2022-2023
MOCK EXAM
S6 Bio
Paper 1

SACRED HEART CANOSSIAN COLLEGE

2022-2023 MOCK EXAMINATION

Secondary 6

BIOLOGY

Paper 1

Time allowed: 2 hours and 30 minutes

This paper must be answered in English

GENERAL INSTRUCTIONS

(1) The full mark of this paper is 120.
(2) There are **TWO** sections, A and B, in this paper.
(3) Section A consists of multiple-choice questions in this question paper and Section B contains conventional questions in Question-Answer Book B.
(4) 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 Multiple-choice Answer Sheet for Section A and the Question-Answer Book B for Section B will be collected separately at the end of the examination**.
(5) Write your name, class and number in the spaces provided on the Multiple-choice Answer Sheet for Section A and the Question-Answer Book for Section B. No extra time will be given after the 'Time is up' announcement.

INSTRUCTIONS FOR SECTION A

(1) Read carefully the instructions on the Multiple-choice Answer Sheet.
(2) When told to check this question paper, you should make sure that all the questions are there. Look for the words 'END OF SECTION A' after the last question.
(3) All questions carry equal marks.
(4) Answer ALL questions. You are advised to use an **HB pencil** to mark all the answers on the Multiple-choice Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured.
(5) You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.
(6) No marks will be deducted for wrong answers.
(7) The diagrams in this section are **NOT** necessarily drawn to scale.

<u>Section A</u>: Multiple-choice Questions (36 marks)

1. Which of the following correctly arranges the sub-cellular structures in descending order of their width?

   A. nucleus, chloroplast, mitochondrion, ribosome, cell membrane
   B. nucleus, mitochondrion, chloroplast, cell membrane, ribosome
   C. cell membrane, ribosome, mitochondrion, chloroplast, nucleus
   D. ribosome, cell membrane, mitochondrion, chloroplast, nucleus

2. Which of the following correctly describe the absorption of glucose in the small intestine?

   (1) Glucose can move along or against a concentration gradient.
   (2) The absorption is assisted by membrane proteins.
   (3) Glucose is not absorbed into lacteal.

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

3. Carbon dioxide is produced in the small intestine. Which of the following correctly shows the transport route of the carbon dioxide for removal?

   A. small intestine → lungs
   B. small intestine → right chambers of the heart → lungs
   C. small intestine → liver → left chambers of the heart → lungs
   D. small intestine → liver → right chambers of the heart → lungs

4. Which of the following substances passes through the membranes into the mitochondrion during aerobic respiration?

   A. triose phosphate
   B. pyruvate
   C. acetyl-CoA
   D. 4-C compound

5. Which of the following does ***not*** require energy released by respiration?

   A. release of neurotransmitters into the synaptic cleft
   B. uptake of glucose from the small intestine
   C. uptake of oxygen from air sacs
   D. release of antibodies by lymphocytes

Directions: Questions 6 and 7 refer to the table below showing the three set-ups used in the study of the salivary amylase activity.

Tube	**P**	**Q**	**R**
Contents	1% salivary amylase + 5% starch	Boiled 1% salivary amylase + 5% starch	Boiled 1% salivary amylase + distilled water

6. We can conclude the catalytic action of amylase on starch by comparing the results of tubes

   A. P and Q only.
   B. P and R only.
   C. Q and R only.
   D. P, Q and R.

7. If the following tests are conducted on the reaction mixture of tube P, which test(s) will give the same result at the beginning of the experiment and after 10 minutes?

   (1) Iodine test
   (2) Albustix paper
   (3) Benedict's test

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

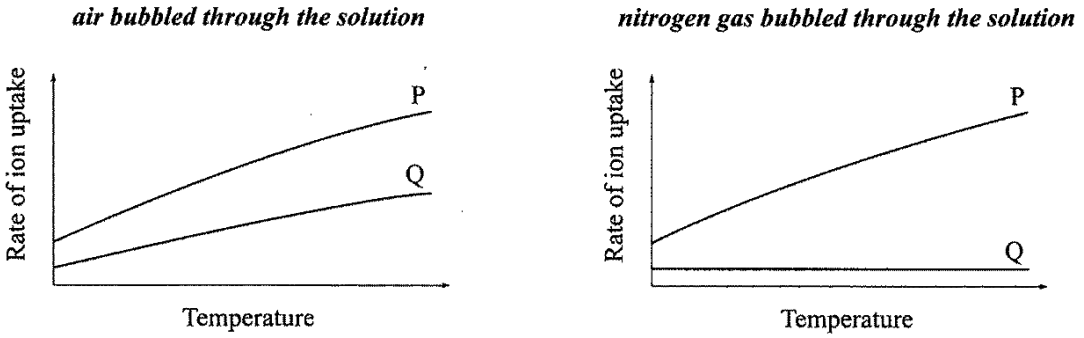
8. A fruit fly has four pairs of chromosomes in its body cells. After meiosis I, how many chromatids are present in each produced cell?

   A. 4
   B. 8
   C. 16
   D. 32

9. In the Fluid Mosaic Model, the cell membrane is described as 'fluid' because

   A. carrier proteins and glycoproteins are interspersed among the phospholipid bilayer.
   B. carrier proteins can change shape.
   C. phospholipid molecules and carrier proteins can move laterally within the phospholipid bilayer.
   D. phospholipid molecules can turn inside out within the phospholipid bilayer.

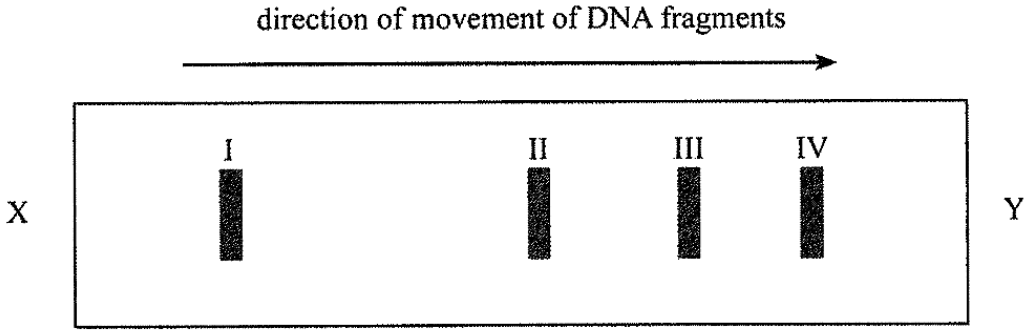
10. The roots of a plant are placed in a dilute solution containing two types of ions, P and Q. The graphs below show the effects of increasing temperatures on the rate of uptake of ions P and Q by the roots under two different conditions:



How are ions P and Q taken up by the roots when air is bubbled through the solution?

	P	***Q***
A.	Diffusion	Diffusion
B.	Diffusion	Active Transport
C.	Active Transport	Diffusion
D.	Active Transport	Active Transport

11. A mixture of DNA fragments was separated by gel electrophoresis. The diagram below shows the DNA fingerprint obtained:

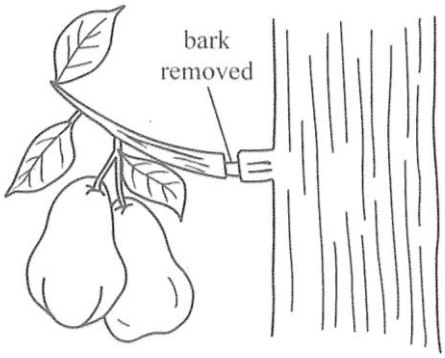


Which of the following statements about the above DNA fingerprint are correct?

(1) Y is the positive terminal, while X is the negative terminal.
(2) The DNA fragments in band I have a larger molecular size than those in band IV.
(3) All the DNA fragments in the four bands are negatively charged.

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

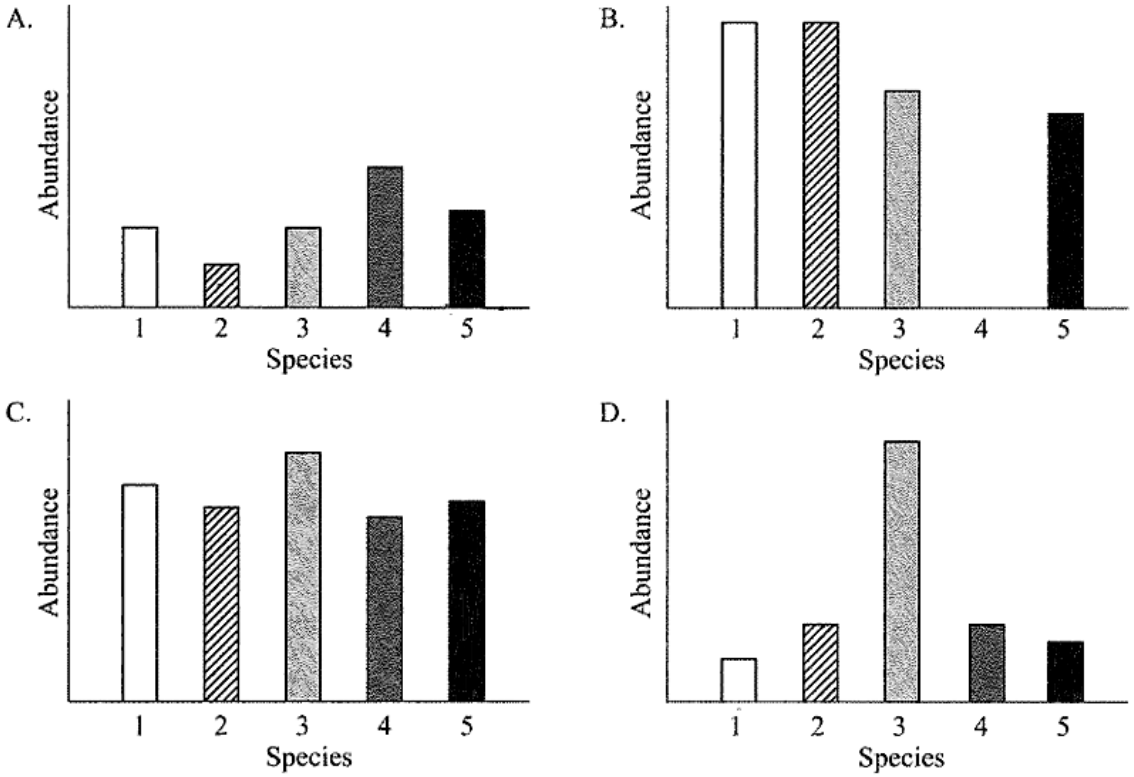
12. The diagram below shows a pear tree with a ring of bark removed from one of its branches. Removing the bark did not remove the xylem.



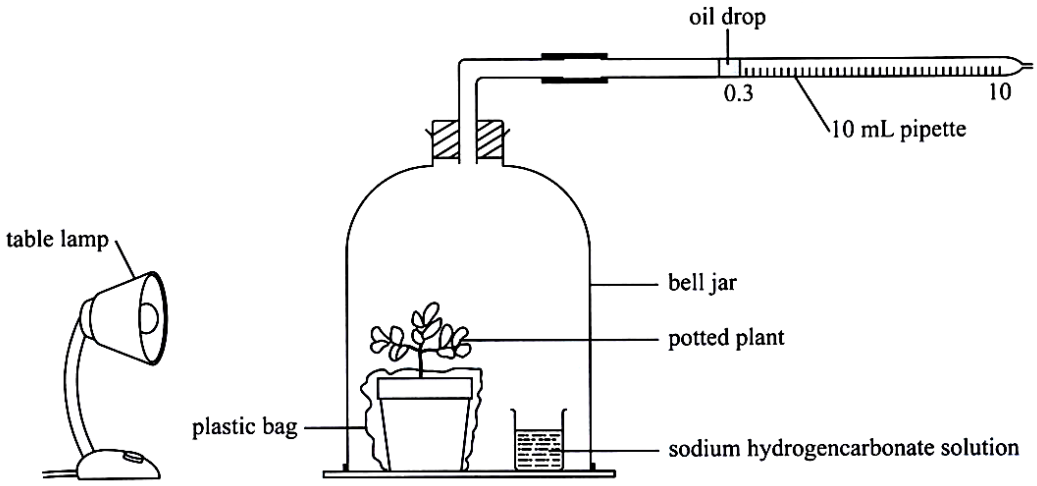
What effects will removing the bark have on the leaves and fruits on the branch?

	Leaves	***Fruits***
A.	Wilted	Reduced
B.	Wilted	Enlarged
C.	Normal	Reduced
D.	Normal	Enlarged

13. The bar charts below show the abundance of five species in four communities (A, B, C and D). Which of the following communities has the highest species diversity?



Directions: Questions 14 and 15 refer to the diagram below, which shows a set-up used to measure the rate of photosynthesis of a potted plant.



14. The table below shows the experimental results:

Initial pipette reading	0.3 mL
Pipette reading after 20 minutes	3.5 mL

Based on the results, what was the rate of photosynthesis of the potted plant?

A. 3.2 mL oxygen produced per hour
B. 9.6 mL oxygen produced per hour
C. 3.2 mL carbon dioxide produced per hour
D. 9.6 mL carbon dioxide produced per hour

15. In order to find out the actual rate of photosynthesis of the potted plant, the experiment should be repeated using another modified set-up. Which of the following modifications should be made in the above set-up for the experiment?

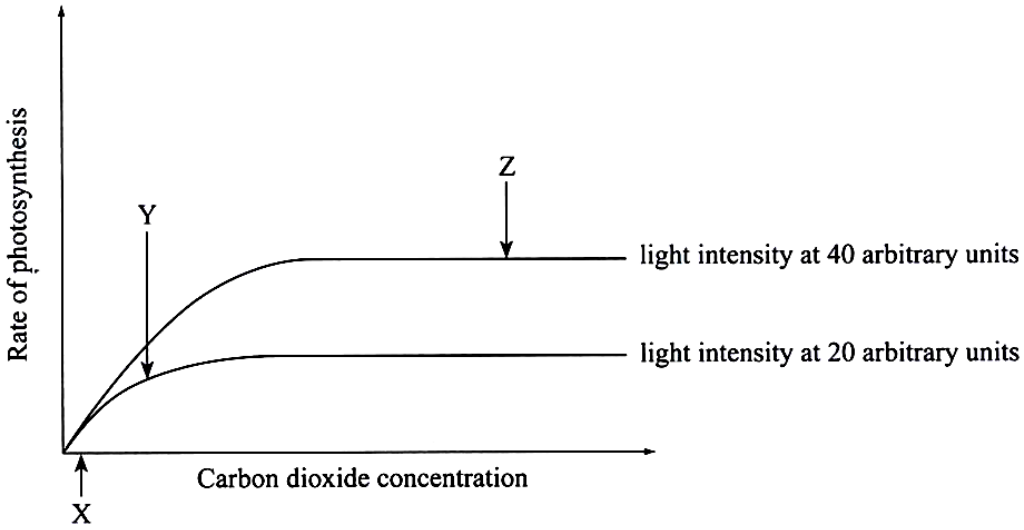
A. Replace sodium hydrogencarbonate solution with potassium hydroxide solution and cover the bell jar with black cloth.
B. Replace sodium hydrogencarbonate solution with distilled water and cover the bell jar with black cloth.
C. Remove the potted plant.
D. Replace sodium hydrogencarbonate solution with distilled water.

16. In which of the following structures can cartilage be found?

(1) Trachea
(2) Bronchiole
(3) Penis

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

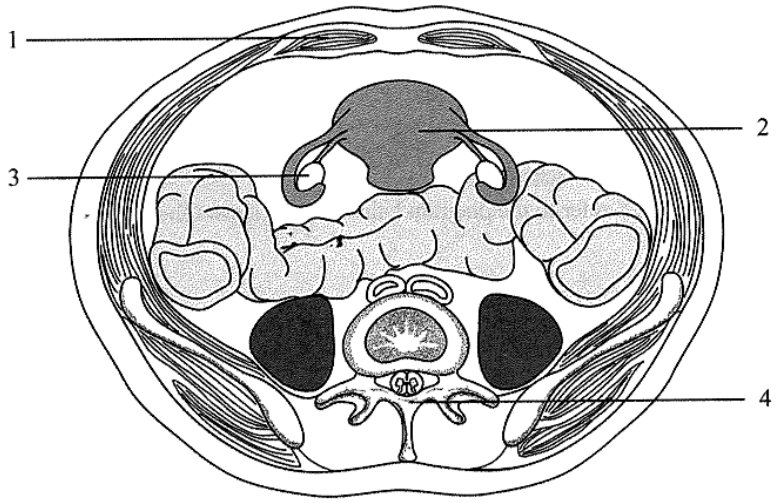
17. The graph below shows the rate of photosynthesis of a plant at two different light intensities when carbon dioxide concentration increases:



Which of the following statements is supported by the graph?

A. Both carbon dioxide concentration and light intensity limit the rate of photosynthesis at point Y.
B. Ligh intensity limits the rate of photosynthesis at carbon dioxide concentrations below X.
C. Increasing light intensity from 20 arbitray units to 40 arbitrary units doubles the rate of photosynthesis.
D. Temperature limits the rate of photosynthesis at point Z.

18. The diagram below shows a cross section of a body part of a woman:



Which of the following labelled structures will help expel the foetus during labour?

A. 1 only
B. 4 only
C. 1 and 2 only
D. 1, 2 and 3 only

Directions: Questions 19 and 20 refer to the table below, which shows the classification of four organisms.

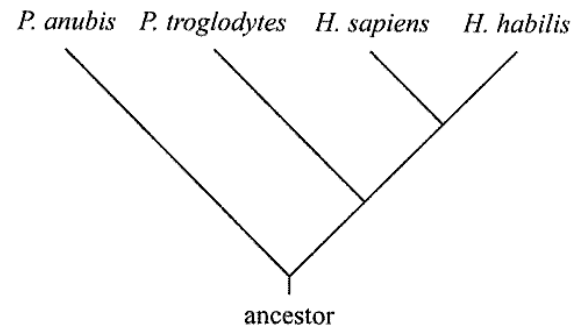
Kingdom	Animalia			
Phylum	Chordata			
Class	Mammalia			
Order	Primates			
Family	Hominidae			Cercopithecidae
Genus	*Homo*		*Pan*	*Papio*
Species	*Homo sapiens* ('wise human' including modern human)	*Homo habilis* ('handy human')	*Pan troglodytes* (chimpanzee)	*Papio anubis* (olive baboon)

19. Which of the following statements is ***incorrect***?

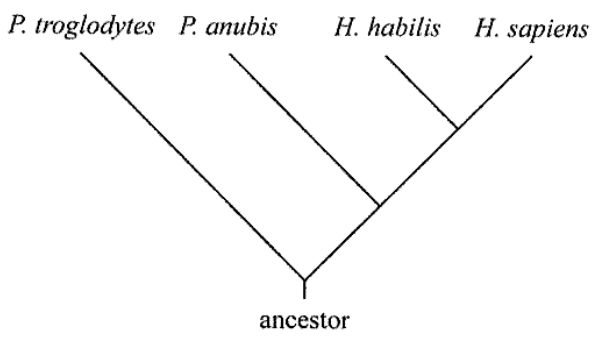
    A. *H. sapiens* carries out extracellular digestion.
    B. *P. troglodytes* has mammary glands.
    C. *P. anubis* carries out external fertilisation.
    D. *H. habilis* can maintain a constant body temperature.

20. Based on the given table, which of the following diagrams best represents the evolutionary tree of the four organisms?

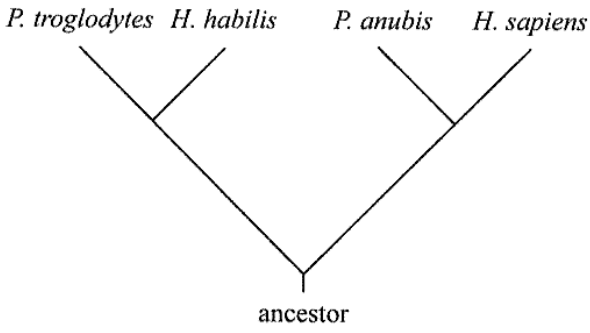
A.



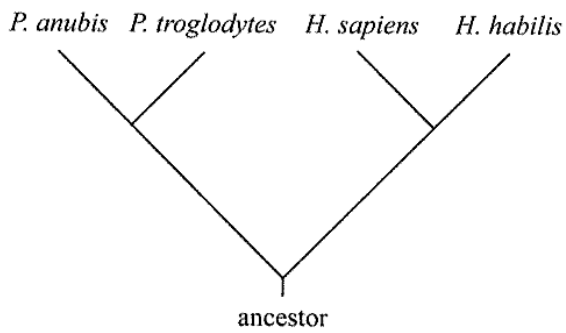
B.



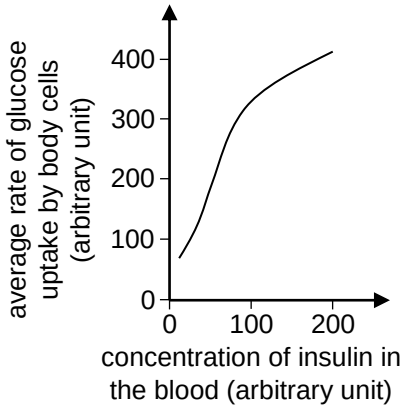
C.



D.

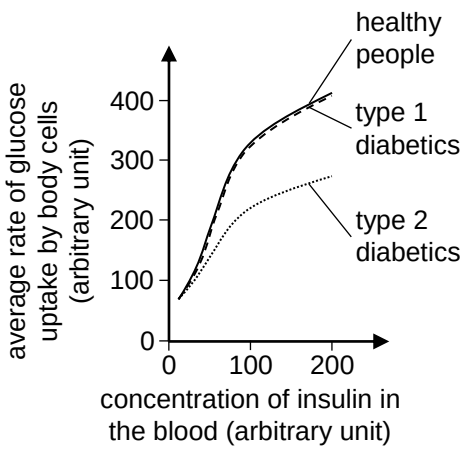


21. An experiment was carried out to investigate the changes in the rate of glucose uptake by body cells after an increasing concentration of insulin is injected into healthy people. The graph below shows the results.

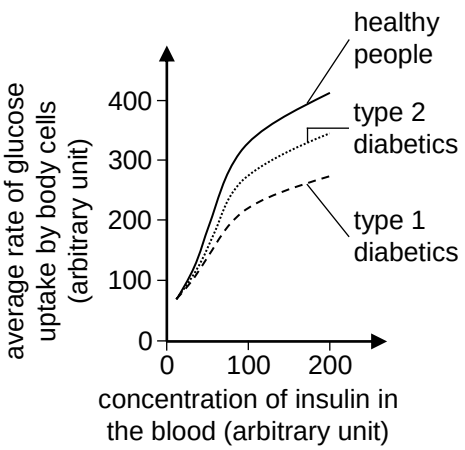


Which of the following graphs shows the most likely results if the experiment was repeated including patients with insulin-dependent (type 1) diabetes mellitus and patients with non-insulin-dependent (type 2) diabetes mellitus?

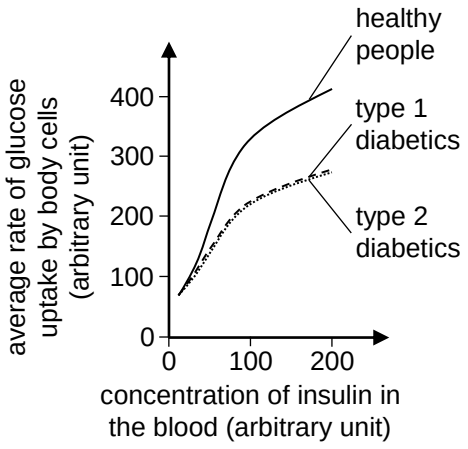
A.



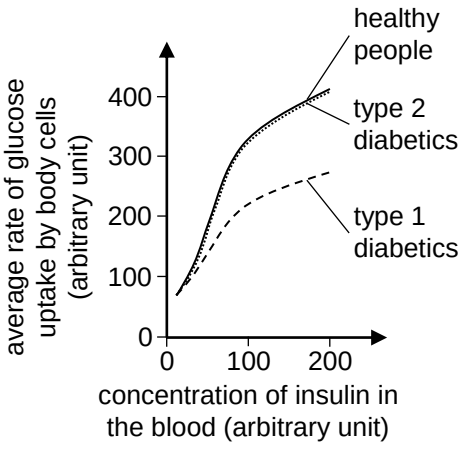
B.



C.



D.



Directions: Questions 22 to 24 refer to the information below, which shows part of the base sequence on one of the strands of a certain gene and four mutations of the same gene segment.

coding strand of the gene:	TGCTCCCTCTACCAGCTG
mutation I:	TGCTCCCTCTACCAACTG
mutation II:	TGCTCCCGCTACCAGCTG
mutation III:	TGCTCCCTCTAACAGCTG
mutation IV:	TGCTCCATCTACCAGCTG

The table below shows the codons in mRNA and the amino acids they code for. The amino acids are represented by their short forms.

UUU, UUC: Phe UUA, UUG: Leu	UCU, UCC, UCA, UCG: Ser	UAU, UAC: Tyr UAA, UAG: Stop	UGU, UGC: Cys UGA: Stop UGG: Trp
CUU, CUC, CUA, CUG: Leu	CCU, CCC, CCA, CCG: Pro	CAU, CAC: His CAA, CAG: Gln	CGU, CGC, CGA, CGG: Arg
AUU, AUC, AUA: Ile AUG: Met	ACU, ACC, ACA, ACG: Thr	AAU, AAC: Asn AAA, AAG: Lys	AGU, AGC: Ser AGA, AGG: Arg
GUU, GUC, GUA, GUG: Val	GCU, GCC, GCA, GCG: Ala	GAU, GAC: Asp GAA, GAG: Glu	GGU, GGC, GGA, GGG: Gly

22. Which of the following is the mRNA produced by the coding strand of the above unmutated gene?

A. TGCTCCCTCTACCAGCTG
B. UGCUCCCUCUACCAGCUG
C. ACGAGGGAGATGGTCGAC
D. ACGAGGGAGAUGGUCGAC

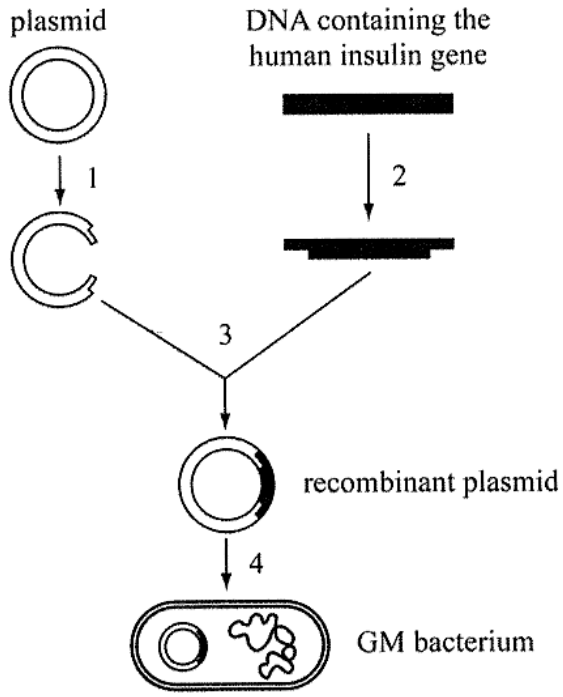
23. How many different kinds of amino acid will be present in the polypeptide chain produced from the segment of unmutated gene?

A. 3
B. 4
C. 5
D. 6

24. Which mutation is likely to have the greatest impact on the protein produced from the gene?

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

25. The diagram below shows the procedure for producing genetically modified (GM) bacteria which can be used to manufacture human insulin.



    Which of the above processes require(s) restriction enzymes?

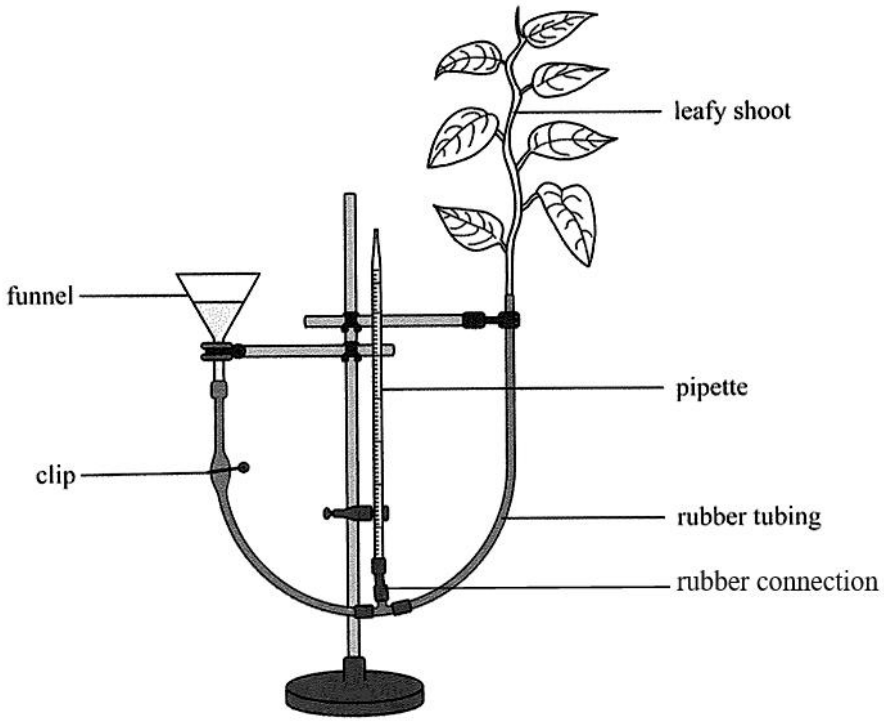
    A. 3 only
    B. 1 and 2 only
    C. 1, 2 and 3 only
    D. 1, 2, 3 and 4

26. Which of the following descriptions about pollination are correct?

    (1) Cross-pollination occurs when pollen grains are transferred from the anther to the stigma of another flower of the same plant.
    (2) Self-pollination leads to the production of genetically different offspring.
    (3) Cross-pollination leads to the greatest genetic variations in the offspring.

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

27. The diagram below shows an experimental set-up used to measure the water absorption rate of a leafy shoot.



Which of the following steps is ***not*** necessary when preparing the set-up?

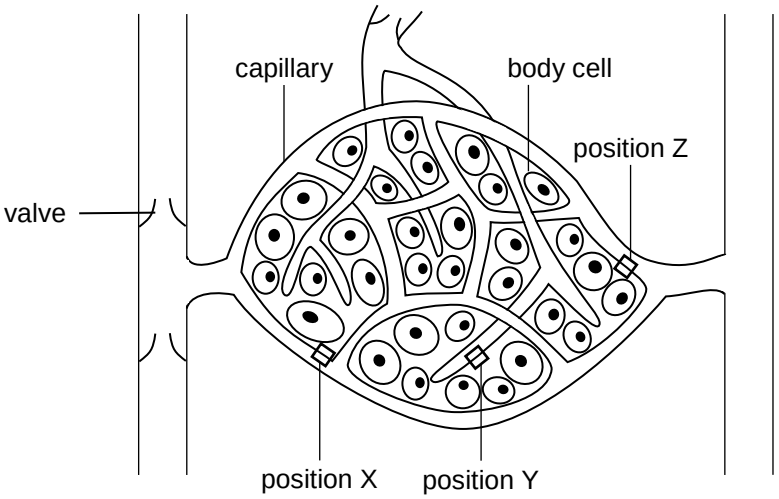
A. A layer of oil should be added to the water surface in the funnel to prevent water evaporation.
B. A layer of oil should be added to the water surface in the pipette to prevent water evaporation.
C. The leafy shoot and the rubber tubing should be assembled under water to prevent the blockage of xylem by air bubbles.
D. All the joints should be smeared with vaseline to prevent the leakage of air and water.

28. Which of the following statements about exhalation are correct?

(1) During exhalation, the stretched elastic fibres of the lung tissue recoil.
(2) At the end of exhalation, the volume of the lungs reaches the minimum.
(3) The difference between the air pressure in the lungs and the atmospheric pressure is the greatest at the beginning of exhalation.

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

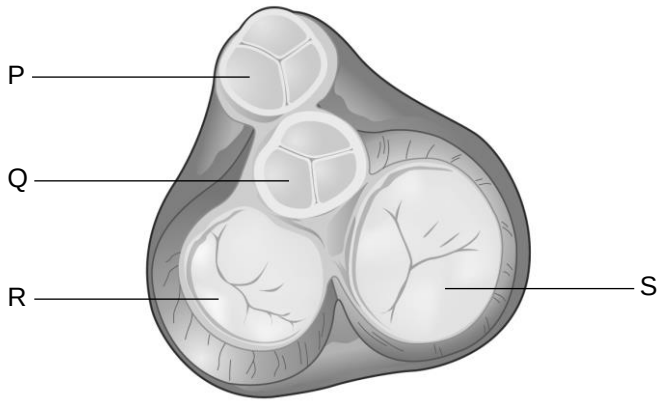
29. The diagram below shows a capillary bed and its neighbouring cells.



Which of the following combinations correctly identifies the main driving force of the movement of water at positions X, Y and Z?

	Position X	***Position Y***	***Position Z***
A.	osmosis	hydrostatic pressure	hydrostatic pressure
B.	osmosis	osmosis	hydrostatic pressure
C.	hydrostatic pressure	hydrostatic pressure	osmosis
D.	hydrostatic pressure	osmosis	osmosis

30. The diagram below shows a human heart with certain parts removed to reveal various valves.



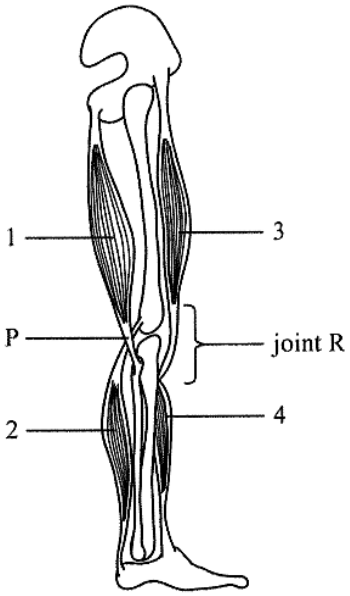
Which valve will a red blood cell first pass through after leaving the capillary bed in the kidney?

A. valve P
B. valve Q
C. valve R
D. valve S

Directions: Questions 31 to 33 refer to the diagram below. Diagram I shows a Karate player kicking out his right leg. Diagram II shows some of the structures associated with his leg.

Diagram I

Diagram II



31. Which of the following correctly shows a pair of antagonistic muscles?

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

32. Which of the following combinations correctly describes the states of the muscles on the right leg when the Karate player is kicking as shown in Diagram I?

	Muscle 2	***Muscle 3***
A.	Contracting	Contracting
B.	Relaxing	Contracting
C.	Contracting	Relaxing
D.	Relaxing	Relaxing

33. Which of the following combinations correctly identifies structure P and the type of joint of R?

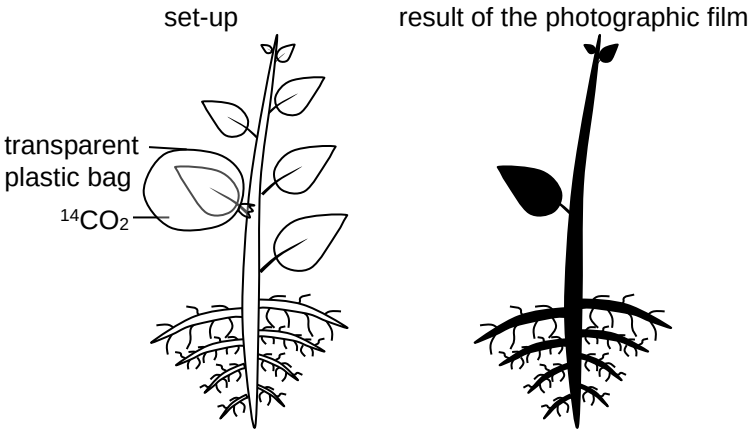
	Structure P	***Joint R***
A.	ligament	hinge joint
B.	ligament	ball-and-socket joint
C.	tendon	hinge joint
D.	tendon	ball-and-socket joint

34. Which of the following are the adaptive features of both air sacs in human lungs and spongy mesophyll in leaves of a terrestrial dicot for gas exchange?

(1) large surface area
(2) one-cell thick wall
(3) the presence of a water film

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

35. A group of scientists carried out an experiment to trace the movement of organic nutrients in a dicot. They supplied one of the leaves with radioactively-labelled carbon dioxide ($^{14}CO_2$) and kept the plant under sunlight. After 12 hours, the plant was exposed to a photographic film to identify radioactivity in different parts of the plant. The diagram below shows the set-up and result of the experiment.



Which of the following statement(s) about the experimental result is / are correct?

(1) From the result, it is deduced that the organic nutrients are transported both upwards and downwards in the stem.
(2) From the result, it is deduced that the organic nutrients are transported in phloem instead of xylem.
(3) From the result, it is deduced that carbon dioxide is absorbed by the enclosed leaf for photosynthesis and sugar produced is transported to growing points not able to undergo photosynthesis actively.

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

36. An experiment was carried out to examine the distribution of stomata in the leaves of a terrestrial plant. The leaf was put under sunlight for one hour and the mass of the leaf was recorded in the beginning and at the end of the experiment. The experiment was repeated using another leaf of a similar size from the same plant but the upper surface of the leaf was smeared with vaseline. The table below shows the results.

	Mass of the leaf (g)	
	Initial value	**Final value**
Leaf without vaseline	10.0	8.5
Upper surface of leaf smeared with vaseline	9.5	8.2

What is/are the conclusion(s) of this investigation?

(1) More water was lost from the leaf without vaseline than the leaf smeared with vaseline.
(2) No stomata are present on the upper surface of the leaf.
(3) There are more stomata on the lower surface of the leaf.

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

END OF SECTION A