Excretion & Homeostasis

(ii) The doctors used urine tests to identify volunteers who had a high salt diet.

Explain why urine tests are a good indicator of how much salt has been consumed.

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1 The kidney is one of the main excretory organs of the body.

(a) Define the term *excretion*.

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..... [3]

(b) One of the roles of the kidney is to filter the blood.

Fig. 1.1 shows a section of a kidney.

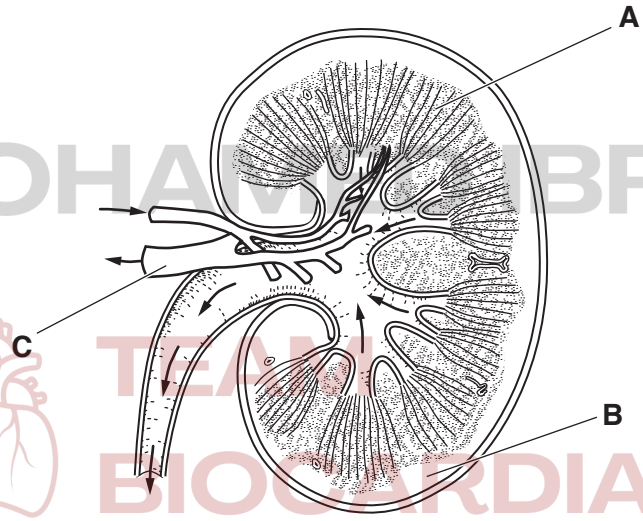

Fig. 1.1

State the name of the parts labelled **A**, **B** and **C** on Fig. 1.1.

A .....

B .....

C .....

[3]

(c) Table 1.1 shows the concentrations of four solutes:

- in the blood in the renal artery
- in the fluid in the kidney tubule
- in the urine.

Table 1.1

solute	solute concentration / g dm^{-3}		
	blood in the renal artery	fluid in the kidney tubule	urine
glucose	0.9	0.9	0.0
protein	83.0	0.0	0.0
salts	8.0	8.0	16.5
urea	0.2	0.2	20.0

(i) Calculate the percentage increase in the concentration of urea between the blood in the renal artery and the urine.

Show your working.

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[2]

(ii) Describe the results for the concentration of salts shown in Table 1.1.

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(iii) State the reason for the difference in the concentration of protein between the blood in the renal artery and the fluid in the kidney tubule.

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(iv) State the reason for the difference in the concentration of glucose between the fluid in the kidney tubule and the urine.

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..... [1]

(d) Dialysis is a treatment used for people with kidney failure.

Some people with kidney failure are given a kidney transplant.

State the advantages of having a kidney transplant instead of dialysis.

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[Total: 15]

4 Insulin is a hormone that regulates the concentration of glucose in the blood.

(a) Define the term *hormone*.

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(b) Two people, **A** and **B**, visited a doctor to discuss their similar symptoms. The doctor thought that their blood glucose concentrations were not very well controlled. A glucose tolerance test was carried out on both people.

A and **B** did not eat or drink anything other than water for eight hours before the test. They then drank a glucose solution. Blood samples were taken at 30 minute intervals. The samples were tested for glucose concentration.

The results are shown in Fig. 4.1.

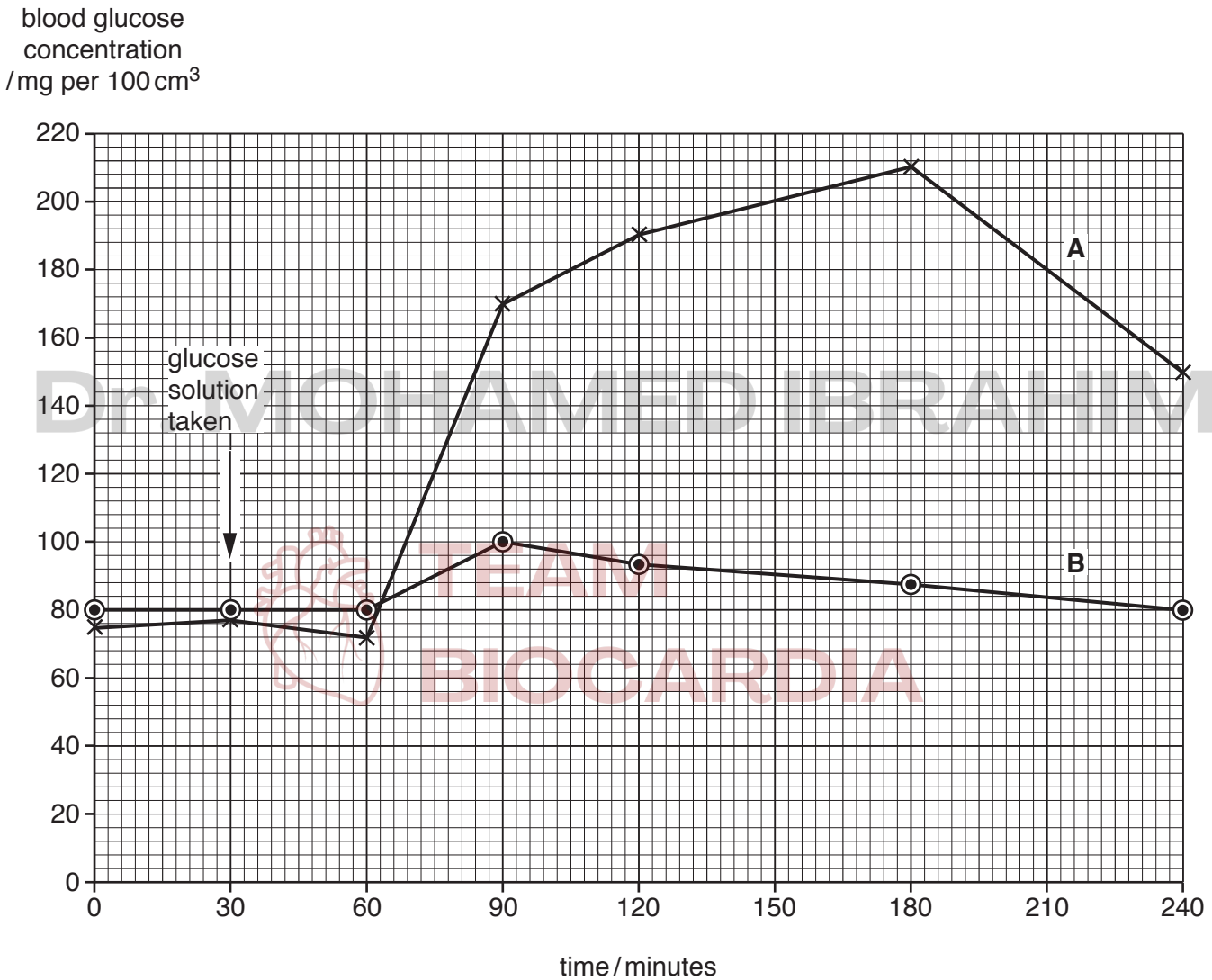

Fig. 4.1

(i) Use Fig. 4.1 to state the blood glucose concentrations of **A** and **B** at 180 minutes.

A ..... mg per 100 cm^3

B ..... mg per 100 cm^3
[1]

(ii) Calculate the percentage increase in the blood glucose concentration in person **A** between 60 and 90 minutes.

Give your answer to the nearest whole number.

Show your working.

..... %
[2]

(iii) Describe how the response of person **A** differs from the response of person **B** in Fig. 4.1.

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(iv) Explain the results of the glucose tolerance test shown by person **B**.

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(v) The doctor thought that person **A** had Type 1 diabetes.

Describe **three** symptoms of Type 1 diabetes.

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[Total: 15]

4 The flow of blood through the skin can be investigated by using a flow-meter.

Fig. 4.1 shows a flow-meter above a section through the skin.

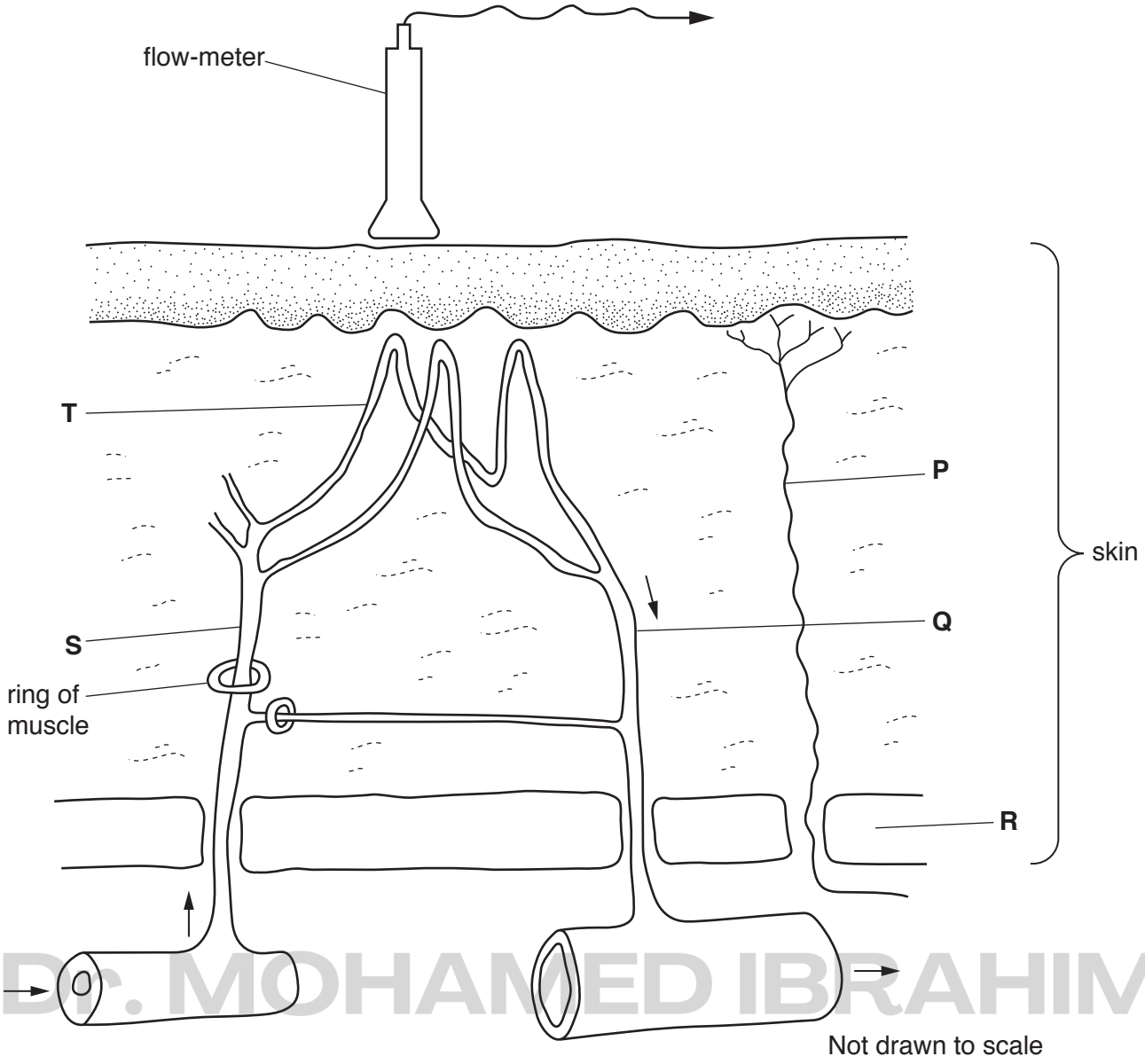

Fig. 4.1

(a) (i) State the name of cell **P**.

.....[1]

(ii) State the types of blood vessel labelled **Q**, **S** and **T**.

Q .....

S .....

T .....

[3]

(iii) State the name of the tissue at **R** that provides insulation.

.....[1]

(b) The blood flow through the skin of some volunteers was measured with a flow-meter when their skin was exposed to different temperatures.

Capsaicin is a compound that gives people the sensation of feeling hot when it is put on the skin. Researchers applied capsaicin to the skin of the volunteers and again measured the blood flow through their skin at different temperatures.

Fig. 4.2 shows the results.

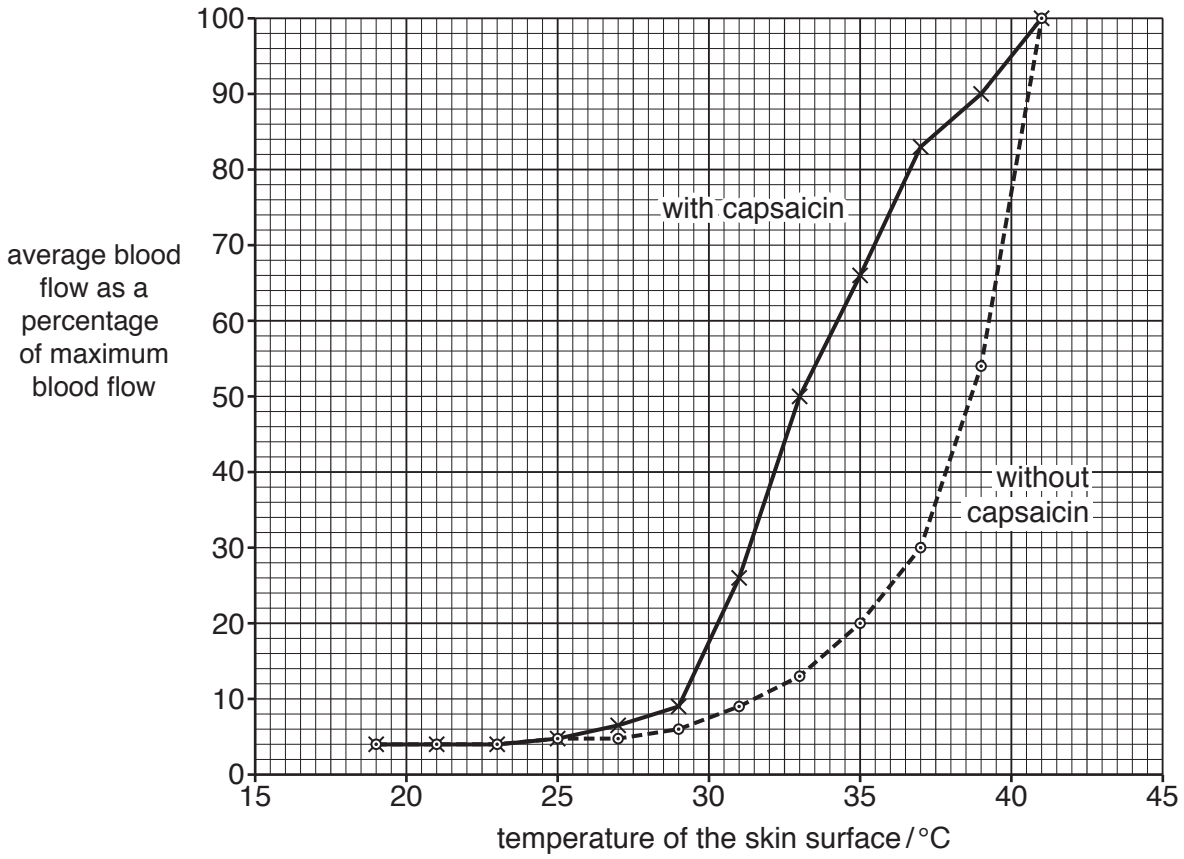

Fig. 4.2

(i) Use the information in Fig. 4.2 to describe the effect of increasing the temperature of the skin surface on blood flow to the skin **without** capsaicin.

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(ii) Explain the mechanism that increases blood flow through the skin.

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(iii) State the difference between the average blood flow for the treatments (with and without capsaicin) at 35 °C.

Space for working.

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(iv) The researchers thought that capsaicin stimulated receptors in the skin.

Explain the process by which capsaicin could reach these receptors.

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(c) Explain the importance of regulating body temperature in humans.

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(d) Body temperature is controlled by both hormones and nerves.

Explain how co-ordination by hormones differs from co-ordination by nerves.

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[Total: 22]