FUKIEN SECONDARY SCHOOL S6 First Term Uniform Test (2021-2022) Biology (1 hour)

Date: 9th November 2021 Time: 10:30a.m. – 11:30a.m.

Name:	
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. Which of the following is/are involved in maintaining the basic rhythm of breathing?
 - (1) The respiratory centre sends nerve impulses to the intercostal muscles and diaphragm muscles.
 - (2) The stretch receptors in the lungs send nerve impulses to the respiratory centre.
 - (3) The cerebrum sends nerve impulses to the intercostal muscles and diaphragm muscles.
 - \mathbf{A} (1) only
 - **B** (1) and (2) only
 - **C** (2) and (3) only
 - **D** (1), (2) and (3)
- 2. Chemoreceptors which detect changes in blood pH are present in
 - (1) the respiratory centre in the medulla oblongata.
 - (2) the carotid bodies in the carotid arteries.
 - (3) the aorta bodies in the aorta.
 - \mathbf{A} (1) only
 - **B** (2) only
 - \mathbf{C} (2) and (3) only
 - **D** (1), (2) and (3)

3. The graph below shows the change in the blood pressure inside the aorta, the left ventricle and the left atrium.



At which time points are the heart sounds produced?

- A 0.1 s and 0.4 s
- **B** 0.15 s and 0.4 s
- C 0.1 s and 0.45 s
- **D** 0.15 s and 0.45 s
- 4. The cardiac output of a person increases when
 - (1) the cardiovascular centre sends more nerve impulses via the sympathetic nerve to the heart.
 - (2) the vagus nerve is more active than the sympathetic nerve.
 - (3) the adrenal glands release more adrenaline.
 - **A** (3) only
 - **B** (1) and (2) only
 - ${\color{black} C} \quad (1) \text{ and } (3) \text{ only} \\$
 - **D** (1), (2) and (3)

5. The graph below shows the changes in the thickness of the uterine lining over 31 days.



The following events occur between day 13 and 17. Arrange them in the correct sequence.

- (1) The concentrations of oestrogen and progesterone in the blood decrease.
- (2) The yellow body degenerates.
- (3) Secretions of FSH and LH from the pituitary gland decrease.
- (4) The uterine lining breaks down.
- **A** (4), (1), (3), (2)
- **B** (2), (1), (4), (3)
- **C** (3), (1), (2), (4)
- **D** (3), (2), (1), (4)
- 6. After fertilization, which of the following prevent(s) menstruation to occur?
 - (1) Human chorionic gonadotrophin (HCG) prevents the generation of the yellow body.
 - (2) The yellow body secretes oestrogen and progesterone.
 - (3) The placenta secretes FSH and LH.
 - \mathbf{A} (1) only
 - **B** (2) only
 - **C** (1) and (2) only
 - **D** (2) and (3) only
- 7. Which of the following statements about fossils is *incorrect*?
 - A Fossils were only found in sedimentary rocks.
 - **B** Fossils give evidence in support of the theory of evolution.
 - **C** Tracks made by organisms can form fossils.
 - **D** A continuous fossil record is seldom found.

8. A scientist analysed and compared the amino acid sequence of a certain protein in five different organisms. The table below shows the number of differences in the amino acid sequence between these organisms.

	Р	Q	R	S	Т
Р	-	17	18	20	21
Q		-	3	12	13
R			-	10	11
S				-	1
Т					-

Which of the following evolutionary trees best illustrates the phylogenetic relationship of these five organisms?

Α

С







- 9. Which of the following is *not* an explanation for the missing links in a fossil record?
 - A Some fossils are located in inaccessible areas.
 - **B** Some organisms cannot form fossils.
 - **C** Some organisms decompose before being buried in mud and sand.
 - **D** Some organisms become extinct before fossils can be formed.
- 10. Which of the following is/are *not* necessary in speciation?
 - (1) environmental changes
 - (2) variations among individuals of a species
 - (3) gene flow between two groups of a population
 - **A** (1) only
 - **B** (2) only
 - **C** (3) only
 - **D** (2) and (3) only

- 11. Which of the following groups of plants do not have vascular tissues?
 - A mosses
 - **B** ferns
 - C conifers
 - **D** monocots
- 12. A sample containing DNA fragments X, Y and Z of different lengths was loaded into a well of a gel slab and the fragments were separated using gel electrophoresis. The graph below shows the lengths of X, Y and Z.



Which of the diagrams below shows the bands on the gel slab after gel electrophoresis and the DNA fragments they contain?



Key:⊕ positive terminal⊖ negative terminal

- Amino acidCodonsAspGAU, GACGluGAA, GAGHisCAU, CACLeuCUA, CUGValGUA, GUG
- 13. The table below shows some codons that code for amino acids.

The amino acid sequence of a part of a protein is shown below.

... Asp-Glu-Leu-His ...

Which of the following tRNA molecules are involved in the synthesis of this part of the protein?



- **A** (1) and (2) only
- **B** (1) and (3) only
- **C** (2) and (3) only
- **D** (1), (2) and (3)
- 14. Which of the following combinations about lifestyle changes and the types of cancer they help prevent is *incorrect*?

	Lifestyle change	Type of cancer prevented
A	eating more vegetables	colorectal cancer
B	not drinking too much alcohol	pancreas cancer
С	not smoking	lung cancer
D	wearing sun protection	skin cancer

- 15. Which of the following are the correct explanations for the difference in the amounts of ATP produced per molecule of glucose in aerobic respiration and anaerobic respiration?
 - (1) The Krebs cycle and oxidative phosphorylation cannot occur in anaerobic respiration because there is no oxygen to accept electrons.
 - (2) Part of the energy released by glucose is stored in NADH in anaerobic respiration.
 - (3) Glucose is only partly broken down in anaerobic respiration.
 - **A** (1) and (2) only
 - **B** (1) and (3) only
 - \mathbf{C} (2) and (3) only
 - **D** (1), (2) and (3)
- 16. The graph below shows the degree of contraction of ciliary muscles in an eye of a person in a period of time. During the period, the eye was focusing on a bird.



Which of the following statements are correct?

- (1) During period X, the lens was becoming less convex.
- (2) During period Y, the tension in the suspensory ligaments was decreasing.
- (3) During period Z, the bird was approaching the person.
- **A** (1) and (2) only
- **B** (1) and (3) only
- **C** (2) and (3) only
- **D** (1), (2) and (3)

17. The photograph below shows some shoots developing from a potato tuber.



Which of the following correctly describes the movement of substances in the phloem of the shoots?

- A Starch is moving up the shoots.
- **B** Starch is moving down the shoots.
- **C** Sugars is moving up the shoots.
- **D** Sugars is moving down the shoots.
- 18. The diagram below shows a flowchart which summarizes the fates of amino acids in digestive system.



making proteins in the body

Which of the following combinations correctly identifies processes X and Y and substance Z?

	X	Y	Z
Α	absorption	deamination	amino group
B	assimilation	deamination	amino group
С	absorption	detoxification	carboxyl group
D	assimilation	deamination	carboxyl group

- 19. An enzyme secreted from the tear glands of the eye forms deposits on contact lenses. Which ingredient do contact lens cleaners contain for removing these deposits?
 - A lipase
 - **B** cellulase
 - **C** pectinase
 - **D** protease

20. In an experiment, two potato strips of the same size were cut from the same potato. The strips were then hung on the two sides of a balance. The weight of the two strips was the same at the beginning. The strips were then immersed into different solutions.



After 4 hours, the arm of the balance tilted to the right. Which of the following can be deduced from the result?

- **A** The water potential of solution X is higher than that of the potato tissue.
- **B** The water potential of solution X is lower than that of the potato tissue.
- **C** The water potential of solution X is higher than that of solution Y.
- **D** The water potential of solution X is lower than that of solution Y.

End of Part I

II. Structured Questions (40 marks)

1. The table below shows the relative quantities of several substances in the blood in the renal artery and renal vein.

	Relative quantities in blood	Relative quantities in blood
Substance	in renal artery	in renal vein
	(arbitrary units)	(arbitrary units)
glucose	10.0	9.7
sodium salts	32.0	29.0
urea	3.0	1.5
oxygen	100.0	35.0
water	180.0	178.0

- (a) Describe and explain the change in the relative quantities of glucose and oxygen as blood flows from the renal artery to the renal vein. (2 marks)
- (b) Describe what happens in the kidney to bring about the difference in the relative quantity of urea between the blood in the renal artery and renal vein. (2 marks)
- (c) (i) State and explain the change in water potential in the blood if a person who is doing strenuous exercise on a hot and dry day.
 (2 marks)
 - (ii) In view of your answer to (i), describe the physiological response to restore the change to a normal level. (5 marks)
- 2. Steven carries out a survey in the polar areas. He accidentally falls into very cold water when he walks on the ice. His core body temperature falls and he may die of hypothermia if he is not rescued in a short time.
 - (a) Explain how Steven produces the sensation of cold after he has fallen in the cold water.

(2 marks)

- (b) When Steven is in the cold water, he begins to shiver.
 - (i) Explain how the body carries out this response. (3 marks)
 - (ii) State the significance of this response. (2 marks)
- (c) Steven is finally rescued and he has the symptoms of hypothermia. Doctors treat Steven by getting him to breathe in warm, humid air.
 Explain how breathing in warm, humid air would help a person to recover from hypothermia. (3 marks)

3. TTT is an insecticide used for killing an insect pest of rice plants. It works by inactivating enzyme Z involved in respiration. A farmer used it repeatedly in his rice field for a year. The number of insect pests dropped sharply initially. However, after using TTT for three months, TTT-resistant insect pests were found and their number increased continuously despite using TTT of higher concentrations.



The diagram below shows the activity of enzyme Z in resistant and non-resistant insect pests at different concentrations of TTT.



- (a) Which curve (A or B) indicates the activity of enzyme Z in TTT-resistant insect pests and which curve indicates that in non-resistant insect pests? (1 mark)
- (b) Suggest a mechanism by which TTT inactivates enzyme Z. (1 mark)

- (c) Describe the effect of concentration of TTT on the activity of enzyme Z in resistant and non-resistant insect pests. (4 marks)
- (d) Explain why the number of TTT-resistant insect pests increased despite using TTT of higher concentrations based on the theory of natural selection. (4 marks)
- 4. The diagram below shows the cut end of a stem from a woody plant. The other end of the stem is being heated in a fire. Steam can be seen coming from the vascular tissue at the cut end of the stem.



- (a) Describe the features of the xylem that enable the steam to pass from the heated end of the stem to the cut end.(2 marks)
- (b) (i) Describe and explain how transpiration contributes to the mechanism of water transport up the stem. (5 marks)
 - (ii) Suggest why a bunch of flowers may survive longer if the ends of the stems are removed immediately before the flowers are placed in water. (2 marks)

End of Paper