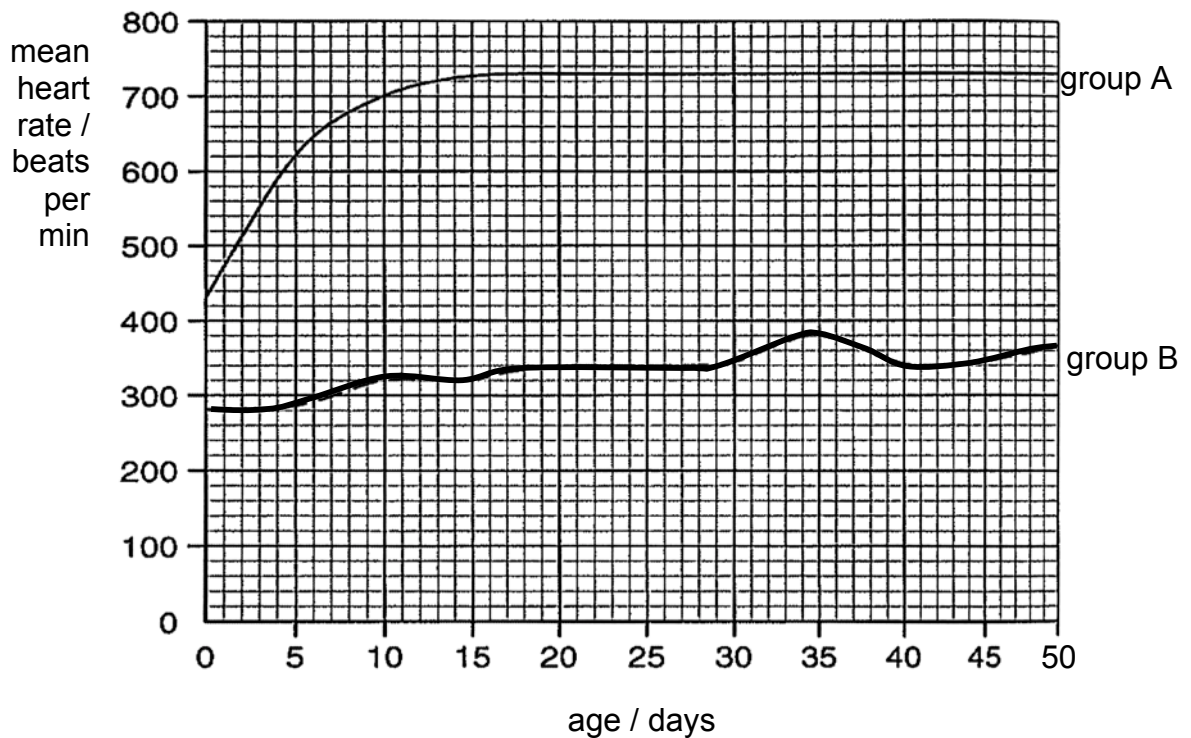


Fig. 6.1

- (i) Describe two differences in mean heart rate of the rats in groups A and B between days 15 to 50. [2]

- (ii) Describe and explain the difference in mean heart rate for group A rats between age 0 and 20 days. [3]

[Total: 8]

Section B

Answer **three** questions on separate writing paper provided.

The last question is in the form of either/or and only **one** of the alternatives should be attempted.

Each question carries **ten** marks.

- 7** An experiment was conducted, where a healthy volunteer was asked to breathe in atmospheric air over a period of time. The volunteer's average number of breaths per minute was measured. The experiment was repeated using 92% O₂ with 8% CO₂, followed by 100% oxygen. Table 7.1 shows the average number of breaths/min recorded over 30 minutes.

time / min	average number of breaths / min		
	21% O ₂ with 0.03% CO ₂ and 78.97% other gases	92% O ₂ with 8% CO ₂	100% O ₂
0	0	0	0
10	27	30	25
20	27	35	22
30	26	42	23

Table 7.1

- (a) Using the graph paper provided, plot and label all three graphs, including a suitable title. [5]
- (b) Using information from all three graphs, compare the breathing rates of the volunteer. [2]
- (c) Using information from the graphs, discuss the following statement: "A person may feel that it is harder to breathe in a room full of people. This is because there is not enough oxygen in the room." [3]

[Total: 10]

- 8 (a) With reference to the metabolism of carbohydrates, amino acids and fats, describe the functions of the liver. [4]

- (b) The quantity of pure alcohol in a drink can be expressed as alcohol units.

One alcohol unit is equivalent to 10 cm^3 of pure (100%) alcohol, which is amount of alcohol the average adult can break down in one hour. This means that there should be little or no alcohol left in the blood of an adult one hour after drinking one unit of alcohol.

The strength of an alcoholic drink can be indicated by the percentage of pure alcohol it contains.

- (i) Calculate the number of units of alcohol consumed by an adult who drank three glasses of wine with a strength of 15%. Each glass contained a volume of 190 cm^3 of wine. Show all working clearly. [2]
- (ii) Calculate how long it would take for the body to break down this amount of alcohol. [1]
- (c) An adult has been drinking a lot of alcohol every day for many years. He has recently started feeling nauseous frequently and has an overall loss of appetite.
- (i) Name a medical condition that he may be suffering from. [1]
- (ii) Suggest and explain a possible treatment, besides decreasing or stopping alcohol intake, to alleviate his symptoms. [2]

[Total: 10]

9 Either

- (a) Fig. 9.1 shows how the rate of photosynthesis varies with light intensity for two bryophyte plants. *Jubula hutchinsiae* (*J. hutchinsiae*) grows in forests, while *Tortula ruralis* (*T. ruralis*) grows in sunny, exposed habitats.

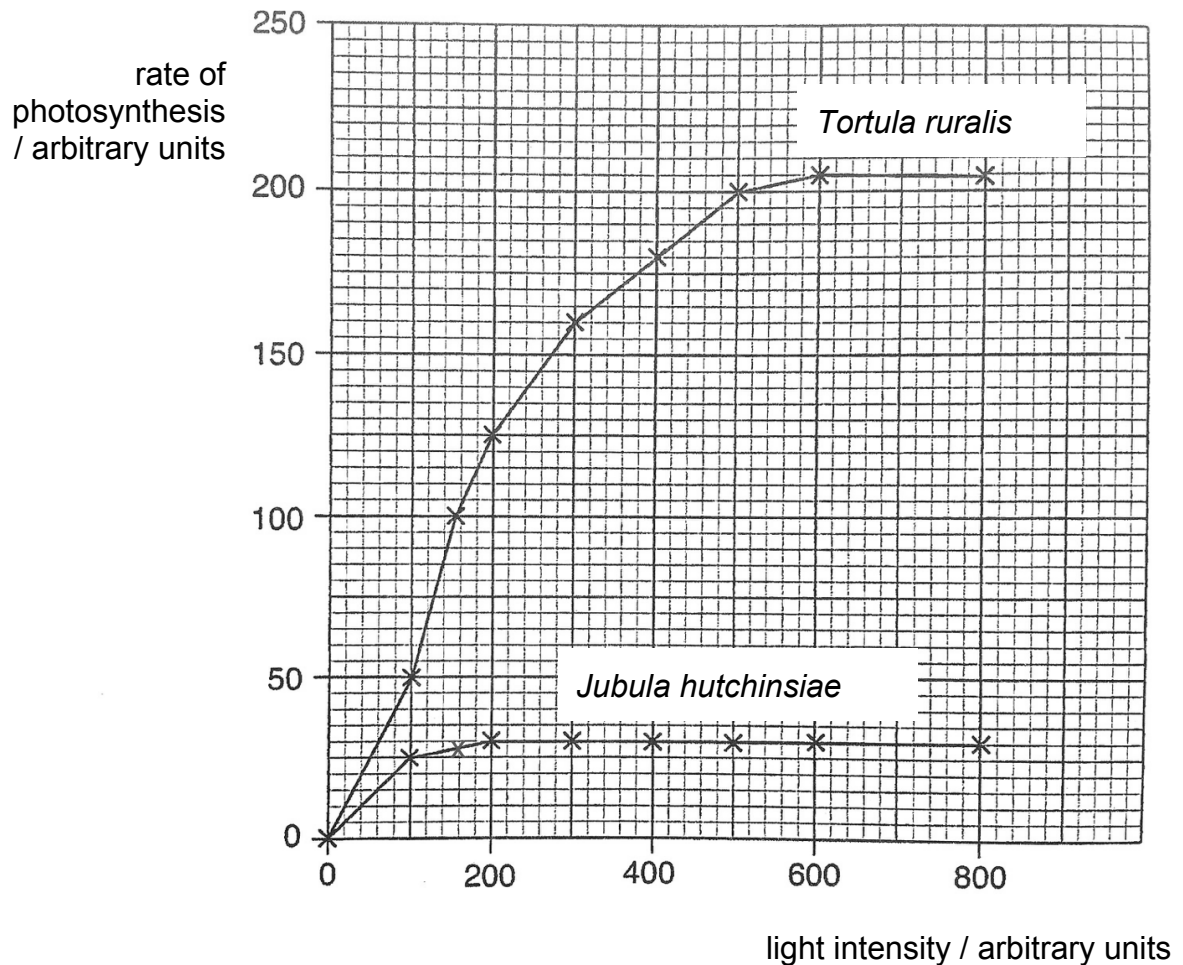


Fig. 9.1

With reference to Fig. 9.1, suggest why the rate of photosynthesis of *J. hutchinsiae* reaches a plateau at a much lower light intensity than that of *T. ruralis*. [4]

- (b) Describe how light intensity affects the rate of photosynthesis of *T. ruralis*. [6]

[Total: 10]

9 Or

(a) Fig. 9.2 shows the changes in pressure in the systemic circulation.

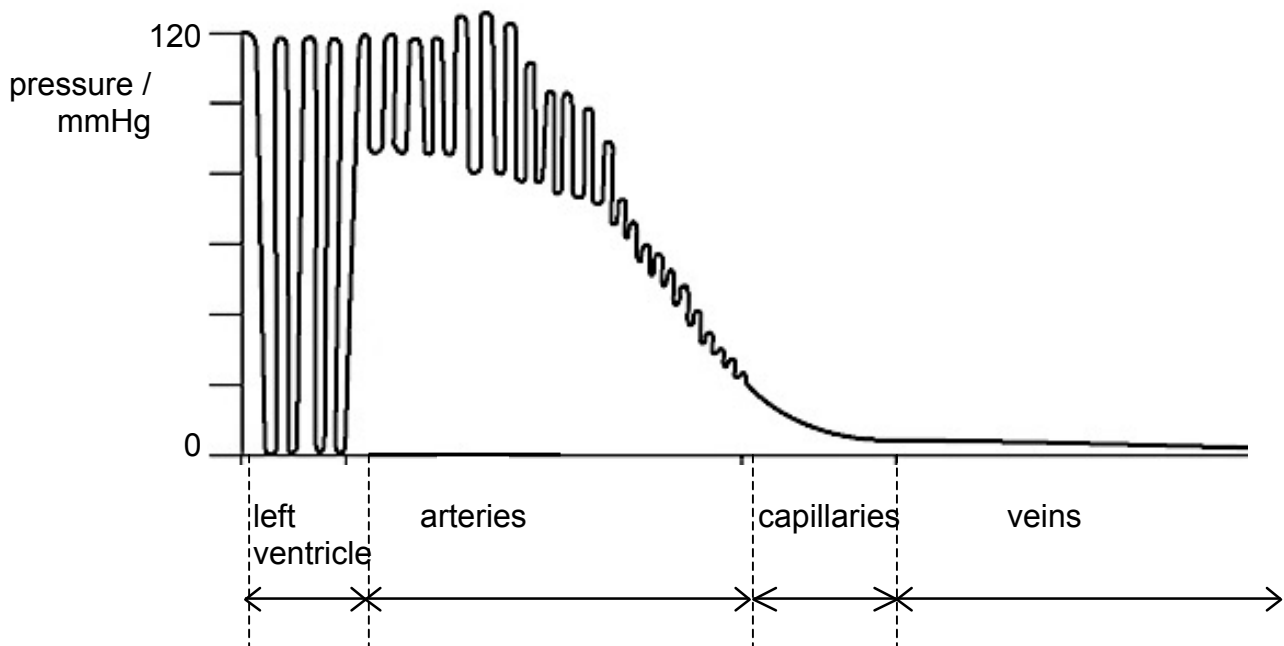


Fig. 9.2

With reference to Fig. 9.2, explain the change in pressure in the systemic [4]
circulation.

(b) List three factors that increase risk of coronary heart disease and describe the [6]
preventive measure for each factor listed.

[Total: 10]

End of paper