

Name	Class	Index Number
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Anglo-Chinese School (Independent)

YEAR 4 INTEGRATED PROGRAMME / SBGE / ACS

TERM 2 COMMON TEST



BIOLOGY

Paper 2

21 April 2023

1 Hour 45 Minutes

No Additional Materials are required.

INSTRUCTIONS TO STUDENTS

Write your name, class, and index number in the spaces at the top of the Question paper.

Write in dark blue or black pen. Use a pencil for any diagrams or graphs.

Section B and Section C

Answer **all** questions in the spaces provided on the Question paper.

At the end of the test, submit the Question paper.

INFORMATION FOR CANDIDATES

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

Name of Parent / Guardian:	
Signature & Date:	

For Examiner's Use	
Section A	/ 30
Section B	/ 40
Section C	/ 10
Total	/ 80

This paper consists of 17 printed pages including this cover page.

Section B

- 1 Fig. 1 below shows a diagrammatic representation of an artificial kidney machine.

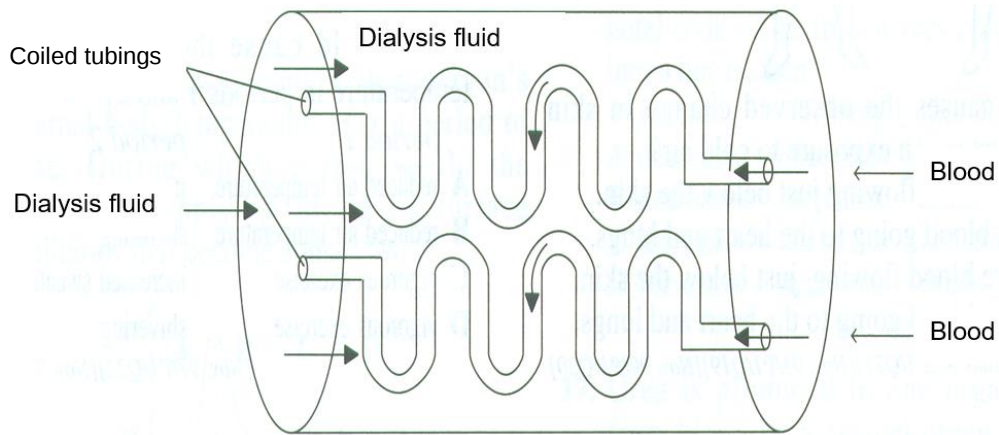


Fig. 1

- (a) Explain why the tubings are coiled rather than straight. [1]

- (b) Explain why it is important that the flow of the dialysis fluid is opposite to the blood. [1]

(c) The dialysis fluid contains a carefully regulated amount of dissolved salts and glucose with a composition similar to blood plasma, without nitrogenous waste.

(i) Explain why the concentration of glucose in the dialysis fluid is maintained at the same concentration as that in the patient's blood. [1]

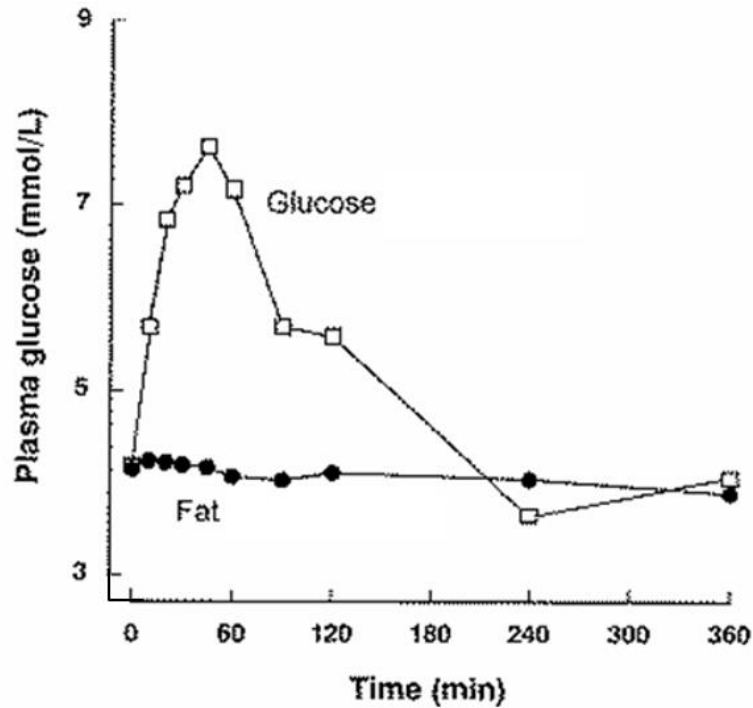
(ii) Why must the dialysis fluid be changed regularly? [1]

(iii) During dialysis, state which types of blood vessel is blood:
(1) withdrawn from the human body (using the new method - fistula).
(2) return to the human body. [1]

(1)
(2)

[Total: 5]

- 2 The graph below shows the level of glucose in the blood plasma after a man has orally taken in 100 g of glucose and 40 g of fat.



- (a) What is the fluctuation in the level of blood glucose 1 hour after the oral intake of
- (i) the 100 g of glucose; [1]
 - (ii) the 40 g of fat? [1]

(i)

(ii)

- (b) How long does it take for the level of blood glucose to return to normal level after the intake of glucose? [1]

- (c) Explain how the body brings the high level of glucose back to normal. [2]

[Total: 5]

- 3 Fig. 3 shows the changes in the concentration of urine and the rate of flow of urine when the concentration of antidiuretic hormone (ADH) in the blood plasma changes.

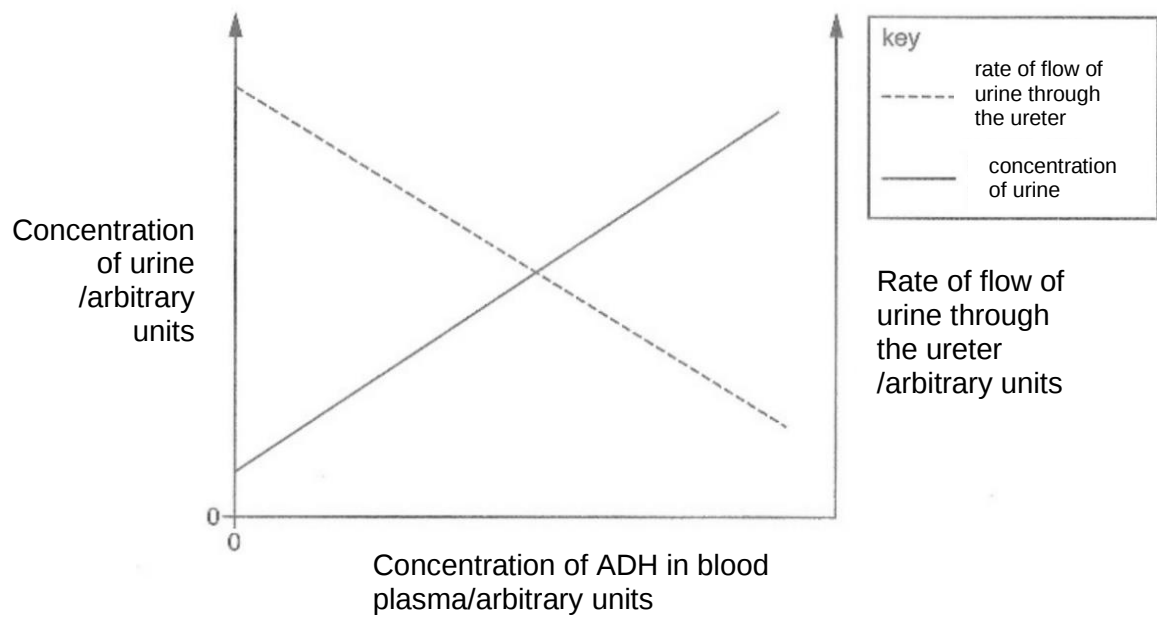


Fig.3

- (a) With reference to Fig.3, describe the relationship between the concentration of ADH in the blood plasma and the concentration of urine. Give a reason for the relationship. [3]

- (b) Suggest how vigorous exercise may affect the concentration of ADH in the blood. [2]

[Total: 5]

- 4 Fig. 4 shows a spinal cord with an incomplete reflex arc that involves three neurones.

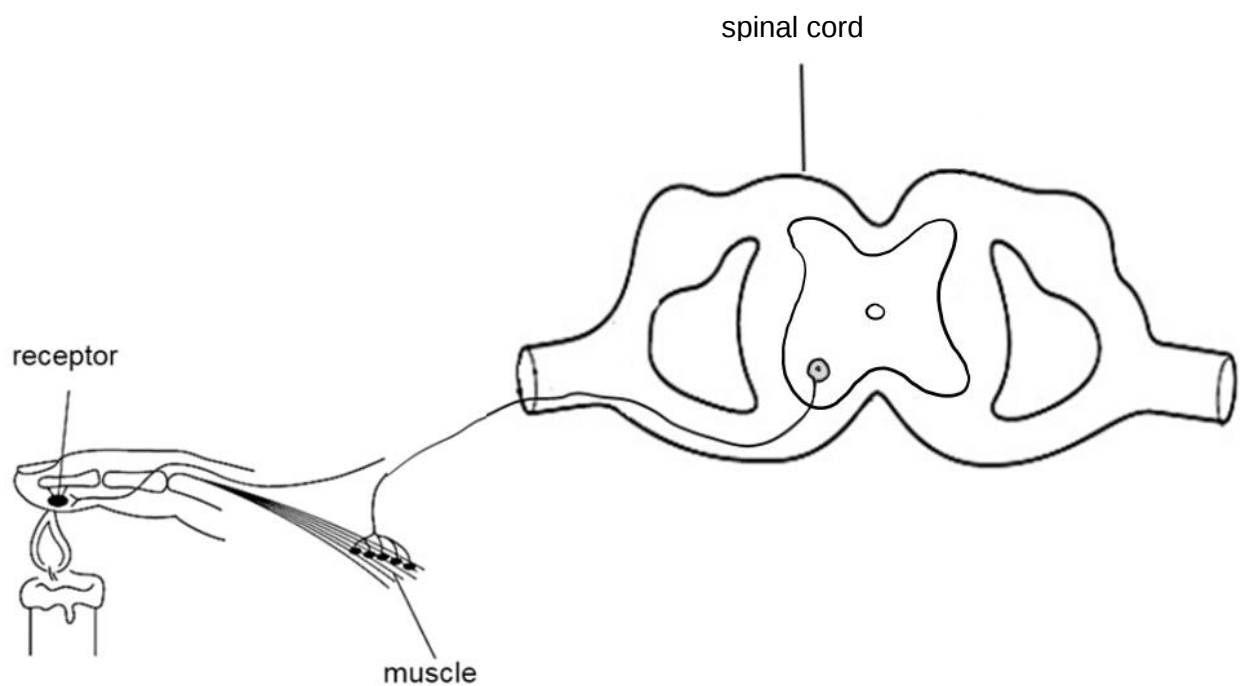


Fig.4

In Fig. 4:

- (a) Draw and label the neurones that conduct nerve impulses into and through the spinal cord to complete the reflex arc. One neurone has been drawn for you. [3]
- (b) Label clearly, the grey matter in the spinal cord. [1]

[Total: 4]

5 Fig. 5 shows the internal structure of an eye.

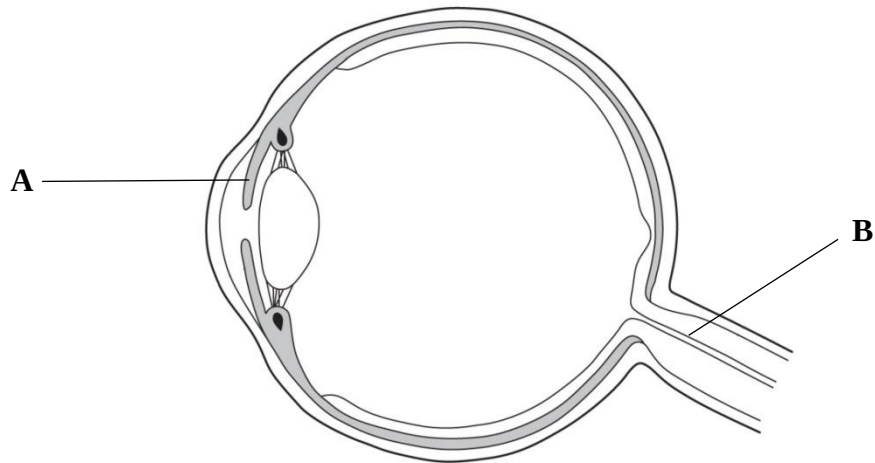


Fig. 5

(a) Name and state the function of the parts labelled A and B. [4]

A:

B:

(b) On Fig. 5, name and label the region of the retina with the most cone receptors. [1]

[Total: 5]

- 6 A student carried out an investigation to observe mitosis in the root tip of an onion (*Allium cepa*).

(a) Table 6 shows the number of cells in each stage of mitosis.

Stage of mitosis	Number of cells in each stage of mitosis	Percentage of cells in each stage of mitosis
Prophase	217	83.8
Metaphase	19	
Anaphase	8	3.1
Telophase	15	5.8

Table 6

- (i) Complete table 6 to show the percentage of cells that were in metaphase. [1]
- (ii) A mitotic index can be calculated for a tissue. This is a measure of the rate of mitosis.

$$\text{Mitotic index} = \frac{\text{Number of dividing cells}}{\text{Total number of cells}}$$

The student counted a total of 863 cells. Using the formula and data from the table, calculate the mitotic index for the root tip. Show your working clearly in the space below. Round off your answer to the nearest 1 decimal place. [2]

- (b) Fig. 6 shows a nucleus of a cell undergoing mitosis.

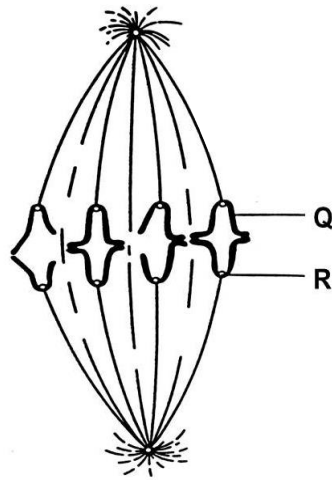


Fig. 6

- (i) Identify the structures R and Q

[1]

R:

Q:

- (ii) State the number of chromosomes in this cell.

[1]

[Total: 5]

- 7 Figure 7.1 shows the chromosomes of a cell at prophase of mitosis. The diploid number of the cell below is 4.

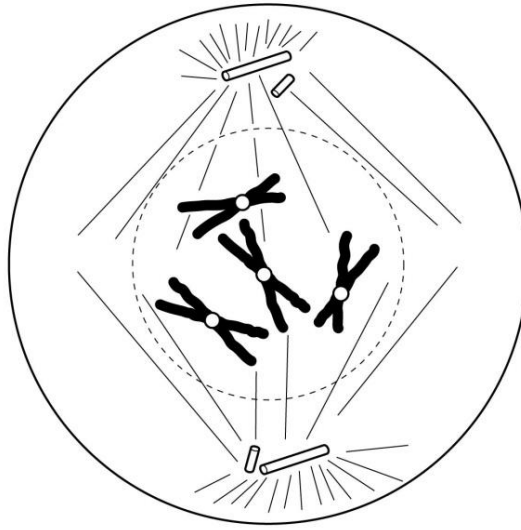


Fig.7.1

- (a) Complete Fig. 7.2 below to show the cell during **anaphase II** of meiosis. Labels are not required. Include spindle fibres in your drawing. [2]

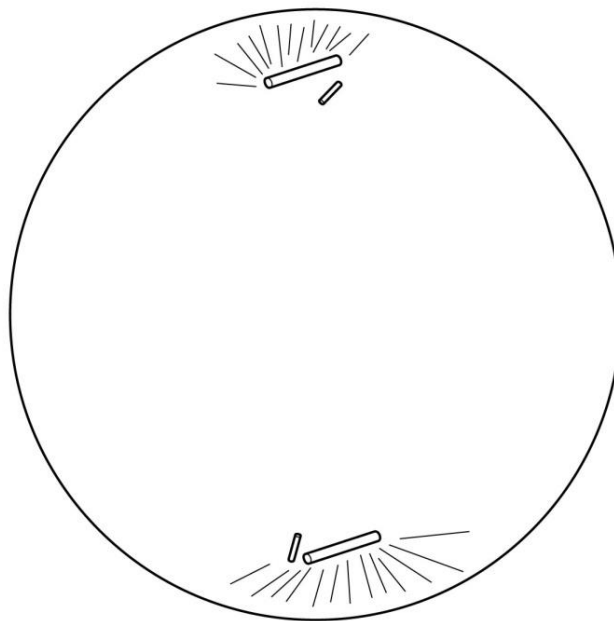


Fig.7.2

(b) Explain why meiosis is important in sexually reproducing organisms.

[3]

[Total: 5]

- 8 Fig. 8 shows a photomicrograph of a pollen grain with a pollen tube growing from it.

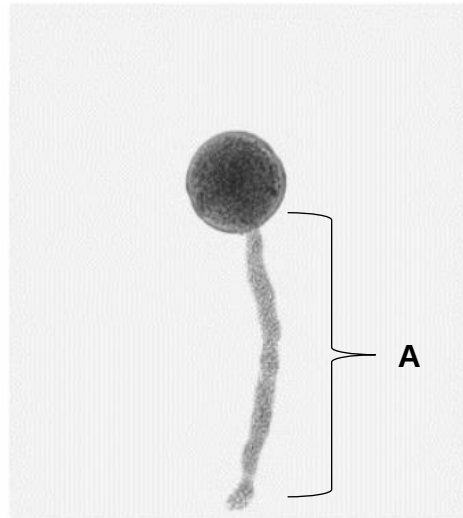


Fig. 8

A student placed pollen grains from the same type of plant in sucrose solutions of different concentrations for a fixed amount of time. After this time, the student used a microscope to examine the pollen grains and tubes.

- (a) Identify structure A in Fig.8. [1]

- (b) Table 8 shows the results of the investigation.

% sucrose concentration	% of pollen grains germinated	mean pollen tube length / mm
1	6	0.005
2	13	0.008
4	25	0.015
8	56	0.040
10	31	0.030
20	25	0.018
40	13	0.006

Table 8

- (i) A total of 12 pollen grains were placed in the 20% sucrose solution.
Using the information in Table 8, calculate the number of pollen grains that germinated to produce a pollen tube in the 20% sucrose solution. [1]

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- (ii) Using the information in Table 8, identify the optimum concentration of sucrose solution for pollen grain germination and pollen tube growth. [1]

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- (c) Describe the route taken by a growing pollen tube until fertilization occurs. [3]

[Total: 6]

Section C

- 1 In an experiment, a person was kept in complete darkness for 30 minutes. After that time, the sensitivity of the person's retina to different wavelengths of light was measured.

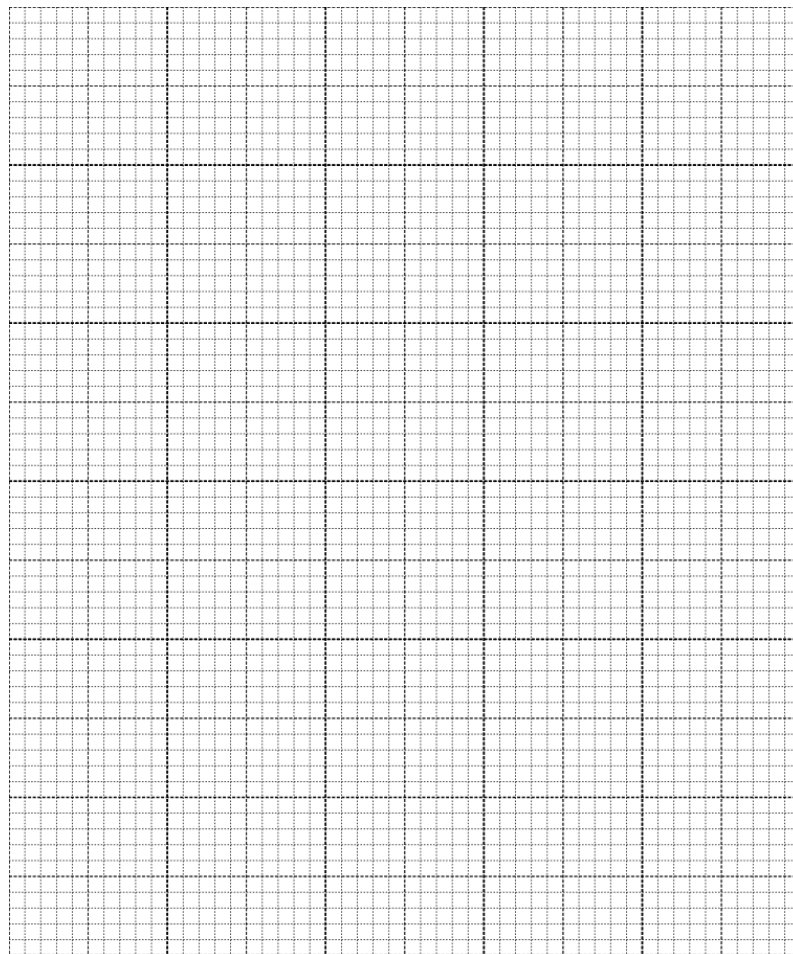
- (a) Table 1 below shows the results of the experiment.

Wavelength of light/nm	420	440	460	480	500	520	540	560	580	600
Sensitivity of retina/arbitrary units	5	15	35	65	100		40	25	15	5

Table 1

- (i) Plot the graph of these data on the grid below.

[4]



- (ii) Using your graph, estimate the sensitivity of retina at 520 nm wavelength of light. Mark this point on your graph and rewrite the value below. [1]

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- (iii) Describe the relationship between the sensitivity of the retina and the wavelength of light. [2]

[illegible]

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