Form Five Final Examination 2020-2021

BIOLOGY (F.5A – 5F)

Date: 23rd June, 2021

Time: 8:25 - 10:55 am

This paper must be answered in English

Name: _____ **Class: F.5 _____ ( )**

GENERAL INSTRUCTIONS

1. There are **TWO** sections, A and B, in this paper. Section A carries 36 marks and Section B carries 84 marks. You are advised to finish Section A in about 35 minutes.

2. Section A consists of multiple-choice questions in this question book. Section B contains conventional questions printed separately in Question-Answer Book B.

3. Answers to Section A should be marked on the Multiple-choice Answer Sheet while answers to Section B should be written in the spaces provided in Question-Answer Book B. **The Answer Sheet for Section A and the Question-Answer Book for Section B must be handed in separately at the end of the examination.**

SECTION A: MULTIPLE-CHOICE QUESTIONS

GENERAL INSTRUCTIONS FOR SECTION A

1. Read the instructions on the Answer Sheet carefully. Insert the information required in the spaces provided.

2. When told to open this book, you should check that all the questions are there. Look for the words "**END OF SECTION A**" after the last question.

3. All questions carry equal marks. **ANSWER ALL QUESTIONS.** You should use an HB pencil to mark all your answers on the Answer Sheet. Wrong marks must be completely erased.

4. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.

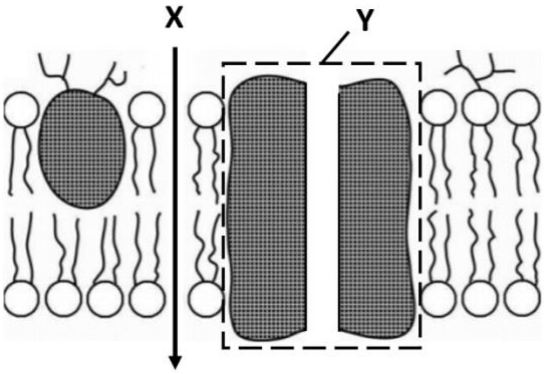
5. No marks will be deducted for wrong answers.

6. The diagrams in this section are **NOT** necessarily drawn to scale.

There are 36 questions in this section.

The diagrams in this section are NOT necessarily drawn to scale.

Directions: Questions 1 and 2 refer to the diagram below which shows a section of the cell membrane.



1. Which substance(s) may move across the cell membrane by taking route X?

(1) Carbon dioxide
(2) Alcohol
(3) Sodium ions

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

2. Which of the following descriptions of the function of molecule Y is correct?

A. It acts as a receptor for binding with specific molecules.
B. It acts as a channel for transporting water molecules.
C. It acts as an enzyme for controlling cellular metabolism.
D. It increases the flexibility of the membrane and helps stabilize the structure.

3. The specificity of amino acids is determined by the

A. amino group.
B. side chain.
C. carboxyl group.
D. peptide bond formed between amino acids.

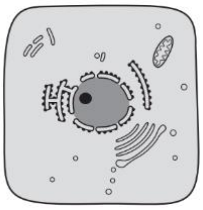
4. Which of the following comparisons about DNA and RNA is correct?

	DNA	***RNA***
A.	contains ribose	contains deoxyribose
B.	single-stranded	double-stranded
C.	contains uracil	contains thymine
D.	relatively stable	relatively unstable

5. Which of the following combinations is found in a prokaryotic cell? (✓: present; ✗: absent)

	Endoplasmic reticulum	***DNA***	***RNA***
A.	✓	✓	✗
B.	✓	✗	✗
C.	✗	✓	✓
D.	✗	✗	✓

6. The diagram below shows an animal cell observed under an electron microscope.



Which of the following represents the same cell observed under a light microscope at x400 magnification?

A. 

B. 

C. 

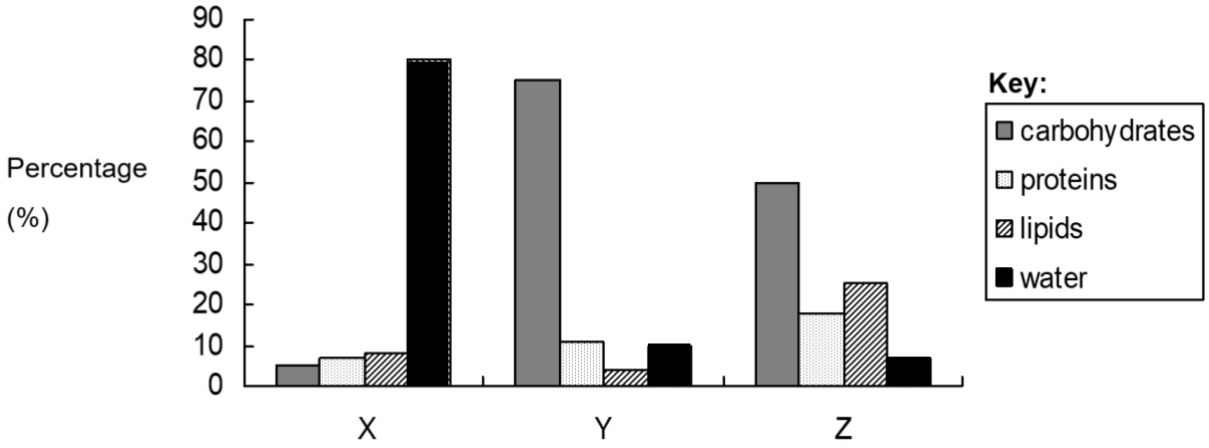
D. 

7. Which of the following events occur during the light-dependent reactions of photosynthesis?

(1) Production of ATP
(2) Production of oxygen gas
(3) Reduction of NAD

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

Directions: Questions 8 and 9 refer to the graph below, which shows the percentage of carbohydrates, proteins, lipids and water in three foods, X, Y and Z.



8. Which of the following combinations correctly identifies foods X, Y and Z?

	X	***Y***	***Z***
A.	rice	peanut	milk
B.	milk	peanut	rice
C.	milk	rice	peanut
D.	rice	milk	peanut

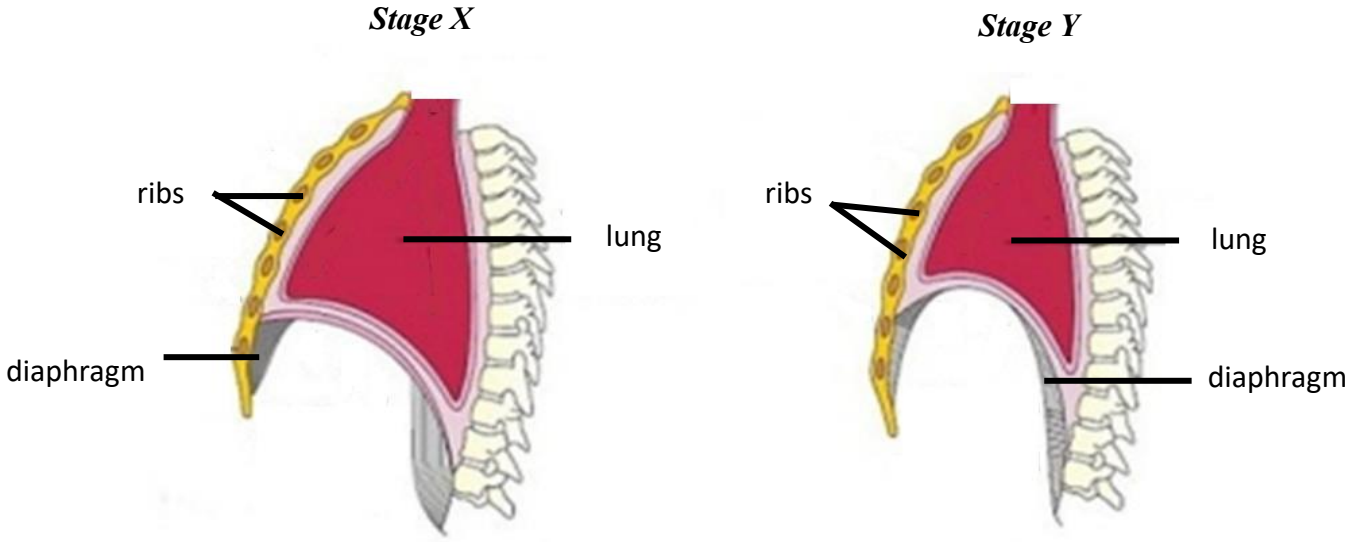
9. Which of the following correctly compares the energy content per unit mass of foods X, Y and Z?

A. X > Y > Z
B. X > Z > Y
C. Z > X > Y
D. Z > Y > X

10. Lipids absorbed in the small intestine are first transported to the

A. liver.
B. gall bladder.
C. large intestine.
D. heart.

Directions: Questions 11 and 12 refer to the diagrams below which show the appearance of the human respiratory system and its associated structures in two different breathing stages:



11. Which of the following statements correctly describes the change that takes place from stage X to stage Y?

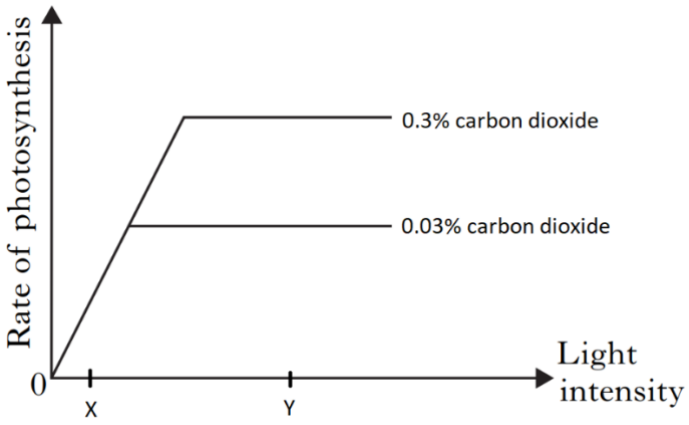
A. Pressure inside the lungs is increasing.
B. Diaphragm muscles are contracting.
C. Volume of the lungs is increasing.
D. Rib cage is moving downward and outward.

12. Which part(s) of the nervous system can control the rate of change from stage X to stage Y?

(1) cerebrum
(2) medulla oblongata
(3) spinal cord

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

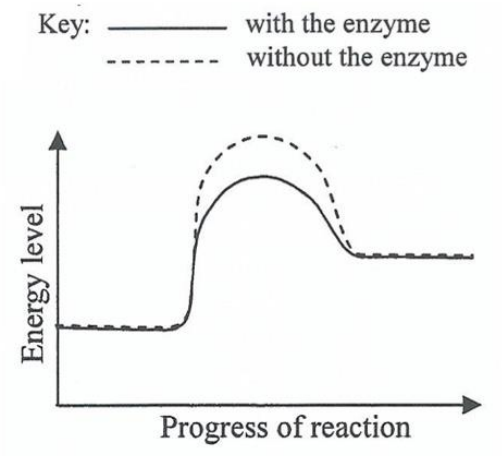
13. The graph below shows the rate of photosynthesis of a plant at different light intensities and different levels of carbon dioxide concentrations at 20 °C.



Which of the following shows the correct combination of limiting factors to rate of photosynthesis at points X and Y?

	Point X	***Point Y***
A.	light intensity	temperature
B.	temperature	carbon dioxide concentration
C.	carbon dioxide concentration	light intensity
D.	light intensity	carbon dioxide concentration

14. The graph below shows the energy levels of a biochemical reaction with and without an enzyme:

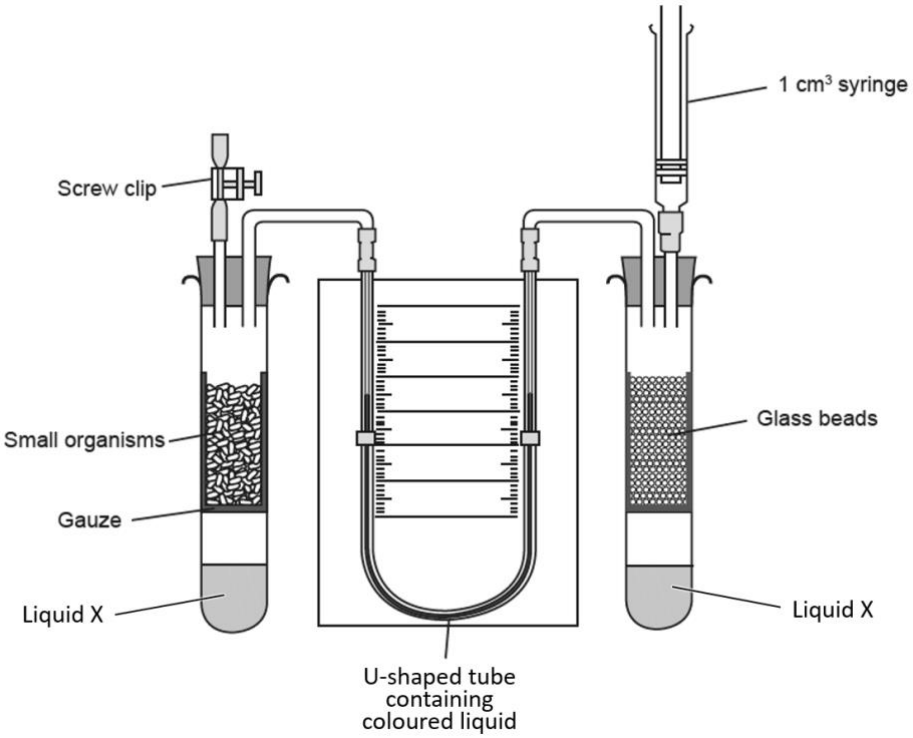


Which of the following reactions could be represented by the graph?

(1) Conversion of glucose to glycogen
(2) Conversion of glucose to pyruvate
(3) Conversion of hydrogencarbonate ions to carbon dioxide

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

15. The diagram below shows an experimental set-up used to investigate the rate of respiration of small organisms.



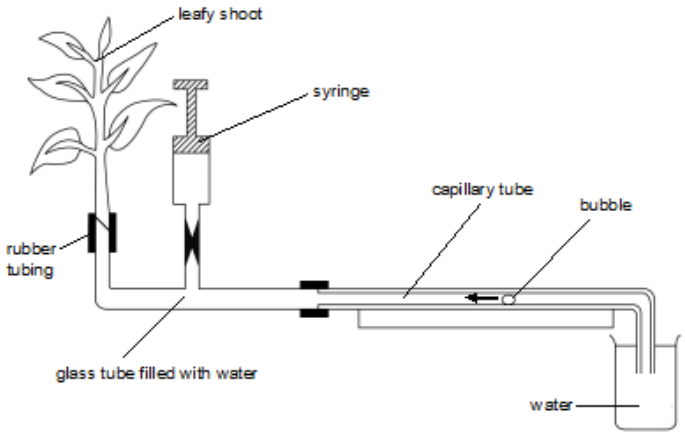
Which of the following shows the correct combination of liquid X and the direction of movement of coloured liquid in the U-shaped tube at the end of experiment?

	Liquid X	***Direction of movement of liquid in the U-shaped tube***
A.	Dilute hydrochloric acid	up on the left side
B.	Sodium hydroxide solution	down on the right side
C.	Hydrogencarbonate indicator	up on the right side
D.	Potassium hydroxide solution	down on the left side

16. Which compound is a waste product of anaerobic respiration in humans?

A. Ethanol
B. Pyruvate
C. Lactic acid
D. Carbon dioxide

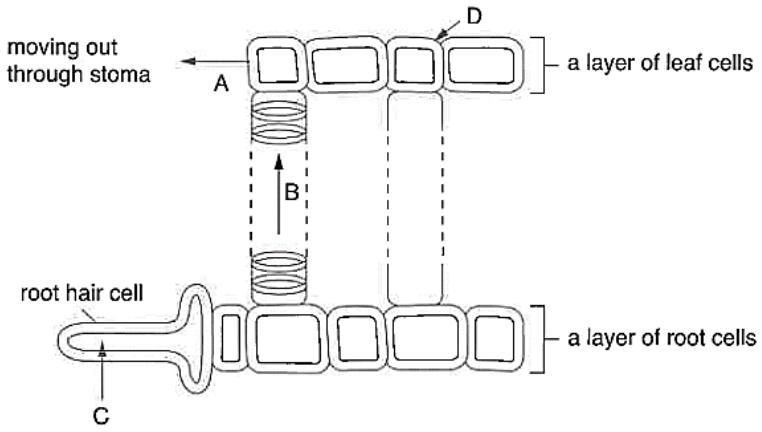
17. A bubble potometer is used to directly measure the rate of



(1) water uptake by a leafy shoot.
(2) transpiration of a leafy shoot.
(3) transport of water in the leafy shoot.

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

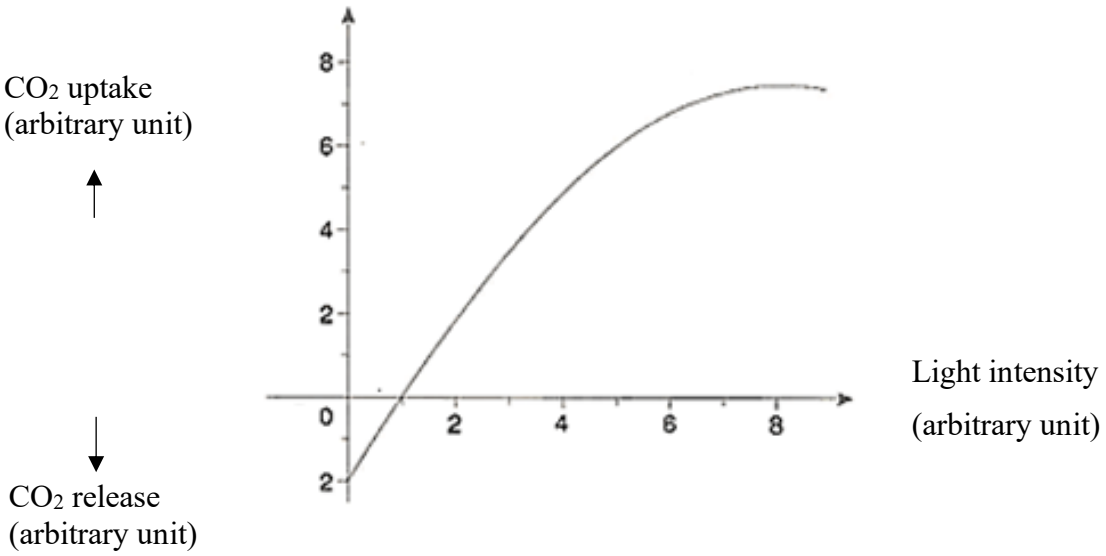
18. The diagram below shows the parts of a plant associated with the transport of substances A, B, C and D in the daytime.



Which of the following combinations shows the correct substance and process causing the movement?

	Substance	***Process causing the movement***
A.	A- oxygen	evaporation
B.	B - water	diffusion
C.	C - minerals	active transport
D.	D - carbon dioxide	osmosis

Directions: Questions 19 and 20 refer to the following graph which shows the effect of light intensity on carbon dioxide exchange in a plant.



19. The rate of respiration of the plant is 0 (arbitrary unit) when the light intensity is _____ (arbitrary unit).

A. 0
B. 1
C. 8
D. none of the above

20. Which of the following statements is correct?

A. There is no gas exchange at the compensation point.
B. The compensation point of the plant can be found at light intensity of 8 units.
C. When the light intensity is greater than 8 units, light intensity is no longer the limiting factor for photosynthesis.
D. When the light intensity is at 8 units, 5 units of carbon dioxide was taken up by the plant for photosynthesis.

21. Regarding their respective roles in human and plant reproduction, which of the following structures have similar functions?

	Humans	***Flowering plants***
A.	penis	pollen tube
B.	vagina	stigma
C.	uterus	anther
D.	seminiferous tubule	filament

Directions: Questions 22 and 23 refer to the diagrams below. Diagram I shows the reflex arc of the withdrawal reflex while diagram II shows three types of neurones:

Diagram I

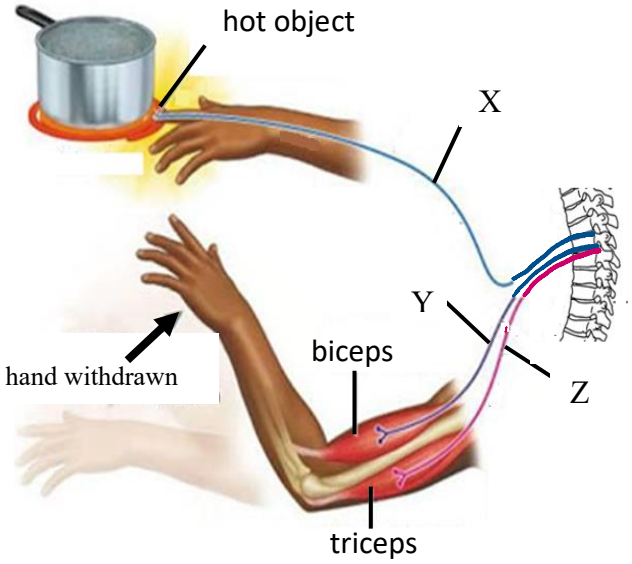
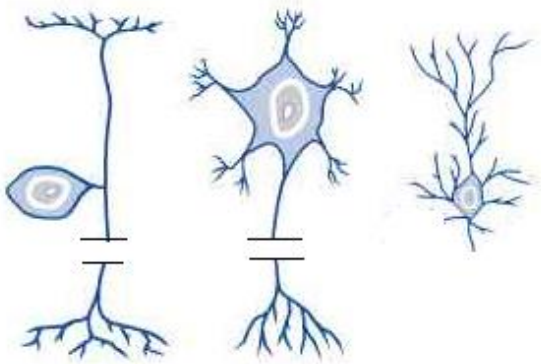


Diagram II



(1) (2) (3)

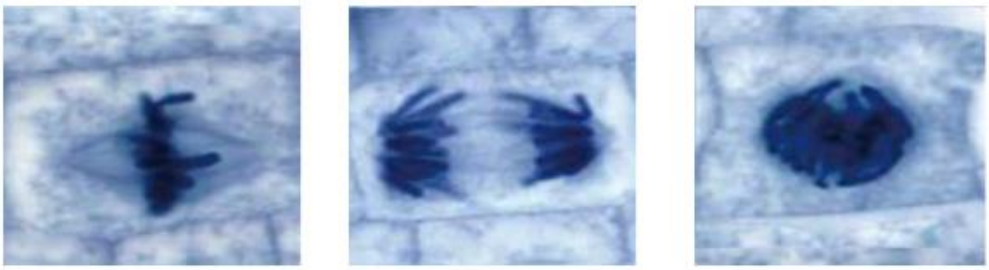
22. Which of the following combinations correctly describes the responses of biceps and triceps when the hand is withdrawn from the hot object?

	Biceps	***Triceps***
A.	contracts	contracts
B.	contracts	relaxes
C.	relaxes	contracts
D.	relaxes	relaxes

23. Which of the following combinations correctly identifies the types of neurones to which X, Y and Z belong?

	X	***Y***	***Z***
A.	(1)	(2)	(3)
B.	(2)	(1)	(1)
C.	(2)	(1)	(3)
D.	(1)	(2)	(2)

24. The following photomicrographs show the different stages of cell division in plant root cells:

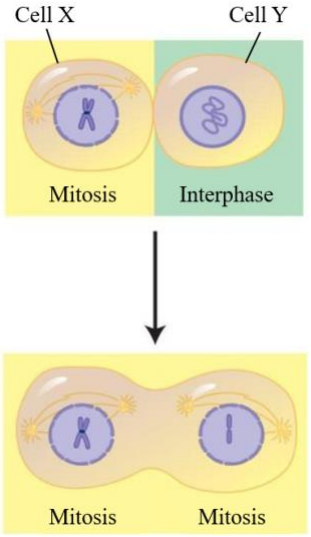


X Y Z

Which of the following statements is correct?

A. Homologous chromosomes line up in pairs at stage X.
B. Spindle fibres contract and pull sister chromatids of chromosomes apart at stage Y.
C. DNA replicates in stage Z.
D. After stage Y, the cell membrane constricts to form two daughter cells.

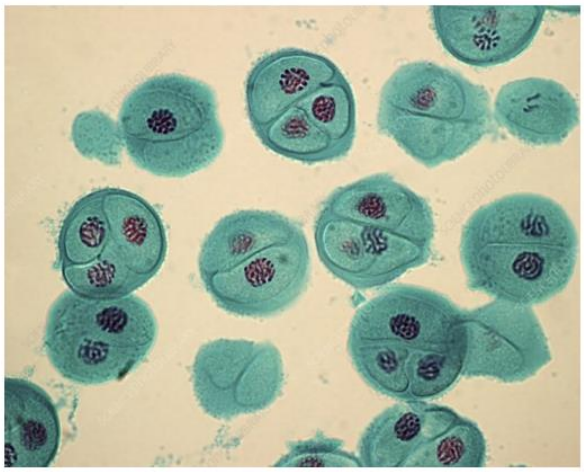
25. The diagram below shows an experiment where a cell undergoing mitosis (cell X) was fused with a cell in interphase (cell Y). Cell Y immediately started to undergo mitosis.

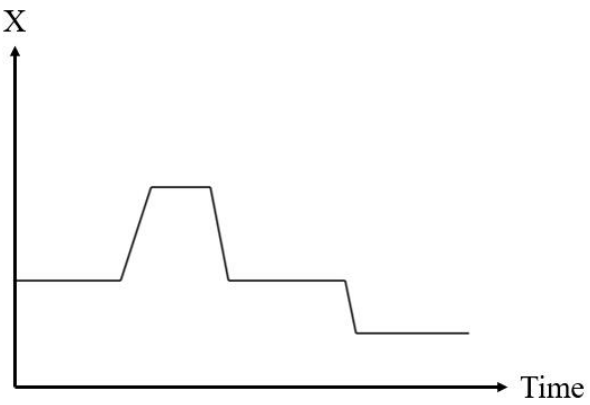


Which of the following conclusions can be made from the experiment?

A. An electrical signal from cell X caused cell Y to enter mitosis.
B. No signal was produced by cell Y to cause cell X to enter interphase.
C. Cell X caused cell Y to enter mitosis because, in normal cells, mitosis occurs after interphase.
D. None of the above conclusions can be made.

26. The following photomicrograph shows meiotic cell division occurring in the anther of a flower. The graph shows the changes in one of the cells over time in one cell cycle.



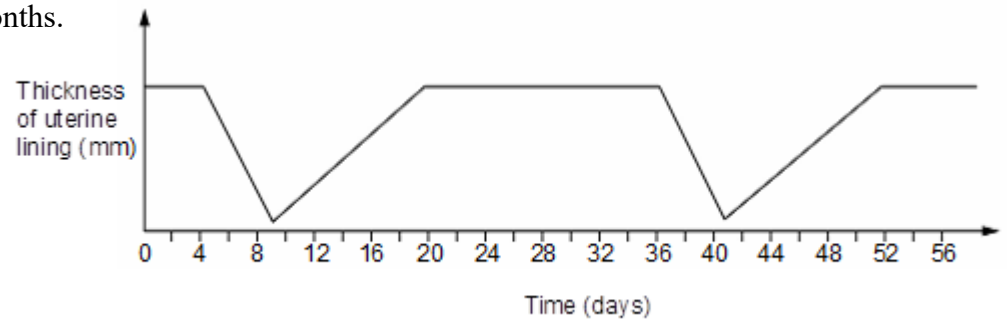


On the Y-axis of the graph, X could most likely represent

(1) volume of each cell.
(2) amount of DNA in each cell.
(3) number of chromosomes in each cell.

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

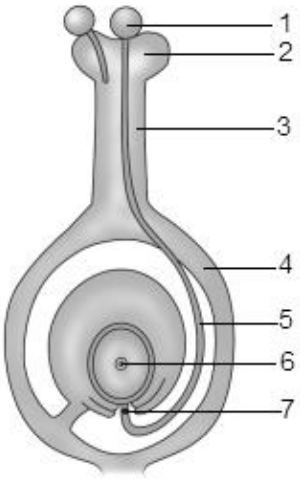
27. The following graph shows the changes in thickness of the uterine lining of a woman in two months.



Ovulation most likely occurs around

A. day 4.
B. day 28.
C. day 36.
D. day 54.

28. The following diagram shows the process of fertilization in flowering plants.



Which of the following combinations about the fate of different structures after fertilization is correct?

	Structure	***After fertilization***
A.	3	becomes the fruit wall
B.	4	becomes the seed coat
C.	5	becomes the cotyledon
D.	6	becomes the embryo

29. Which of the following combinations correctly classifies algae and plants and the reason for the classification?

	Classification	***Reason***
A.	Different kingdoms	Algae do not have vascular tissue nor rhizoids while plants do
B.	Different kingdoms	Algae are aquatic, while most plants are terrestrial
C.	Same kingdom	Both have chlorophyll
D.	Same kingdom	Both are autotrophic

30. The photos below show three organisms - P, Q, and R:

Organism P

Organism Q

Organism R

Which of the following descriptions about the organisms is correct?

A. Larvae of organism Q use gills for gas exchange, while larvae of organisms P and R use lungs for gas exchange.
B. Embryos of organism P develops in water, while embryos of organisms Q and R develop in hard shells on land.
C. All three organisms are poikilotherms.
D. All three organisms reproduce by external fertilization.

31. The photo below shows a plant, while the table shows the features of four specimens collected in a field study:

Specimen	Roots	Stems	Leaves	Seeds	Flowers	Chlorophyll
I	✓	✓	✓	✓	✓	✓
II	×	×	×	×	×	✓
III	✓	✓	✓	×	×	✓
IV	✓	✓	✓	✓	×	✓

Key: ✓ = present × = absent

The plant shown in the photo is

A. Specimen I
B. Specimen II
C. Specimen III
D. Specimen IV

32. A square metre of grassland receives about 1 047 000 kJ of solar light energy each year. The table below shows what happens to this energy.

	kJ
used in evaporation of water	523 500
transmitted to the ground	335 000
reflected by the leaves	165 000
used for growth	21 500
used for other life processes	1 500
respiratory heat loss	500

How much energy is absorbed by the grass?

A. 23 000 kJ
B. 23 500 kJ
C. 188 500 kJ
D. 1 046 000 kJ

33. In a family, both the father and mother have normal colour vision. The father is of blood group B, while the mother is of blood group O. Their biological son is red-green colour blind and of blood group O. Which of the following about the family is correct?

(1) The father must be heterozygous for his blood group genotype.
(2) If the parents were to have a biological daughter, she must have normal colour vision.
(3) If the parents were to have another biological son, he must be of blood group O.

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

34. Which of the following statements regarding variations is correct?

A. All variations are heritable.
B. Fraternal twins may have different traits involving discontinuous variations.
C. Variations between gametes from the same individual are caused by random fertilization.
D. Variations can be caused by crossing over in prophase II.

35. The table below shows the number of amino acid differences between humans and other selected organisms for cytochrome C oxidase, which is an enzyme in mitochondria essential for cell respiration.

Organism	Number of amino acid differences from human
chimpanzee	0
horse	12
fruit fly	29
pigeon	12
rhesus monkey	1
tuna fish	21

Based on the above information, which vertebrate is the least related to humans?

A. Chimpanzee
B. Fruit fly
C. Rhesus monkey
D. Tuna fish

36. Which of the following is/are required for natural selection to occur?

(1) acquired characteristics
(2) genetic variation
(3) intraspecific competition

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

End of Section A

Go on to Question-Answer Book for questions on Section B