

AS Level Biology B (Advancing Biology)
H022/02 Biology in depth
Sample Question Paper

Date – Morning/Afternoon

Time allowed: 1 hour 30 minutes



You must have:

- the Insert

You may use:

- a scientific calculator



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First name											
Last name											
Centre number							Candidate number				

INSTRUCTIONS

- Use black ink. You may use an HB pencil for graphs and diagrams.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION

- The total mark for this paper is **70**.
- The marks for each question are shown in brackets [].
- Quality of extended responses will be assessed in questions marked with an asterisk (*).
- This document consists of **20** pages.

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SPECIMEN

2 **Table 2.1** shows some components which can be found in phloem sap.

Component	Concentration (mg cm^{-3})
Sucrose	80 – 160
Protein	1.45 – 2.20
Amino acids	5.20
Phosphate ions	0.35 – 0.55
Potassium ions	2.30 – 4.40

Table 2.1

(a) Explain what is meant by the term *organic molecule* using an example from **Table 2.1**.

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..... [2]

(b) A student tested a sample of phloem sap by placing the sample in a test tube and carrying out a Benedict's test. The result of the Benedict's test was negative.

(i) Describe the appearance of the test tube when a negative result is obtained in a Benedict's test.

.....

..... [1]

(ii) The student observed that, following the Benedict's test, the tube appeared cloudy. Using your knowledge of the Benedict's test and the information in **Table 2.1**, suggest why the tube content appeared cloudy after the test.

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..... [2]

3 (a) Scientists studying human evolution have shown that both *Homo neanderthalensis* and *Homo sapiens* were ‘hunter-gatherers’. Both evolved behaviours in response to the changing environment. *Homo sapiens* made the transition to producing food.

(i) What evidence might suggest that both species hunted food?

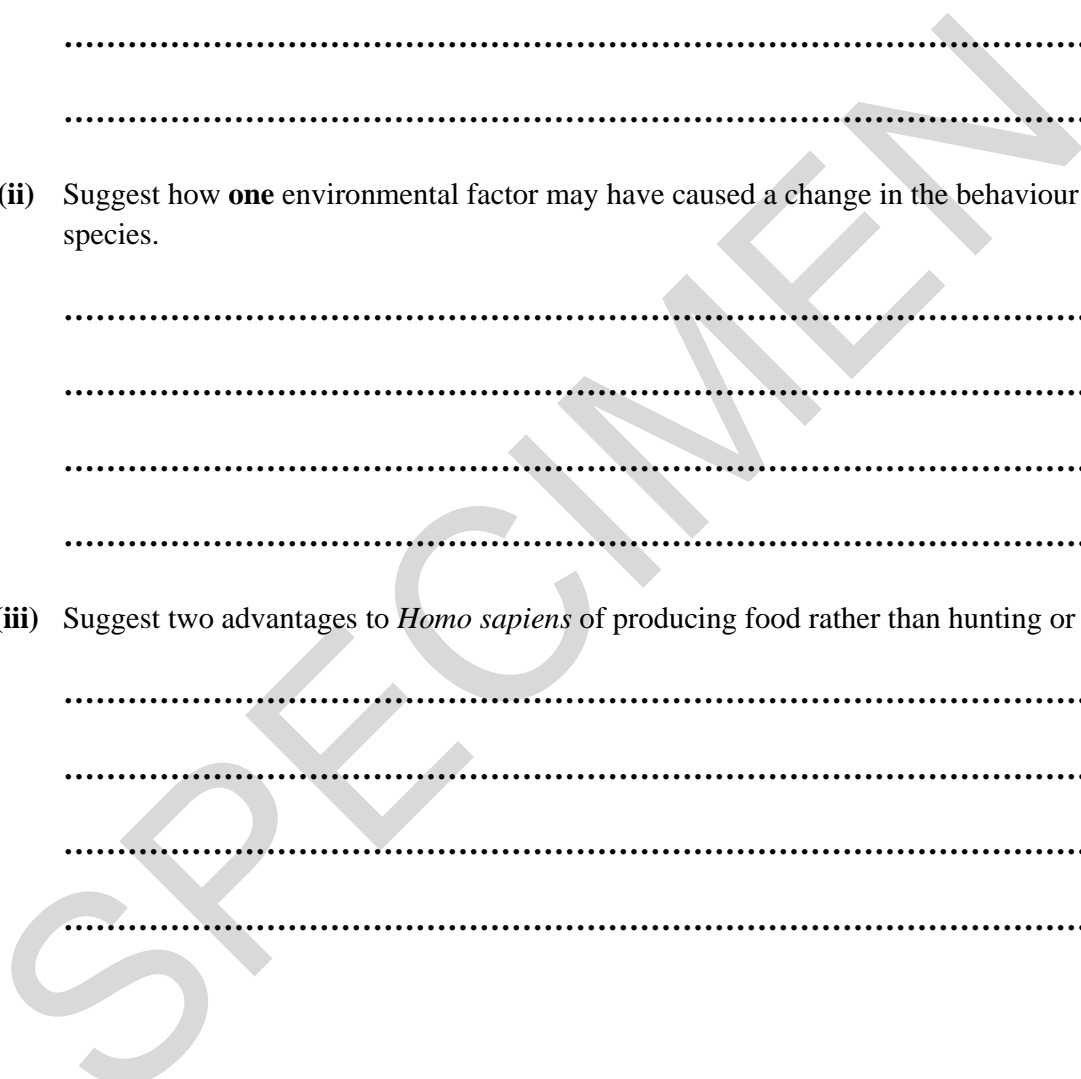
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..... [2]

(ii) Suggest how **one** environmental factor may have caused a change in the behaviour of both species.

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..... [2]

(iii) Suggest two advantages to *Homo sapiens* of producing food rather than hunting or gathering.

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..... [2]



- (b) The hyoid bone is a horseshoe-shaped structure found in the neck. It supports the root of the tongue and is needed for speech. Hyoid bones from *Homo neanderthalensis* were discovered in 1989.

Why is the discovery of the hyoid bone **not** conclusive evidence of the ability of *Homo neanderthalensis* to speak?

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..... [2]

SPECIMEN

4 Viruses are pathogens. They can infect both animal and plant cells.

Fig. 4.1 is a diagram of the human immunodeficiency virus (HIV).

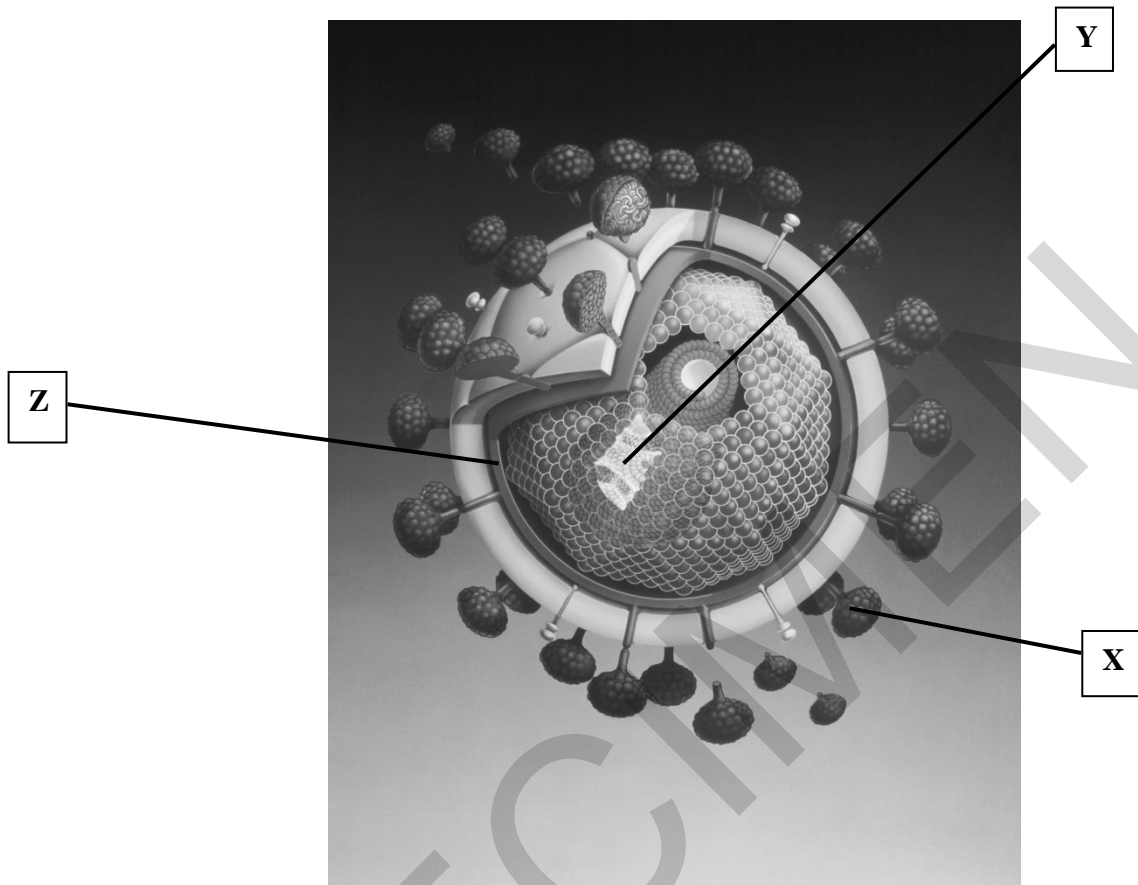


Fig. 4.1

(a) What is the role of structure X?

X

..... [1]

Fig. 4.2 shows the trends in the incidence of AIDS, the number of AIDS-related deaths, and the prevalence of AIDS in the USA from 1985 to 2003.

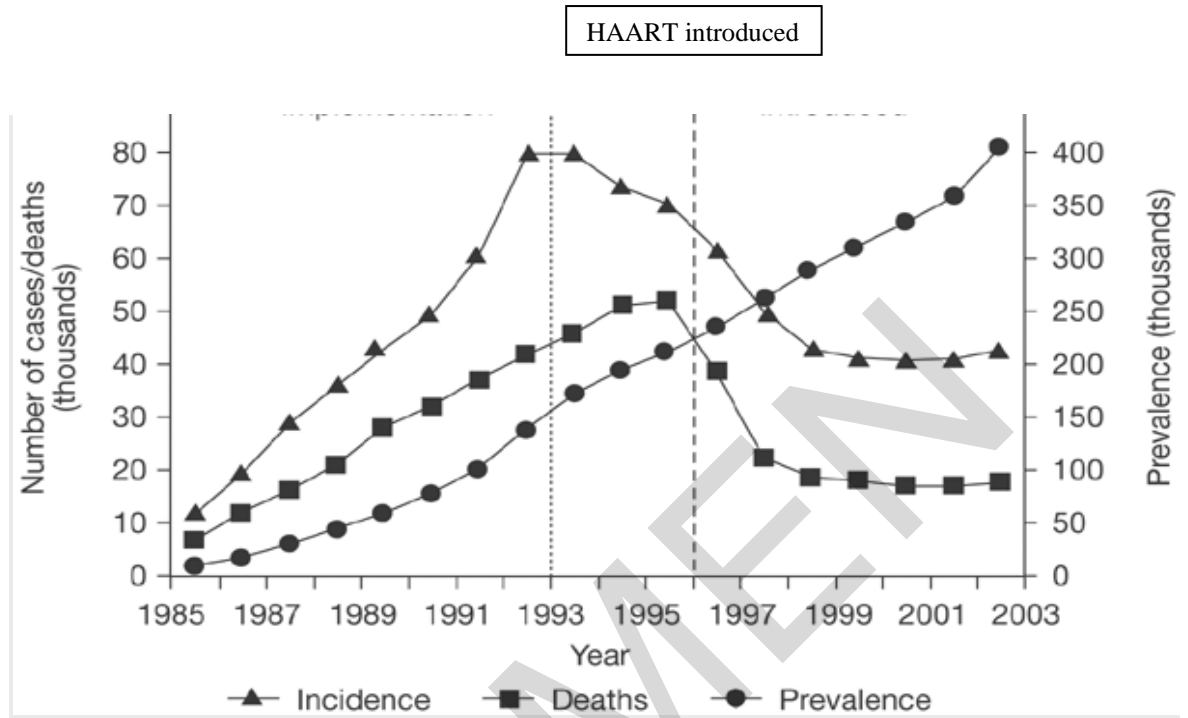


Fig. 4.2

(ii) Compare the trends in incidence of AIDS and AIDS-related deaths between 1988 and 1995.

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[3]

(iii) HAART was introduced in 1996.

Evaluate the effectiveness of the introduction of HAART on the prevalence of AIDS and the number of AIDS-related deaths.

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[3]

- 5 (a) When preparing cells for viewing under a microscope, the technique of differential staining may be used.

Fig. 5.1, on the insert, is a micrograph showing a stained section of plant root tissue.

- (i) Use **Fig. 5.1** to explain what is meant by differential staining.

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..... [2]

- (ii) Selecting the appropriate measurements from **Fig. 5.1, on the insert,** calculate the proportion of the root area that is occupied by the **stele**.

You can assume that all the structures are circular.

Show your working.

proportion of root area occupied by the stele[3]

- (iii) **Fig. 5.2, on the insert,** shows light micrographs of the blood smears from two patients, **A and B.**

To prepare the samples for viewing under the microscope, health professionals must first obtain blood from the patients.

State and explain **one** safety precaution that must be taken by a health professional when obtaining and handling blood samples.

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..... [2]

- (iv) A laboratory technician compared the stained smear from both patients, **A** and **B**, from **Fig. 5.2, on the insert**, and made the following statements:

Statement 1: *'The blood smear of patient B appears normal'.*

Statement 2: *'The same differential stain was used in preparing both blood smears'.*

Statement 3: *'The cell labelled X in both micrographs can be identified as a lymphocyte'.*

Statement 4: *'Patient A may have a type of blood cancer'.*

What evidence in **Fig. 5.2, on the insert**, supports the statements made by the laboratory technician?

Statement 1.....

.....

Statement 2.....

.....

Statement 3.....

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Statement 4.....

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[4]

- (v) The laboratory technician suggested that further blood smears for patient **A** would be needed before the diagnosis was confirmed.

Suggest why.

.....

..... [1]

(c) (i) Flow cytometers can be used to analyse blood. Fig. 5.4 outlines the process of flow cytometry.

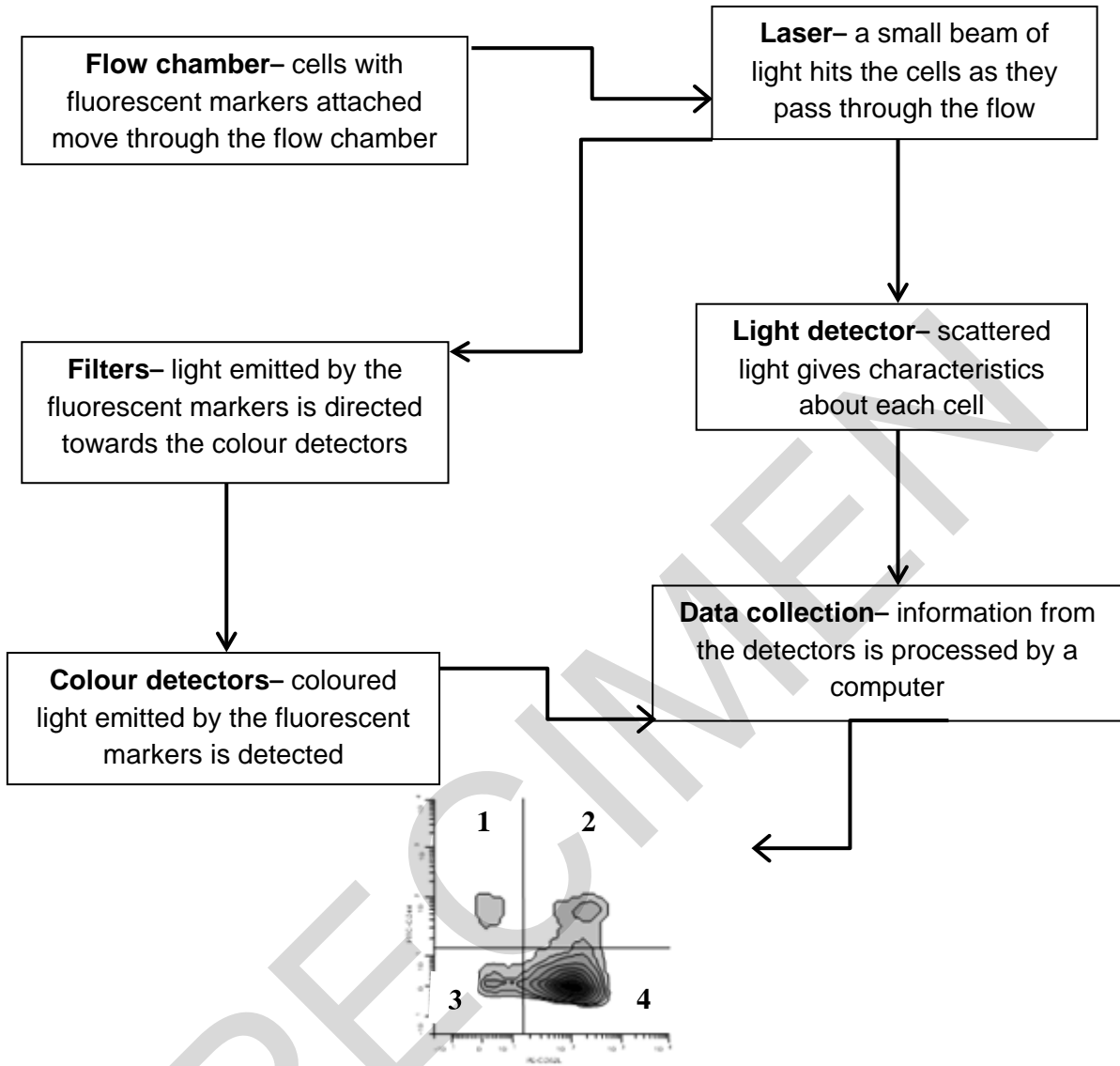


Fig. 5.4

Evaluate the use of using flow cytometry in blood analysis.

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[5]

6 Apoptosis is programmed cell death. It is an important process in the formation of fingers and toes of a developing fetus.

(a) Statements **A** to **E** below describe the process of apoptosis.

Put the statements in the correct order.

A 'blebbing' of the cell surface membrane occurs

B apoptotic bodies are engulfed by phagocytes

C the cell shrinks

D breakdown of the nucleus occurs

E receptors on phagocytes recognise surface phospholipids on the apoptotic bodies

.....

[3]

(b) (i) **Fig. 6.1** shows the hands of a fetus at two different stages in development.

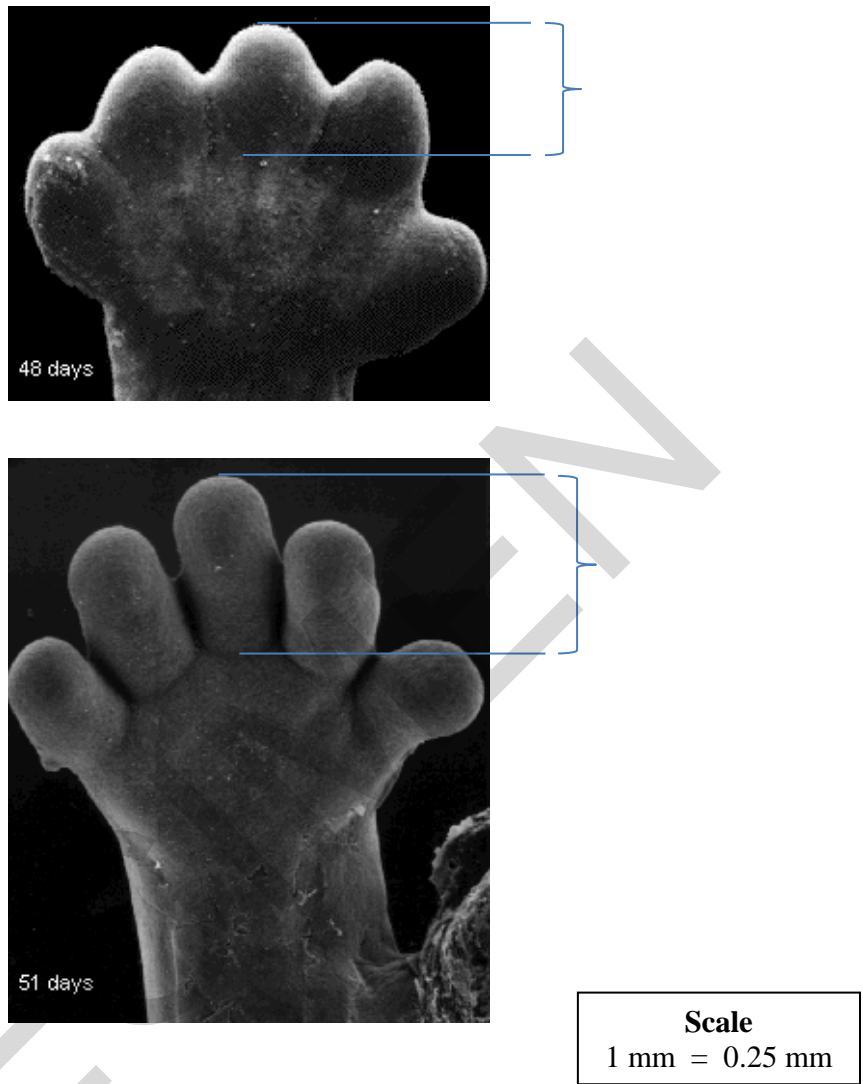


Fig. 6.1

Using **Fig. 6.1**, calculate the growth **rate** of the middle digit between 48 and 51 days.

Show your working.

growth rate mm day⁻¹ [2]

- (ii) Name **one** nutrient that is required to support the growth of tissues in the developing fetus and state its role.

.....
..... [1]

END OF QUESTION PAPER

SPECIMEN

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SPECIMEN

Copyright Information:

Page 8, Fig. 4.1: HIV image © Hans-Ulrich Osterwalder/Science Photo Library

Page 10, Fig. 4.2: AIDS graph © Yarchoan, R., Tosato, G., and Little, R.F. (2005), 'Therapy Insight: AIDS-related malignancies—the influence of antiviral therapy on pathogenesis and management'. *Nature Clinical Practice Oncology* (2005) 2. 406-415. Available at: - [http://www.nature.com/nrclinonc/journal/v2/n8/fig_tab/ncponc0253_F1.html#figure-titleTherapy Insight: AIDS-related malignancies—the influence of antiviral therapy on pathogenesis and management](http://www.nature.com/nrclinonc/journal/v2/n8/fig_tab/ncponc0253_F1.html#figure-titleTherapy%20Insight:%20AIDS-related%20malignancies—the%20influence%20of%20antiviral%20therapy%20on%20pathogenesis%20and%20management)

Page 13, Fig. 5.3: Leukaemia graph © www.cancerresearch.org.uk

Page 14, Fig. 5.4: Process of flow cytometry © Oregon State University, Environmental Health Science Center, 1011 ALS Building, Corvallis, OR 97331

Page 15, Fig. 5.5: Cytotoxic T lymphocytes © Oregon State University, Environmental Health Science Center, 1011 ALS Building, Corvallis, OR 97331

Page 17, Fig. 6.1: hands of fetus images © <http://www.i-am-pregnant.com/Pregnancy/calendar/week/7>

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You must have:

- the Question Paper



INFORMATION

- This document consists of **4** pages. Any blank pages are indicated.

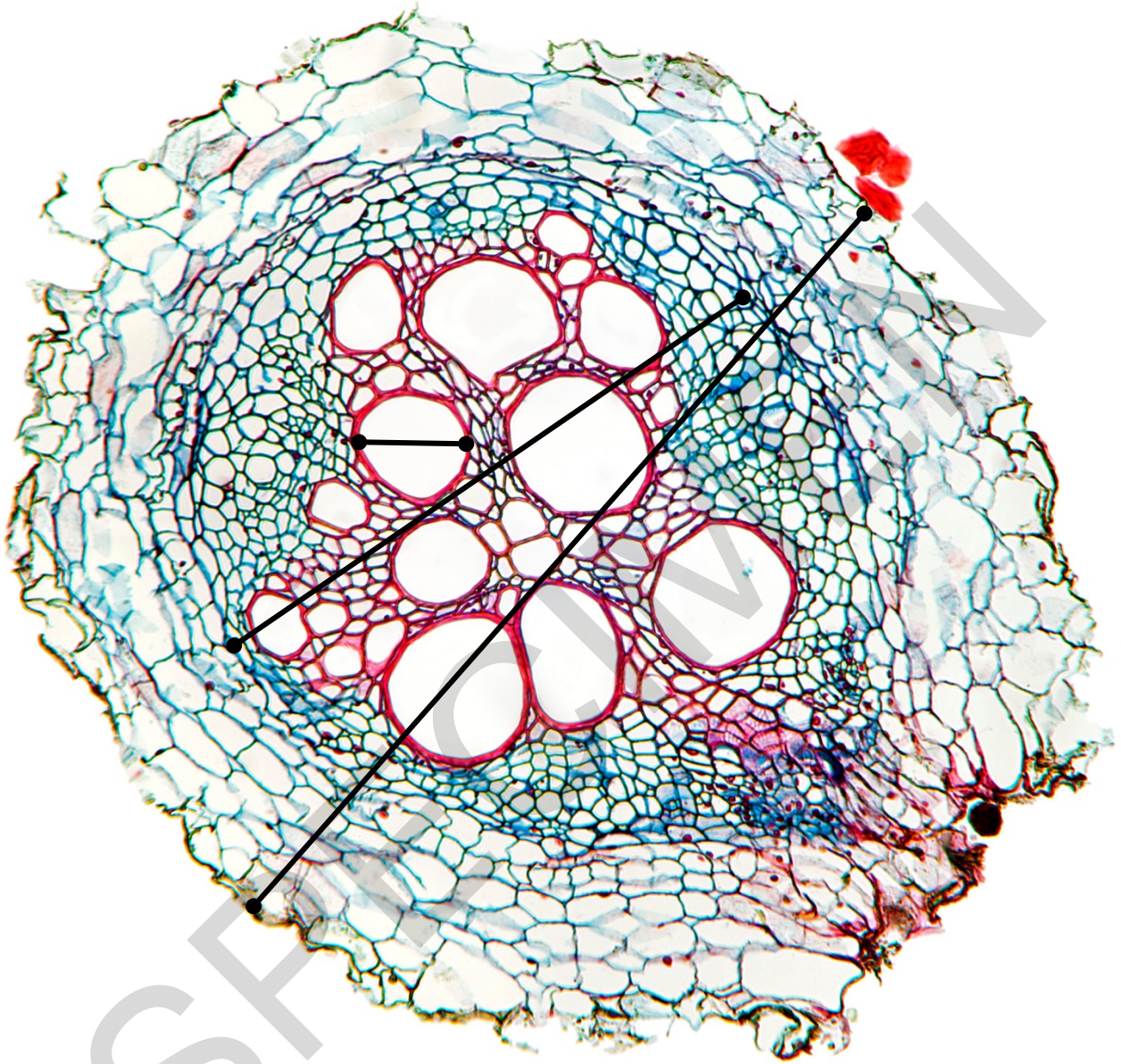
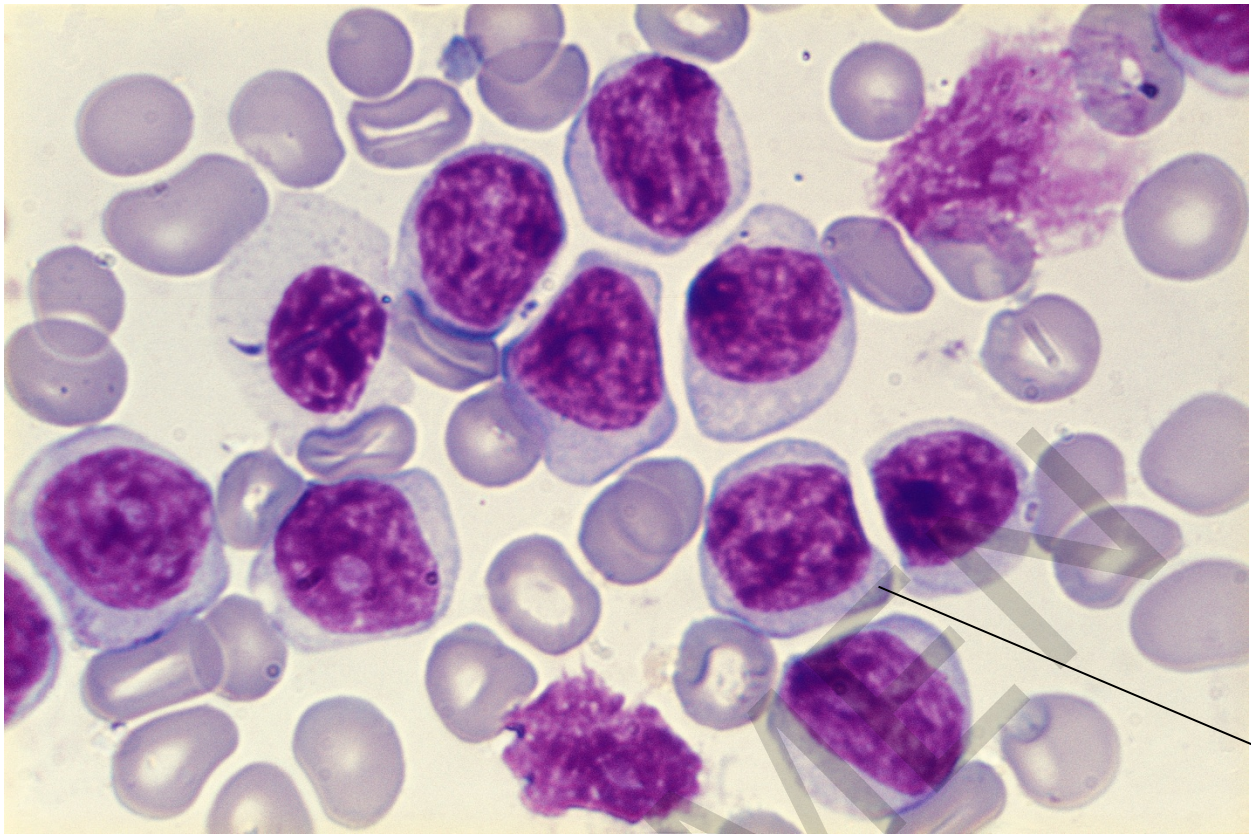
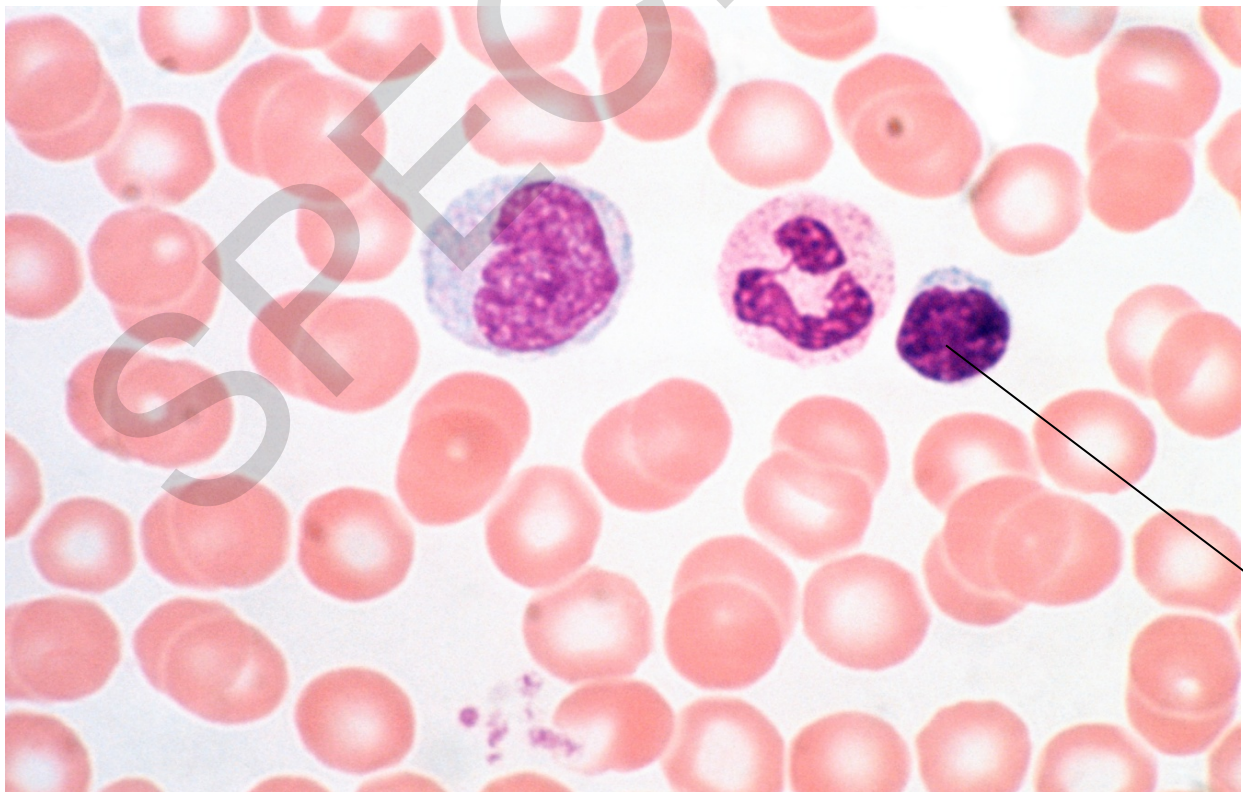


Fig. 5.1

3



Patient A



Patient B

Fig. 5.2