FUKIEN SECONDARY SCHOOL

S4 First Term Uniform Test (2020-2021)

Biology

(1 hour)

Date: 22nd October 2020 Name:_____

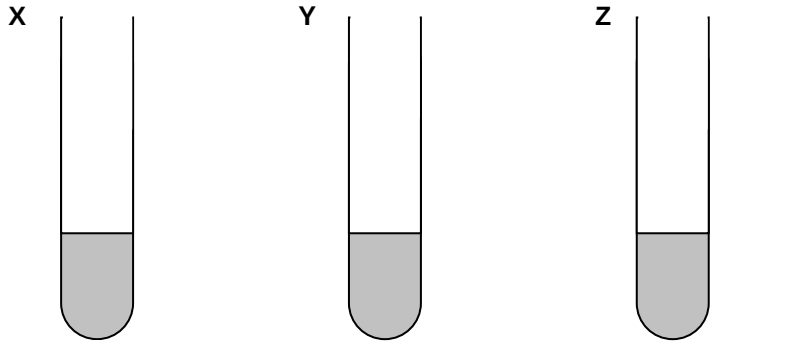
Time: 8:30a.m. - 9:30a.m. Class: _____ No.: _____

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 diagram below shows the set-up of three test tubes.



The pH of the contents of each test tube was recorded at the beginning and again 15 minutes later. How did the pH change?

A The pH increased in all test tubes.

B The pH decreased in all test tubes.

C The pH increased in tubes Y and Z but did not change in tube X.

D The pH decreased in tubes X and Y but did not change in tube Z.

2. The digestion of fats and oils occur more quickly when they are emulsified. Emulsifying fats and oils gives them
   A a lower temperature for the action of enzymes.
   B a greater surface area for the action of enzymes.
   C a smaller mass for the action of enzymes.
   D a higher pH for the action of enzymes.

3. Which of the following statements about the enzymes in the human intestine is/are **incorrect**?
   (1) The enzymes can synthesize essential amino acids.
   (2) The enzymes can break down large food molecules into soluble products.
   (3) The enzymes can convert excess food to useful products.
   A (1) only
   B (1) and (3) only
   C (2) and (3) only
   D (1), (2) and (3)

4. The table below shows the sites of the action and reaction carried out by three different digestive juices. What are the digestive juices X, Y and Z?

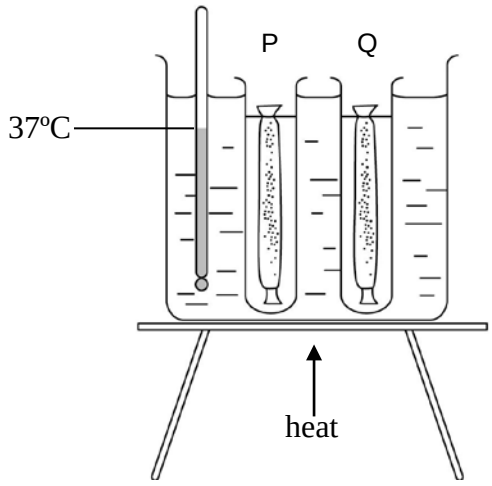
Digestive juice	Site of action	Reaction (substrate → product)
X	mouth cavity	starch → maltose
Y	stomach	protein → peptide
Z	duodenum	starch → maltose

	X	Y	Z
A	gastric juice	saliva	pancreatic juice
B	bile	gastric juice	pancreatic juice
C	saliva	gastric juice	pancreatic juice
D	saliva	bile	intestinal juice

5. Why do people need vitamin D to keep bones and teeth strong?
   A Vitamin D prevents the loss of calcium and phosphate ions.
   B Vitamin D stimulates the production of phosphate ions in the body.
   C Vitamin D is one of the components of bones and teeth.
   D Vitamin D promotes the uptake of calcium ions.

6. Which of the following vitamins are fat-soluble?
   (1) vitamin A
   (2) vitamin C
   (3) vitamin D
   A (1) and (2) only
   B (1) and (3) only
   C (2) and (3) only
   D (1), (2) and (3)

Directions: Questions 7 to 9 refer to the diagram below which shows the set-up used in an experiment.



Dialysis tubings P and Q contain starch and water. One of the two tubings contains an enzyme. The water surrounding the dialysis tubings is tested with iodine test and Benedict's test at the beginning of the experiment and again 30 minutes later. Some of the results are shown in the following table.

	Iodine test		**Benedict's test**	
	Water surrounding P	Water surrounding Q	Water surrounding P	Water surrounding Q
At the beginning	brown	brown	blue	blue
After 30 minutes	X	brown	brick-red precipitate	Y

7. Which of the following combinations correctly shows the correct colours X and Y?

	X	***Y***
A	brown	blue
B	brown	brick-red precipitate
C	blue-black	blue
D	blue-black	brick-red precipitate

8. Which of the following statements about the experiment is ***incorrect***?
   A Dialysis tubing P contains the enzyme.
   B The enzyme used is amylase.
   C Reducing sugars are present in the water surrounding dialysis tubing Q after 30 minutes.
   D Reducing sugars in dialysis tubing P are small enough to pass through the dialysis tubing.

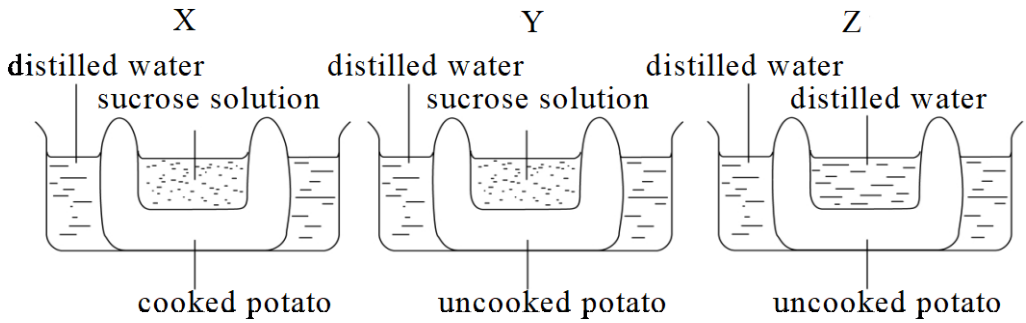
9. What does the water surrounding the dialysis tubing represent, if the dialysis tubing represents the human alimentary canal?
   A lymph
   B blood
   C tissue fluid
   D urine

10. Dietary fibre has no energy value to us because
   A cellulose cannot be broken down through respiration.
   B dietary fibre is too tough to be chewed completely.
   C cellulose has no energy value.
   D we do not have enzymes to digest cellulose.

11. Which of the following statements about vitamins are correct?
   (1) Vitamins are organic food substances.
   (2) No vitamins can be synthesised by our bodies.
   (3) Vitamins have no energy value our bodies.
   A (1) and (2) only
   B (1) and (3) only
   C (2) and (3) only
   D (1), (2) and (3)

12. Which of the following would be affected if iron is insufficient in the diet?
    A production of visual purple
    B production of haemoglobin
    C clotting of blood
    D formation of bones and teeth

Directions: Questions 13 to 15 refer to the diagram below which shows an experiment on osmosis. In the experiment, three peeled potatoes X, Y and Z were prepared. X has been cooked in boiling water. A central cavity was left in each potato by scooping out the tissue. The potatoes were then put in small troughs of distilled water. Sucrose solution was put in cavities of X and Y while the cavity of Z was filled with distilled water.



13. Which of the following correctly shows the permeability of the cell membranes of the cells in potato cups X and Y?

	Potato cup X	***Potato cup Y***
A	impermeable	differentially permeable
B	freely permeable	freely permeable
C	freely permeable	differentially permeable
D	differentially permeable	impermeable

14. What would be the observation after 12 hours?
    A Only the level of sucrose solution in the cavity of potato Y would have risen.
    B The level of distilled water surrounding potatoes X and Y would have risen.
    C The level of sucrose solution in the cavities of potatoes X and Z would have dropped.
    D The levels of sucrose solution and distilled water in the cavities of potatoes X, Y and Z would remain unchanged.

15. The results of this experiment were as shown in question 14 because
    (1) potatoes were impermeable so water could not pass through.
    (2) osmosis occurred in living tissues only.
    (3) osmosis did not occur when there was no difference in the water potential on the two sides of the living tissue.
    A (1) only
    B (1) and (2) only
    C (2) and (3) only
    D (1), (2) and (3)

16. Which of the following combinations ***incorrectly*** shows the molecule and the mechanism by which the molecule is transported across the cell membrane?

	Molecule	**Mechanism of transport**
A	amino acid	active transport
B	oxygen	simple diffusion
C	water	osmosis
D	glucose	simple diffusion

17. Which of the following statements about the nucleus is ***incorrect***?
    A It is surrounded by a single membrane.
    B It contains the genetic material DNA.
    C It is absent from mature red blood cells.
    D It can be found in eukaryotic cells.

18. Which of the following cell structures are present in both human white blood cell and plant root cells?
    (1) nucleus
    (2) mitochondria
    (3) ribosomes
    A (1) and (2) only
    B (1) and (3) only
    C (2) and (3) only
    D (1), (2) and (3)

19. Which of the following parts of a plant cell contain phosphate?
    (1) DNA in nucleus
    (2) cell membrane
    (3) cell wall
    A (1) and (2) only
    B (1) and (3) only
    C (2) and (3) only
    D (1), (2) and (3)

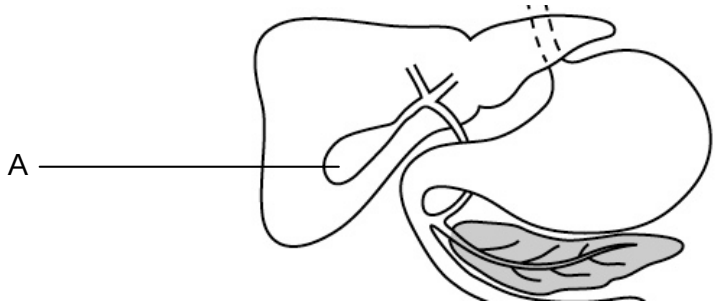
20. Energy can be stored as glycogen and adipose tissues in our bodies. Which of the following correctly shows their locations in our bodies?

	Glycogen	**Adipose tissues**
A	under skin	around internal organs
B	in muscles	under the skin
C	in liver	in muscles
D	around internal organs	in the liver

End of Section I

II. Structured Questions (40 marks)

1. Richard noticed that his skin and sclera of the eyes turned yellow and his faeces turned white. He then went to see a doctor.
   Ultrasound scanning showed that some stones were formed in the duct between organ A and duodenum, as shown in the diagram below. The doctor advised him to undergo a surgery to remove organ A.



   a Why did Richard's skin and sclera turn yellow? (3 marks)

   b State and explain the effect of the removal of organ A on the digestion of food. (2 marks)

2. The table below shows the nutritional information in 100 g of three brands of breakfast cereals.

	Brand A	**Brand B**	**Brand C**
Energy (kJ)	1515	1600	1511
Carbohydrate (g)	75	68.7	77.1
Fat (g)	0	6.4	2.1
Protein (g)	12.8	9.5	6.1
Dietary fibre (g)	2.5	8.0	4.8
Iron (mg)	8.3	6.6	0

   a Which nutrient(s) shown in the table contribute(s) to the energy of the cereals? (3 marks)

   b Brand B cereal also contains nuts and dried fruits. Name three carbohydrates that may be found in Brand B cereal. (3 marks)

   c A 30-year-old woman is dieting. She takes Brand C cereal with low fat milk to replace all meals in a day in order to reduce the daily energy intake.

      i Why can people lose weight by reducing the daily energy intake? (2 marks)

      ii Suggest ***one*** disease that may result if the woman keeps on having this diet for a month. Give ***one*** symptom of this disease. (2 marks)

3. Rose analysed the food contents of tomatoes, potatoes, peas and onions. She constructed the following table.

Vegetable (100 g)	**Total carbohydrate (g /100 g)**	**Starch (g /100 g)**	**Dietary fibre (g /100 g)**
Tomatoes	3	Trace	1
Potatoes	17	16	1
Peas	9	5	5
Onions	4	Trace	1

a The amount of total carbohydrate is calculated as the sum of the amounts of sugars and starch. From the table, which vegetable has the highest content of sugars? (1 mark)

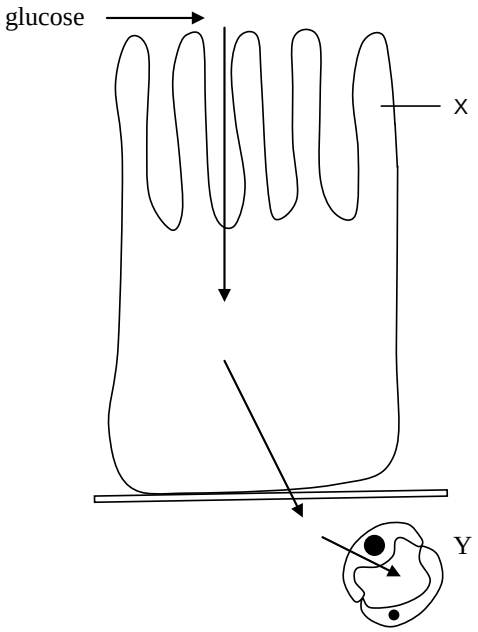
b There are 17 mg of vitamin C in 100 g of peas. If Rose eats 100 g of peas, she has 25% of the recommended daily allowance (RDA) of vitamin C.

i Calculate the RDA of vitamin C for Rose. Show your workings. (2 marks)

ii State the disease caused by the deficiency of vitamin C. (1 mark)

c In some developing countries, many people suffer from prolonged starvation. If you are from a charity organisation, which of the four foods from the above table will you bring to the people in developing countries? Why? (2 marks)

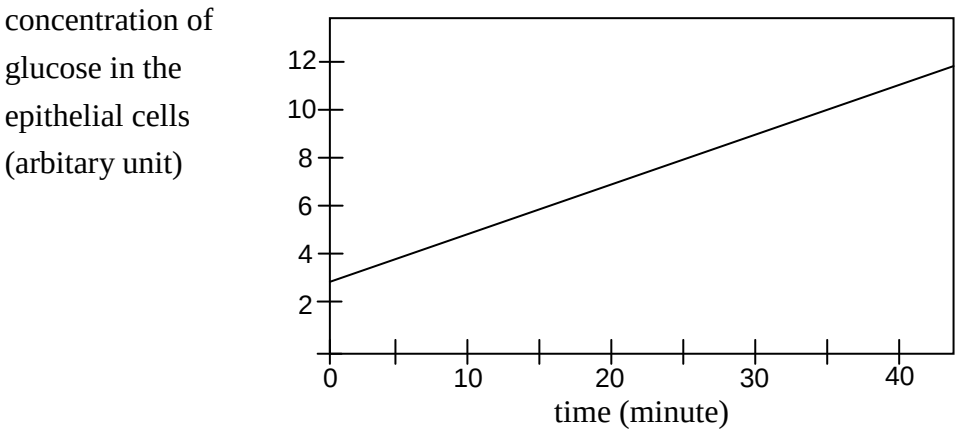
4. The diagram below shows the absorption of glucose into a surface of ileum and then to the blood vessel towards the liver.



a Name structure X and blood vessel Y. (2 marks)

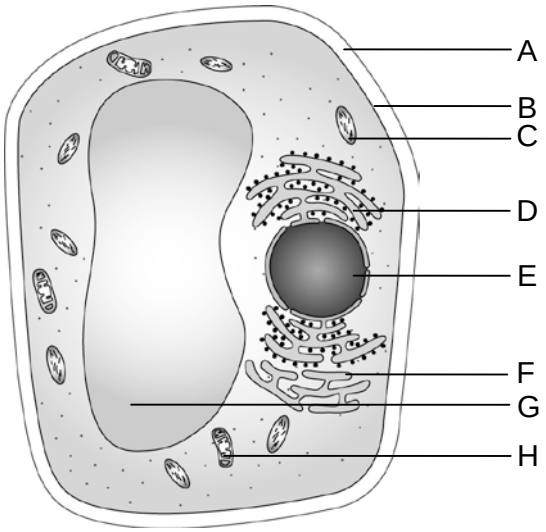
b Explain how they can facilitate glucose absorption. (4 marks)

c A piece of the ileum wall was placed in a solution of glucose. The concentration of glucose in the solution was lower than that inside the cells. The graph below shows the concentration of glucose in the cells over 40 minutes.



With the help of the graph, explain how glucose is absorbed into the epithelial cells. (4 marks)

5. The diagram below shows a cell observed under an electron microscope.



a Suggest ***three*** reasons why the cell is likely to be a plant, but not an animal cell. (3 marks)

b Complete the table below to compare structures A and B. (4 marks)

	Structure A	**Structure B**
Main chemical constituents	**i**	**ii**
Permeability	**iii**	**iv**

c Using the letters in the diagram, state the structure which

i stores pigments other than chlorophyll. (1 mark)

ii absorbs light energy. (1 mark)

End of Paper