FUKIEN SECONDARY SCHOOL

S5 First Term Uniform Test (2021-2022)

Biology

(1 hour)

Date: 8th November 2021 Name:_____

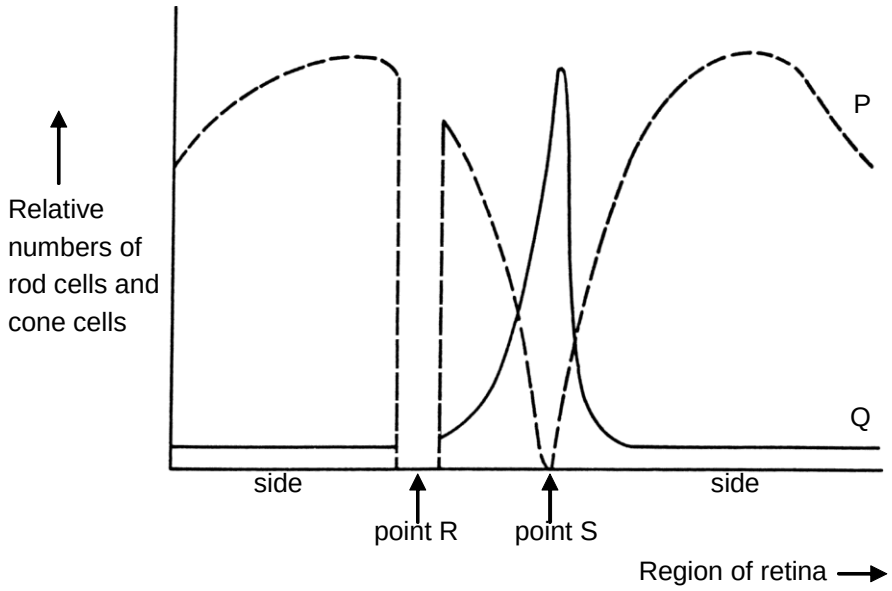
Time: 10:30a.m. - 11:30a.m. Class: _____ No.: _____

Instructions to students:

1. Write your name, class and class number on both the question paper and the answer sheets.
2. Answer ALL questions.
3. Write down all the answers on the answer sheets.
4. Hand in the question paper and the answer sheets at the end of the examination.
5. The total mark of the paper is 60.

I. Multiple Choice Questions (20 marks)

1. The graph below shows the relative numbers of rod cells and cone cells in different regions of the retina of the human eye.

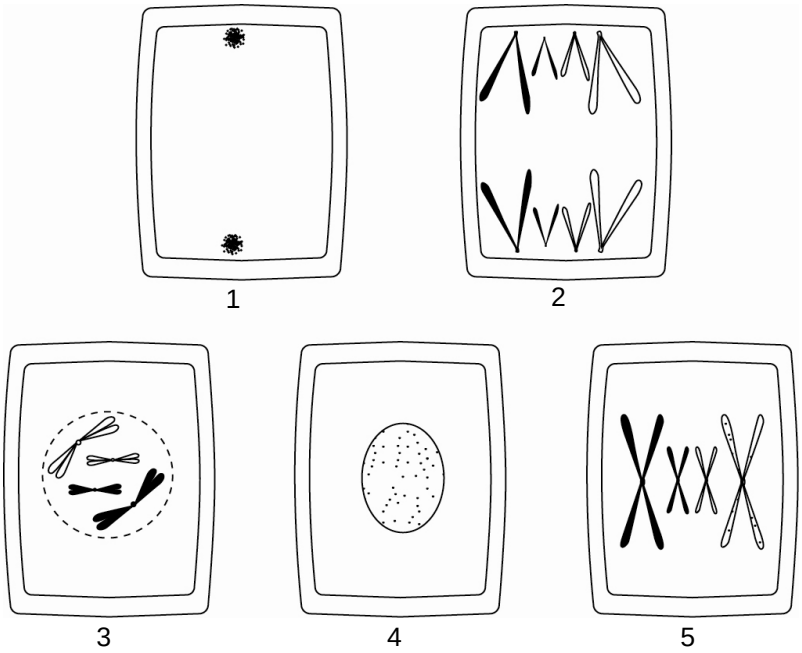


Which of the following combinations correctly identifies structures P to S?

	P	***Q***	***R***	***S***
A.	rod cells	cone cells	blind spot	yellow spot
B.	cone cells	rod cells	yellow spot	blind spot
C.	rod cells	cone cells	yellow spot	blind spot
D.	cone cells	rod cells	blind spot	yellow spot

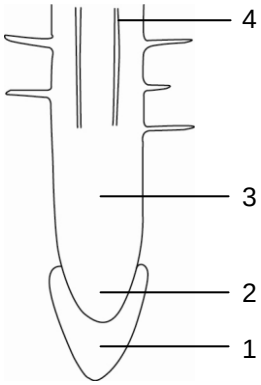
2. Which of the following statements about the hearing processes is ***incorrect***?
   A. The pinna collects sound waves and directs them along the auditory canal.
   B. The ear bones transmit and amplify the vibrations from the eardrum to the oval window.
   C. Vibrations from the round window cause the perilymph and the endolymph in the cochlea to vibrate.
   D. Nerve impulses are transmitted to the brain along the auditory nerve.

Directions: Questions 3 and 4 refer to the diagram below which shows the stages of the mitotic cell division in a cell.



3. The correct sequence is
   A. 1 → 5 → 3 → 2 → 4.
   B. 3 → 4 → 5 → 2 → 1.
   C. 4 → 1 → 2 → 5 → 3.
   D. 4 → 3 → 5 → 2 → 1.

4. The following diagram shows the vertical section of the root tip of an onion plant.



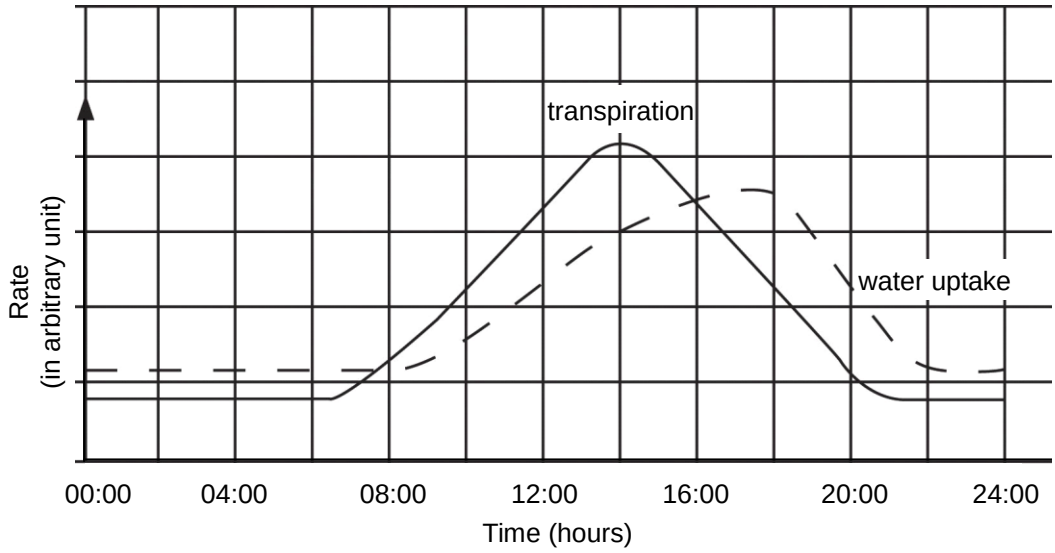
In which region of the root tip would the mitotic cell division shown in Question 3 be found?

A. 1
B. 2
C. 3
D. 4

5. Which of the following comparisons about the compositions of blood in the umbilical artery and the umbilical vein is correct?

	Blood in the umbilical artery	***Blood in the umbilical vein***
A.	more glucose	less glucose
B.	less urea	more urea
C.	less oxygen	more oxygen
D.	less carbon dioxide	more carbon dioxide

Directions: Questions 6 and 7 refer to the graph below which shows the rate of transpiration and water uptake by a leafy plant during a 24-hour period.



6. At which time is the rate of water uptake equal to the rate of transpiration?
   A. 00:00 and 07:50
   B. 00:00 and 14:00
   C. 07:50 and 16:00
   D. 14:00 and 17:50

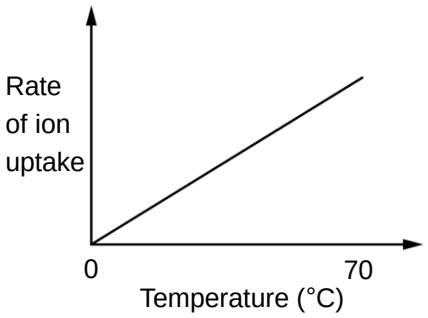
7. Which of the following statements correctly explain the increase in water content of the plant during the time interval from 22:00 to 06:00?

   (1) More water is taken up than lost.
   (2) Transpiration stops in darkness.
   (3) Stomata are closed at night.

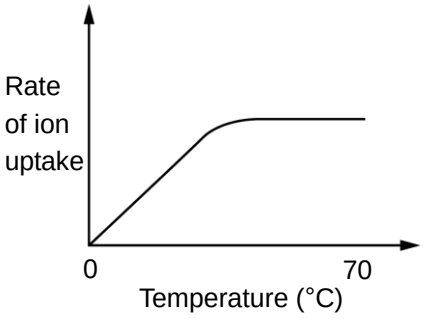
   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. (1), (2) and (3)

8. Which of the following graphs best shows the effect of increasing temperature on the rate of uptake of mineral ions by root cells?

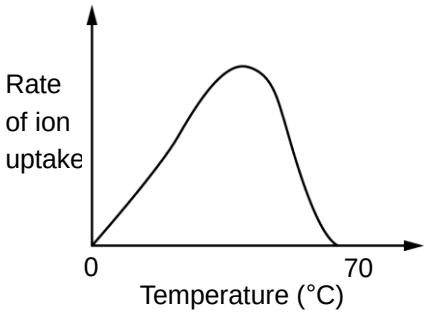
A.



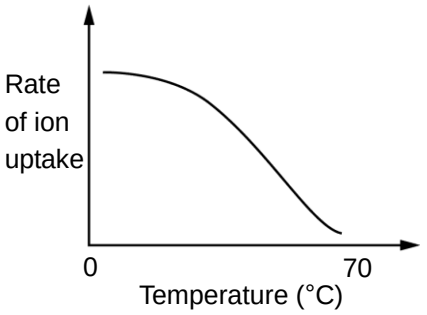
B.



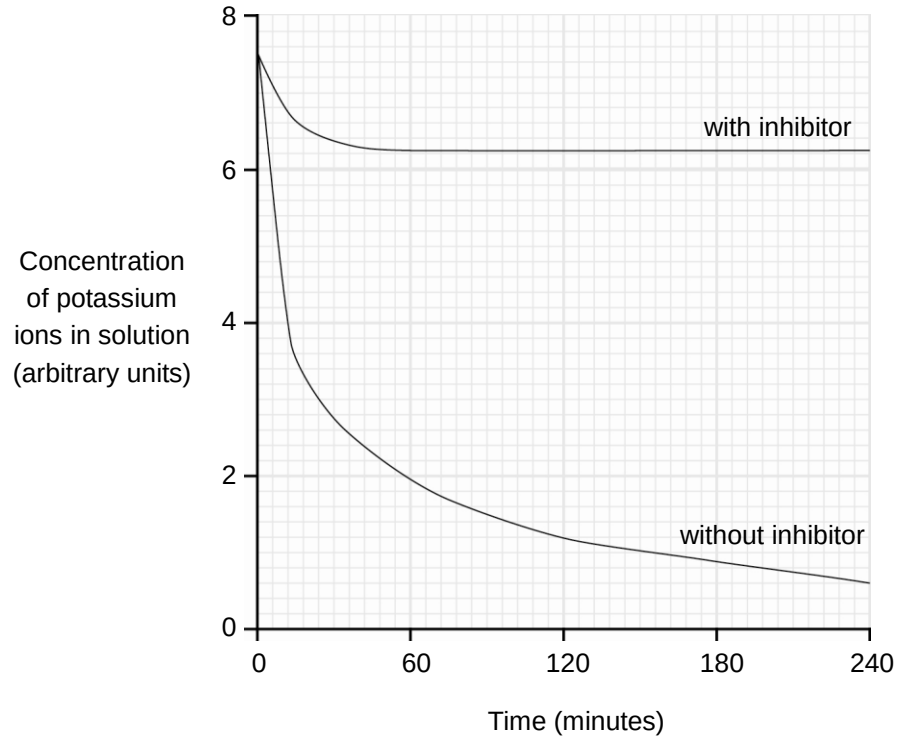
C.



D.



9. In an experiment, two root samples from a plant were placed in two beakers of aerated solution containing potassium ions. Potassium cyanide, a respiratory inhibitor, was added to one of the solutions. The concentrations of potassium ions in the two solutions were recorded at regular intervals. The following graph shows the results.



According to the graph, which of the following statements is ***incorrect***?

A. Between 0 to 30 minutes, the root absorbs potassium ions by diffusion in the presence of inhibitor.

B. After 60 minutes, there is no net movement of potassium ions between the root cells and the solution in the presence of inhibitor.

C. Between 0 to 30 minutes, the root absorbs potassium ions mainly by active transport in the absence of inhibitor.

D. After 60 minutes, there is a net movement of potassium ions down the concentration gradient from the solution into the root cells in the absence of inhibitor.

10. Which of the following comparisons between artery and vein is / are correct?

	Artery	***Vein***
(1)	more elastic fibres in the wall	less elastic fibres in the wall
(2)	deep inside the body	near the body surface
(3)	all carries oxygenated blood	all carries deoxygenated blood

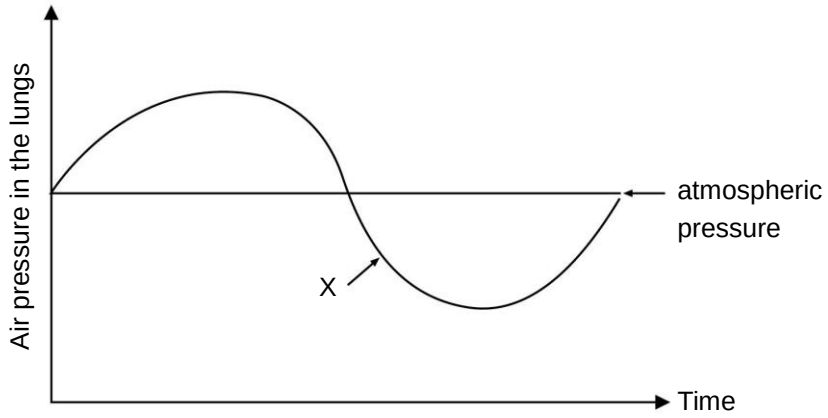
A. (1) only
B. (2) only
C. (1) and (2) only
D. (2) and (3) only

11. Which of the following statements about the hepatic portal vein are correct?

(1) During fasting, it carries blood with the highest concentration of glucose.
(2) It has blood capillaries at both ends.
(3) It carries blood from the small intestine to the liver.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

12. The graph below shows the change in air pressure in the lungs of a man in one normal breath.



What of the following correctly shows the states of the diaphragm muscles and rib cage at time point X?

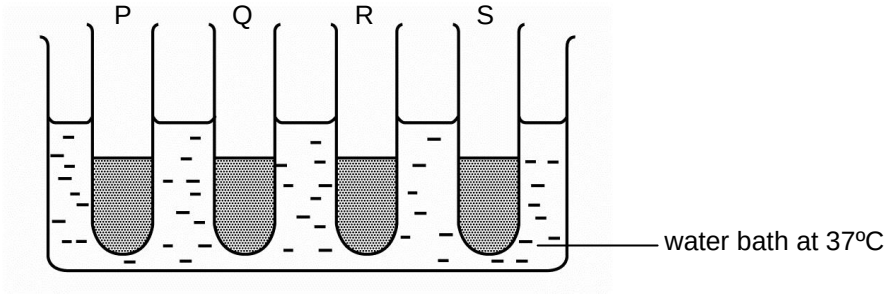
	Diaphragm muscles	***Rib cage***
A.	contract	moves upwards
B.	contract	moves downwards
C.	relax	moves upwards
D.	relax	moves downwards

13. Which of the following statements about non-essential amino acids is correct?
    A. They are not essential to the functioning of our body.
    B. They can only be obtained from food.
    C. They can be made from other amino acids in the body.
    D. There are total 20 non-essential amino acids in human bodies.

14. Which of the following combinations correctly shows the results of biochemical tests on the urine of a healthy man?

	Protein test strip	***Benedict's test***
A.	negative result	brick-red precipitate
B.	negative result	blue solution
C.	positive result	brick-red precipitate
D.	positive result	blue solution

15. The diagram below shows an experiment to investigate the digestion of lipids by lipase. In this experiment, milk was used as the lipid source.



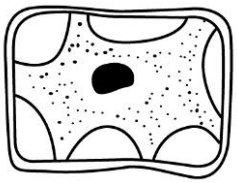
The following table shows the contents of test tubes P to S.

Test tube	**Contents**
P	4 cm^3 milk + 1 cm^3 lipase + 1 cm^3 distilled water
Q	4 cm^3 milk + 1 cm^3 boiled lipase + 1 cm^3 distilled water
R	4 cm^3 milk + 1 cm^3 lipase + 1 cm^3 sodium hydrogencarbonate solution
S	4 cm^3 milk + 1 cm^3 distilled water + 1 cm^3 sodium hydrogencarbonate solution

Which of the following combinations about the final pH of the contents in test tubes is ***incorrect***?

	Test tube	***Final pH of contents***
A	P	slightly acidic
B.	Q	neutral
C.	R	slightly alkaline
D.	S	slightly alkaline

16. The diagram below shows a plant cell immersed in a 15% sucrose solution.



What property of the sucrose solution causes the appearance of the plant cell?

A. It has a lower water potential than that of the cytoplasm of the cell.
B. It has a higher water potential than that of the cytoplasm of the cell.
C. It pushes the cell membrane inwards from the cell wall.
D. It causes the breakdown of the cell membrane.

17. The rate of diffusion can be increased by

(1) increasing the temperature.
(2) increasing the surface area over which diffusion occurs.
(3) decreasing the concentration gradient between the two regions.

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only

18. Which of the following comparisons between prokaryotic cells and eukaryotic cells is ***incorrect***?

	Prokaryotic cells	***Eukaryotic cells***
A.	smaller in size	larger in size
B.	example: bacterial cell	example: animal cell
C.	do not possess RNA	possess RNA
D.	without mitochondria	with mitochondria

19. Which of the following is the correct sequence of using a light microscope for observation at a low power magnification?
    (1) Slowly turn the coarse adjustment knob to raise the body tube until the image is clear.
    (2) Lower the body tube by turning the coarse adjustment knob until the objective is just above the slide.
    (3) Adjust the condenser and the iris diaphragm until the light is sufficient and even.
    (4) Turn the fine adjustment knob to make the image sharp.
    A. (2), (1), (4), (3)
    B. (2), (3), (1), (4)
    C. (3), (2), (1), (4)
    D. (4), (1), (3), (2)

20. Which of the following is/are the function(s) of lipids in organisms?
    (1) as a component of cell membranes
    (2) as a form of energy stores in plants
    (3) as a heat insulator in mammals
    A. (3) only
    B. (1) and (2) only
    C. (2) and (3) only
    D. (1), (2) and (3)

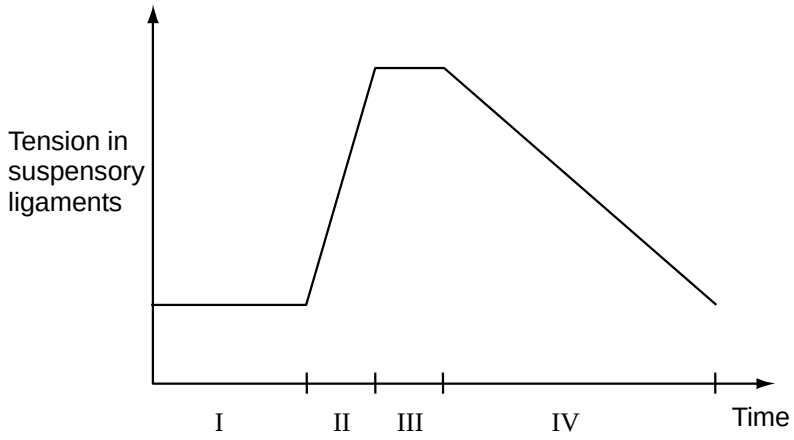
End of Section I

II. Structured Questions (40 marks)

1. In an investigation, a girl was asked to cover one eye with a piece of cardboard. She was then guided to focus on the same object which was switched to different positions.

Position	Description
A	The object was far away from the girl.
B	The object was far away from the girl first and then moved towards her.
C	The object was near the girl.
D	The object was near the girl first and then moved away from her.

The following graph shows the changes of the tension in the suspensory ligaments of her eye when she was seeing the object at different positions.



(a) Match the time periods (I to IV) with the corresponding positions of the objects (A to D). (2 marks)

(b) State and explain the changes of the curvature of the lens in period II. (3 marks)

(c) The girl was short-sighted.

(i) Draw a ray diagram in the space below to show how an image of a distant object is formed on her retina. (3 marks)

(ii) On the same ray diagram, draw how an image of the same object would be formed on her retina if she did not have the eye defect. (1 mark)

(iii) Suggest how short sight can be corrected. (1 mark)

2. A coleoptile grows towards a unilateral light source as shown in ***Figure I***.

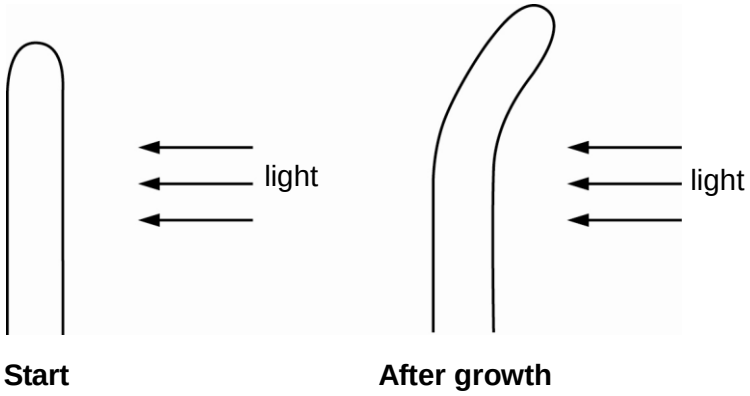


Figure I

Scientists have put forward two hypotheses to explain the above growth response.

Hypothesis 1: Auxin at the coleoptile tip is broken down by light on the illuminated side of the shoot.

Hypothesis 2: Auxin at the coleoptile tip moves from the illuminated side to the shaded side of the coleoptile.

The scientists carried out experiment to test these two hypotheses. ***Figure II*** shows the experimental results. The numbers under each agar block represent the amount of auxin (arbitrary units) that has diffused into the block from the coleoptile tip.

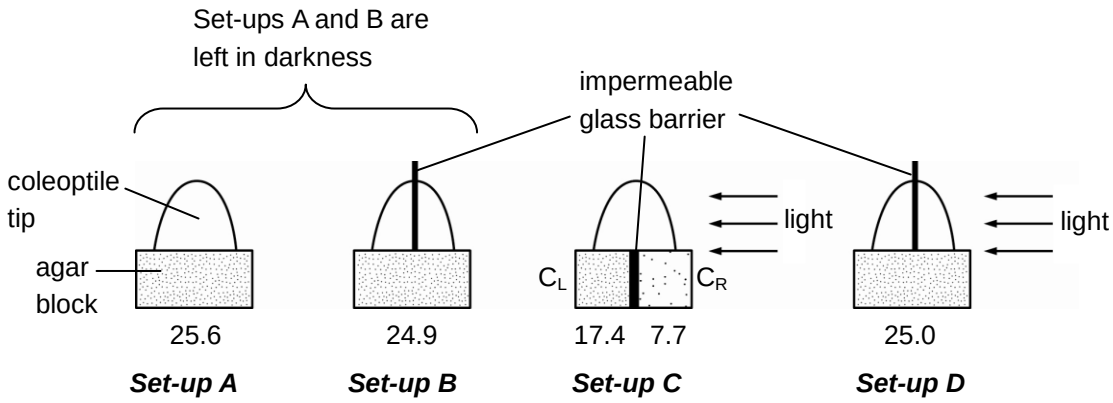


Figure II

(a) Suggest one controlled variable in the experiment. (1 mark)

(b) (i) Do the results of the above experiment support **Hypothesis 1**? Explain your answer. (3 marks)

(ii) Do the results of the above experiment support **Hypothesis 2**? Explain your answer. (3 marks)

(c) Two coleoptiles had the tips cut and then the two agar blocks from set-up C (C_L and C_R) were placed on one side of the cut ends as shown in ***Figure III***.

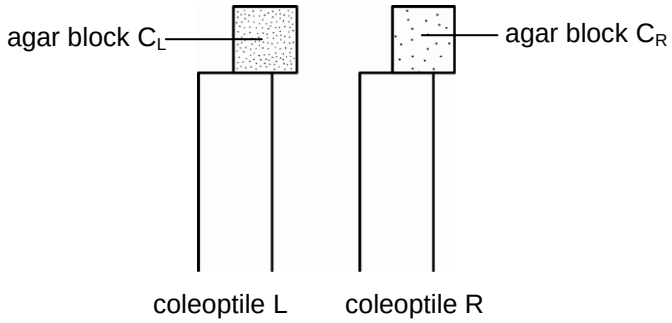


Figure III

Describe and compare the appearances of coleoptiles L and R after two days. (3 marks)

3. Tina and her classmates carried out an investigation on castor oil seeds. They allowed the seeds to germinate and then analysed the lipid and glucose contents in the seeds.
The following table shows the changes in the lipid and glucose contents of castor oil seedlings during 17 days.

Time of germination (day)	**Lipid content (% of dry mass)**	**Glucose content (% of dry mass)**
0	70.9	0.0
2	63.5	0.0
5	47.8	3.0
8	24.8	7.9
11	17.7	8.8
14	13.0	13.1
17	4.8	17.9

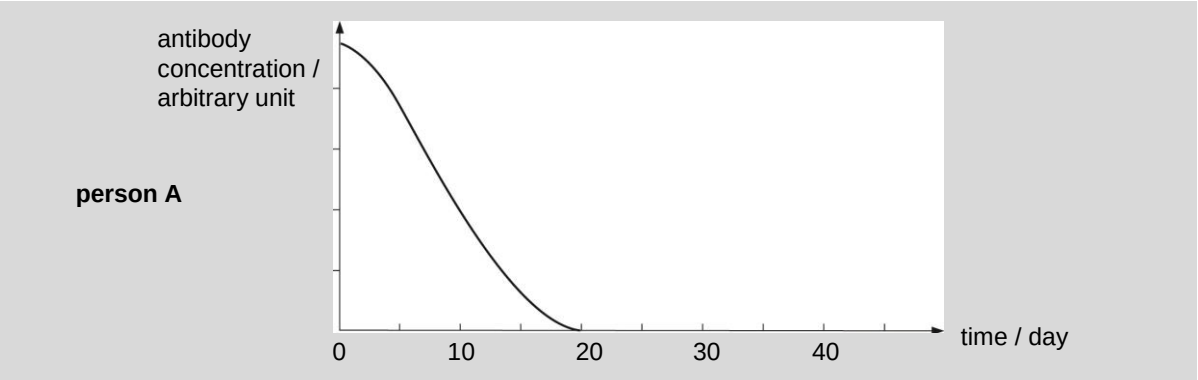
(a) Based on the results in the table, state the main form of stored organic food in castor oil seed. (1 mark)

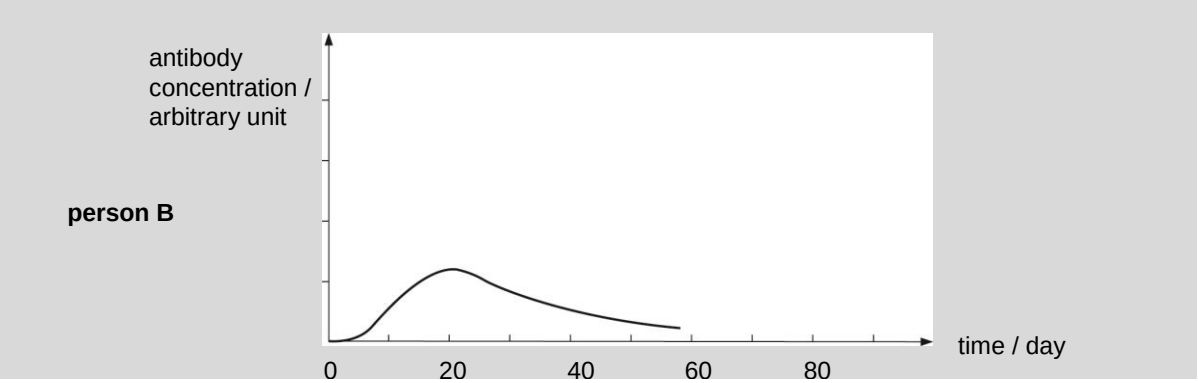
(b) Explain the changes of lipid content in the seedlings. (4 marks)

(c) Explain the changes of glucose content in the seedlings. (3 marks)

(d) Dry mass was measured in the project. State ***two*** disadvantages of measuring the growth by measuring the dry mass. (2 marks)

4. Two people took part in a study to find out the effectiveness of two types of immunization. Person A received an injection of antibodies against tetanus and person B received a tetanus vaccination. In the following weeks, the blood from these two people was analysed for the presence of antibodies against tetanus. The results are shown in the graphs below.





(a) Name the types of immunity received by person A and person B respectively. (1 mark)

(b) Describe and explain the antibody concentration in person A and person B. (5 marks)

(c) Sketch on the graph of person B what you expect to happen to the antibody concentration if person B receives a booster vaccination on day 60. (2 marks)

(d) Can the researcher measure the concentration of all antibodies in person B instead of the concentration of tetanus antibodies? Explain briefly. (2 marks)

End of Paper