Oxford Cambridge and RSA

AS Level Biology A

H020/02 Depth in biology

Question Set 14

1. Fig. 1 is a photomicrograph of a mammalian blood smear.

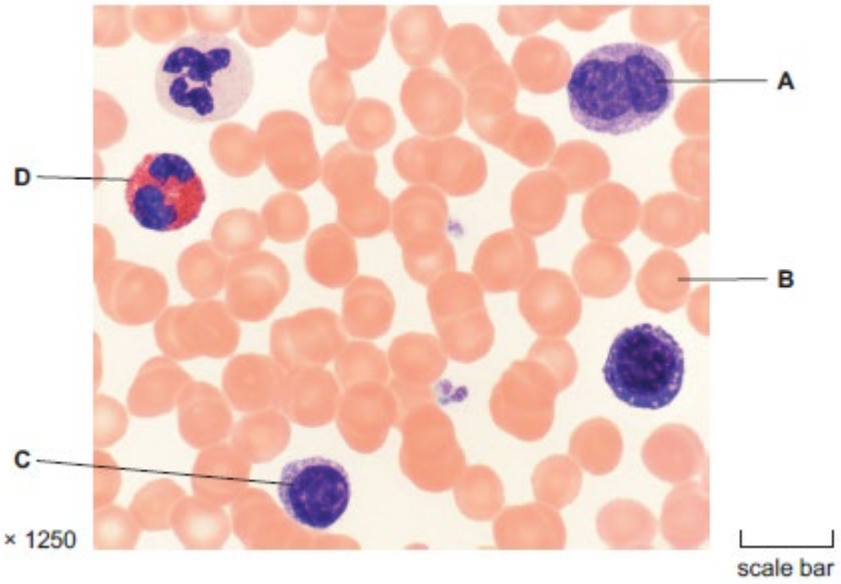

Fig. 1

(a) Calculate the image length, in μm, represented by the scale bar.

Give your answer to **2** significant figures.

Scale bar = 12mm = 12000 μm

I A M $M = \frac{I}{A}$ $1250 = \frac{I}{12000\mu m}$ $I = 1.5 \times 10^{7}\ \mu m$

length = ... 1.5×10^{7} ..... μm **[2]**

(b) **(i)** Name the cell labelled **B**. Red blood cell **[1]**

(ii) Cells **A**, **C** and **D** work together to carry out an important function.

State the function that cells **A**, **C** and **D** perform. **[1]**

Involved in the specific immune response against foreign bodies.

(c) The smear has been stained with haematoxylin and eosin stain. This is a differential stain.

- Haematoxylin stains nucleic acid blue.
- Eosin stains protein (including cytoplasmic proteins) pink or red.

(d) Explain why it is important to use a differential stain when examining a blood smear under the microscope. **[3]**

It is important to enable easy differentiation between different structures. White blood cells are colourless so cannot be differentiated under normal conditions. Differential staining enables the nucleus of the cell to be stained a different colour from the cytoplasm, enabling different nucleus shapes and thus white blood cell types to be distinguished. It also enables white blood cell counts to take place.

(e) Using Fig. 1 and the information provided, suggest **and** explain why the cytoplasm of cell **C** and cell **D** reacted differently to the stain. **[4]**

The cytoplasms of eosinophils (cell D) stain red because they contain a high concentration of cytoplasmic proteins which have a high affinity for and take up eosin. The cytoplasms contain many proteins because eosinophils are granulocytes with many protein-containing granules. In comparison the cytoplasms of lymphocytes (cell C), which are agranulocytes, do not have a high concentration of proteins so do not take up eosin. The cytoplasms stain pale blue due to the presence of RNA which takes up haematoxylin.

Total Marks for Question Set 14: 11