1. Describe the homeostatic mechanisms that regulate the water content of the blood by changing how much water is reabsorbed from the collecting duct.

You do **not** need to describe how the loop of Henle sets up a water potential gradient in your answer.

[6]

2(a). Organisms can be ectotherms or endotherms.

i. Define the term **endotherm**.

[1]

ii. Suggest **one** advantage and **one** disadvantage that ectotherms have compared to endotherms.

Advantage

Disadvantage

[2]

(b). During a class discussion, one student stated:

‘Ectotherms cannot control their body temperature.’

Another student stated:

‘Ectotherms control their body temperature by behavioural responses, but endotherms do not.’

Discuss, using examples, whether these two statements are correct.

[6]

(c). Infection by pathogens such as bacteria and viruses often causes release of pyrogens into the blood.

Pyrogens stimulate the enzyme COX-2 to produce the compound PGE_2.

PGE_2 binds to receptors in the hypothalamus and this results in an increase in the thermogenic set point.

i. Suggest the consequences of an increase in the thermogenic set point.

[2]

ii. PGE_2 receptors are located on the cell surface membrane.

State **two** functions of the cell surface membrane that are illustrated by the action of PGE_2.

1

2

[2]

3. Which of the statements about communication systems is correct?

A Cell signalling acts only over short distances.

B Communication systems are required to coordinate responses and maintain a near-constant internal environment.

C Effectors that respond to hormones do not respond to nervous stimulation.

D Plants do not require communication systems because, unlike animals, they do not respond to their environments.

Your answer ☐ **[1]**

4. Fig. 2.1 shows a light micrograph of a blood smear.

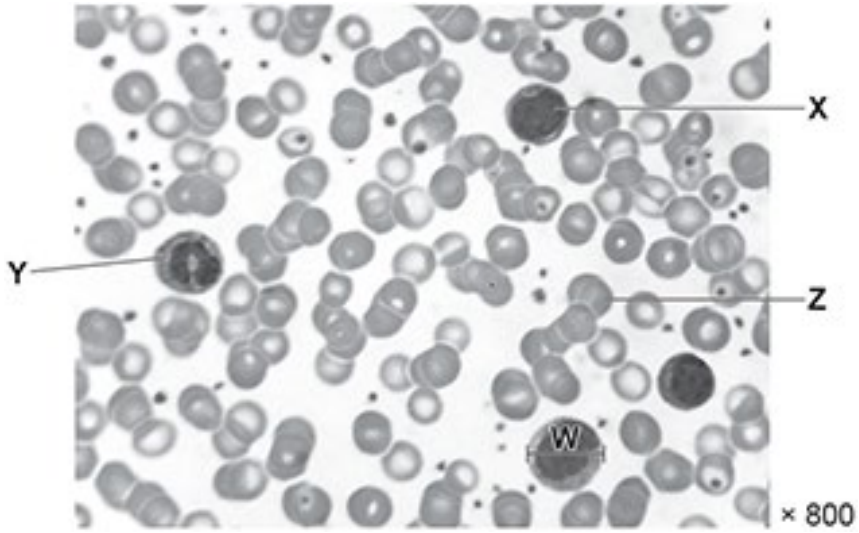

Fig. 2.1

i. The cells labelled **X** and **Y** in **Fig. 2.1** are two different types of white blood cell.

Identify the types of white blood cell labelled **X** and **Y**.

X _____

Y _____

[2]

ii. The blood cell labelled **Z** in **Fig. 2.1** contains a high concentration of haemoglobin.

Outline **two** other ways in which the blood cell labelled **Z** is adapted for its function.

_____

_____

_____

_____

[2]

iii. The diameter of another blood cell is represented by the line **W** in **Fig. 2.1**.

The magnification used to produce **Fig. 2.1** was × 800.

Calculate the actual diameter, **W**, of the blood cell.

Give your answer in μm.

Diameter = ... μm [2]

5. Which process is an example of cell signalling?

A Binding of a virus to a receptor on the cell surface membrane of an epithelial cell in the upper respiratory tract

B Binding of acetylcholine to cell surface receptors on sodium ion channels in the post-synaptic neurone

C Co-transport of glucose and Na^+ ions across the cell surface membrane of an epithelial cell in the proximal convoluted tubule

D Operation of the Na^+/K^+ pump in the cell surface membrane of the axon

Your answer ☐ **[1]**

6. Which statement describes an aspect of homeostasis?

A Effectors detect a change and cause release of hormones that bind to target cells.

B Homeostasis maintains the internal body temperature of animals at a constant level.

C Homeostasis involves both positive and negative feedback.

D Receptors coordinate nervous and hormonal responses.

Your answer ☐ **[1]**

END OF QUESTION PAPER