

FORM TP2007166

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You must sign below and return this booklet with the Answer Sheet. Failure to do so may result in disqualification.	
Signature	

TEST CODE **92207010**

MAY/JUNE 2007

CARIBBEAN EXAMINATIONS COUNCIL

ADVANCED PROFICIENCY EXAMINATION

BIOLOGY - UNIT 2

Paper 01

90 minutes

11 JUNE 2007 (p.m.)

READ THE FOLLOWING DIRECTIONS CAREFULLY.

1. In addition to this test booklet, you should have an answer sheet.
2. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
3. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

Which of the following is NOT a form of energy storage?

- (A) ATP  
(B) Lipid  
(C) Alcohol  
(D) Lactic acid

Sample Answer

(B)  (C)  (D)

The best answer to this item is "ATP", so answer space (A) has been blackened.

4. If you want to change your answer, be sure to erase your old answer completely and fill in your new choice.
5. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, omit it and go on to the next one. You can come back to the harder items later. Your score will be the total number of correct answers.
6. You may do any rough work in this booklet.
7. Figures are not necessarily drawn to scale.
8. The use of non-programmable calculators is allowed.
9. This test consists of 45 items. You will have 90 minutes to answer them.
10. Do not be concerned that the answer sheet provides spaces for more answers than there are items in this test.

**DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.**

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1. In plant cells, which of the following processes uses ATP?

- (A) Osmosis in root hairs
- (B) Mineral uptake in root hairs
- (C) Diffusion into root hairs
- (D) Turgor pressure in root cortex

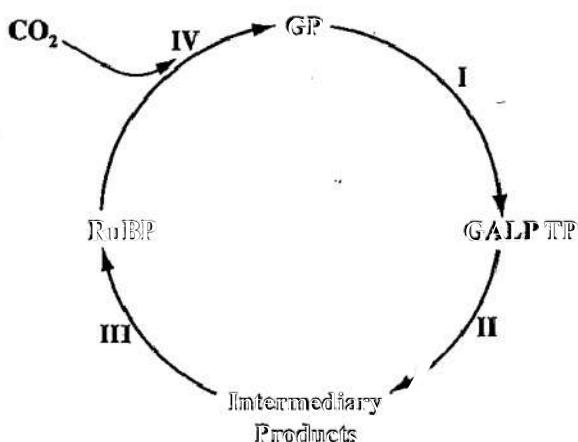
2. The spongy mesophyll is the chief site of gaseous exchange in a dicotyledonous leaf. This is possible because the cells are

- (A) elongated in shape and vertically packed
- (B) irregular in shape and tightly packed
- (C) found near the upper surface of the leaf
- (D) found near the lower surface of the leaf

3. Which of the following processes, taking place during photosynthesis, returns chlorophyll molecules to their reduced state?

- (A) Formation of ATP
- (B) Photolysis of water
- (C) Excitation of Photosystem
- (D) Oxidation of NADPH

- 4.



#### THE CALVIN CYCLE

ATP, produced in photophosphorylation, is used in the Calvin Cycle shown above. Which of the following combinations correctly identifies the stages, labelled I to IV where ATP is used?

- (A) I and II only
- (B) I and III only
- (C) II and IV only
- (D) IV and III only

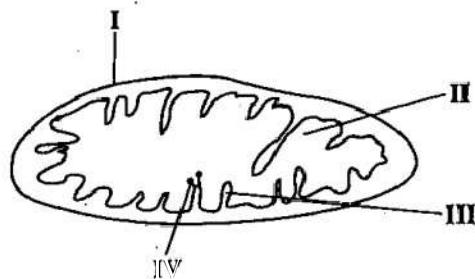
5. An investigation of the effect of light intensity and temperature on the rate of photosynthesis of a suspension of *Chlorella* cells showed that at higher light intensities, the cells photosynthesized much faster at  $20^\circ\text{C}$  than at  $15^\circ\text{C}$ . This is because

- (A) photosynthesis is an enzyme controlled process
- (B) carbon dioxide diffuses at higher temperatures
- (C) high temperatures favour high transpiration rates
- (D) higher light intensities increase the rate of photolysis of water

6. If oxygen is not available during the process of aerobic respiration, the net number of ATP molecules produced from a molecule of glucose is

(A) 2  
(B) 4  
(C) 34  
(D) 38

7. In the diagram of the mitochondrion below, enzymes which catalyse oxidative phosphorylation are located at site

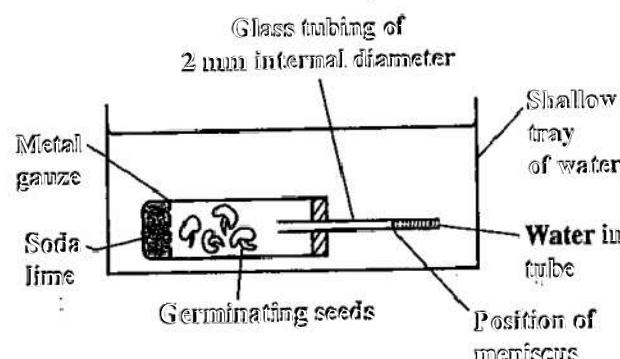


(A) I  
(B) II  
(C) III  
(D) IV

8. Which of the following pairs of options is correct for both the Krebs cycle and the electron transport chain?

Krebs Cycle	Electron Transport Chain
O <sub>2</sub> is not consumed	O <sub>2</sub> is consumed
CO <sub>2</sub> not produced	CO <sub>2</sub> produced
Site of action is the inner membrane of the mitochondrion	Site of action is the inner layer of the grana
NAD <sup>+</sup> is reduced to NADH + H <sup>+</sup>	NAD <sup>+</sup> is reduced to NADH + H <sup>+</sup>

Item 9 refers to the following apparatus set up to determine the rate of respiration of germinating seeds.



The results of the experiment are presented in the table below.

Time (mins)	Volume of Oxygen Absorbed (cm <sup>3</sup> ) (based on distance moved by meniscus)
5	1.6
10	2.1
15	3.4
20	4.2

9. Which of the following quantities represents the average rate of oxygen uptake by the seeds during the time course of the experiment?

(A) 4.2 cm<sup>3</sup> min<sup>-1</sup>  
(B) 0.21 cm<sup>3</sup> min<sup>-1</sup>  
(C) 1.26 cm<sup>3</sup> min<sup>-1</sup>  
(D) 6.7 cm<sup>3</sup> hr<sup>-1</sup>

10. In muscle tissue undergoing strenuous contractions, the formation of lactate is due to the

(A) high concentration of carbon dioxide  
(B) high concentration of glycogen  
(C) low concentration of glucose  
(D) low concentration of oxygen

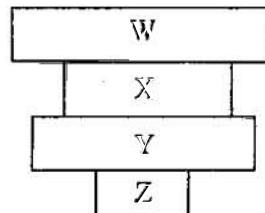
11. Which of the following is a correct definition of the term "habitat"?

- (A) The relationship between an organism and other species
- (B) The interacting community of organisms and the environment
- (C) The way in which the environment is exploited by the organism
- (D) A location within a biome where an organism dwells

12. Net primary production (NPP) is

- (A) the transfer of energy through an ecosystem
- (B) the amount of organic material available to herbivores
- (C) the amount of organic material made in photosynthesis
- (D) the amount of energy reaching the earth's surface

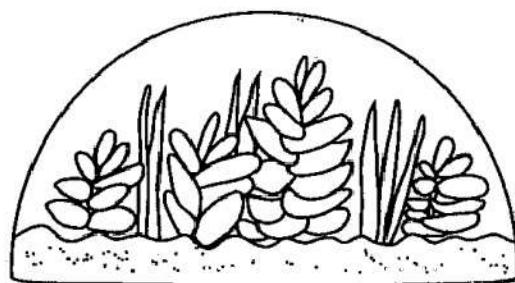
13. The figure below represents an ecological pyramid of numbers. The species of organisms in the pyramid are blackbirds, aphids, lice and cherry trees.



Match EACH of the species below with the options above.

	W	X	Y	Z
(A)	lice	aphids	blackbirds	cherry trees
(B)	blackbirds	lice	aphids	cherry trees
(C)	aphids	cherry trees	lice	blackbirds
(D)	lice	blackbirds	aphids	cherry trees

Item 14 refers to the terrarium below, an example of a self-sustaining unit.



14.

Which of the following reasons explains why the plants in the jar continue to thrive for several months after the jar is sealed, even though no additional materials are used?

- (A) The plants contain stored carbohydrates that are utilized.
- (B) Microorganisms in the soil decompose the organic wastes to facilitate recycling.
- (C) There are no herbivores in the jar to eat the plants and thus limit photosynthesis.
- (D) The glass jar exposes the plants to adequate light for photosynthesis.

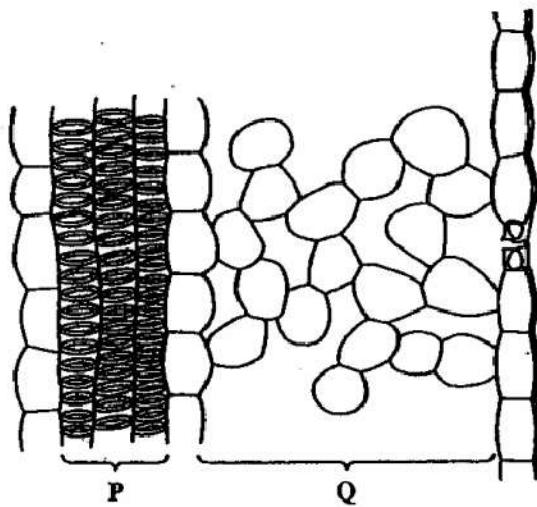
15.

In the nitrogen cycle, denitrifying bacteria convert

- (A) atmospheric nitrogen to nitrates
- (B) nitrates to atmospheric nitrogen
- (C) ammonium compounds to nitrates
- (D) atmospheric nitrogen to ammonium compounds

16. Which of the following describes the function of the endodermis?
- (A) It controls the movement of water and ions to the xylem using a Caspary strip.  
(B) It releases root pressure as water moves into the xylem by osmosis.  
(C) It allows water molecules to cling to the surface by cohesion so that a continuous column is created.  
(D) It forms a system of inter-connected plasmodesmata through which water and ions can move.
18. The function of the companion cell in mature phloem tissue is that it
- (A) provides structural support for the sieve tubes  
(B) actively moves sucrose out of neighbouring photosynthesizing cells to the sieve tubes  
(C) moves sucrose against a concentration gradient into the xylem  
(D) contains a nucleus needed for cell division of the sieve tube elements

Item 17 refers to the diagram below which shows some of the cells involved in loss of water from part of a plant.



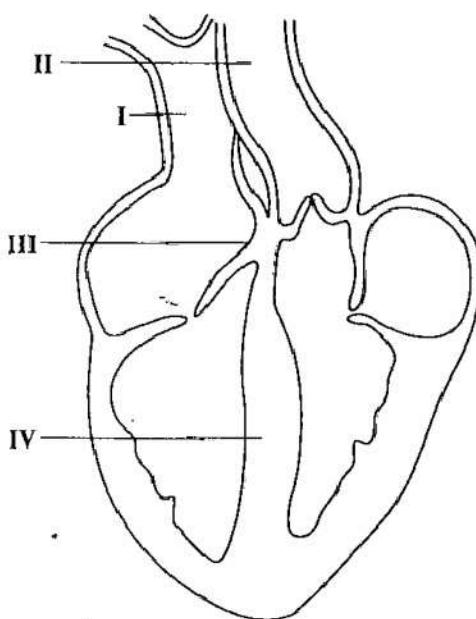
17. Which of the following correctly identifies the regions labelled P and Q?

	<b>Region P</b>	<b>Region Q</b>
(A)	Xylem	Mesophyll cells
(B)	Xylem	Root cortex
(C)	Phloem	Palisade
(D)	Phloem	Stem cortex

19. Which of the following statements presents the BEST evidence to support the mass flow theory of phloem transport?

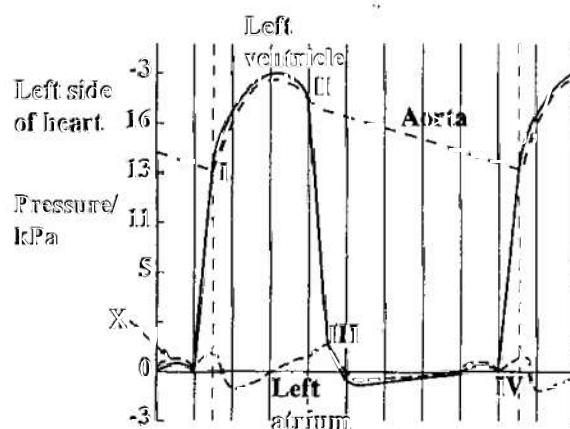
- (A) Phloem tissue carries manufactured food to destinations simultaneously, rather than to the greatest 'sink'.  
(B) Sieve plates are a barrier and have been reduced in the course of evolution.  
(C) Contents of sieve tubes are under pressure, and sugar solution exudes of phloem are cut.  
(D) Appropriate gradients between 'source' and 'sink' tissues do not exist.

Item 20 shows a diagram of a longitudinal section of the heart.



20. The position of the sino-atrial node is indicated by  
(A) I  
(B) II  
(C) III  
(D) IV

Items 21 - 22 refer to the diagram below which shows the pressure in the left side of the heart.



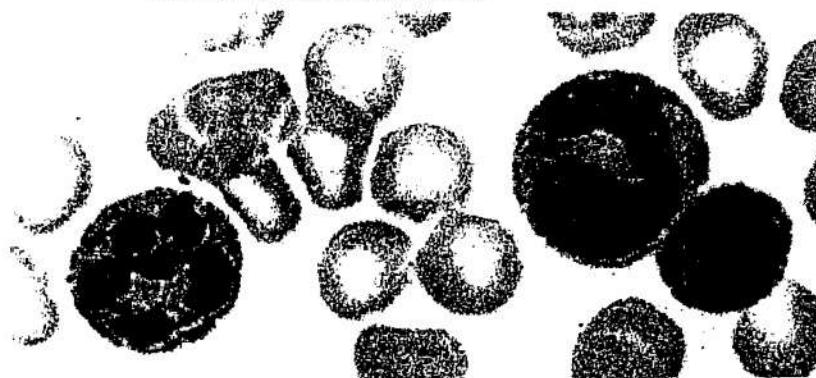
21. The semi-lunar valves close at

- (A) I  
(B) II  
(C) III  
(D) IV

22. The small surge in pressure in region X is caused by

- (A) atrial diastole  
(B) atrial systole  
(C) ventricular diastole  
(D) ventricular systole

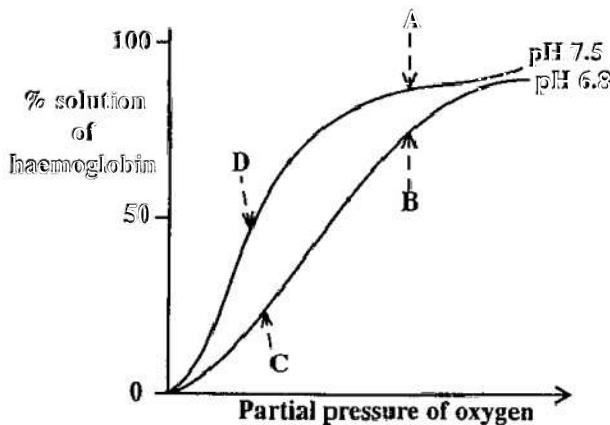
Item 23 refers to the photograph below which shows a human blood smear.



23. What is the approximate magnification of this photograph?
- (A) x 700  
(B) x 170  
(C) x 70  
(D) x 15

GO ON TO THE NEXT PAGE

Item 24 refers to the graph below which shows the oxygen dissociation curve for haemoglobin at pH 6.8 and 7.5.



24. The percentage saturation of haemoglobin in the blood leaving an active muscle is shown at

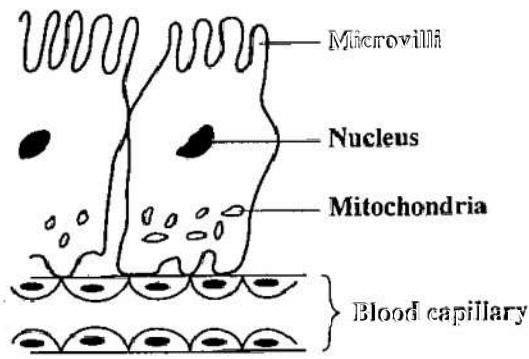
(A) A  
(B) B  
(C) C  
(D) D

25. Which of the following combinations of processes numbered I to IV, relates to the liver?

I. Glucose regulation  
II. Transamination  
III. Storage of Vitamins A, B and D  
IV. Manufacture of digestive enzymes

(A) I, II and III  
(B) I, II and IV  
(C) I, III and IV  
(D) II, III and IV

Item 26 refers to the diagram below which shows the ultrastructure of two cells from the kidney with part of an adjacent capillary.



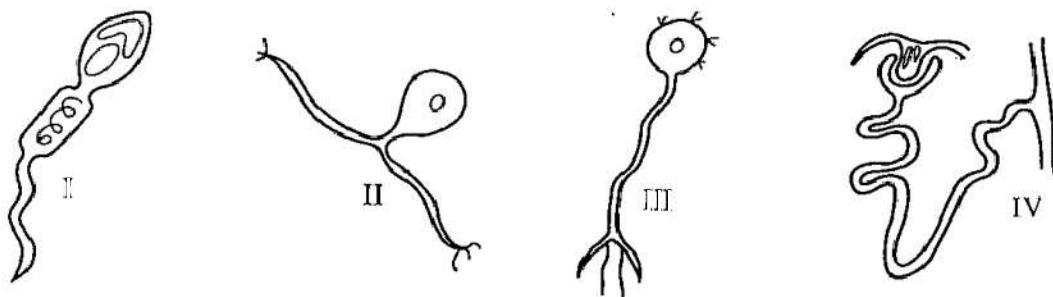
26. The region of the nephron shown is the

(A) Bowman's capsule  
(B) collecting duct  
(C) glomerulus  
(D) proximal tubule

27. Glomerular filtrate contains substances with a relative molecular mass less than 68,000. Larger molecules such as red blood cells and proteins are prevented from passing into the nephron because of the

(A) basement membrane  
(B) capillary endothelium  
(C) podocytes  
(D) glomerular pressure

28. Which of the following pairs of cells and structures possess myelin sheaths?



- (A) I and II only
- (B) II and III only
- (C) III and IV only
- (D) IV and I only

29. A delay of 0.5 ms occurs in transmission across a synapse because

- (A) calcium ions diffuse into the synaptic knob
- (B) ion channels in the postsynaptic membrane respond slowly to the presence of acetylcholine which diffuses across the cleft
- (C) the synaptic knob releases acetylcholine which diffuses across the cleft
- (D) the presynaptic membrane is in a refractory period

30. Glucagon is a hormone secreted by cells in the pancreas. Which TWO of the following changes are brought about by glucagon?

- II. It decreases the blood glucose level.
- III. It increases the blood glucose level.
- IV. It stimulates the breakdown of glycogen.
- IV. It stimulates the formation of glycogen.

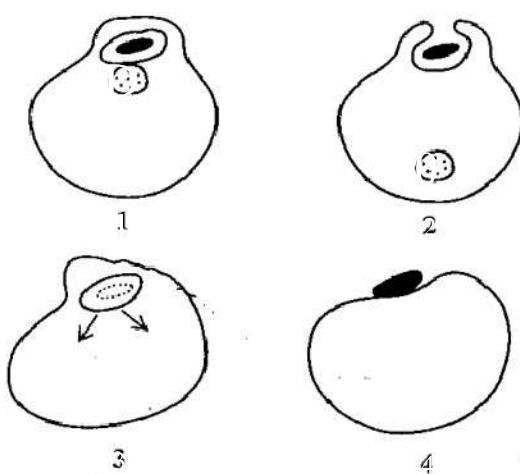
- (A) I and III
- (B) I and IV
- (C) II and III
- (D) II and IV

31. Which of the following correctly identifies three groups of nutrients that provide energy in the diet?
- (A) Protein, minerals, fibre  
(B) Lipids, carbohydrates, fibre  
(C) Lipids, carbohydrates, protein  
(D) Minerals, water, fibre
32. Which of the following conditions is NOT caused by malnutrition?
- (A) Obesity  
(B) Marasmus  
(C) Kwashiorkor  
(D) Emphysema
33. Fatty deposits in arteries can contribute to strokes and heart disease. This condition is called
- (A) arteriosclerosis  
(B) arthritis  
(C) thrombosis  
(D) atherosclerosis
34. Which of the following factors is responsible for the increase in heart rate during exercise?
- (A) Accumulation of lactic acid in the muscles  
(B) Decreased oxygen concentration in the blood stream  
(C) Increased adrenaline in the blood stream  
(D) Increased glucose concentration in the blood stream
35. Which of the following combinations correctly describe the pathogens responsible for malaria, dengue fever and AIDS?

Malaria	Dengue Fever	AIDS
Eukaryotic parasite	Virus	Virus
Bacterium	Eukaryotic parasite	Virus
Virus	Bacterium	Eukaryotic parasite
Eukaryotic parasite	Bacterium	Bacterium

36. Which of the following diseases is treated with drugs that have a similar structure to the DNA molecule?
- (A) AIDS  
(B) Malaria  
(C) Dengue fever  
(D) Sickle cell anaemia

Item 37 refers to the diagrams below which shows the stages of phagocytism of a bacterium by a neutrophil.



37. Which of the following shows the correct sequence of the phagocytic process?

- (A) 4      2      3      1
- (B) 2      1      3      4
- (C) 4      2      1      3
- (D) 1      3      2      4

38. The following are characteristics of lymphocytes.

- I. Attack cells infected with microorganisms
- II. Produce antibodies
- III. Produce memory cells
- IV. Mature in the thymus gland

Two characteristics of T lymphocytes are

- (A) I and II only
- (B) I and III only
- (C) I and IV only
- (D) III and IV only

Item 39 refers to the options below.

- I. Globular glycoprotein
- II. Four polypeptide chains
- III. Two identical binding sites
- IV. A hinge region

39. The above features are characteristic of

- (A) antigens
- (B) antibodies
- (C) phagocytes
- (D) haemoglobin

40. A newborn baby is protected from diseases by antibodies acquired from the maternal circulation. This is an example of

- (A) artificial active immunity
- (B) artificial passive immunity
- (C) natural active immunity
- (D) natural passive immunity

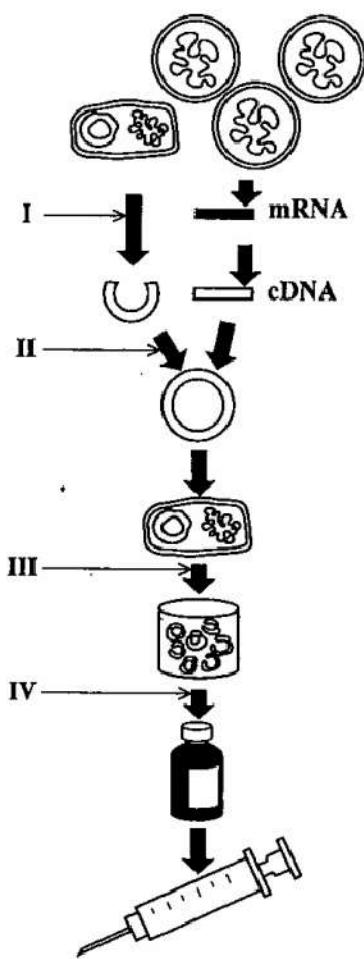
41. Which of the following is NOT an example of an application for monoclonal antibodies?

- (A) Pregnancy testing
- (B) Diagnosis of diseases
- (C) Prevention of transplanted organ rejection
- (D) Gene therapy

42. Fat accumulates in the liver when alcohol is consumed regularly because

- (A) liver cells use alcohol as an energy source instead of fat
- (B) fat absorbs alcohol and helps to detoxify it
- (C) alcohol is used to synthesise fat molecules in the liver
- (D) alcohol prevents the liver cells from secreting fat molecules

Item 43 refers to the diagram below which shows the manufacture of recombinant human insulin.



43. At which point of the stages, labelled I, II, III and IV, does the replication of donor genes occur?

- (A) I
- (B) II
- (C) III
- (D) IV

44.

Which pair of effects, labelled I to IV, is a direct result of nicotine in tobacco smoke?

- I. Constriction of arterial diameter
- II. Increased mucus production in the alveoli
- III. Paralysis of cilia in the bronchi
- IV. Increased stickiness of blood platelets

- (A) I and II
- (B) I and IV
- (C) II and III
- (D) III and IV

45.

Which of the following explains the use of restriction enzymes in gene technology?

- (A) Breaking down bacterial cell walls to release plasmids
- (B) Forming DNA from RNA
- (C) Cutting open circular DNA of plasmids
- (D) Joining different pieces of DNA to form recombinant plasmids

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

**FORM TP2008161**

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<b>CANDIDATE - PLEASE NOTE!</b>	
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TEST CODE **02207010**

MAY/JUNE 2008

**CARIBBEAN EXAMINATIONS COUNCIL**

**ADVANCED PROFICIENCY EXAMINATION**

**BIOLOGY - UNIT 3**

**Paper 01**

**90 minutes**

**09 JUNE 2008 (P.M.)**

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3. On your answer sheet, find the row which corresponds to your answer and shade the square bearing the same letter as the answer you have chosen. Look at the sample item below.

**Sample Item**

Which of the following is NOT a form of energy storage?

- (A) ATP  
(B) Lipid  
(C) Alcohol  
(D) Lactic acid

**Sample Answer**



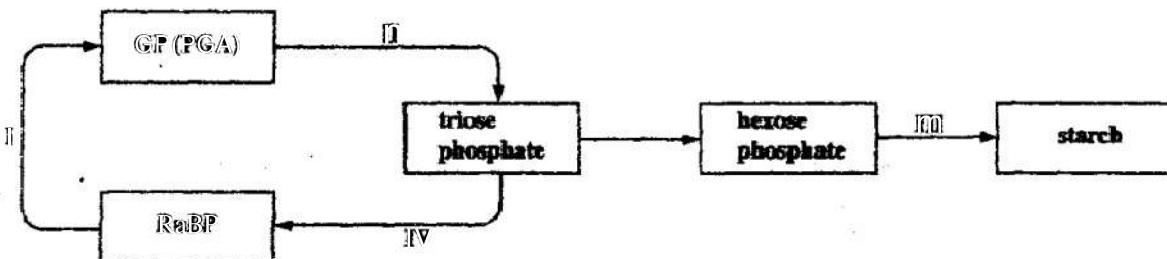
The best answer to this item is "ATP", so answer option (A) has been blanked out.

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**DO NOT TURN THIS PAGES UNTIL YOU ARE TOLD TO DO SO.**

1. The function of the light dependent reaction in photosynthesis is to
- (A) produce sugar  
(B) regenerate RuBP  
(C) produce ATP and reduce NADP  
(D) produce electrons to stabilize the photosystems
2. The electrons from non-cyclic photophosphorylation pass into the Calvin cycle via which of the following?
- (A) ATP  
(B) NADH<sub>2</sub>  
(C) FAD  
(D) NADP

Item 3 refers to the diagram below which outlines the events of the Calvin cycle.



3. Which of the stages labelled I - IV on the diagram represents the stage at which carbon dioxide is incorporated into the cycle?
- (A) I  
(B) II  
(C) III  
(D) IV
4. Which of the following combinations correctly describes the MAIN factors affecting the rate of photosynthesis?
- I. Light intensity and temperature  
II. Carbon dioxide concentration and state of the stomata  
III. NAD and ATP availability  
IV. Phytochromes and the availability of ions
- (A) I and II only  
(B) I and III only  
(C) I, II and III only  
(D) I, II, III and IV
5. During which of the following pathways does the synthesis of ATP occur by substrate-level phosphorylation?
- I. Glycolysis  
II. Krebs cycle  
III. Electron transport chain
- (A) I only  
(B) I and II only  
(C) II and III only  
(D) I, II and III only

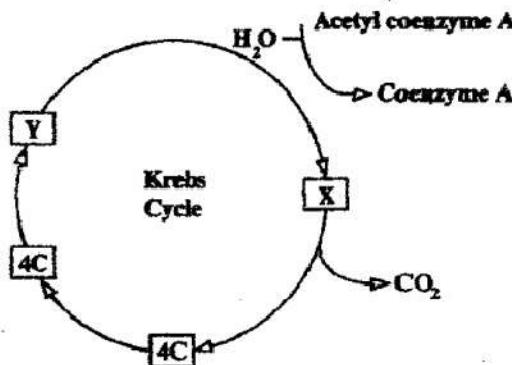
6. Under anaerobic conditions, the pyruvic acid produced by a respiring muscle cell can be

- I. oxidized to carbon dioxide and water
  - II. used to regenerate NADH
  - III. converted to lactic acid.
  - IV. decarboxylated to form acetyl CoA.
- (A) III only  
(B) II and III only  
(C) I, III and IV only  
(D) II, III and IV only

7. The final product(s) of glycolysis is/are

- (A) acetyl coenzyme A  
(B) reduced NADH  
(C) ATP, NAD and pyruvate  
(D) pyruvate, ATP and NADH

Item 8 refers to the Krebs cycle shown below.



8. How many carbon atoms are represented at X and Y respectively?

- (A) 4C and 5C  
(B) 5C and 4C  
(C) 6C and 4C  
(D) 6C and 5C

9. Which of the following describes an ecosystem?

- (A) Producers + consumers + decomposers + non-living component  
(B) Producers + decomposers + habitats + non-living component  
(C) Producers + consumers + habitats + non-living component  
(D) Consumers + decomposers + habitats + non-living component

10. The table below shows the estimated energy content for the trophic levels of a grassland.

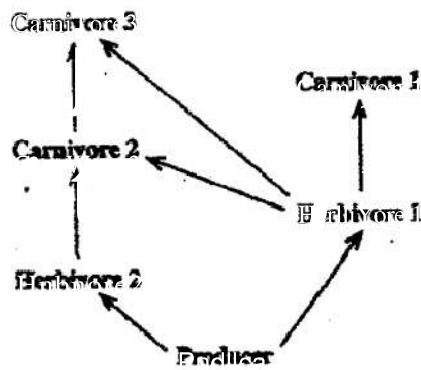
Levels	Energy content/ kJm <sup>-2</sup>
Producers	5600
Herbivores	125
Omnivores	15
Carnivores	10

Which of the following indicates the percentage decrease in energy between producer and herbivore?

- (A) 0.0022%  
(B) 0.022%  
(C) 0.22%  
(D) 2.2%

11. Which sequence correctly represents the action of nitrifying bacteria?
- (A) Ammonium  $\rightarrow$  nitrite  $\rightarrow$  nitrate  
(B) Nitrogen  $\rightarrow$  nitrate  $\rightarrow$  nitrite  
(C) Nitrate  $\rightarrow$  ammonium  $\rightarrow$  nitrogen  
(D) Nitrite  $\rightarrow$  nitrate  $\rightarrow$  ammonium
14. The term 'biodiversity' is BEST described as
- (A) the number of species on earth  
(B) the variety of different life forms on earth  
(C) the range of genera on earth  
(D) the range of ecosystems on earth

Item 12 refers to the diagram below.



12. What factor other than sunlight would make this a self-sustaining ecosystem?
- (A) Producers  
(B) Primary consumers  
(C) Higher order consumers  
(D) Detritivores
13. Which of the following ecological terms refers to only one species?
- (A) Population  
(B) Community  
(C) Food chain  
(D) Producer
15. The creation of seed banks is an economical method of maintaining plant diversity. Preparation of material for storage involves
- I. reduction of the moisture content of the seeds  
II. selection of the best seeds  
III. planting the seeds  
IV. freezing the seeds
- (A) IV only  
(B) I and II only  
(C) II and III only  
(D) I, II and IV only
16. The diagram below shows three adjacent plant cells I, II and III. The values of their water potentials are given in kPa.
- I                    II                    III
- In which direction would there be a NET flow?
- (A) I  $\rightarrow$  II and II  $\rightarrow$  III  
(B) II  $\rightarrow$  I and III  $\rightarrow$  I  
(C) II  $\rightarrow$  III and III  $\rightarrow$  I  
(D) III  $\rightarrow$  II and I  $\rightarrow$  II

**Item 17** refers to 4 stages in the loss of water from the stem to the atmosphere, down a water potential gradient.

- I. Water leaves through the stomata by diffusion into the atmosphere.
  - II. Water evaporates from the surface of the mesophyll cells.
  - III. Water travels from cell to cell down a water potential gradient in the mesophyll.
  - IV. Water passes from the stem xylem into the mesophyll cells.
17. Which of the following describes the correct sequence by which water is lost by transpiration?

- (A) I, II, III, IV  
 (B) I, II, IV, III  
 (C) II, I, IV, III  
 (D) IV, III, II, I

**Item 18** refers to the darkly staining material labelled X in Figure 18a which is often found blocking Structure Y in Figure 18b.



Figure 18a

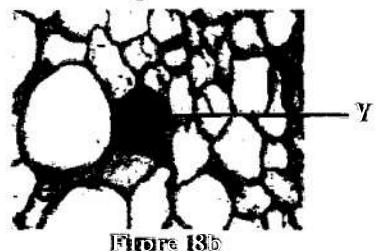


Figure 18b

18. What is the identity of X?

- (A) Cellulose  
 (B) Lignin  
 (C) Cellulose  
 (D) Starch

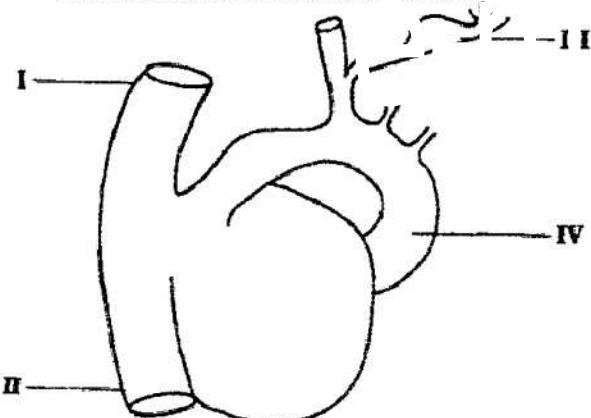
19. Which of the following choices is correct in relation to the translocation of organic material?

- (A) Sugars are always translocated downwards or towards the base of the plant.  
 (B) The source is a site where sugars are produced, while sinks are sites where sugars are utilized.  
 (C) The sugar which is transported in all plants is sucrose.  
 (D) Sugars travel in the phloem against a concentration gradient.

20. Which of the following is correct for BOTH arteries and veins?

	Arteries	Veins
A	Thin walled	Few elastic fibres
B	Collagen fibres present	Thick walled
C	Few elastic fibres	Have valves
D	Thick walled	Collagen fibres present

**Item 21** refers to the following diagram of the heart and associated blood vessels.



21. The inferior vena cava is represented by

- (A) I  
 (B) II  
 (C) III  
 (D) IV

22. Which of the following is the correct sequence of events in a single heart beat known as the cardiac cycle?

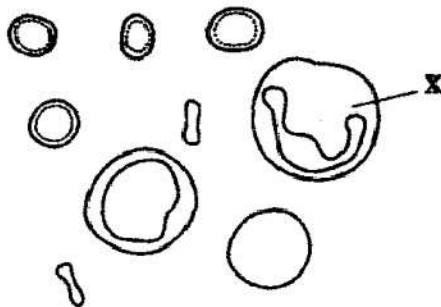
- (A) Atrial systole → ventricular systole → atrial diastole → ventricular diastole  
(B) Ventricular diastole → atrial systole → atrial diastole → ventricular systole  
(C) Atrial diastole → atrial systole → ventricular systole → ventricular diastole  
(D) Ventricular systole → atrial systole → atrial diastole → ventricular diastole

Item 23 refers to the following table showing the distribution of blood volume, pressure and velocity in a human's vascular system.

	Volume / cm <sup>3</sup>	Pressure / mmHg	Velocity / cm s <sup>-1</sup>
A	100	100	40
B	50	30	5
C	2 200	10	0.3
D	300	2	18

23. Which set of data corresponds with those for the vena cavae?

Item 24 refers to the following diagram.



24. The cell labelled X in the diagram above is

- (A) an erythrocyte  
(B) a platelet  
(C) a monocyte  
(D) a neutrophil

25. Which combination below shows how positive feedback affects a change in output and the directional flow of an impulse?

	Output	Directional flow
(A)	Large	same direction
(B)	Small	opposite direction
(C)	Large	no direction
(D)	Small	same direction

26. The outcome of an increase in insulin production is

- (A) an increase in cell permeability to glucose  
(B) a fall in glucose conversion to glycogen  
(C) an increase in blood glucose sugar levels  
(D) an increase in conversion of glycogen to glucose conversion

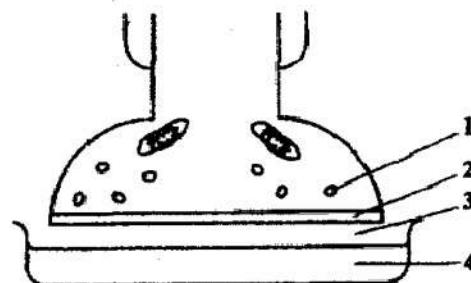
27. Which of the following structural features prevents molecules, with a molecular mass greater than 68 000, passing from the glomerular capillaries into Bowman's capsule?
- (A) The basement membrane of the epithelial cell of Bowman's capsule  
(B) The cell surface membrane of the endothelial cells of the capillaries  
(C) The cell surface membrane of the epithelial cells of the Bowman's capsule  
(D) The spaces between the extensions of the podocytes of Bowman's capsule
29. Which of the following explains why respiratory poison would affect the transmission of nerve impulses?
- (A)  $\text{Na}^+$  gates require energy to open.  
(B) Energy is required to restore the resting potential.  
(C) Energy is required to change the voltage potential from  $-70 \text{ mV}$  to  $+40 \text{ mV}$ .  
(D) They act as inhibitors of transmitter substances.

Item 28 refers to the table below which shows volumes of water reabsorbed at different regions of the human kidney nephrons. The total volume of filtrate produced by the glomerulus is  $180 \text{ dm}^3/\text{day}$ .

Region	Volume of water ( $\text{dm}^3$ ) reabsorbed/day
Proximal tubules	147.0
Loop of Henle	10.0
Distal tubules	19.2
Collecting duct	2.2

28. What is the volume of urine produced per day?
- (A)  $1.6 \text{ dm}^3$   
(B)  $2.2 \text{ dm}^3$   
(C)  $21.4 \text{ dm}^3$   
(D)  $178.4 \text{ dm}^3$

Item 30 refers to the diagram below showing the gap between two neurones.



30. Where is acetyl choline stored and secreted?

	Stored	Secreted into
(A)	1	3
(B)	1	4
(C)	2	3
(D)	2	4

31. Which of the following diseases is matched to its MOST appropriate category?

Disease	Category
(A) AIDS	Hereditary
(B) Stroke	Degenerative
(C) Diabetes	Infectious
(D) Emphysema	Deficiency

32. Alcoholism is a disease which has been linked to intrafamily violence, aggressive behaviour and petty crime. In which of the following four disease categories can alcoholism be placed?

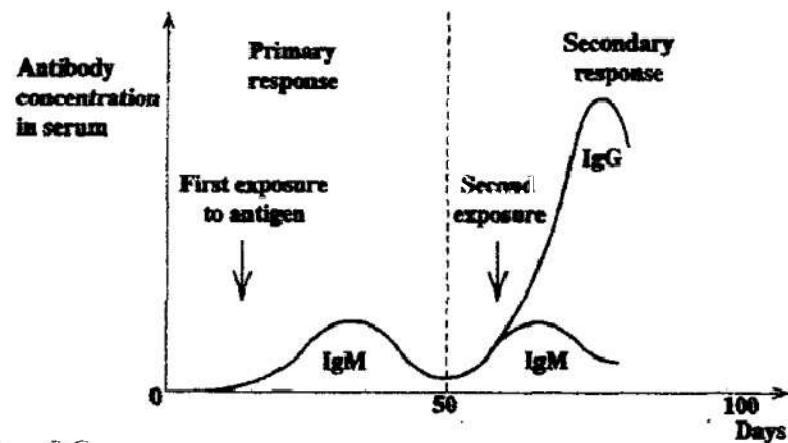
- I. Deficiency
- II. Inherited
- III. Degenerative
- IV. Social

- (A) I and II only
- (B) I and III only
- (C) I, III and IV only
- (D) III and IV only

33. Which of the following is NOT a function of T-helper cells?

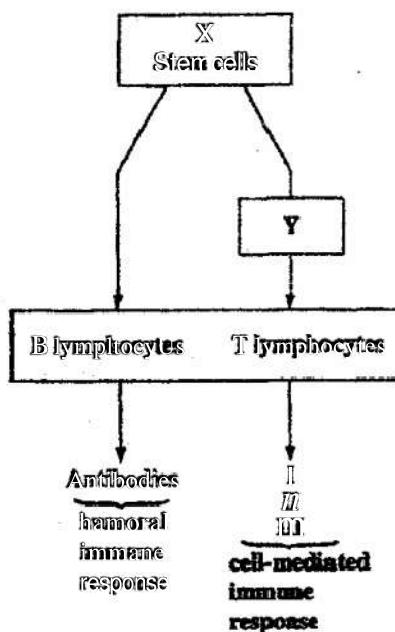
- (A) They activate B-lymphocytes to divide and differentiate into plasma cells.
- (B) They quickly produce plasma cells when they encounter antigen for the second time.
- (C) They assist T-Killer cells in the destruction of foreign cells.
- (D) They activate phagocytic cells to engulf foreign cells and body cells infected with foreign antigen.

35. The diagram below shows antibody levels in blood serum after exposure to a particular antigen. Which of the following immunoglobulins is/are important in the body's first response to an antigen?



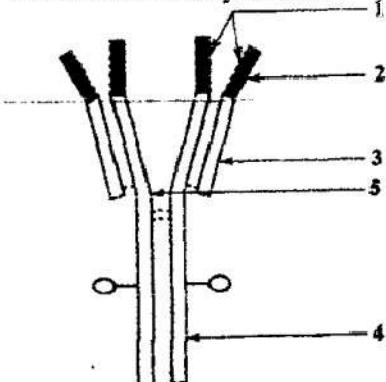
- (A) IgG
- (B) IgG and IgM
- (C) IgM and IgG
- (D) IgM

34. Which of the following correctly identifies the structure labelled Y?



- (A) Lymph node
- (B) Thymus gland
- (C) Red bone marrow
- (D) Hypothalamus

Item 36 refers to the diagram below which illustrates an antibody molecule.



36. The two labels which represent the antigen binding site and the region which gives flexibility in binding to antigens are

- (A) 1 and 4
- (B) 1 and 5
- (C) 2 and 5
- (D) 3 and 4

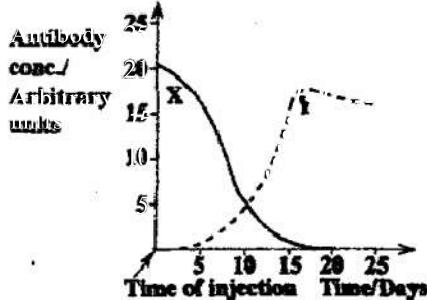
Item 37 refers to the following information.

Two types of immunity were investigated in patients suffering from tetanus.

Person X is injected with antibodies to the disease.

Person Y is injected with vaccine and produces antibodies as a result.

Blood samples are removed from both people at regular intervals. The results are shown on the graph below.



37. The types of immunity being investigated are

- (A) passive natural, active natural
- (B) passive artificial, active artificial
- (C) active natural, passive artificial
- (D) ~~passive artificial, active natural~~

38.

Which of the following combinations represent common uses of monoclonal antibodies?

- I. Prevention of transplant rejection
- II. Early diagnosis of cholera
- III. Tissue typing for transplants
- IV. Pregnancy testing

- (A) I, II and III only
- (B) I, III and IV only
- (C) II, III and IV only
- (D) I, II, III and IV

39.

Which of the following is NOT a reason why energy requirements differ in people from birth to old age?

- (A) The amount of activity varies with occupation.
- (B) Metabolic rate reduces with age.
- (C) Gender makes no difference to energy needs.
- (D) As a person ages they may be less active.

40.

Body Mass Index (BMI) is now used as a simple means of assessing obesity. Which one of the following formulae is used to calculate BMI?

- (A)  $BMI = \frac{\text{height in m}}{\text{body mass in kg}^2}$
- (B)  $BMI = \frac{\text{body mass in kg}}{\text{height in m}^2}$
- (C)  $BMI = \frac{\text{body mass in kg}}{\text{age of individual in yrs}}$
- (D)  $BMI = \frac{\text{body mass in kg}}{\text{height in m}}$

41. A professional athlete and an untrained individual each engaged in 10 minutes of exercise. The athlete's blood pressure, pulse and breathing rate remained almost unchanged while the untrained individual experienced an increase in all three parameters. Which of the following accounts for this?

- (A) The athlete developed increased muscle mass.
- (B) Cardiac output and lung capacity increased with athletic training.
- (C) The athlete has more stamina due to a specialized diet.
- (D) Endurance levels are higher in the athlete.

41. Which of the following correctly identifies the causative agent and the mode of transmission of dengue fever?

Causative Agent	Mode of Transmission
(A) Virus	Vector
(B) Bacterium	Vector
(C) Virus	Airborne
(D) Bacterium	Airborne

43. After regular consumption of alcohol, fat accumulates in the liver. Which of the following provides an explanation of this?

- (A) Alcohol provides a substrate for the synthesis of fat molecules in the liver.
- (B) Alcohol damages liver cells, so they cannot convert fat into lipoproteins.
- (C) Alcohol acts as a buffer for fat, and absorbs the fat and stores it.
- (D) Alcohol is used by liver cells in preference to fat, as an energy source.

44. Which of the following statements explain why alcohol consumption can result in the production of large quantities of watery urine (diuresis)?

- I. Alcohol increases the production of ADH.
  - II. Alcohol inhibits ADH production.
  - III. Alcohol reduces the permeability of the collecting ducts.
- (A) I and II only
  - (B) I and III only
  - (C) II and III only
  - (D) I, II and III

Item 45 refers to the table below showing three components of tobacco smoke, X, Y and Z and their effects.

X	Y	Z
Constricts arterioles	Combines with haemoglobin	Increases secretion of mucus
Stimulates release of adrenaline	Decreases levels of oxygen in blood	Thickens lung tissue
Increases 'stickiness' of platelets	Damages the lining of arteries	Promotes lung cancer

45. Which of the following correctly identifies X, Y and Z?

	X	Y	Z
(A)	Tar	Nicotine	Carbon monoxide
(B)	Tar	Carbon monoxide	Nicotine
(C)	Nicotine	Carbon monoxide	Tar
(D)	Nicotine	Tar	Carbon monoxide

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

FORM TP2008161

MAY/JUNE 2008

CARIBBEAN EXAMINATIONS COUNCIL  
ADVANCED PROFICIENCY EXAMINATION  
BIOLOGY-UNIT 2

Paper 01

90 minutes

11 JULY 2008 (p.m.)

**READ THE FOLLOWING INSTRUCTIONS CAREFULLY.**

1. This test consists of 45 items. You will have 90 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Do not be concerned that the answer sheet provides spaces for more answers than there are items in this test.
4. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
5. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

Which of the following is NOT a form of energy storage?

- (A) ATP  
(B) Lipid  
(C) Alcohol  
(D) Lactic acid

Sample Answer

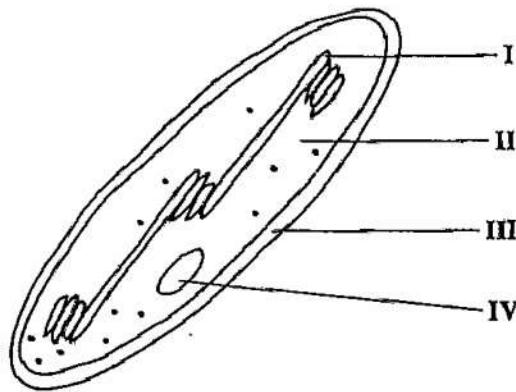
(B) (C) (D)

The best answer to this item is "ATP", so answer space (A) has been shaded.

6. If you want to change your answer, be sure to erase it completely before you fill in your new choice.
7. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, omit it and go on to the next one. Your score will be the total number of correct answers.
8. You may do any rough work in this booklet.
9. Figures are not necessarily drawn to scale.
10. The use of non-programmable calculators is allowed.

**DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.**

Item 1 refers to the following diagram which shows a chloroplast.



1. RuBP carboxylase can be found in Region  
  - (A) I
  - (B) II
  - (C) III
  - (D) IV
2. The electrons from non-cyclic photophosphorylation pass into the Calvin cycle via which of the following?  
  - (A) ATP
  - (B) NADH<sub>2</sub>
  - (C) FAD
  - (D) NADP
3. The Calvin cycle is important as it produces  
  - (A) triose phosphate that can be used for the production of carbohydrates
  - (B) reduced NAD that is used to generate ATP
  - (C) oxygen that helps maintain the carbon dioxide balance in the atmosphere
  - (D) glucose phosphate which can be used to form sucrose

4. Which of the following CORRECTLY describes the MAIN factors affecting the rate of photosynthesis?

- I. Light intensity and temperature
  - II. Carbon dioxide concentration and state of the stomata
  - III. NAD and ATP availability
  - IV. Phytochromes and the availability of ions
- (A) I and II only  
(B) I and III only  
(C) I, II, and III only  
(D) I, II, III and IV

5. High oxygen concentration can limit photosynthesis by preventing the formation of glycerate phosphate. This is due to

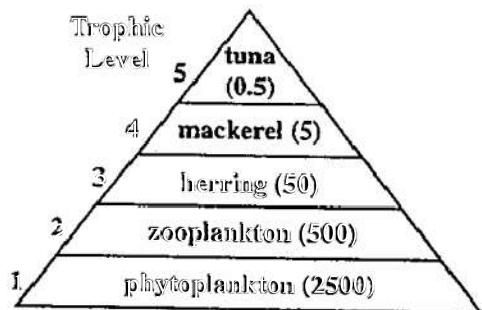
- (A) the oxidation of reduced NADP by oxygen  
(B) oxygen combining with RuBP instead of carbon dioxide  
(C) oxygen combining with Rubisco instead of carbon dioxide  
(D) triose phosphate which cannot regenerate RuBP in high oxygen concentration

6. The reaction linking glycolysis and the Krebs' cycle results in the formation of

- (A) ATP  
(B) pyruvate  
(C) acetyl CoA  
(D) triose phosphate

7. The FINAL pathway for all carbon atoms, derived from food, during cellular respiration is the
- (A) food chain  
(B) Kreb's cycle  
(C) Calvin cycle  
(D) electron transport chain
8. The oxygen consumed during cellular respiration is directly involved in
- (A) the citric acid cycle  
(B) the phosphorylation of ADP  
(C) the oxidation of pyruvate to acetyl CoA.  
(D) accepting electrons at the end of the electron transport chain
- 
9. Which of the following BEST describes an ecosystem?
- (A) Producers + consumers + habitats + non-living component  
(B) Producers + decomposers + habitats + non-living component  
(C) Consumers + decomposers + habitats + non-living component  
(D) Producers + consumers + decomposers + non-living component
- 
10. During vigorous exercise pyruvate is
- (A) reduced to lactate  
(B) converted to glycogen  
(C) converted to ethanol  
(D) transferred to acetyl CoA
11. Which sequence CORRECTLY represents the action of nitrifying bacteria?
- (A) Ammonium → nitrite → nitrate  
(B) Nitrogen → nitrate → nitrite  
(C) Nitrate → ammonium → nitrogen  
(D) Nitrite → nitrate → ammonium
12. Which of the following sequences is CORRECTLY ranked in order of decreasing size?
- (A) Ecosystem - biome - habitat  
(B) Biome - ecosystem - habitat  
(C) Habitat - ecosystem - biome  
(D) Habitat - biome - ecosystem
13. Improvement of biodiversity can BEST be achieved by
- (A) controlled hunting  
(B) systematic logging  
(C) creating green areas  
(D) monocropping
14. Endangered species may BEST be described as species
- (A) which are under threat of declining in number  
(B) with low population numbers that are in considerable danger of becoming extinct  
(C) which cannot be found in areas that they recently inhabited or in other likely habitats  
(D) with small populations which are restricted geographically with localised habitats

**Item 15** refers to an ocean food pyramid. The number in brackets represents the weight of the organism.



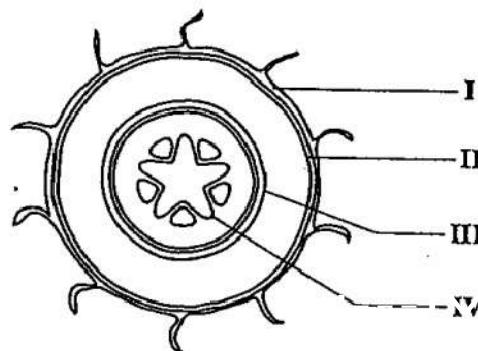
15. The percentage of energy available for transfer to a person eating 0.5 kilograms of tuna is approximately
- (A) 1%
  - (B) 5%
  - (C) 10%
  - (D) 20%

16. Which of the following does NOT describe how mineral ions are transported from the soil to the endodermis of the root?
- (A) Transported with water via the apoplast route
  - (B) Carried across the root cells passively with water in the transpiration stream
  - (C) By active transport via the apoplast route
  - (D) By passive diffusion across the apoplast route

17. Which of the following describes the correct sequence by which water is lost through transpiration?

- II. Water passes from the xylem into the mesophyll cells.
  - III. Water travels from cell to cell down a water potential gradient.
  - IV. Water evaporates from the surface of the mesophyll cells.
  - V. Water leaves through the stomata by diffusion.
- (A) I, II, III, IV  
(B) I, II, V, III  
(C) II, I, IV, III  
(D) IV, III, II, I

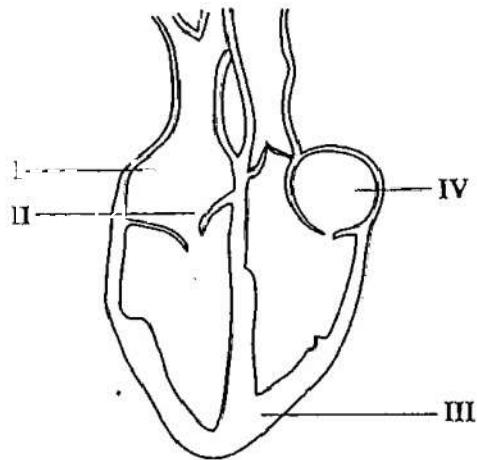
**Item 18** refers to the following diagram which represents the distribution of tissues in a dicotyledonous root.



18. Transport of water along the apoplast pathway is prevented by the region labelled

- (A) I
- (B) II
- (C) III
- (D) IV

Item 19 refers to the following diagram which shows a longitudinal section of a mammalian heart.



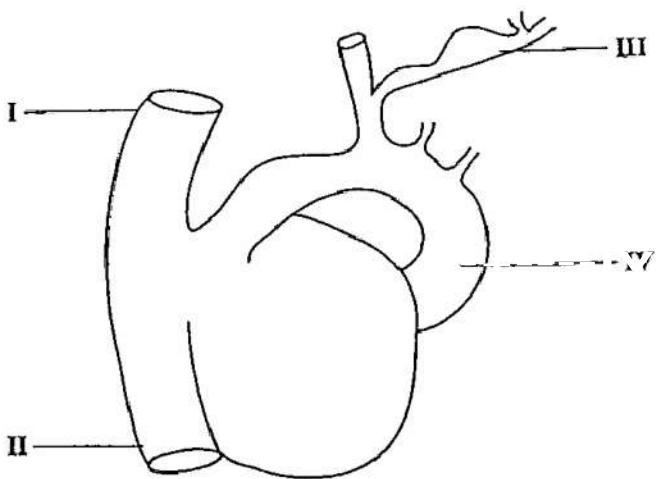
19. The position of the sinoatrial node is identified by the region labelled

- (A) I
- (B) II
- (C) III
- (D) IV

20. Which of the following is correct for BOTH arteries and veins?

	Arteries	Veins
(A)	Thin walled	Few elastic fibres
(B)	Collagen fibres present	Small lumen
(C)	Few elastic fibres	Has valves
(D)	Thick walled	Collagen fibres present

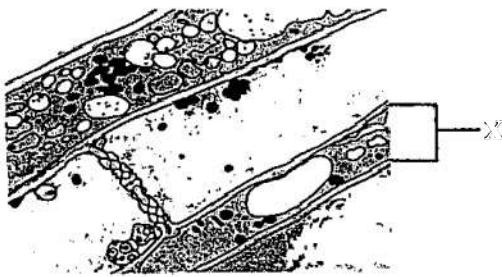
Item 21 refers to the following diagram which shows the heart and associated blood vessels.



21. The inferior vena cava is labelled

- (A) I
- (B) III
- (C) III
- (D) IV

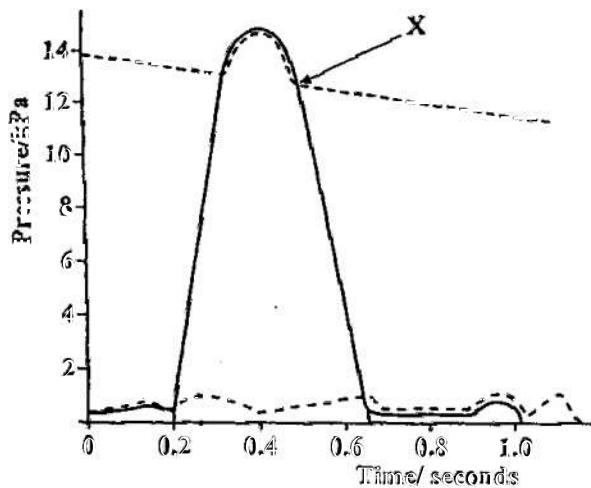
Item 22 refers to the following photomicrograph which shows a mature sieve tube element.



22. The region labelled X is

- (A) the sieve plate
- (B) the sieve pore
- (C) a plastid
- (D) a companion cell

Item 23 refers to the following diagram which shows the pressure changes to the left side of the heart and the aorta during the cardiac cycle.



23. The section labelled X represents the
- pressure in the aorta as the heart empties
  - pressure in the ventricles as the heart fills
  - atrial pressure as the heart empties
  - ventricular pressure as the heart fills
24. Which term BEST describes homeostasis?
- Variable internal and external environment
  - Maintenance of a constant internal environment
  - Constant internal environment, providing complete dependence on the external environment
  - Constant internal and external environment resulting from a fall in temperature
25. The effect of glucagon on mammalian muscle cells is
- stimulation of DNA synthesis
  - an increase in the hydrolysis of lipids
  - alteration of the receptor site on the cell membrane
  - stimulation of the rapid conversion of glycogen to glucose

26. Which of the following is the CORRECT mechanism by which glucose in the kidney is returned to the blood system?

	Site	Mechanism
(A)	Collecting duct	Passive diffusion
(B)	Proximal tubule	Active transport
(C)	Loop of Henlé	Passive diffusion
(D)	Distal tubule	Active transport

27. In the mammalian kidney, which substance is NOT reabsorbed from the proximal tubule by active transport?

- Hormones
- Amino acids
- Glucose
- Urea

Item 28 refers to the following table which shows the volume of water reabsorbed per day at different regions of the human kidney nephrons. The total volume of filtrate produced by the glomerulus is 180 dm<sup>3</sup>/day.

Region	Volume of water reabsorbed/dm <sup>3</sup>
Proximal tubules	147.0
Loop of Henlé	10.0
Distal tubules	19.2
Collecting duct	2.2

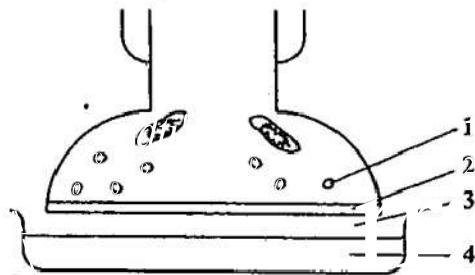
28. What is the volume of urine produced per day?

- 1.6 dm<sup>3</sup>
- 2.2 dm<sup>3</sup>
- 21.4 dm<sup>3</sup>
- 178.4 dm<sup>3</sup>

29. In myelinated neurones the action potential is generated.

- (A) in Schwann cells
- (B) all along the axon
- (C) in the myelin sheath only
- (D) at the nodes of Ranvier only

Item 30 refers to the diagram below showing the gap between two neurones.



30. Which structures indicate where acetylcholine is (i) stored and (ii) released?

	Stored	Released
(A)	1	3
(B)	1	4
(C)	2	3
(D)	2	4

31. Chronic bronchitis is a condition suffered by persons who smoke cigarettes. The MOST appropriate meaning of the term 'chronic', in this context, is

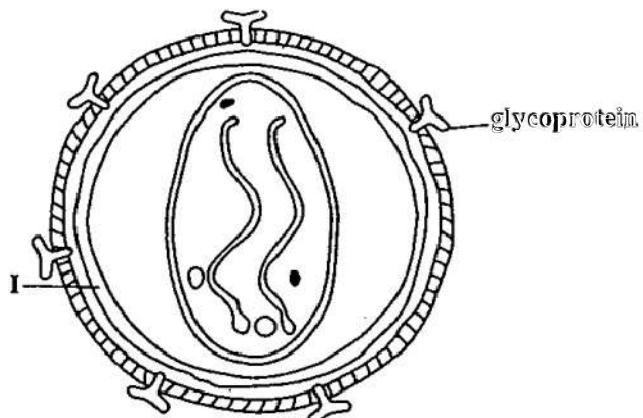
- (A) severe
- (B) sudden onset
- (C) long term
- (D) intense

32. Alcoholism is a disease which has been linked to intrafamily violence, aggressive behaviour and petty crime. In which of the following categories can alcoholism be placed?

- I. Deficiency
- II. Self-inflicted
- III. Degenerative
- IV. Social

- (A) I and II
- (B) I and III
- (C) III and IV
- (D) III and IV

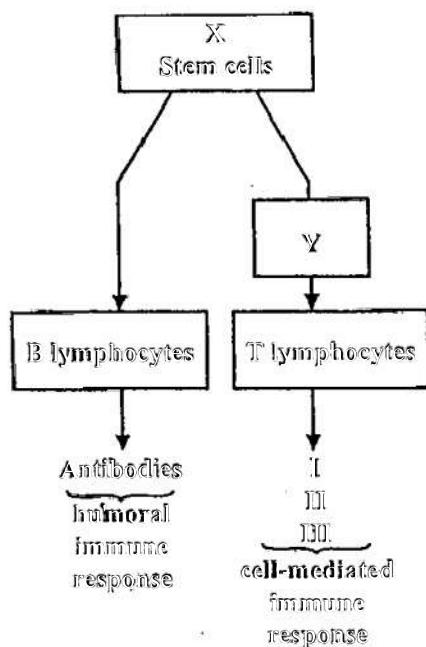
Item 33 refers to the following diagram which shows the structure of a human immuno-deficiency virus (HIV).



33. The function of the structure labelled I is to

- (A) anchor the glycoproteins
- (B) enclose and support the viral DNA and enzymes
- (C) inhibit viral replication
- (D) transcribe the viral DNA, so it can be integrated into the host DNA

Item 34 refers to the following diagram.



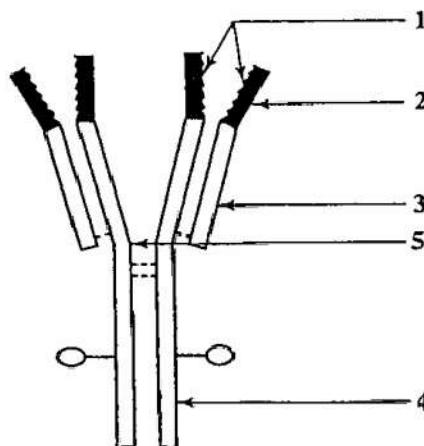
34. The structure labelled Y represents the

- (A) lymph node
- (B) thymus gland
- (C) red bone marrow
- (D) hypothalamus

35. Mast cells

- (A) are found in lymph nodes only
- (B) are the smallest circulating granulocytes
- (C) are large granulocytes which engulf pathogens
- (D) contain many granules rich in histamine and heparin

Item 36 refers to the diagram below which illustrates an antibody molecule.



36. The two labels which represent the antigen binding site and the region which gives flexibility in binding to antigens are

- (A) 1 and 4
- (B) 1 and 5
- (C) 2 and 5
- (D) 3 and 4

37. Which of the following BEST describes tolerance, a form of physical drug dependence?

- (A) A severe craving for a drug which interferes with a person's ability to function normally
- (B) Characterized by the continued desire for a drug, even after physical dependence is gone
- (C) Develops in persons who have used large quantities of substances such as alcohol and barbiturates
- (D) Occurs when the body becomes accustomed to a drug and requires ever-increasing amounts to achieve the same effect

38. Which of the following is NOT a method of transmission of the HIV?

- (A) Sexual intercourse
- (B) Sharing intravenous needles
- (C) Gene transfer from mother to foetus
- (D) Breast feeding or breast milk

39. Which of the following explains why energy requirements differ in persons?

- I. The amount of activity varies with occupation.
- II. Metabolic rate reduces with age.
- III. As a person ages they may be less active.

- (A) I only
- (B) I and II only
- (C) II and III only
- (D) I, II and III

40. Body Mass Index (BMI) is now used as a simple means of assessing obesity. Which of the following formulae is used to calculate BMI?

- (A)  $BMI = \frac{\text{height (m)}}{\text{body mass}^2 (\text{kg}^2)}$
- (B)  $BMI = \frac{\text{body mass (kg)}}{\text{height}^2 (\text{m}^2)}$
- (C)  $BMI = \frac{\text{body mass (kg)}}{\text{age of individual (yrs)}}$
- (D)  $BMI = \frac{\text{body mass (kg)}}{\text{height (m)}}$

41. A professional athlete and an untrained individual each engaged in 10 minutes of exercise. The athlete's blood pressure, pulse and breathing rate remained almost unchanged, while the untrained individual experienced an increase in all three parameters. Which of the following statements MOST likely accounts for this?

- (A) The athlete developed increased muscle mass.
- (B) Cardiac output and lung capacity increased with athletic training.
- (C) The athlete has more stamina due to a specialized diet.
- (D) Endurance levels are higher in the athlete.

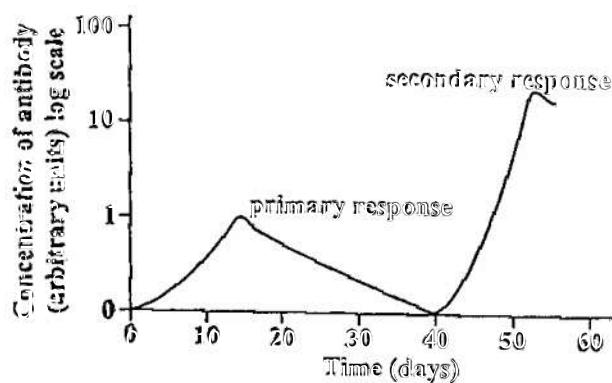
42. Which of the following describes a possible outcome of the effect of tobacco smoke on the cardiovascular system?

- (A) Haemoglobin combines with carbon monoxide resulting in less oxygen being transported in the blood.
- (B) Nicotine lowers the blood pressure and therefore the heart rate.
- (C) Platelets become less cohesive and increase the likelihood of thrombosis.
- (D) The blood supply to the body extremities increases and oxygen is delivered to cells at a faster rate.

43. With regular consumption of alcohol, fat accumulates in the liver because

- (A) alcohol is used in the synthesis of fat molecules in the liver
- (B) alcohol suppresses the ability of liver cells to secrete fat molecules
- (C) fat absorbs alcohol and detoxifies it
- (D) liver cells use alcohol instead of fat as an energy source

Items 44 - 45 refer to the following diagram which shows the changes in antibody concentration in the blood during the primary and secondary responses.



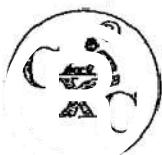
44. These responses are MOST likely caused by

- (A) antigens
- (B) antibiotics
- (C) antitoxins
- (D) antioxidants

45. The secondary response is faster and stronger because

- (A) B cells rapidly transform into plasma cells
- (B) B cells rapidly transform into memory cells
- (C) memory cells are present and rapidly become plasma cells
- (D) memory cells rapidly transform into T cells

**IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.**



FORM TYP 2009149

↑ AFFIX SEAL HERE ↑

<b>CANDIDATE - PLEASE NOTE:</b>	
You must sign below and return this booklet with the Answer Sheet. Failure to do so may result in disqualification.	
Signature _____	

TEST CODE **02207010**

MAY/JUNE 2009

## CARIBBEAN EXAMINATIONS COUNCIL

## ADVANCED PROFICIENCY EXAMINATION

## BIOLOGY - UNIT 2

Paper 01

90 minutes

12 JUNE 2009 (a.m.)

## • READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 45 items. You will have 90 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

Which of the following is NOT a form of energy storage?

- (A) ATP  
(B) Lipid  
(C) Alcohol  
(D) Lactic acid.

Sample Answer

(A)  (B)  (C)  (D)

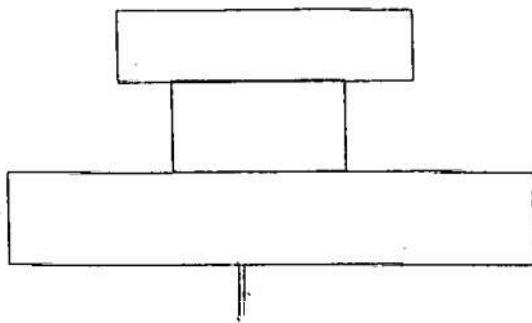
The best answer to this item is "ATP", so answer space (A) has been shaded.

5. If you want to change your answer, erase it completely and fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, omit it and go on to the next one. Your score will be the total number of correct answers.
7. You may do any rough work in this booklet.
8. Figures are not necessarily drawn to scale.
9. Do not be concerned that the answer sheet provides spaces for more answers than there are items in this test.

**DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.**

1. The electrons from non-cyclic photophosphorylation pass into the Calvin cycle via
- (A) ATP  
(B) NADH<sub>2</sub>  
(C) FAD  
(D) NADP
2. During photosynthesis P<sub>680</sub> emits electrons that
- (A) can be recycled directly to P<sub>680</sub>  
(B) fall back directly to P<sub>680</sub>  
(C) will generate ATP  
(D) will generate reduced NAD
3. Which of the following combinations correctly describes the MAIN factors affecting the rate of photosynthesis?
- I. Light intensity and temperature  
II. Carbon dioxide concentration and state of the stomata  
III. NAD and ATP availability  
IV. Phytochromes and the availability of ions
- (A) I and II only  
(B) I and III only  
(C) I, II and III only  
(D) I, II, III and IV
4. In muscle tissue undergoing strenuous contractions, the formation of lactate is due to the
- (A) low concentration of glucose  
(B) low concentration of oxygen  
(C) high concentration of glycogen  
(D) high concentration of carbon dioxide
5. In aerobic respiration, the maximum number of ATP molecules that may be produced from a molecule of glucose is
- (A) 2  
(B) 4  
(C) 34  
(D) 38
6. Two substances which enter the mitochondrial cristae and are oxidised are
- (A) ADP and phosphate  
(B) NADH<sub>2</sub> and FADH  
(C) Phosphate and acetyl CoA  
(D) ADP and pyruvate
7. The two MAIN products of oxidative phosphorylation in the mitochondrion are
- (A) ATP and water  
(B) oxygen and water  
(C) NAD and FAD  
(D) hydrogen and oxygen
8. The oxygen consumed during cellular respiration is directly involved in
- (A) phosphorylation of ADP  
(B) conversion of citrate to oxaloacetate  
(C) oxidation of pyruvate to acetyl CoA  
(D) accepting electrons in electron transport chain reaction

Item 9 refers to the following pyramid of numbers.



9. Which of the following food chains would create the pyramid of numbers represented above?

- (A) Decayed leaf  $\rightarrow$  earthworms  $\rightarrow$  small birds  $\rightarrow$  large birds
- (B) Tree  $\rightarrow$  aphids  $\rightarrow$  birds  $\rightarrow$  fleas
- (C) Tree  $\rightarrow$  ants  $\rightarrow$  lizards  $\rightarrow$  birds
- (D) Tree  $\rightarrow$  birds  $\rightarrow$  fleas  $\rightarrow$  bacteria

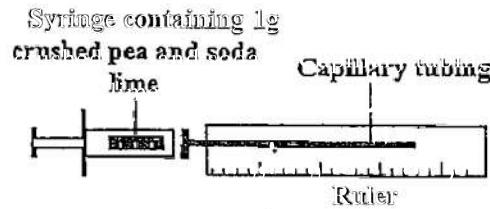
10. Which of the following statements about the electron transport chain are correct?

- I. Located in the mitochondria and chloroplasts.
  - II. Involved in the production of ATP.
  - III. Located on the membranes.
  - IV. Oxygen is always the final electron acceptor.
- (A) I and IV only
  - (B) II and III only
  - (C) I, II and III only
  - (D) II, III and IV only

11. Net primary production in an ecosystem over a given period may be BEST defined as the total amount of

- (A) organic matter produced by all organisms in the ecosystem
- (B) new organic matter produced only by green plants
- (C) organic matter used in respiration and metabolism by all organisms in the ecosystem
- (D) new organic matter remaining after respiration and metabolism has been fuelled

Item 12 refers to the following diagram.



12. An experiment is set up as shown above to calculate the rate of respiration in red pea. After 50 seconds, the indicator fluid in the capillary tubing moved 8.5 mm. The diameter of the capillary tubing is 0.4 mm. What is the rate of respiration in the red pea?

- (A)  $0.2 \text{ mm}^3 \text{ g}^{-1} \text{s}^{-1}$
- (B)  $0.68 \text{ mm}^3 \text{ g}^{-1} \text{s}^{-1}$
- (C)  $1.7 \text{ mm}^3 \text{ g}^{-1} \text{s}^{-1}$
- (D)  $8.6 \text{ mm}^3 \text{ g}^{-1} \text{s}^{-1}$

13. Which of the following are the substrate and product(s) of anaerobic respiration?

Substrate	Product
(A) Glucose	Lactic acid + $\text{CO}_2$
(B) Glucose	Ethanol + $\text{CO}_2$
(C) Pyruvate	Ethanol + $\text{CO}_2$
(D) Pyruvate	Lactic acid

14. Which of the following combinations may be applied to the term biodiversity?

- I. Variety of species on earth
  - II. Can be defined at the genetic level
  - III. May be defined at the ecosystem level
  - IV. Relates only to endangered species
- (A) I, II and III only  
 (B) I, II and IV only  
 (C) I, III and IV only  
 (D) II, III and IV only

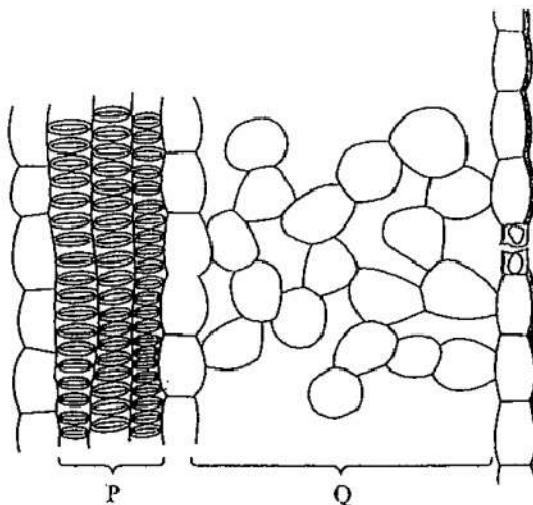
15. Which of the following statements describes the function of denitrifying bacteria in the nitrogen cycle?

- (A) Split the nitrogen molecule to form nitrates  
 (B) Convert nitrates to atmospheric nitrogen  
 (C) Convert ammonium compounds to nitrates  
 (D) Split nitrogen molecules to form ammonium.

16. In an experiment, the water potential of the water in a soil, is found to be  $-40 \text{ kPa}$ , while that of pure water is  $0 \text{ kPa}$ . This difference is due to the

- (A) presence of mineral ions in the soil water  
 (B) greater kinetic energy of the soil water molecules  
 (C) small size of the mineral ions in the soil water  
 (D) water potential of soil water being positive

Item 17 refers to the diagram below which shows some of the cells involved in loss of water from part of a plant.



17.

Which of the following combinations correctly identifies the regions labelled P and Q?

	Region P	Region Q
(A)	Phloem	Palisade
(B)	Phloem	Stem cortex
(C)	Xylem	Mesophyll cells
(D)	Xylem	Root cortex

18.

In a study of water movement in plants, the cut end of a leafy shoot is placed in a dilute solution of a dye. After a few hours, deposits of the dye accumulate in the leaves.

The rate of movement of the dye up the stem is NOT increased by

- (A) humidity  
 (B) wind speed  
 (C) temperature  
 (D) availability of water

19. Which of the following statements is true according to the mass (pressure) flow hypothesis?

- (A) Sucrose moves in the phloem against a concentration gradient.
- (B) The loading of sugars into the phloem in the leaf is achieved by osmosis.
- (C) A source is a site where sugars are produced, while a sink is a site where sugars are utilized.
- (D) Water is actively transported from the intercellular spaces into the cell sap at the root end of the system.

20. Which of the following combinations correctly describes systolic and diastolic blood pressure?

	Systolic Blood Pressure	Diastolic Blood Pressure
(A)	Produced by contraction of the atria	Pressure in the arteries after the atria contract
(B)	Pressure in the arteries after the atria contract	Produced by contraction of the atria
(C)	Produced by contraction of the ventricles	Pressure in the arteries after the ventricles relax
(D)	Pressure in the arteries after the ventricles relax	Produced by contraction of the ventricles

21. In the human heart, what is the point of initiation of the mammalian heartbeat?

- (A) Purkyne fibres
- (B) Sinoatrial node
- (C) Node of Ranvier
- (D) Atrioventricular node

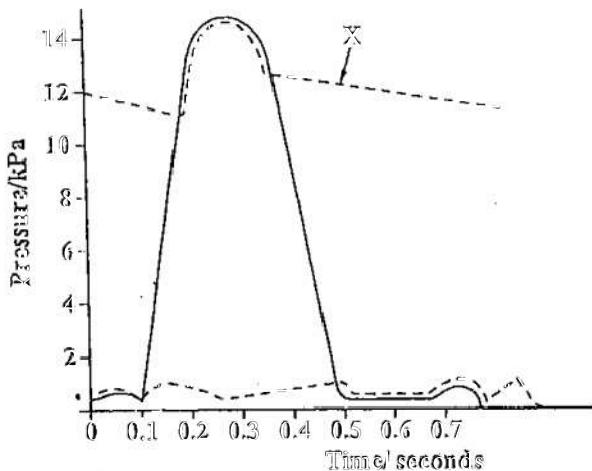
Item 22 refers to the following diagram which shows the heart and associated blood vessels.



22. The region labelled X is the

- (A) aorta
- (B) pulmonary artery
- (C) inferior vena cava
- (D) superior vena cava

Item 23 refers to the following diagram which shows the pressure changes to the left side of the heart and the aorta during the cardiac cycle.



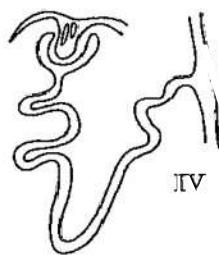
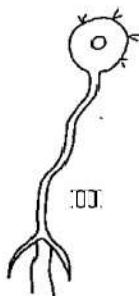
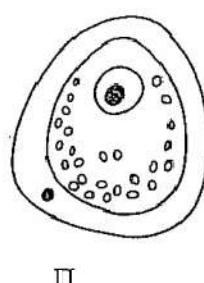
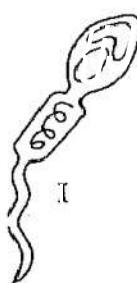
23. The section labelled X represents the
- (A) pressure in the ventricles as the heart fills
  - (B) pressure in the aorta as the heart empties
  - (C) atrial pressure as the heart empties
  - (D) ventricular pressure as the heart fills
24. Which of the following is true concerning the effect of insulin on target cells?
- (A) Decreased glucose metabolism
  - (B) Increased gluconeogenesis
  - (C) Increased blood glucose concentration
  - (D) Increased glucose permeability of cell membranes

Item 25 refers to the table below which gives the pulse rate of humans at different stages of their growth and development to adulthood.

	Pulse rate (beats/min)
I.	110 - 140
II.	80 - 90
III.	50 - 85
IV.	50 - 70

25. Which group BEST represents infants?
- (A) I
  - (B) II
  - (C) III
  - (D) IV
26. Which of the following statements about glucagon is INCORRECT?
- (A) Acts in opposition to insulin
  - (B) Acts primarily on liver cells
  - (C) Raises blood glucose levels
  - (D) Is synthesized by islet Beta cells
27. A healthy person has recently drunk a large quantity of (pure) water. Which statement BEST describes the result of this action?
- (A) The production of ADH increases.
  - (B) The water potential of the urine becomes less negative.
  - (C) The solute concentration of the urine becomes more negative.
  - (D) The permeability of the collecting ducts increases.

28. Which of the following cells and structures possesses myelin sheaths?

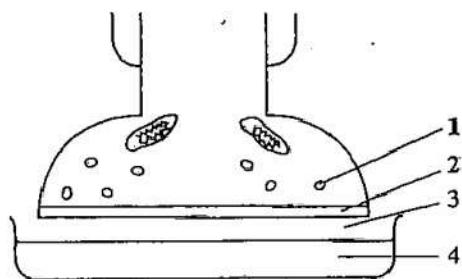


- (A) I
- (B) II
- (C) III
- (D) IV

29. The speed of transmission of a nerve impulse is affected by the

- (A) strength of the impulse
- (B) concentration of acetyl choline
- (C) presence of the myelin sheath
- (D) amount of  $\text{Na}^+$  that enters the neuron

Item 30 refers to the diagram below showing the gap between two neurons.



30. The protein receptors for the neurotransmitter are located at

- (A) 1
- (B) 2
- (C) 3
- (D) 4

31. In which of the following ways can an individual become infected with HIV from an infected person?

- I. Exchange of saliva during kissing
- II. Blood transfusion
- III. Breastfeeding
- IV. Sharing hypodermic needles

- (A) II and III only
- (B) I, II and IV only
- (C) II, III and IV only
- (D) I, II, III and IV

32. Which of the following is true for mast cells?

- (A) They are found in lymph nodes only.
- (B) They are the smallest circulating granulocytes.
- (C) They are large granulocytes which engulf pathogens.
- (D) They contain many granules rich in histamine and heparin.

33. Which of the following is a feature of B lymphocytes?
- They bind only to whole antigen molecules via receptors on their cell surfaces.
  - They must pass through the thymus gland before they can become fully functional.
  - They release cytokines when activated.
  - They suppress the activity of phagocytotes.
- Item 34 refers to the graph below which shows the changes in antibody concentration in serum during the primary and secondary response to an antigen.
- 
34. What type of cell is responsible for initiating the increase in antibody production after the second injection of antigen?
- B-cells
  - T-cells
  - Macrophages
  - Memory cell
35. Which of the following combinations correctly describes the pathogens responsible for dengue fever and AIDS?
- | Dengue Fever          | AIDS                  |
|-----------------------|-----------------------|
| Bacterium             | Retrovirus            |
| Single stranded RNA   | Double stranded DNA   |
| Infects B lymphocytes | Infects T lymphocytes |
| Parasitic disease     | Infectious disease    |
36. The monomers that make up the heavy and light chains of an antibody molecule are joined by
- disulphide bonds
  - hydrogen bonds
  - glycosidic bonds
  - peptide bonds
- Item 37 refers to the diagrams below which show the stages of phagocytosis of a bacterium by a neutrophil.
- 
37. Which of the following shows the correct sequence of the phagocytosis process?
- 1 3 2 4
  - 2 1 3 4
  - 4 2 1 3
  - 4 2 3 1

38. Which of the following is correct regarding the use of monoclonal antibodies in pregnancy testing?
- (A) If a test is negative, mouse monoclonal anti-HCG antibodies do not bind to polyclonal anti-mouse antibodies in the control region.  
(B) If the test is positive, mouse monoclonal anti-HCG antibodies bind to HCG only at the control region.  
(C) Mouse monoclonal anti-HCG antibodies can detect low levels HCG.  
(D) Mouse monoclonal anti-HCG antibodies cannot detect low levels HCG.
39. A baby receives antibodies from its mother via the placenta. This is called
- (A) artificial passive immunity  
(B) natural passive immunity  
(C) artificial active immunity  
(D) natural active immunity
40. Which of the following is true for Body Mass Index (BMI)?
- (A) It cannot be used to measure obesity in children.  
(B) It is a perfect method for measuring a person's weight.  
(C) It is calculated using both height and weight measurements.  
(D) It measures the distribution of excess fat in the body.
41. A key feature of monoclonal antibodies is that they are manufactured by
- (A) most cells  
(B) cancer cells  
(C) one type of T cell  
(D) one type of B cell
42. Which of the following combinations correctly identifies the causative agent and the mode of transmission of dengue fever?
- | Causative Agent | Mode of Transmission |
|-----------------|----------------------|
| (A) Virus       | Vector               |
| (B) Bacterium   | Vector               |
| (C) Virus       | Airborne             |
| (D) Bacterium   | Airborne             |
43. With regular consumption of alcohol, fat accumulates in the liver because
- (A) fat absorbs alcohol and detoxifies it  
(B) liver cells use alcohol instead of fat as an energy source  
(C) alcohol is used in the synthesis of fat molecules in the liver  
(D) alcohol suppresses the ability of liver cells to secrete fat molecules

44. Which of the following is a mutagen and can cause lung cancer?

- (A) Tar
- (B) Alcohol
- (C) Nicotine
- (D) Carbon monoxide

45. Which of the following BEST describes tolerance, a form of physical drug dependence?

- (A) A severe craving for a drug which interferes with a person's ability to function normally
- (B) Characterized by the continued desire for a drug, even after physical dependence is gone
- (C) Develops in persons who have used large quantities of substances such as alcohol and barbiturates
- (D) Occurs when the body becomes accustomed to a drug and requires ever-increasing amounts to achieve the same effect

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.



FORM TP2010142

You must sign below and return this booklet with the Answer Sheet. Failure to do so may result in disqualification.

Signature

TEST CODE 02207010

MAY/JUNE 2010

CARIBBEAN EXAMINATIONS COUNCIL

ADVANCED PROFICIENCY EXAMINATION

BIOLOGY - UNIT 2

Paper 01

90 minutes

(11 JUNE 2010 (a.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 45 items. You will have 90 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Do not be concerned that the answer sheet provides spaces for more answers than there are items in this test.
4. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
5. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

Which of the following is NOT a form of energy storage?

- (A) ATP  
(B) Lipid  
(C) Alcohol  
(D) Lactic acid

Sample Answer

Ⓐ Ⓝ Ⓟ Ⓡ

The best answer to this item is "ATP", so answer space (A) has been shaded.

6. If you want to change your answer, erase it completely and fill in your new choice.
7. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, omit it and go on to the next one. Your score will be the total number of correct answers.
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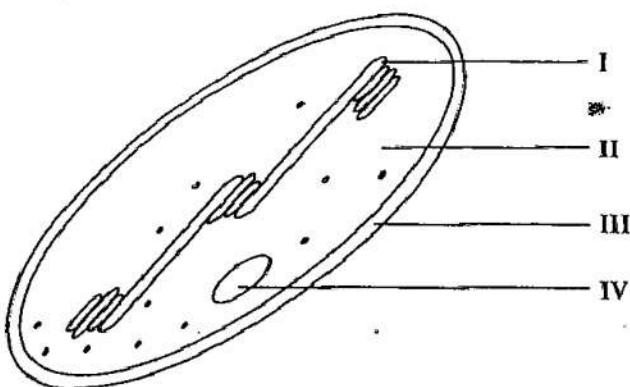
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02207010/CAPE 2010

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Item 1 refers to the following diagram which represents a chloroplast.



1. Ribulose biphosphate carboxylase can be found in Region

- (A) I
- (B) II
- (C) III
- (D) IV

2. The electrons from non-cyclic photophosphorylation pass into the Calvin cycle via

- (A) ATP
- (B) FAD
- (C) NADP
- (D) NADH<sub>2</sub>

3. The Calvin cycle is temperature dependent because

- (A) increased temperature increases the diffusion of carbon dioxide
- (B) increased temperature increases the rate of collision of molecules
- (C) enzymes involved in the reaction are affected by changes in temperature
- (D) the reduction of glyceraldehyde 3-phosphate to triose phosphate requires high temperature

4. The role of oxygen in aerobic respiration is to

- (A) oxidize pyruvic acid
- (B) break down glucose into pyruvic acid
- (C) synthesize thirty-eight molecules of ATP
- (D) accept hydrogen ions in the electron transport chain

5. High oxygen concentration can limit photosynthesis by preventing the formation of glyceraldehyde 3-phosphate. This is due to

- (A) the oxidation of reduced NADP by oxygen
- (B) oxygen combining with RuBP instead of carbon dioxide
- (C) oxygen combining with Rubisco instead of carbon dioxide
- (D) triose phosphate which cannot regenerate RuBP in high oxygen concentration

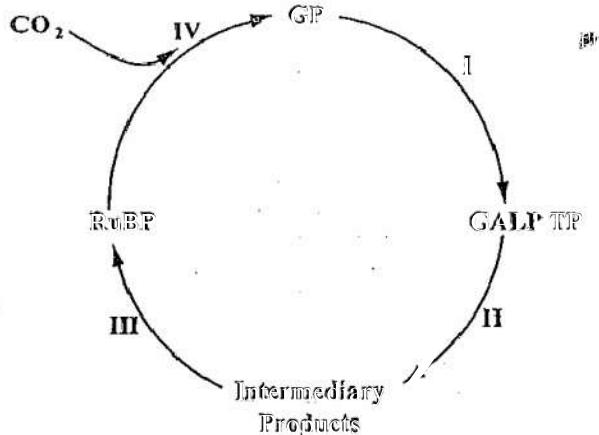
6. The spongy mesophyll is the chief site of gaseous exchange in a dicotyledonous leaf. This is possible because the cells are

- (A) irregular in shape and tightly packed
- (B) elongated in shape and vertically packed
- (C) found near the upper surface of the leaf
- (D) found near the lower surface of the leaf

7. The final product(s) of glycolysis is/are

- (A) reduced NADH
- (B) acetyl coenzyme A
- (C) ATP, NAD and pyruvate
- (D) pyruvate, ATP and NADH

Item 8 refers to the Calvin cycle shown below where ATP produced in photophosphorylation is utilised.



8. Which of the following combinations correctly identifies the stages where ATP enters the cycle?
- (A) I and II only
  - (B) I and III only
  - (C) II and III only
  - (D) III and IV only

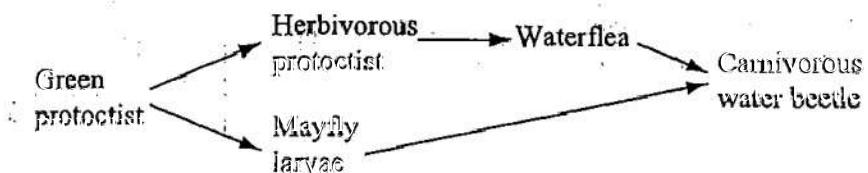
9. Which of the following equations shows the fate of pyruvic acid during anaerobic respiration?

- (A) Pyruvic acid  $\rightarrow$  lactic acid +  $\text{CO}_2$  + 2ATP net
- (B) Pyruvic acid  $\rightarrow$  lactic acid +  $\text{CO}_2$  + 4ATP net
- (C) Pyruvic acid  $\rightarrow$  alcohol +  $\text{CO}_2$  + 2ATP net
- (D) Pyruvic acid  $\rightarrow$  alcohol +  $\text{CO}_2$  + 4ATP net

10. Which sequence correctly represents the action of nitrifying bacteria?

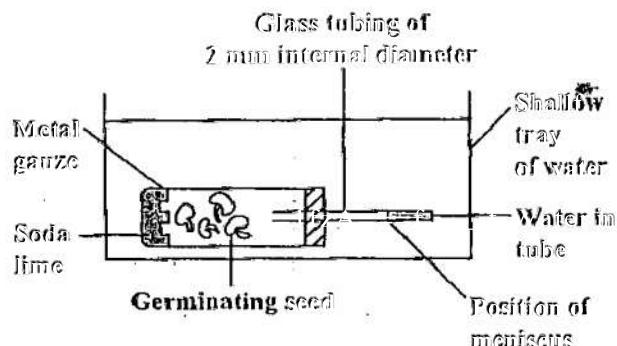
- (A) Nitrogen  $\rightarrow$  nitrate  $\rightarrow$  nitrite
- (B) Nitrite  $\rightarrow$  nitrate  $\rightarrow$  ammonium
- (C) Ammonium  $\rightarrow$  nitrite  $\rightarrow$  nitrate
- (D) Nitrate  $\rightarrow$  ammonium  $\rightarrow$  nitrogen

Item 11 refers to the diagram below that shows a simple food web.



11. Which of the following organisms is INCORRECTLY identified with its trophic level?
- (A) Green protocist - primary producer
  - (B) Herbivorous protocist - primary producer
  - (C) Carnivorous water beetle - secondary consumer
  - (D) Carnivorous water beetle - tertiary consumer

Item 12 refers to the following apparatus set up to determine the rate of respiration of germinating seeds.



The results of the experiment are presented in the table below.

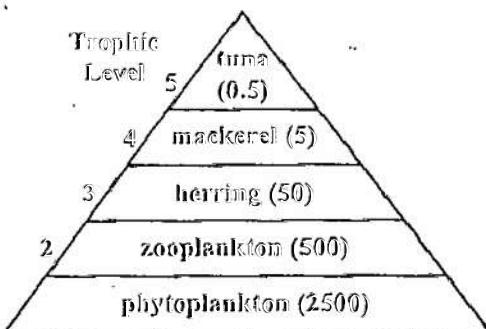
Time (mins)	Volume of Oxygen Absorbed ( $\text{cm}^3$ ) (based on distance moved by meniscus)
5	1.6
10	2.1
15	3.4
20	4.2

12. Which of the following quantities represents the average rate of oxygen uptake by the seeds during the time of the experiment?
- (A)  $0.21 \text{ cm}^3 \text{ min}^{-1}$
  - (B)  $1.26 \text{ cm}^3 \text{ min}^{-1}$
  - (C)  $4.2 \text{ cm}^3 \text{ min}^{-1}$
  - (D)  $6.74 \text{ cm}^3 \text{ hr}^{-1}$

13. Which of the following pathways contributes the MOST electrons to the electron transport chain?
- (A) Glycolysis
  - (B) Calvin cycle
  - (C) Krebs cycle
  - (D) Pyruvate oxidation

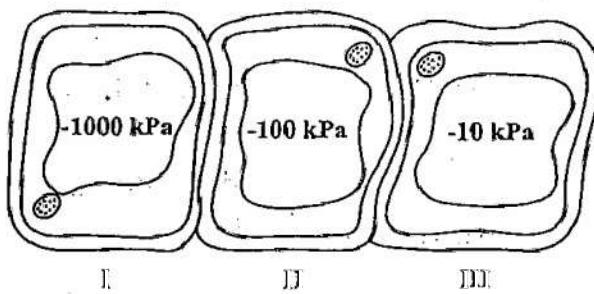
14. The term 'biodiversity' is BEST described as the
- (A) range of genera on earth
  - (B) number of species on earth
  - (C) range of ecosystems on earth
  - (D) variety of different life forms on earth

Item 15 refers to an ocean food pyramid. The number in brackets represents the weight of the organism.



15. The percentage of energy available for transfer to a person eating 0.5 kilograms of tuna is approximately
- (A) 1 %
  - (B) 5 %
  - (C) 10 %
  - (D) 20 %

Item 16 refers to the diagram below which shows three adjacent plant cells, I, II and III. The values of their water potentials are given in kPa.



16. In which direction would there be a NET flow?
- (A) I  $\rightarrow$  II and II  $\rightarrow$  III
  - (B) II  $\rightarrow$  I and III  $\rightarrow$  I
  - (C) II  $\rightarrow$  III and II  $\rightarrow$  I
  - (D) III  $\rightarrow$  II and II  $\rightarrow$  I

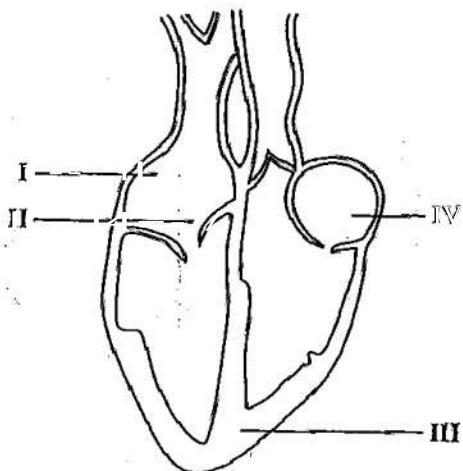
17. Which of the following is NOT a part of the symplastic pathway in plants?

- (A) Cytoplasm of root hairs
- (B) Lumen of xylem cells
- (C) Plasmodesmata of companion cells
- (D) Cell surface membrane of cortical cells

18. Which of the following causes the stomata to open?

- (A) an increase in carbon dioxide in the air spaces in the leaves
- (B) a decrease in the turgor pressure in guard cells
- (C) accumulation of water in guard cells by active transport
- (D) an influx of  $K^+$  into guard cells followed by water by osmosis

Item 19 refers to the following diagram which shows a longitudinal section of a mammalian heart.



19. The position of the sinoatrial node is identified by the region labelled

- (A) I
- (B) II
- (C) III
- (D) IV

20. Which of the following is correct for BOTH arteries and veins?

	Arteries	Veins
(A)	Thin walled	Few elastic fibres
(B)	Collagen fibres present	Thick walled
(C)	Few elastic fibres	Valves present
(D)	Thick walled	Collagen fibres present

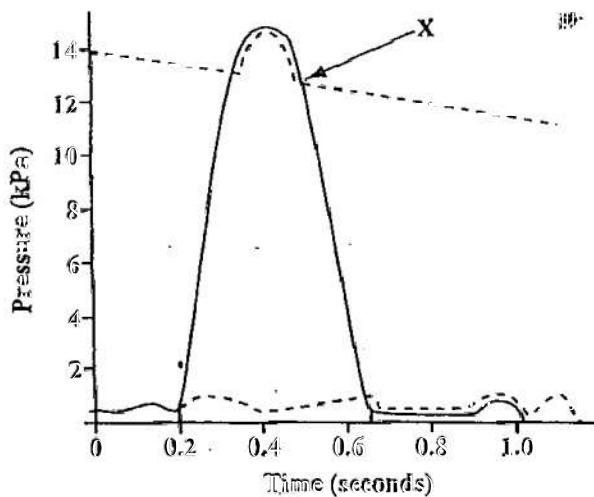
21. The function of the companion cell in mature phloem tissue is to

- (A) provide structural support for the sieve tubes
- (B) actively move sucrose out of neighbouring photosynthesizing cells to the sieve tubes
- (C) move sucrose against a concentration gradient into the xylem
- (D) provide a nucleus needed for cell division of the sieve tube elements

22. Pulse is a direct measure of

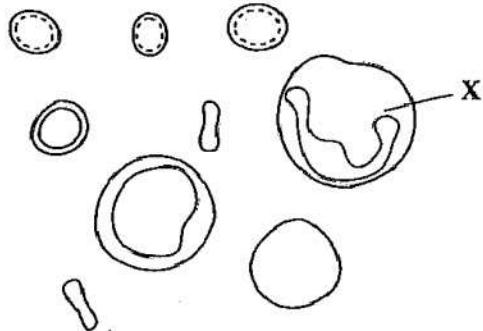
- (A) heart rate
- (B) breathing rate
- (C) stroke volume
- (D) blood pressure

Item 23 refers to the following diagram which shows the pressure changes to the left side of the heart and the aorta during the cardiac cycle.



23. The section labelled X represents the
- (A) atrial pressure as the heart empties
  - (B) ventricular pressure as the heart fills
  - (C) pressure in the ventricles as the heart empties
  - (D) pressure in the aorta as the heart empties

Item 24 refers to the following diagram.



24. The cell labelled X in the diagram above is
- (A) a platelet
  - (B) a monocyte
  - (C) a neutrophil
  - (D) an erythrocyte

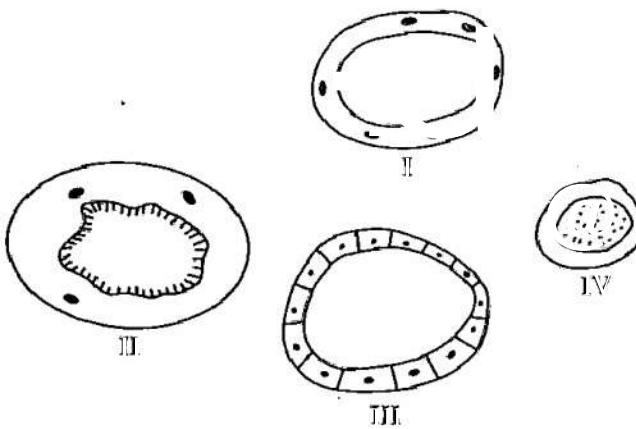
25. Which statement about glucagon is INCORRECT? Glucagon causes

- (A) glycogen to break down to glucose in the liver
- (B) glycogen to break down to glucose in the muscles
- (C) amino acids and glycerol to be converted to glucose
- (D) increased release of glucose into the blood when it is needed

26. One activity that is NOT an example of a negative feedback is the regulation of

- (A) pulse rate
- (B) blood sugar
- (C) blood pressure
- (D) body temperature

Item 27 refers to the drawings below which show sections through a nephron.



27. Which figure BEST represents a section through the proximal convoluted tubule?

- (A) I
- (B) II
- (C) III
- (D) IV

Item 28 refers to the table below which shows volume of water reabsorbed in the different regions of the human kidney nephrons. The total volume of filtrate produced by the glomerulus is 180 litres per day.

Region	Volume of water (litres) reabsorbed per day
Proximal tubules	147.0
Loop of Henlé	10.0
Distal tubules	19.2
Collecting ducts	2.2

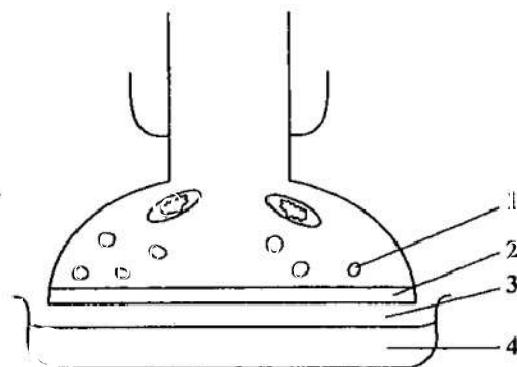
28. What is the volume of urine produced per day, in litres?

(A) 1.6  
(B) 2.2  
(C) 21.4  
(D) 178.4

29. Glomerular filtrate contains substances with a relative molecular mass less than 68,000. Larger molecules, such as red blood cells and proteins, are **prevented** from passing into the nephron because of the

(A) podocytes  
(B) glomerular pressure  
(C) capillary endothelium  
(D) basement membrane

Item 30 refers to the diagram below showing the gap between two neurones.



30. Where is acetyl choline stored and secreted?

	Stored	Secreted into
(A)	1	3
(B)	1	4
(C)	2	3
(D)	2	4

31. Which disease is appropriately matched with its category?

	Disease	Category
(A)	AIDS	Hereditary
(B)	Stroke	Degenerative
(C)	Diabetes	Infectious
(D)	Emphysema	Deficiency

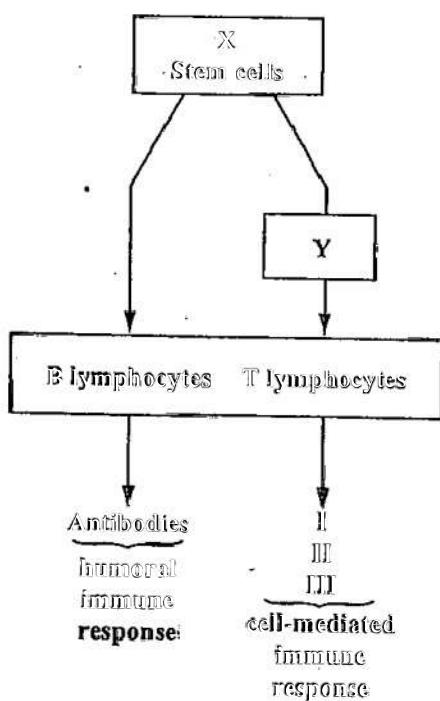
32. Which of the following can be found inside the central core of the human immunodeficiency virus (HIV)?

(A) DNA only  
(B) DNA and RNA  
(C) DNA and reverse transcriptase  
(D) RNA and reverse transcriptase

33. The condition that is NOT caused by malnutrition is

- (A) obesity
- (B) marasmus
- (C) emphysema
- (D) kwashiorkor

Item 34 refers to the following diagram.



34. The structure labelled Y is

- (A) a lymph node
- (B) the thymus gland
- (C) the hypothalamus
- (D) red bone marrow

35. In an effort to save the life of a friend, a man donated one of his kidneys. However, some time after the implantation, the kidney was rejected. This type of immune response is

- (A) natural and active
- (B) natural and passive
- (C) artificial and active
- (D) artificial and passive

36. In some situations the body's immune response is very specific and targeted; in other situations it is not. Which of the following is/are NOT part of the body's nonspecific response system?

- (A) Neutrophils
- (B) Macrophages
- (C) Inflammation
- (D) Antibodies

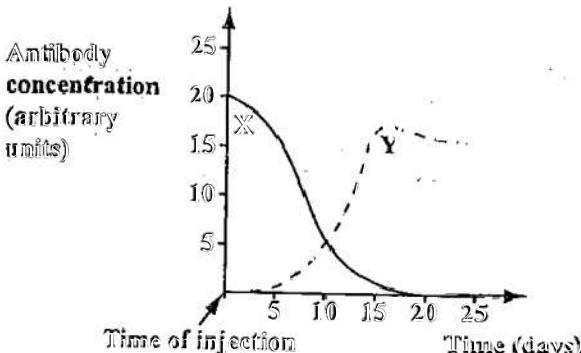
Item 37 refers to the following information.

Two types of immunity are investigated in patients suffering from tetanus.

Person X is injected with antibodies to the disease.

Person Y is injected with a vaccine and produces antibodies as a result.

Blood samples are removed from both people at regular intervals. The results are shown on the graph below.

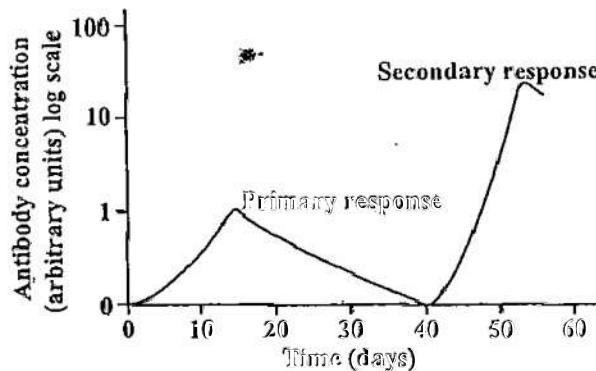


37. The types of immunity being investigated are

- (A) passive natural and active natural
- (B) passive artificial and active artificial
- (C) active natural and passive artificial
- (D) active artificial and active natural

38. Which of the following is NOT a method of transmission of the HIV?
- (A) Sexual intercourse  
(B) Sharing intravenous needles  
(C) Breastfeeding or breast milk  
(D) Gene transfer from mother to foetus
39. The monomers that make up the heavy and light chains of an antibody molecule are joined by
- (A) peptide bonds  
(B) hydrogen bonds  
(C) glycosidic bonds  
(D) disulphide bonds
40. Body Mass Index (BMI) is now used as a simple means of assessing obesity. Which of the following formulae is used to calculate BMI?
- (A)  $\frac{\text{Height (m)}}{\text{Body mass}^2 (\text{kg}^2)}$   
(B)  $\frac{\text{Body mass (kg)}}{\text{Height (m)}}$   
(C)  $\frac{\text{Body Mass (kg)}}{\text{Height}^2 (\text{m}^2)}$   
(D)  $\frac{\text{Body mass (kg)}}{\text{Age of individual (yrs)}}$
41. A runner prepares for six months to run a marathon, by exercising for three hours daily. This MOST likely results in an increase in
- I. cardiac output  
II. tidal volume  
III. muscle size  
IV. blood pressure
- (A) I and II only  
(B) I, II and III only  
(C) I, III and IV only  
(D) II, III and IV only
42. Dengue fever is caused by a
- (A) virus transmitted by the *Aedes* mosquito  
(B) virus transmitted by the *Anopheles* mosquito  
(C) plasmodium transmitted by the *Aedes* mosquito  
(D) plasmodium transmitted by the *Anopheles* mosquito
43. Which of the following is a mutagen and causes cancer?
- (A) Tar  
(B) Alcohol  
(C) Nicotine  
(D) Carbon monoxide

Item 44 refers to the following diagram which shows the changes in antibody concentration in the blood during primary and secondary responses.



44. These responses are MOST likely caused by

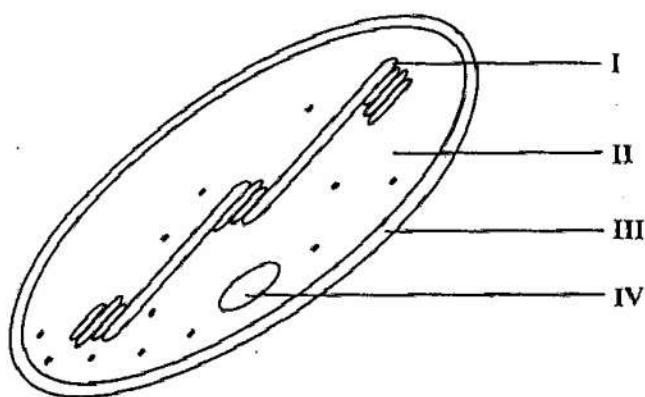
- (A) antigens
- (B) antibiotics
- (C) antitoxins
- (D) antioxidants

45. One effect of alcohol consumption is that it

- (A) inhibits the release of ADH
- (B) increases the release of ADH
- (C) increases sexual performance
- (D) increases muscular coordination

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

Item 1 refers to the following diagram which represents a chloroplast.



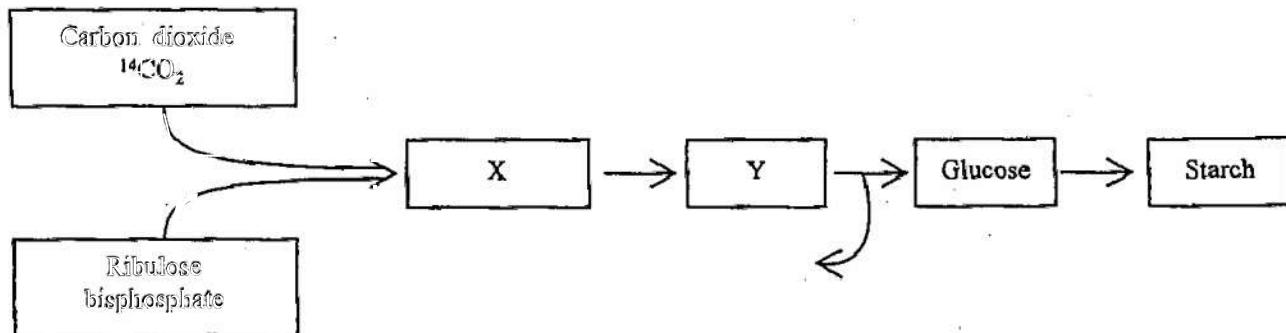
Item 2. The electrons from non-cyclic photophosphorylation pass into the Calvin Cycle via

- (A) ATP
- (B) FAD
- (C) NADP
- (D) NADH<sub>2</sub>

1. Ribulose bisphosphate carboxylase can be found in Region

- (A) I
- (B) II
- (C) III
- (D) IV

Item 3 refers to the reaction scheme below which shows the dark reaction pathway of the Calvin Cycle occurring for about 20 seconds.

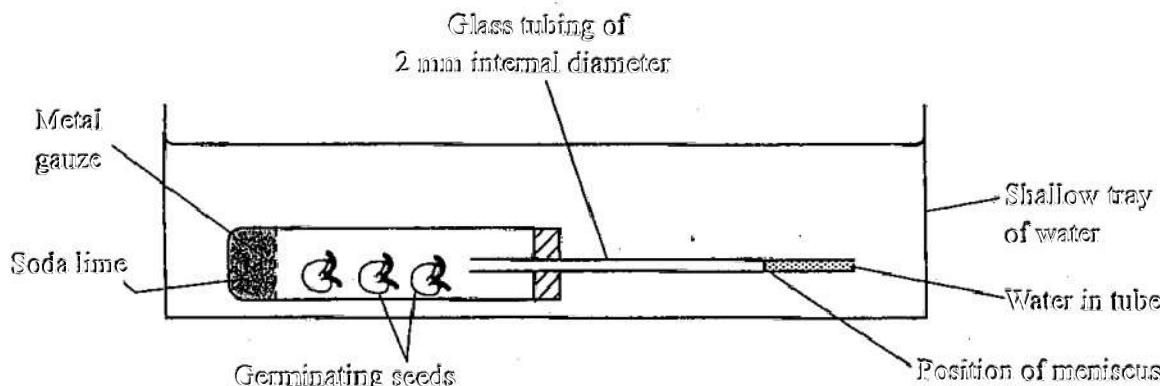


3. Which of the following correctly identifies the compounds, X and Y?

- | X                        | Y                    |
|--------------------------|----------------------|
| (A) Phosphoglyceric acid | Triose phosphate     |
| (B) Triose phosphate     | Phosphoglyceric acid |
| (C) Simple sugars        | Proteins             |
| (D) Acetyl CoA           | Succinic acid        |

4. The yield of greenhouse crops is higher than that of field crops, due to increased photosynthetic activity by the plants. Which of the following factors may contribute to this?
- Constant application of farmyard manure
  - Rotation of plants
  - Humid air and moist soil conditions
  - Higher than average carbon dioxide levels
- (A) I and II only  
 (B) I and III only  
 (C) II and IV only  
 (D) III and IV only.
5. Which of the following substances are present in the matrix of a mitochondrion?
- Glucose
  - Adenosine diphosphate
  - Adenosine triphosphate
  - Acetyl co-enzyme A
- (A) I and II only  
 (B) II and III only  
 (C) II, III and IV only  
 (D) I, II, III and IV
6. During aerobic respiration in mammals, pyruvic acid is
- used in the Kreb's Cycle
  - converted to lactic acid
  - used to synthesise glycogen
  - one of the products of the Kreb's Cycle

Items 7 - 8 refer to the apparatus below which is set up to determine the rate of respiration of germinating seeds.



7. Which of the following statements explain why the apparatus is left in the water for five minutes before readings are taken?
- To allow water to fill the capillary tube.
  - To stabilise the pressure of the apparatus.
  - To stabilise the temperature of the apparatus.
  - The seeds needed to adjust to experimental temperature.
- (A) I and II only  
 (B) II and III only  
 (C) II, III and IV only  
 (D) I, II, III and IV
8. Another set of apparatus is set up in exactly the same way but glass beads are used instead of germinating peas. The purpose of the apparatus with the beads is to
- serve as a control
  - measure oxygen taken up
  - measure carbon dioxide produced
  - show that germinating seeds absorb carbon dioxide

Item 9 refers to the diagram below which shows how energy flows in an ecosystem.



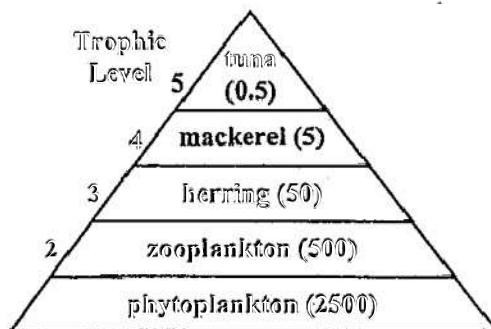
9. At which of the following stages is the MOST energy lost?

- (A) Lizard → hawk
- (B) Sunlight → grass
- (C) Grass → grasshopper
- (D) Grasshopper → lizard

10. In the 1950's, G. R. Gause observed that two species of flour beetle, *Tribolium confusum* and *Tribolium castaneum*, survived well on their own. However, when they were put together, only one of the species survived. This resulted in the hypothesis called Gause's Competitive Exclusion Principle which states that no two species can co-exist if they occupy the same

- (A) niche
- (B) habitat
- (C) ecosystem
- (D) environment

Item 11 refers to an ocean food pyramid. The number in brackets represents the weight of the organism.



11. The percentage of energy available for transfer to a person eating 0.5 kilograms of tuna is approximately

- (A) 1 %
- (B) 5 %
- (C) 10 %
- (D) 20 %

12. Which sequence correctly represents the action of nitrifying bacteria?

- (A) Ammonium → nitrite → nitrate
- (B) Nitrite → nitrate → ammonium
- (C) Nitrogen → nitrate → nitrite
- (D) Nitrate → ammonium → nitrogen

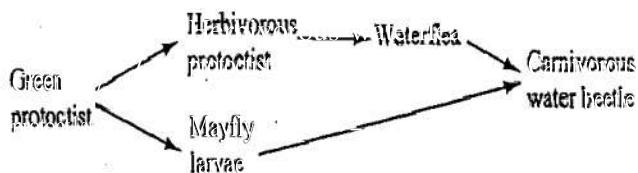
13. The number and range of different species found in an ecosystem are called its

- (A) biotic factors
- (B) abiotic factors
- (C) species diversity
- (D) community

14. Which of the following are NOT conservation methods used to maintain biodiversity?

- I. Gene bank
  - II. Botanic garden
  - III. Protected reserve
  - IV. Endangered species
- (A) I and II only  
(B) I, II and III only  
(C) I, II and IV only  
(D) I, II, III and IV

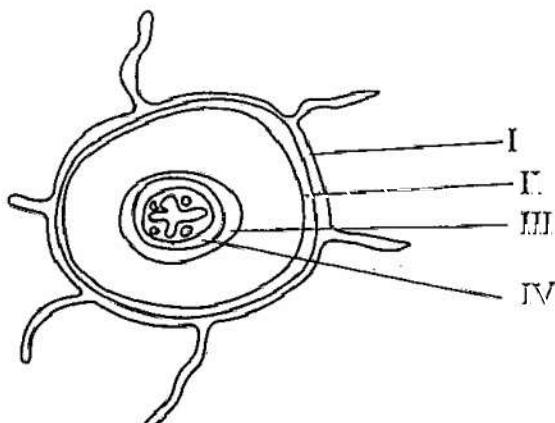
Item 15 refers to the diagram below that shows a simple food web.



15. Which of the following organisms is INCORRECTLY identified with its trophic level?

- (A) Green prototist - primary producer  
(B) Herbivorous prototist - primary producer  
(C) Carnivorous water beetle - secondary consumer  
(D) Carnivorous water beetle - tertiary consumer

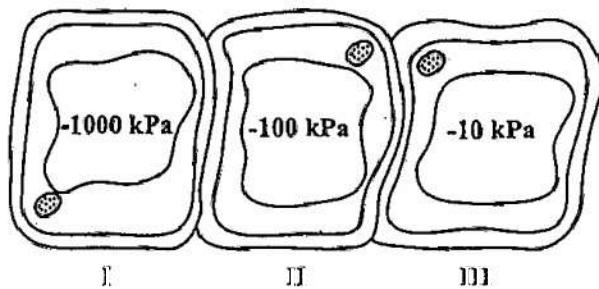
Item 16 refers to the diagram below which shows a transverse section of a typical dicotyledonous root.



16. The Caspian strip is found in the layer labelled

- (A) I  
(B) II  
(C) III  
(D) IV

Item 17 refers to the diagram below which shows three adjacent plant cells, I, II and III. The values of their water potentials are given in kPa.

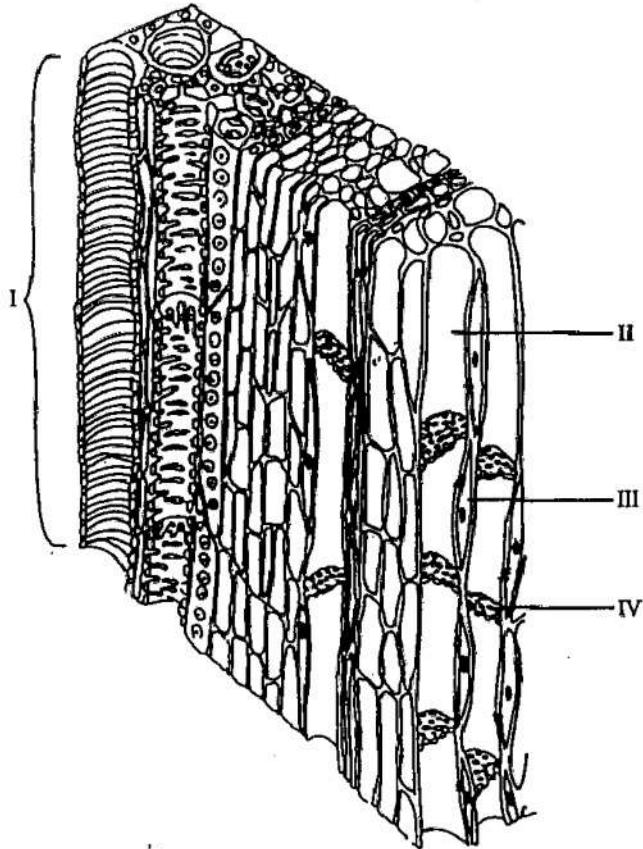


17. In which direction would there be a NET flow?

- (A) I → II and II → III  
(B) II → I and III → I  
(C) II → III and II → I  
(D) III → II and II → I

18. The function of the companion cell in mature phloem tissue is to
- (A) provide structural support for the sieve tubes
  - (B) provide a nucleus needed for cell division of the sieve tube elements
  - (C) move sucrose against a concentration gradient into the xylem
  - (D) actively move sucrose out of neighbouring photosynthesizing cells to the sieve tubes
20. The tunica externa found in the walls of certain blood vessels is made up of MAINLY
- (A) elastic fibres
  - (B) collagen fibres
  - (C) smooth muscle
  - (D) squamous epithelium

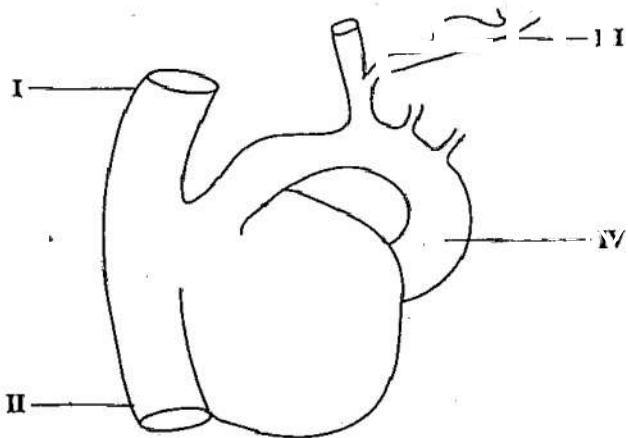
Item 19 refers to the following three-dimensional diagram of part of a plant stem.



19. Which labelled part is living but lacks a nucleus?
- (A) I
  - (B) II
  - (C) III
  - (D) IV

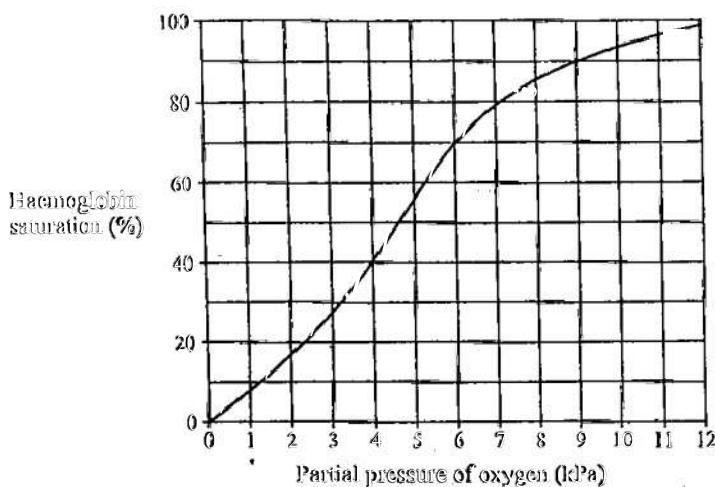
21. The first sound in the cardiac cycle is caused by the
- (A) closing of the semi-lunar valves
  - (B) opening of the semi-lunar valves
  - (C) closing of the atrio-ventricular valves
  - (D) opening of the atrio-ventricular valves

Item 22 refers to the following diagram of the heart and associated blood vessels.



22. The inferior vena cava is represented by
- (A) I
  - (B) II
  - (C) III
  - (D) IV
23. Which of the following structures must be stimulated to increase heart rate?
- (A) Vena cava
  - (B) Cardiac muscle
  - (C) Sino-atrial node
  - (D) Atrio-ventricular node

Item 24 refers to the graph below which shows the sigmoid (S-shaped) dissociation curve for haemoglobin of a human adult.



24. During cycling, the partial pressure of oxygen found in the pulmonary vein leaving the lungs and in a vein leaving a muscle is MOST likely

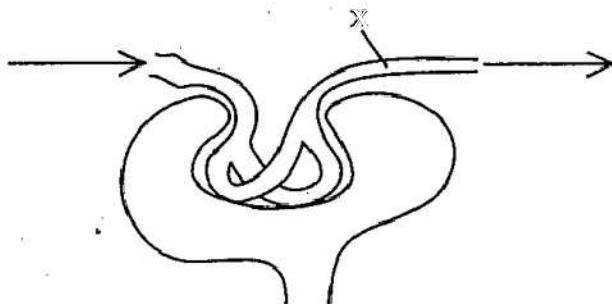
	pO <sub>2</sub> (kPa) in pulmonary vein leaving lungs	pO <sub>2</sub> (kPa) in pulmonary vein leaving muscle
(A)	0	12
(B)	2	12
(C)	6	6
(D)	12	2

25. A diabetic administers an injection of insulin into the body. How does this lead to a lowering of blood glucose concentration?
- (A) By decreasing the permeability of cells to glucose
  - (B) By increasing the excretion of glucose in the urine
  - (C) By promoting the formation of the hormone glucagon in the pancreas
  - (D) By promoting the synthesis of polysaccharides from absorbed glucose

26. Bananas produced in the Caribbean are exported to markets all over the world. The bananas are harvested mature but still green, yet must arrive at the markets ready to eat. Which of the following procedures ensures that the fruit is still marketable after shipping?

- (A) Ethylene application and chilling during shipping
- (B) Storage of the fruit in chillers with minimum lighting
- (C) Use of carbon dioxide during shipping and ethylene application later
- (D) Storage of the fruit in chillers followed by increased temperature when approaching port

Item 27 refers to the following diagram of the glomerulus and Bowman's capsule of a nephron.



27. If the diameter of the blood vessel is made smaller at X, a possible outcome is that
- (A) the rate of ultrafiltration will be increased
  - (B) the rate of ultrafiltration will be decreased
  - (C) water re-absorption will be decreased
  - (D) the rate of urine production will be reduced

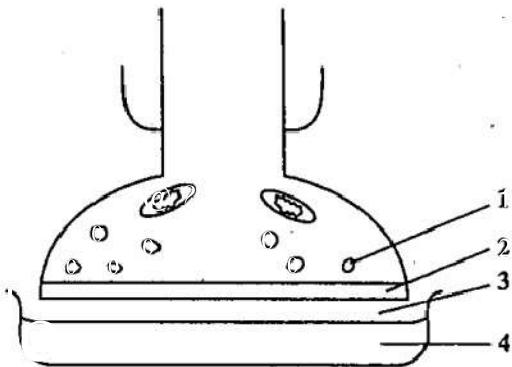
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Region	Volume of water (litres) reabsorbed per day
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Distal tubules	19.2
Collecting ducts	2.2

28. What is the volume of urine produced per day, in litres?

- (A) 1.6
- (B) 2.2
- (C) 21.4
- (D) 178.4

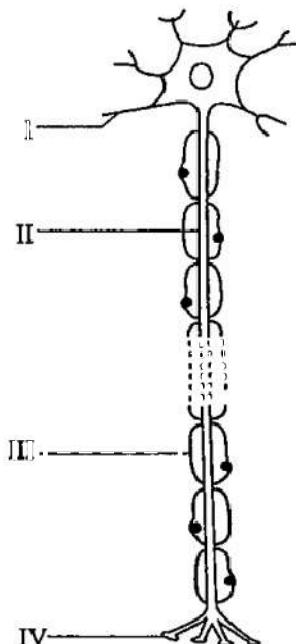
Item 29 refers to the diagram below showing the gap between two neurones.



29. Where is acetyl choline stored and secreted?

- |     | Stored | Secreted into |
|-----|--------|---------------|
| (A) | 1      | 3             |
| (B) | 1      | 4             |
| (C) | 2      | 3             |
| (D) | 2      | 4             |

Item 30 refers to the following diagram of a neurone.



30. Which region assists in speeding up the conduction of nerve impulses?

- (A) I
- (B) II
- (C) III
- (D) IV

31. AIDS is caused by a

- (A) retrovirus
- (B) rhinovirus
- (C) bacterium
- (D) protozoan

32. A disease that develops slowly and persists for a long time is BEST described as

- (A) acute
- (B) chronic
- (C) degenerative
- (D) self-inflicted

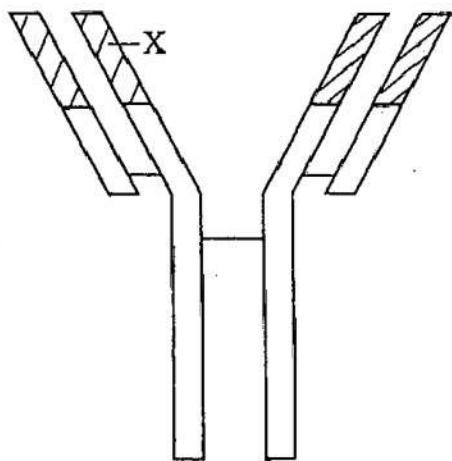
33. The organism that causes AIDS infects and destroys cells of the body's immune system so that their number gradually decreases. These cells are known as

- (A) B lymphocytes
- (B) plasma cells
- (C) T helper lymphocytes
- (D) T memory lymphocytes

34. Which of the following statements is NOT an explanation of the way in which antibodies work to protect the body from pathogens?

- (A) They cause agglutination of bacteria.
- (B) They combine with viruses preventing them from damaging cells.
- (C) They coat bacteria preventing phagocytes from ingesting them.
- (D) They attach to flagella of the bacteria making them easier for phagocytes to digest.

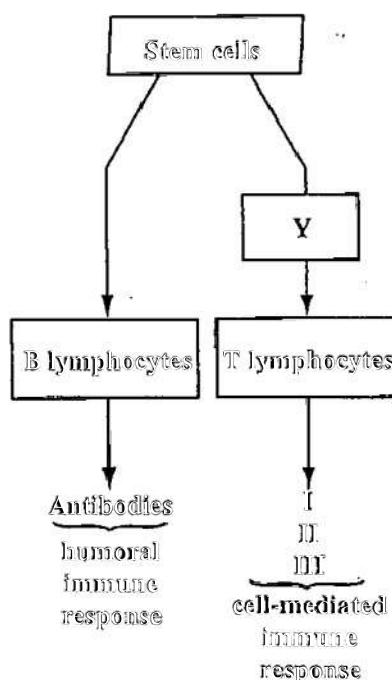
Item 35 refers to the following diagram.



35. Which of the following correctly identifies the structure labelled X in the diagram?

- (A) Hinge region
- (B) Variable region
- (C) Disulphide bridge
- (D) Light polypeptide chain

Item 36 refers to the following diagram.



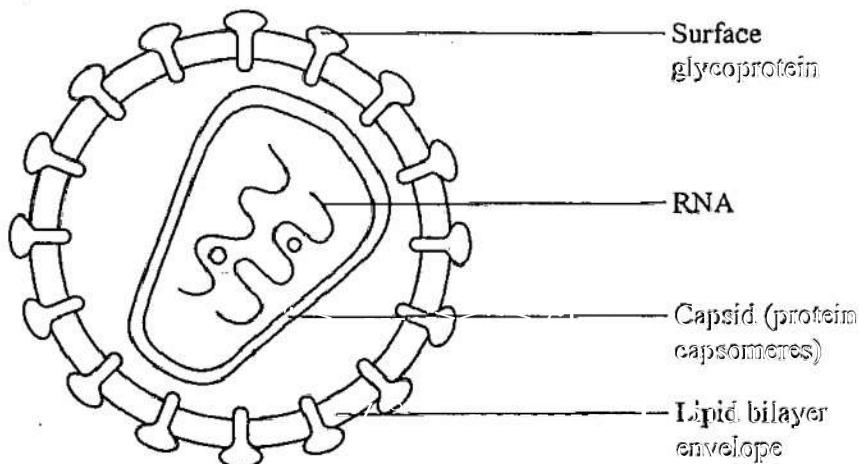
36. The structure labelled Y is

- (A) a lymph node
- (B) the thymus gland
- (C) the hypothalamus
- (D) red bone marrow

37. Which of the following is true for mast cells?

- (A) They are found in lymph nodes only.
- (B) They are the smallest circulating granulocytes.
- (C) They are large granulocytes which engulf pathogens.
- (D) They contain many granules rich in histamine and heparin.

Item 38 refers to the following diagram of the structure of the human immunodeficiency virus.



38. The components of the virus which are considered to be important in producing a vaccine against the virus are the

- (A) RNA and capsid
- (B) RNA and surface glycoprotein
- (C) capsid and lipid bilayer envelope
- (D) surface glycoprotein and the lipid bilayer envelope

39. A runner prepares for six months to run a marathon, by exercising for three hours daily. This MOST likely results in an increase in

- I. cardiac output
- II. tidal volume
- III. muscle strength
- IV. blood pressure

- (A) I, II and III only
- (B) I, II and IV only
- (C) I, III and IV only
- (D) II, III and IV only

40. Body Mass Index (BMI) is now used as a simple means of assessing obesity. Which of the following formulae is used to calculate BMI?

- (A)  $\frac{\text{Height (m)}}{\text{Body mass}^2 (\text{kg}^2)}$
- (B)  $\frac{\text{Body mass (kg)}}{\text{Height (m)}}$
- (C)  $\frac{\text{Body mass (kg)}}{\text{Height}^2 (\text{m}^2)}$
- (D)  $\frac{\text{Body mass (kg)}}{\text{Age of individuals (yrs)}}$

41. Injecting virus antigens into the body results in  
(A) natural immunity  
(B) artificial immunity  
(C) an antigenic drift  
(D) an antigenic shift
42. Which of the following is NOT a possible cause of hypertension?  
(A) Arthritis  
(B) Kidney disease  
(C) Atherosclerosis  
(D) High levels of aldosterone
43. One effect of alcohol consumption is that it  
(A) inhibits the release of ADH  
(B) increases the release of ADH  
(C) increases sexual performance  
(D) increases muscular coordination
44. It is believed that tar in cigarette smoke causes  
(A) the blood platelets to become sticky  
(B) more adrenaline to be released into the blood  
(C) blockage in blood vessels, resulting in less oxygen being transported.  
(D) increased secretion of mucus from goblet cells in the epithelium
45. Which of the following BEST describes tolerance, a form of physical drug dependence?  
(A) A severe craving for a drug which interferes with a person's ability to function normally  
(B) Characterized by the continued desire for a drug, even after physical dependence is gone  
(C) Develops in persons who have used large quantities of substances such as alcohol and barbiturates  
(D) Occurs when the body becomes accustomed to a drug and requires ever-increasing amounts to achieve the same effect.

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.



CANDIDATE - PLEASE NOTE!

PRINT your name on the line below and return this booklet with the Answer Sheet. Failure to do so may result in disqualification.

TEST CODE **02207010**

**FORM TP2012146**

MAY/JUNE 2012

CARIBBEAN EXAMINATIONS COUNCIL

ADVANCED PROFICIENCY EXAMINATION

BIOLOGY - UNIT 2

Paper 01

90 minutes

**12 JUNE 2012 (a.m.)**

**READ THE FOLLOWING INSTRUCTIONS CAREFULLY.**

1. This test consists of 45 items. You will have 90 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Do not be concerned that the answer sheet provides spaces for more answers than there are items in this test.
4. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
5. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

Which of the following is NOT a form of energy storage?

- (A) ATP  
(B) Lipid  
(C) Alcohol  
(D) Lactic acid

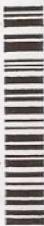
Sample Answer

(B)  (C)  (D)

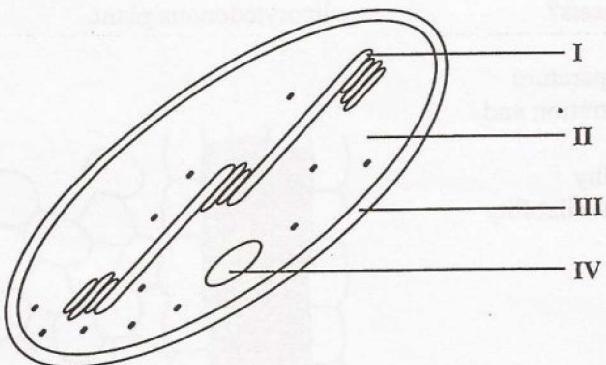
The best answer to this item is "ATP", so answer space (A) has been shaded.

6. If you want to change your answer, erase it completely and fill in your new choice.
7. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, omit it and go on to the next one. Your score will be the total number of correct answers.
8. You may do any rough work in this booklet.
9. Figures are not necessarily drawn to scale.
10. The use of silent, non-programmable calculators is allowed.

**DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.**



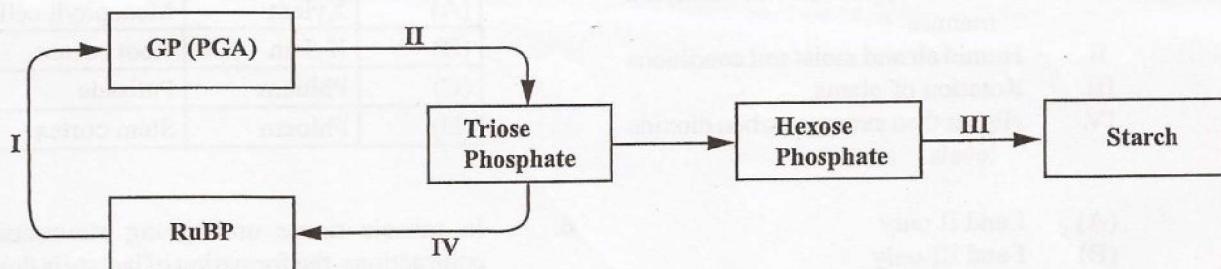
Item 1 refers to the following diagram which represents a chloroplast.



1. Ribulose biphosphate carboxylase can be found in region

- (A) I
- (B) II
- (C) III
- (D) IV

Item 2 refers to the following diagram which outlines the events of the Calvin cycle.



2. Which of the stages labelled I - IV on the diagram represents the stage at which carbon dioxide is incorporated into the cycle?

- (A) I
- (B) II
- (C) III
- (D) IV

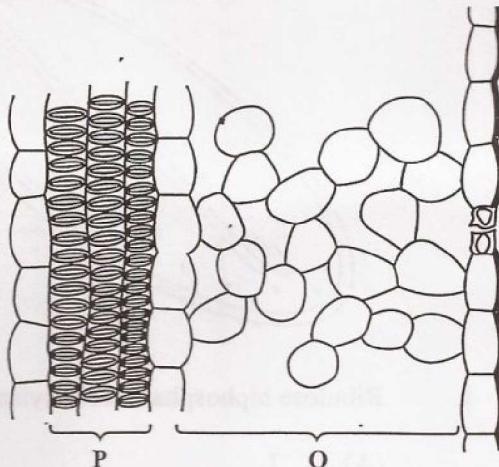
3. Which of the following combinations correctly describes the MAIN factors affecting the rate of photosynthesis?

- I. Light intensity and temperature
  - II. Carbon dioxide concentration and state of the stomata
  - III. NAD and ATP availability
  - IV. Phytochromes and the availability of ions
- (A) I and II only  
(B) I and III only  
(C) I, II and III only  
(D) I, II, III and IV

4. The yield of greenhouse crops is higher than that of field crops, due to increased photosynthetic activity by the plants. Which of the following factors may contribute to this?

- I. Constant application of farmyard manure
  - II. Humid air and moist soil conditions
  - III. Rotation of plants
  - IV. Higher than average carbon dioxide levels
- (A) I and II only  
(B) I and III only  
(C) II and IV only  
(D) III and IV only

Item 5 refers to the following diagram which shows some cells in the leaves of a dicotyledonous plant.



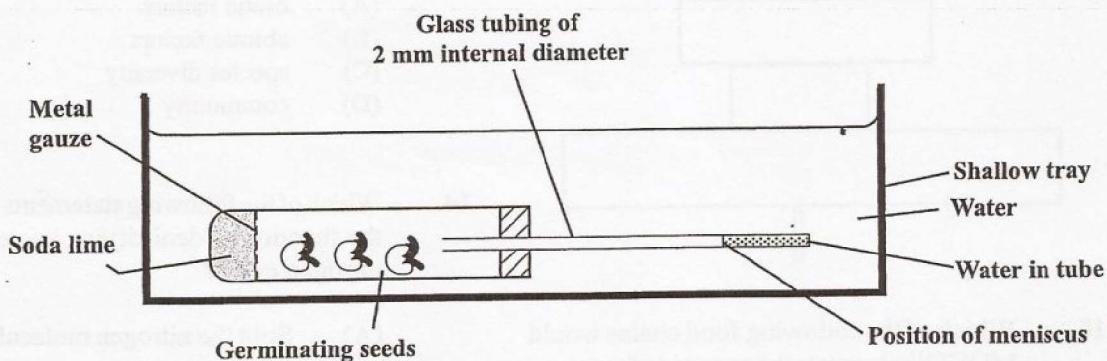
5. Which of the following correctly identifies the regions labelled P and Q?

	Region P	Region Q
(A)	Xylem	Mesophyll cells
(B)	Xylem	Root cortex
(C)	Phloem	Palisade
(D)	Phloem	Stem cortex

6. In muscle tissue undergoing strenuous contractions, the formation of lactate is due to the

- (A) low concentration of glucose
- (B) low concentration of oxygen
- (C) high concentration of glycogen
- (D) high concentration of carbon dioxide

Item 7 refers to the following apparatus which is set up to determine the rate of respiration of germinating seeds.



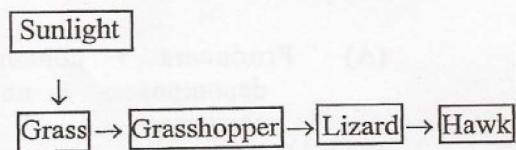
7. Which of the following statements explain why the apparatus is left in the water for five minutes before readings are taken?

- I. To allow water to fill the capillary tube.
  - II. To stabilise the pressure of the apparatus.
  - III. To stabilise the temperature of the apparatus.
  - IV. The seeds needed to adjust to experimental temperature.
- (A) I and II only  
(B) II and III only  
(C) II, III and IV only  
(D) I, II, III and IV

8. In anaerobic respiration, the maximum number of ATP molecules that may be produced from a molecule of glucose is

- (A) 2  
(B) 4  
(C) 34  
(D) 38

Item 9 refers to the diagram below which shows how energy flows in an ecosystem.



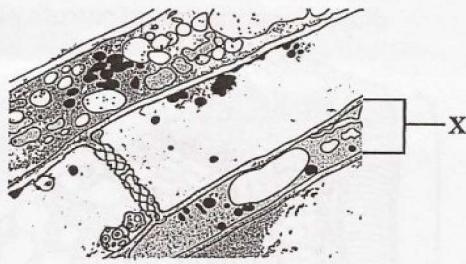
9. At which of the following stages is the MOST energy lost?

- (A) Lizard → hawk  
(B) Sunlight → grass  
(C) Grass → grasshopper  
(D) Grasshopper → lizard

20. Which of the following statements is true according to the mass (pressure) flow hypothesis?

- (A) Sucrose moves in the phloem against a concentration gradient.
- (B) The loading of sugars into the phloem in the leaf is achieved by osmosis.
- (C) A source is a site where sugars are utilized, while a sink is a site where sugars are produced.
- (D) Water is actively transported from the intercellular spaces into the cell sap at the root end of the system.

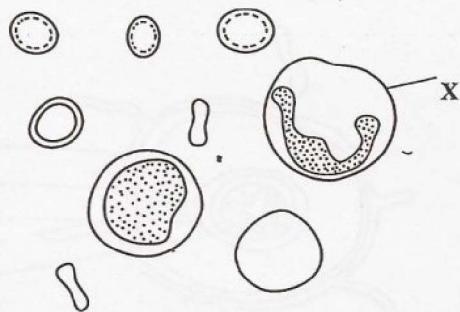
Item 21 refers to the following electronmicrograph which shows a mature sieve tube element and adjacent structures.



21. The structure labelled X is

- (A) a plastid
- (B) the sieve pore
- (C) the sieve plate
- (D) a companion cell

Item 22 refers to the following diagram of some components of blood.



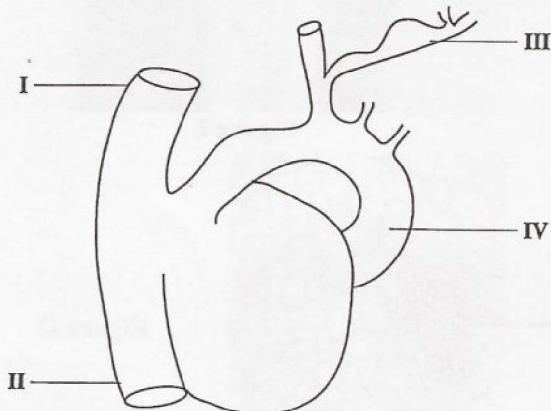
22. The cell labelled X in the diagram above is

- (A) a platelet
- (B) a monocyte
- (C) an erythrocyte
- (D) a neutrophil

23. Which of the following structures must be stimulated to increase heart rate?

- (A) Vena cava
- (B) Cardiac muscle
- (C) Sinoatrial node
- (D) Atrioventricular node

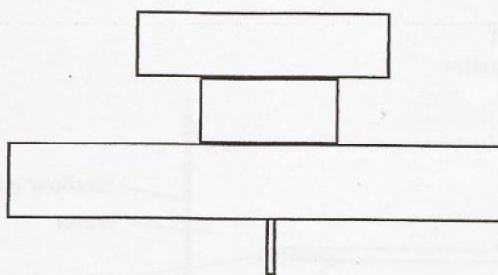
Item 24 refers to the following diagram of the heart and associated blood vessels.



24. The inferior vena cava is labelled as

- (A) I
- (B) II
- (C) III
- (D) IV

Item 10 refers to the following pyramid of numbers.



10. Which of the following food chains would MOST likely create the pyramid of numbers represented above?
- (A) Decayed leaf → earthworms → small birds → large birds  
(B) Tree → aphids → birds → fleas  
(C) Tree → ants → lizards → birds  
(D) Decayed leaf → bacteria → fleas → bird
11. The two MAIN products of oxidative phosphorylation in the mitochondrion are
- (A) ATP and water  
(B) NAD and FAD  
(C) oxygen and water  
(D) hydrogen and oxygen
12. Which of the following describes an ecosystem?
- (A) Producers + consumers + decomposers + non-living component  
(B) Producers + decomposers + habitats + non-living component  
(C) Producers + consumers + habitats + non-living component  
(D) Consumers + decomposers + habitats + non-living component

13. The number and range of different species found in an ecosystem are called its

- (A) biotic factors  
(B) abiotic factors  
(C) species diversity  
(D) community

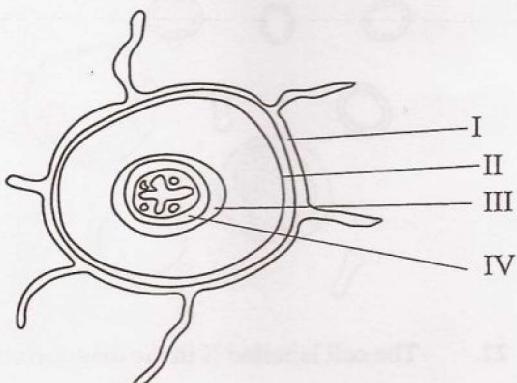
14. Which of the following statements describes the function of denitrifying bacteria in the nitrogen cycle?

- (A) Split the nitrogen molecule to form nitrites.  
(B) Split nitrogen molecules to form ammonium.  
(C) Convert ammonium compounds to nitrates.  
(D) Convert nitrates to atmospheric nitrogen.

15. Which of the following are true about biodiversity?

- I. Variety of species on earth.  
II. Can be defined at the genetic level.  
III. May be defined at the ecosystem level.  
IV. Relates only to endangered species.
- (A) I, II and III only  
(B) I, II and IV only  
(C) I, III and IV only  
(D) II, III and IV only

Item 16 refers to the following diagram which shows a transverse section of a typical dicotyledonous root.



16. The Caspary strip is found in the layer labelled

- (A) I
- (B) II
- (C) III
- (D) IV

Item 17 refers to the darkly staining material labelled X in Figure I, which is often found as the inner layer of Structure Y in Figure II.

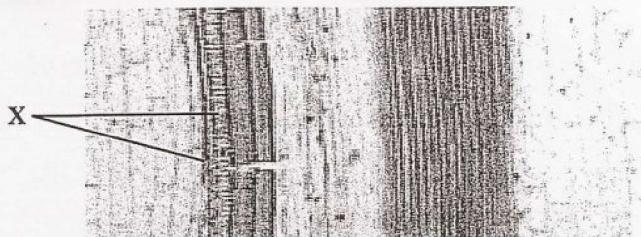


Figure I

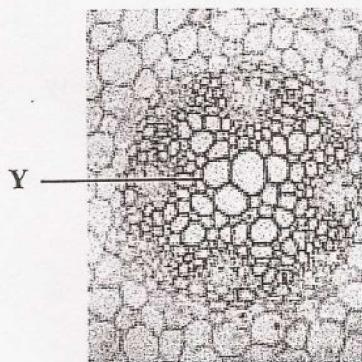
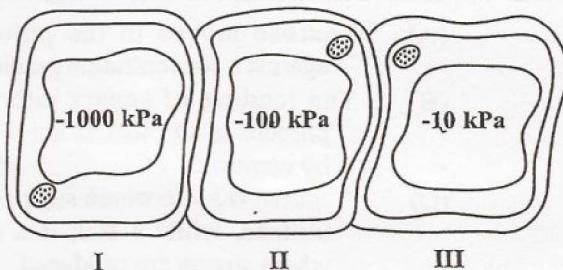


Figure II

17. What is the identity of X?

- (A) Starch
- (B) Lignin
- (C) Callose
- (D) Cellulose

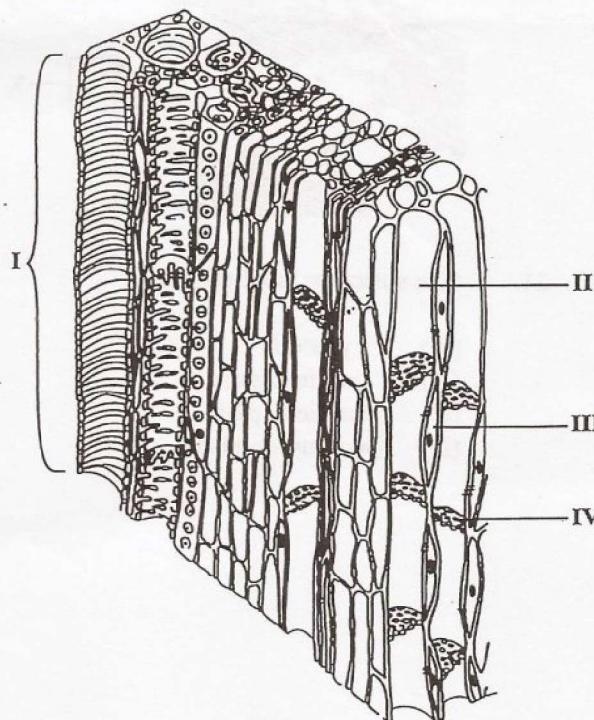
Item 18 refers to the following diagram which shows three adjacent plant cells, I, II and III. The values of their water potentials are given in kPa.



18. In which direction would there be a NET flow of water?

- (A) I → II and II → III
- (B) II → I and III → I
- (C) II → III and II → I
- (D) III → II and II → I

Item 19 refers to the following three-dimensional diagram of part of a plant stem.



19. Which labelled part is living but lacks a nucleus?

- (A) I
- (B) II
- (C) III
- (D) IV

25. The result of an increase in insulin production is

- (A) an increase in cell permeability to glucose
- (B) a fall in glucose conversion to glycogen
- (C) an increase in blood glucose sugar levels
- (D) an increase in conversion of glycogen to glucose

26. Bananas produced in the Caribbean are exported to markets all over the world. The bananas are harvested mature but still green, yet must arrive at the markets ready to eat. Which of the following procedures ensures that the fruit is still marketable after shipping?

- (A) Ethylene application and chilling during shipping
- (B) Storage of the fruit in chillers with minimum lighting
- (C) Use of carbon dioxide during shipping and ethylene application later
- (D) Storage of the fruit in chillers followed by increased temperature when approaching port

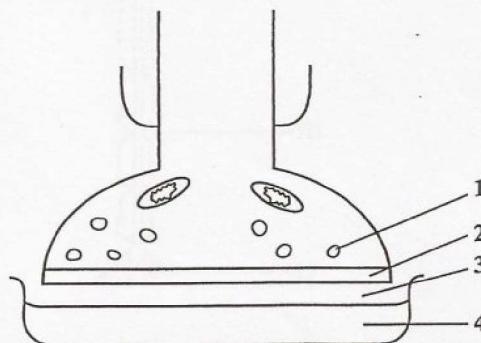
27. Which of the following structural features prevents molecules, with a molecular mass greater than 68 000, passing from the glomerular capillaries into Bowman's capsule?

- (A) The basement membrane of the epithelial cell of Bowman's capsule
- (B) The cell surface membrane of the endothelial cells of the capillaries
- (C) The cell surface membrane of the epithelial cells of the Bowman's capsule
- (D) The spaces between the extensions of the podocytes of Bowman's capsule

28. The speed of transmission of a nerve impulse is affected by the

- (A) strength of the impulse
- (B) concentration of acetyl choline
- (C) presence of the myelin sheath
- (D) amount of  $K^+$  that enters the neurone

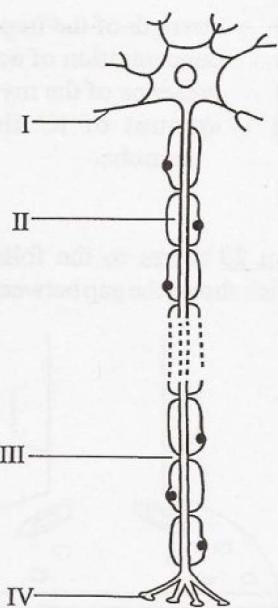
Item 29 refers to the following diagram which shows the gap between two neurones.



29. Where is acetyl choline stored and secreted?

	Stored	Secreted into
(A)	1	3
(B)	1	4
(C)	2	3
(D)	2	4

Item 30 refers to the following diagram of a neurone.



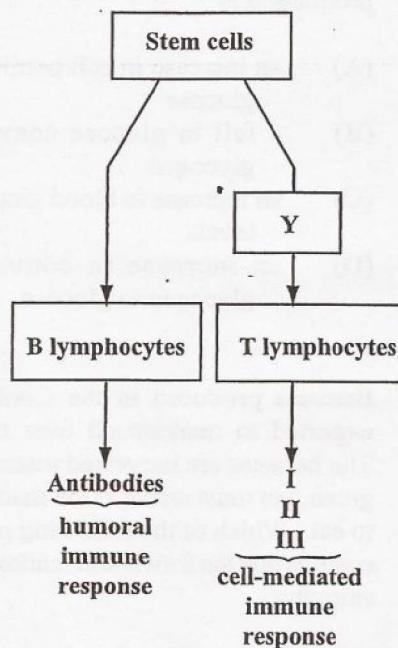
30. Which region assists in speeding up the conduction of nerve impulses?
- (A) I
  - (B) II
  - (C) III
  - (D) IV

31. AIDS is caused by a
- (A) retrovirus
  - (B) rhinovirus
  - (C) bacterium
  - (D) protozoan

32. Which of the following diseases is MOST appropriately matched to its category?

	Disease	Category
(A)	AIDS	Hereditary
(B)	Stroke	Degenerative
(C)	Diabetes	Infectious
(D)	Emphysema	Deficiency

Item 33 refers to the following diagram.

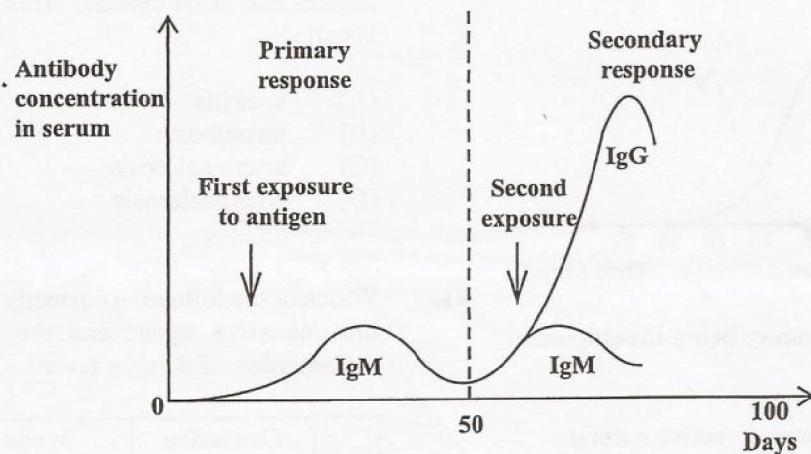


33. Which of the following correctly identifies the structure labelled Y?
- (A) Lymph node
  - (B) Thymus gland
  - (C) Hypothalamus
  - (D) Red bone marrow
34. Which of the following statements is NOT an explanation of the way in which antibodies work to protect the body from pathogens?
- (A) They cause agglutination of bacteria.
  - (B) They combine with viruses preventing them from damaging cells.
  - (C) They coat bacteria preventing phagocytosis from ingesting them.
  - (D) They attach to the flagella of bacteria making them easier for phagocytes to digest.

35. Which of the following are common uses of monoclonal antibodies?

- I. Prevention of transplant rejection
  - II. Early diagnosis of cholera
  - III. Tissue typing for transplants
  - IV. Pregnancy testing
- (A) I, II and III only  
(B) I, III and IV only  
(C) II, III and IV only  
(D) I, II, III and IV

Item 36 refers to the following diagram which shows antibody levels in blood serum after exposure to a particular antigen.



36. Which of the following immunoglobulins is/are important in the body's first response to an antigen?

- (A) IgG  
(B) IgM  
(C) IgM and IgG  
(D) IgG and IgM

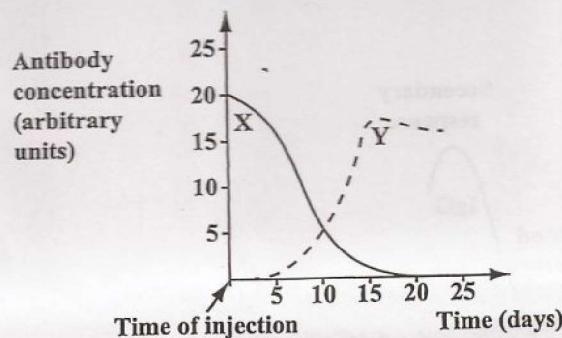
Item 37 refers to the following information.

Two types of immunity are investigated in patients suffering from tetanus.

Person X is injected with antibodies to the disease.

Person Y is injected with vaccine and produces antibodies as a result.

Blood samples are removed from both patients at regular intervals. The results are shown on the graph below.



37. The types of immunity being investigated are

- (A) passive natural, active natural
- (B) active artificial, active natural
- (C) active natural, passive artificial
- (D) passive artificial, active artificial

38. Which of the following is NOT a reason why energy requirements differ in people from birth to old age?

- (A) The amount of activity varies with occupation.
- (B) Metabolic rate reduces with age.
- (C) Gender makes no difference to energy needs.
- (D) As persons age they may be less active.

39. A runner prepares for six months to run a marathon by exercising for three hours daily. This MOST likely results in an increase in

- I. cardiac output
- II. tidal volume
- III. muscle size
- IV. blood pressure

- (A) I and II only
- (B) I, II and III only
- (C) I, III and IV only
- (D) II, III and IV only

40. Fatty deposits in arteries can contribute to strokes and heart disease. This condition is called

- (A) arthritis
- (B) thrombosis
- (C) arteriosclerosis
- (D) atherosclerosis

41. Which of the following correctly identifies the causative agent and the mode of transmission of dengue fever?

	Causative Agent	Mode of Transmission
(A)	Virus	Vector
(B)	Bacterium	Vector
(C)	Virus	Airborne
(D)	Bacterium	Airborne

42. After regular consumption of alcohol, fat accumulates in the liver. Which of the following provides an explanation for this?
- (A) Alcohol provides a substrate for the synthesis of fat molecules in the liver.  
(B) Alcohol damages liver cells, so they cannot convert fat into lipoproteins.  
(C) Alcohol acts as a buffer for fat, and absorbs the fat and stores it.  
(D) Alcohol is used by liver cells in preference to fat, as an energy source.
43. Which of the following BEST describes tolerance, a form of physical drug dependence?
- (A) A severe craving for a drug which interferes with a person's ability to function normally  
(B) Characterized by the continued desire for a drug, even after physical dependence is gone  
(C) Develops in persons who have used large quantities of substances such as alcohol and barbiturates  
(D) Occurs when the body becomes accustomed to a drug and requires ever-increasing amounts to achieve the same effect
44. It is believed that tar in cigarette smoke causes
- (A) the blood platelets to become sticky  
(B) more adrenaline to be released into the blood  
(C) blockage in blood vessels, resulting in less oxygen being transported  
(D) increased secretion of mucus from goblet cells in the epithelium
45. Which of the following interventions would be appropriate to include in an AIDS prevention programme?
- (A) A one-time lecture on the morals of sex outside of marriage  
(B) Basic education regarding the facts on HIV transmission  
(C) Providing information about personal hygiene  
(D) Publishing information on drugs used in the treatment of AIDS

**END OF TEST**

**IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.**



**CANDIDATE - PLEASE NOTE!**

You must sign below and return this booklet with the Answer Sheet. Failure to do so may result in disqualification.

Signature

TEST CODE 02207010

MAY/JUNE 2013

FORM TP2013146

CARIBBEAN EXAMINATIONS COUNCIL  
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®

BIOLOGY - UNIT 2

Paper 01

1 hour 30 minutes

14 JUNE 2013 (a.m.)

**READ THE FOLLOWING INSTRUCTIONS CAREFULLY.**

1. This test consists of 45 items. You will have 1 hour and 30 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Do not be concerned that the answer sheet provides spaces for more answers than there are items in this test.
4. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
5. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

Which of the following is NOT a form of energy storage?

- (A) ATP  
(B) Lipid  
(C) Alcohol  
(D) Lactic acid

Sample Answer

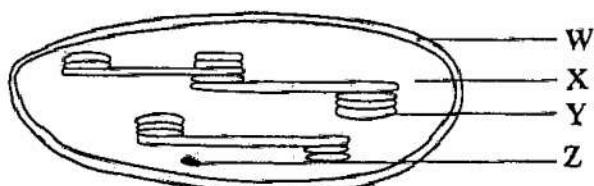
(B)  (C)  (D)

The best answer to this item is "ATP", so answer space (A) has been shaded.

6. If you want to change your answer, erase it completely and fill in your new choice.
7. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, omit it and go on to the next one. Your score will be the total number of correct answers.
8. You may do any rough work in this booklet.
9. Figures are not necessarily drawn to scale.
10. The use of non-programmable calculators is allowed.

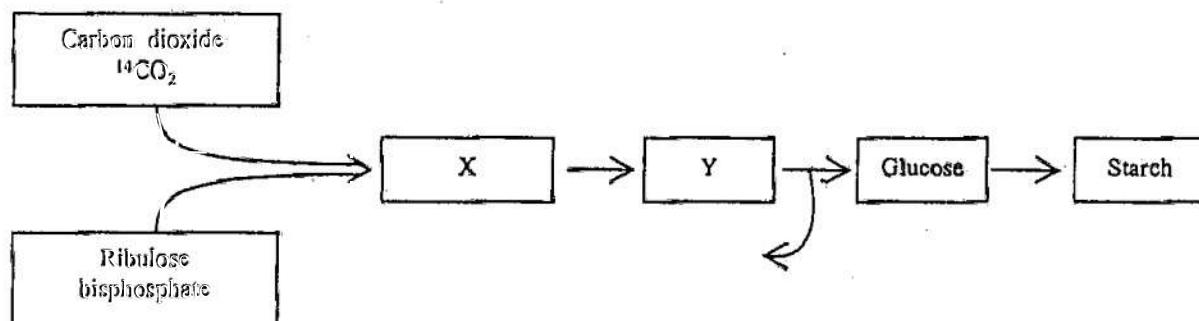
**DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.**

Item 1 refers to the following diagram which shows the structure of a chloroplast.



1. The photosystems are located in the structure labelled
  - (A) W
  - (B) X
  - (C) Y
  - (D) Z
  
2. The role of the antenna complex in Photosystems I and II is to
  - (A) produce oxygen
  - (B) regenerate RuBP
  - (C) produce carbohydrates
  - (D) collect light energy

Item 3 refers to the following diagram which outlines the events of the Calvin cycle.



3. Which of the following correctly identifies the compounds, X and Y?

- | X                        | Y                    |
|--------------------------|----------------------|
| (A) Phosphoglyceric acid | Triose phosphate     |
| (B) Triose phosphate     | Phosphoglyceric acid |
| (C) Simple sugars        | Proteins             |
| (D) Acetyl CoA           | Succinic acid        |

4. The yield of greenhouse crops is higher than that of field crops, due to increased photosynthetic activity by the plants. Which of the following factors MOST likely contribute to this?

- I. Constant application of farmyard manure
  - II. Rotation of plants
  - III. Humid air and moist soil conditions
  - IV. Higher than average carbon dioxide levels
- (A) I and II only  
(B) I and III only  
(C) II and IV only  
(D) III and IV only

5. Mitochondria in muscle have more cristae than mitochondria in skin cells. What is the significance of this?

- (A) Increased surface area for absorption of pyruvate for ATP production  
(B) Increased surface area for Kreb's cycle reactions  
(C) Steeper hydrogen ion concentration gradient in the mitochondria  
(D) More ATP-ase for ATP production

6. During aerobic respiration in mammals, pyruvic acid is

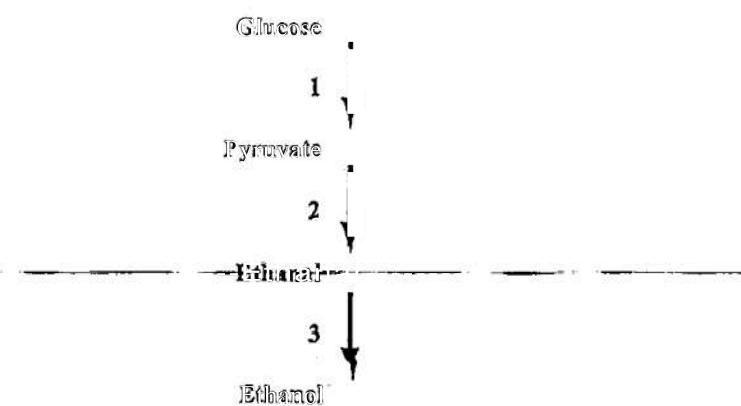
- (A) used in the Kreb's cycle  
(B) converted to lactic acid  
(C) used to synthesise glycogen  
(D) one of the products of the Kreb's cycle

7.

Which of the following contributes MOST electrons to the electron transport chain?

- (A) Glycolysis  
(B) Kreb's cycle  
(C) Calvin cycle  
(D) Fermentation

Item 8 refers to the following flow diagram which shows the pathways involved in anaerobic respiration in yeast.

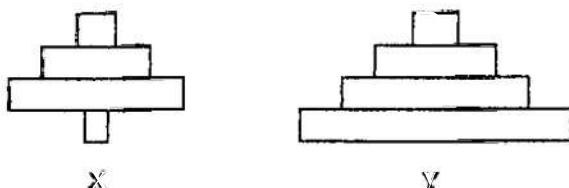


8.

Which of the stages, labelled 1, 2 and 3, involve(s) decarboxylation?

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

Item 9 refers to the following two types of biological pyramids, labelled X and Y, which represent different parameters of a particular food chain.



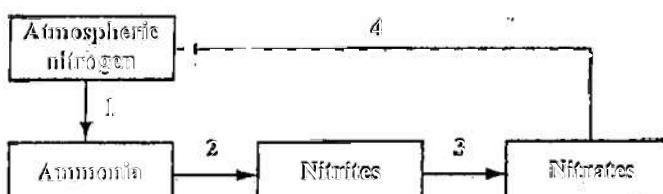
9. Which of the following correctly identifies the pyramids and the appropriate FIRST trophic level?

	X	Y	First Trophic Level
(A)	Number	Biomass	Evergreen tree
(B)	Biomass	Number	Phytoplankton
(C)	Biomass	Number	Evergreen tree
(D)	Number	Biomass	Phytoplankton

10. In the 1950's, G. R. Gause observed that two species of flour beetle, *Tribolium confusum* and *Tribolium castaneum*, survived well on their own. However, when they were put together, only one of the species survived. This resulted in the hypothesis called Gause's Competitive Exclusion Principle which states that no two species can co-exist if they occupy the same

- (A) niche
- (B) habitat
- (C) ecosystem
- (D) environment

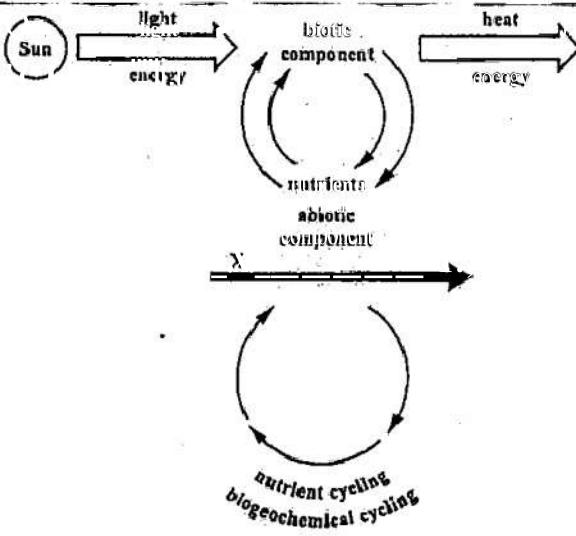
Item 11 refers to the following diagram which shows the nitrogen cycle.



11. At which stage does denitrification occur?

- (A) 1
- (B) 2
- (C) 3
- (D) 4

Item 12 refers to the following diagram which is a schematic summary of the operational processes in an ecosystem.



12. The arrow labelled X MOST likely represents

- (A) energy flow
- (B) water flow
- (C) recycling of faecal wastes
- (D) positive feedback mechanisms

13. The number and range of different species found in an ecosystem are called its

- (A) biotic factors
- (B) abiotic factors
- (C) species diversity
- (D) community

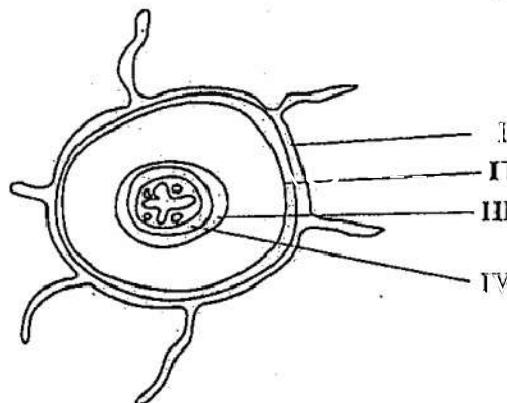
14. Which of the following does NOT explain how deforestation might increase the risk of flooding?

- (A) The water cycle is disrupted.
- (B) Tree roots bind soil particles together.
- (C) Tree canopy prevents rain beating down on the soil.
- (D) Soil nutrients are lost through leaching and run-off water.

15. Which of the following is NOT a conservation method used to maintain biodiversity?

- (A) Seed bank
- (B) Botanic garden
- (C) Protected reserve
- (D) Genetic engineering

Item 16 refers to the following diagram which shows a transverse section of a typical dicotyledonous root.



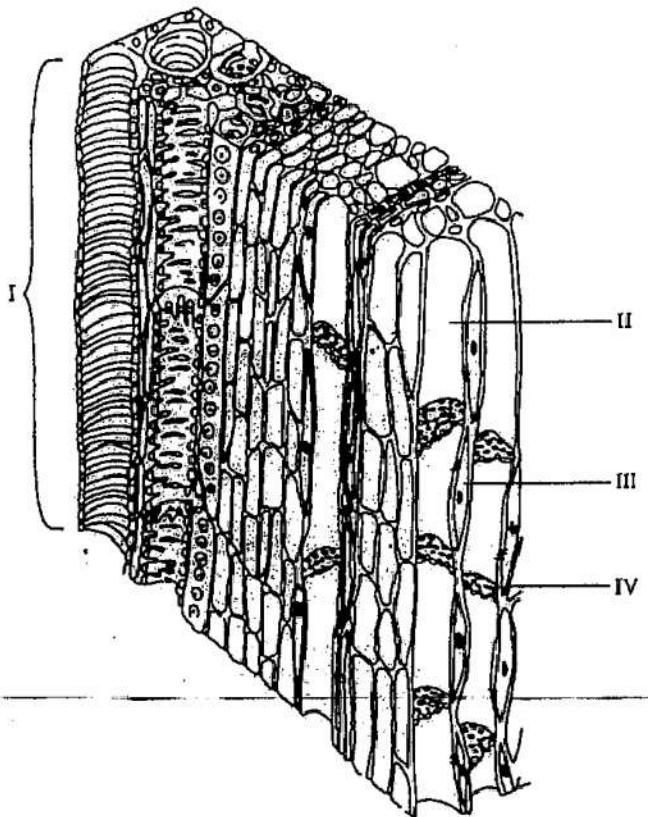
16. The Caspary strip is found in the layer labelled

- (A) I
- (B) II
- (C) III
- (D) IV

17. In a study of water movement in plants, the cut end of a leafy shoot is placed in a dilute solution of a dye. After a few hours, deposits of the dye accumulate in the leaves. The rate of movement of the dye up the stem is NOT increased by

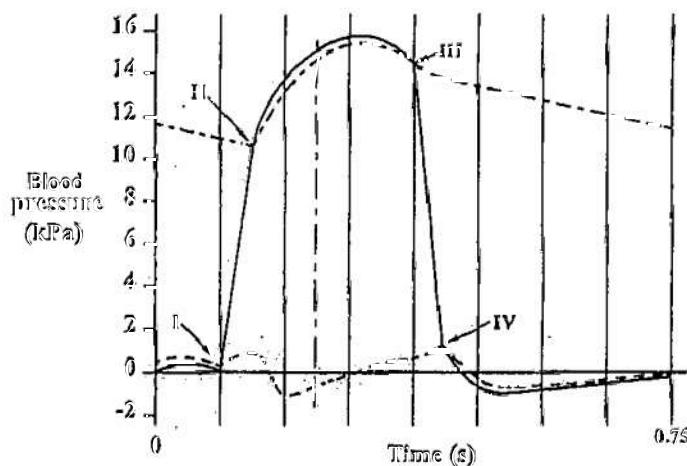
- (A) humidity
- (B) wind speed
- (C) temperature
- (D) darkness

Item 18 refers to the following three-dimensional diagram of part of a plant stem.



18. Which labelled part contains rough endoplasmic reticulum?
- (A) I  
(B) II  
(C) III  
(D) IV
19. Which of the following statements is true according to the mass (pressure) flow hypothesis?
- (A) Sucrose moves in the phloem against a concentration gradient.  
(B) The loading of sugars into the phloem in the leaf is achieved by osmosis.  
(C) A source is a site where sugars are utilized, while a sink is a site where sugars are produced.  
(D) Water is actively transported from the intercellular spaces into the cell sap at the root end of the system.
20. The tunica externa found in the walls of arteries and veins is made up of MAINLY
- (A) elastic fibres  
(B) collagen fibres  
(C) smooth muscle  
(D) squamous epithelium

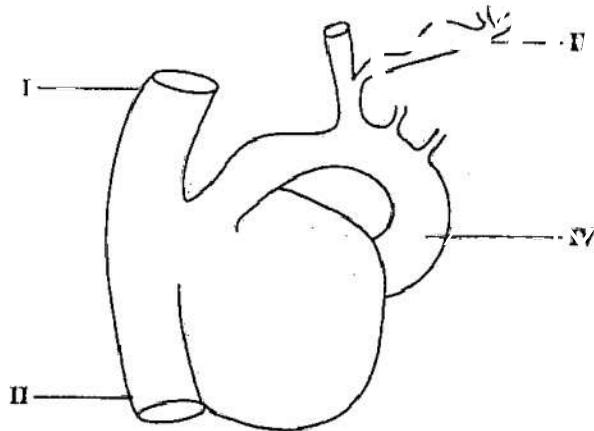
Item 21 refers to the following graph which shows changes in blood pressure in the left ventricle during the cardiac cycle.



21. Valves open and close due to changes in pressure. Which of the following labels, I, II, III and IV, correctly identifies the point on the graph when the aortic valve closes?

- (A) I
- (B) II
- (C) III
- (D) IV

Item 22 refers to the following diagram of the heart and associated blood vessels.



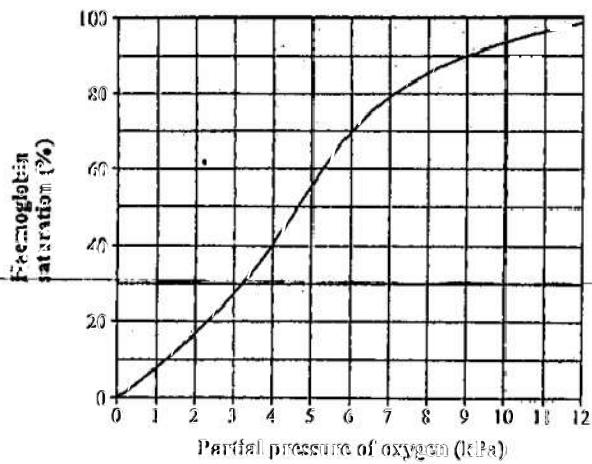
22. The inferior vena cava is represented by

- (A) I
- (B) II
- (C) III
- (D) IV

23. Which of the following structures must be stimulated to increase heart rate?

- (A) Vena cava
- (B) Cardiac muscle
- (C) Sino-atrial node
- (D) Atrio-ventricular node

Item 24 refers to the following graph which shows the sigmoid (S-shaped) dissociation curve for haemoglobin of a human adult.



24. During cycling, the partial pressure of oxygen found in the pulmonary vein leaving the lungs and in a vein leaving a muscle is MOST likely

	pO <sub>2</sub> (kPa) in Pulmonary Vein Leaving Lungs	pO <sub>2</sub> (kPa) in Vein Leaving Muscle
(A)	0	12
(B)	2	12
(C)	6	6
(D)	12	2

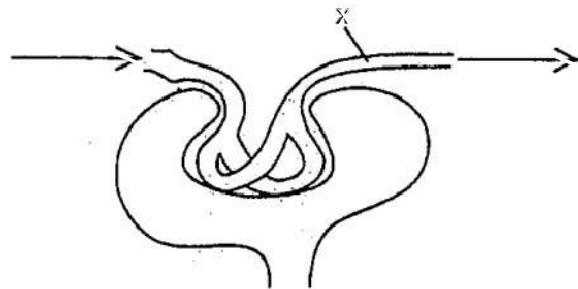
25. Which of the following is an example of positive feedback?

- (A) Temperature regulation
- (B) Blood glucose regulation
- (C) Generation of an action potential
- (D) Regulation of water levels in the body by ADH

26. When a decrease in normal blood glucose concentration is detected, Hormone X is secreted. What is Hormone X and precisely where is it produced?

	Hormone X	Location Produced
(A)	Insulin	α cells in pancreas
(B)	Insulin	β cells in pancreas
(C)	Glucagon	α cells in pancreas
(D)	Glucagon	β cells in pancreas

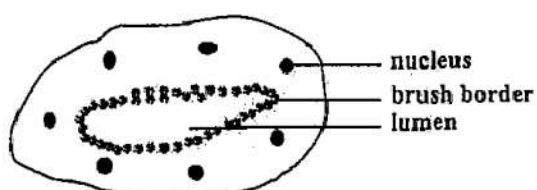
Item 27 refers to the following diagram of the glomerulus and Bowman's capsule of a nephron.



27. If the diameter of the blood vessel is made smaller at X, a possible outcome is that

- (A) the rate of ultrafiltration will increase
- (B) the rate of ultrafiltration will decrease
- (C) water re-absorption will decrease
- (D) the rate of urine production will decrease

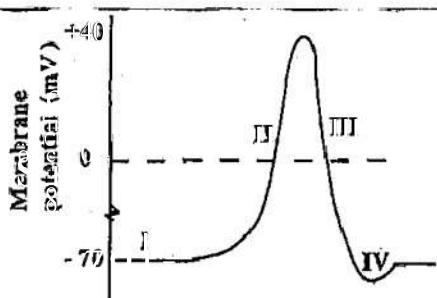
Item 28 refers to the following illustration of a section of a kidney nephron, drawn by a student.



28. The drawing above MOST likely represents the

- (A) proximal convoluted tubule
- (B) distal convoluted tubule
- (C) loop of Henle
- (D) collecting duct

Item 29 refers to the following diagram.



29. Diffusion of sodium ions into the axon occurs at

- (A) I
- (B) II
- (C) III
- (D) IV

30. Which region assists in speeding up the conduction of nerve impulses?

- (A) I
- (B) II
- (C) III
- (D) IV

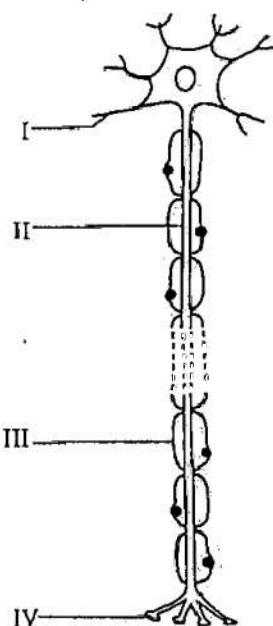
31. AIDS is caused by a

- (A) retrovirus
- (B) rhinovirus
- (C) bacterium
- (D) protozoan

32. A disease that develops slowly and persists for a long time is BEST described as

- (A) acute
- (B) chronic
- (C) degenerative
- (D) self-inflicted

Item 30 refers to the following diagram of a neurone.



33. A highly malignant tumour linked to ultraviolet radiation is a
- (A) sarcoma  
(B) melanoma  
(C) lymphoma  
(D) papilloma
34. Which of the following types of lymphocytes do NOT release lymphokines when stimulated?
- (A) Killer T-cells  
(B) Helper T-cells  
(C) Memory T-cells  
(D) Suppressor T-cells
35. The monomers that make up the heavy and light chains of an antibody molecule are joined by
- (A) peptide bonds  
(B) hydrogen bonds  
(C) glycosidic bonds  
(D) disulphide bonds
36. Which of the following statements BEST describes the term 'immune response'?
- (A) Formation of blood clots to limit the entry of foreign organisms  
(B) Production of cells and substances which recognize and eliminate foreign organisms  
(C) Secretion of mucus to trap foreign organisms at the skin  
(D) Recognition and protection of self-cells
37. Which of the following is true for mast cells?
- (A) They are found in lymph nodes only.  
(B) They are the smallest circulating granulocytes.  
(C) They are large granulocytes which engulf pathogens.  
(D) They contain many granules rich in histamine and heparin.
38. A key feature of monoclonal antibodies is that they are manufactured by
- (A) mast cells  
(B) cancer cells  
(C) one type of B-cell  
(D) one type of T-cell.
39. Which of the following is NOT an example of the use of monoclonal antibodies?
- (A) Locating tumours  
(B) Detecting pregnancy  
(C) Diagnosing AIDS  
(D) Diagnosing dengue fever
40. Body Mass Index (BMI) may be used as an indicator for obesity. Which of the following BMI values BEST reflects that of an obese individual?
- (A) 25  
(B) 27  
(C) 29  
(D) 31
41. Injecting virus antigens into the body results in
- (A) natural immunity  
(B) artificial immunity  
(C) an antigenic drift  
(D) an antigenic shift

42. Which of the following BEST describes the disease atherosclerosis?
- (A) Extensive damage to the endothelial lining of the arteries  
(B) Formation of large blood clots in arteries  
(C) Build-up of plaque in the walls of arteries  
(D) Calcification of the walls of arteries
43. Item 43 refers to the following table which shows the number of cases of dengue haemorrhagic fever (per 100 000 inhabitants) reported in the Americas for 2001 and 2002.
- | 2001  | 2002   |
|-------|--------|
| 5 000 | 15 000 |
44. It is believed that tar in cigarette smoke causes
- (A) the blood platelets to become sticky  
(B) more adrenaline to be released into the blood  
(C) blockage in blood vessels, resulting in less oxygen being transported  
(D) increased secretion of mucus from goblet cells in the epithelium
45. Which two stages of alcoholic liver disease are reversible?
- (A) Liver cells are replaced by fibrous scar tissue, and the liver becomes swollen and fatty.  
(B) Liver becomes swollen and fatty, and inflammation of the liver.  
(C) Liver cells are replaced by fibrous scar tissue, and inflammation of the liver.  
(D) Liver becomes swollen and fatty, and liver cirrhosis.

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.



CANDIDATE - PLEASE NOTE	
You must sign below and return this booklet with the Answer Sheets. Failure to do so may result in disqualification.	
<hr/> <hr/> <hr/>	
Signature	

TEST CODE 02207010

FORM TP2014143

MAY/JUNE 2014

CARIBBEAN EXAMINATIONS COUNCIL  
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®  
BIOLOGY - UNIT 2

Paper 01

1 hour 30 minutes

13 JUNE 2014 (a.m.)

**READ THE FOLLOWING INSTRUCTIONS CAREFULLY.**

1. This test consists of 45 items. You will have 1 hour and 30 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Do not be concerned that the answer sheet provides spaces for more answers than there are items in this test.
4. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
5. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

Which of the following is NOT a form of energy storage?

- (A) ATP  
(B) Lipid  
(C) Alcohol  
(D) Lactic acid

Sample Answer

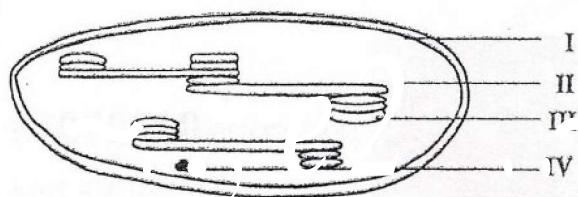
(B)  (C)  (D)

The best answer to this item is "ATP", so answer space (A) has been shaded.

6. If you want to change your answer, erase it completely and fill in your new choice.
7. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, omit it and go on to the next one. Your score will be the total number of correct answers.
8. You may do any rough work in this booklet.
9. Figures are not necessarily drawn to scale.
10. The use of non-programmable calculators is allowed.

**DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.**

**Item 1** refers to the following diagram which shows the structure of a chloroplast.



1. The photosystems are located in which of the structures labelled I to IV?

- (A) I
- (B) II
- (C) III
- (D) IV

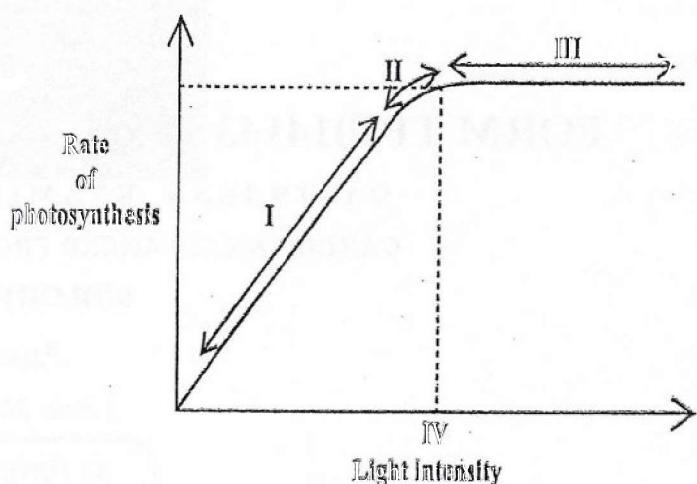
2. The role of the antenna complex in Photosystems I and II is to

- (A) produce oxygen
- (B) regenerate RuBP
- (C) produce carbohydrates
- (D) collect light energy

3. Which of the following occur in the Calvin cycle?

- (A) Fixation of carbon dioxide and production of ATP
- (B) Fixation of carbon dioxide and regeneration of RuBP
- (C) Oxidation of NADPH and production of ATP
- (D) Reduction of NADP and regeneration of RuBP

**Item 4** refers to the following graph which shows the effects of increasing light intensity on the rate of photosynthesis.



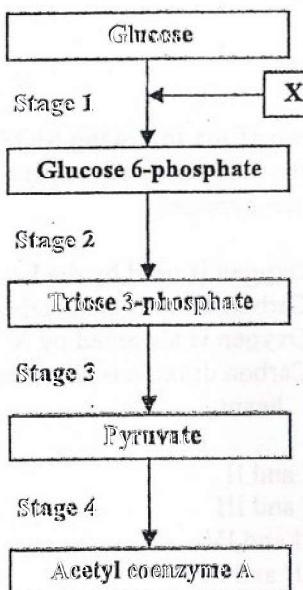
4. At which of the stages labelled I, II, III and IV would light be a limiting factor?

- (A) I
- (B) II
- (C) III
- (D) IV

5. Mitochondria in muscle have more cristae than mitochondria in skin cells. What is the significance of this?

- (A) Increased surface area for absorption of pyruvate for ATP production
- (B) Steeper hydrogen ion concentration gradient in the mitochondria
- (C) Increased surface area for Kreb's cycle reactions
- (D) More ATP-ase for ATP production

Items 6-7 refer to the following diagram which shows an outline of glycolysis.



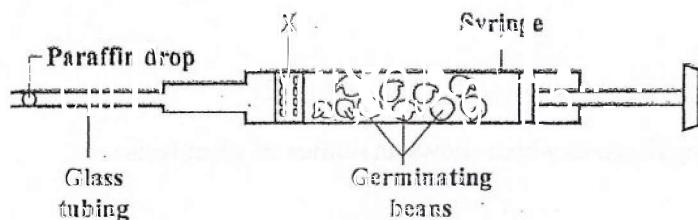
6. Which of the following is the name of Substance X?

- (A) ATP
- (B) ADP
- (C) NAD
- (D) NADH

7. Which of the following correctly identifies the location of Stage 4 in a eukaryotic cell?

- (A) Cytoplasm
- (B) Cristae of mitochondrion
- (C) Matrix of mitochondrion
- (D) Inter-membranal space of mitochondrion

Items 8–9 refer to the following diagram which shows a simple respirometer.



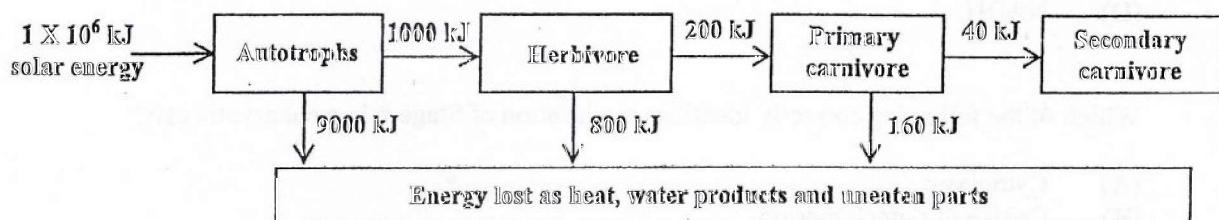
8. The chemical at X is MOST likely

- (A) sodium chloride
- (B) sodium carbonate
- (C) potassium hydroxide
- (D) potassium carbonate

9. Which two of the following MOST likely explain the movement of the paraffin drop towards the syringe?

- I. Oxygen is used by the beans.
  - II. Carbon dioxide is absorbed by X.
  - III. Oxygen is absorbed by X.
  - IV. Carbon dioxide is absorbed by the beans.
- 
- (A) I and II
  - (B) I and III
  - (C) II and IV
  - (D) III and IV

Item 10 refers to the following diagram of energy flow in a food chain.



10. Which of the following would represent the total amount of energy acquired by the producer?

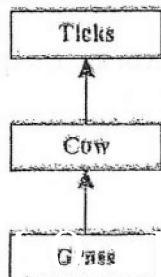
- (A) 10 kJ
- (B) 1 000 kJ
- (C) 10 000 kJ
- (D) 100 000 kJ

GO ON TO THE NEXT PAGE

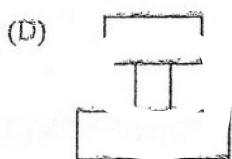
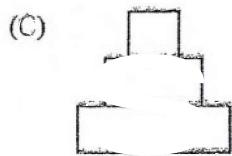
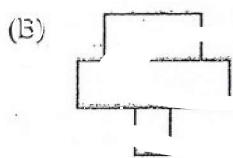
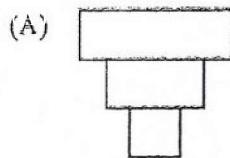
11. The way in which the specific environment is exploited by an organism is an appropriate definition for
- (A) a habitat
  - (B) an ecosystem
  - (C) a trophic level
  - (D) an ecological niche

Item 12 refers to the following information.

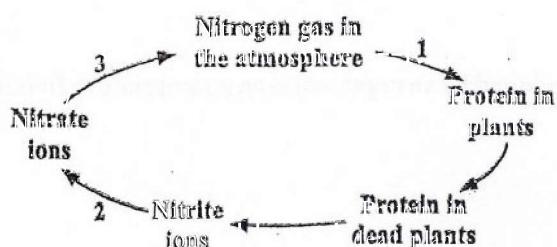
Ticks are parasites of cows. A single cow can be parasitized by several thousand ticks. A possible food chain involving ticks is as follows.



12. Which of the following would represent a pyramid of numbers based on the above food chain?



Item 13 refers to the following diagram which shows part of the nitrogen cycle.



13. Which of the following shows the types of bacteria that are involved in Steps 1, 2 and 3?

	Nitrogen-fixing Bacteria	Denitrifying Bacteria	Nitrifying Bacteria
(A)	1	3	2
(B)	2	1	3
(C)	3	1	2
(D)	3	2	1

14. Which of the following does NOT explain how deforestation might increase the risk of flooding?

- (A) The water cycle is disrupted.
- (B) Tree roots bind soil particles together.
- (C) Tree canopies prevent rain beating down on the soil.
- (D) Soil nutrients are lost through leaching and run-off water.

15. Which of the following is NOT a conservation method used to maintain biodiversity?

- (A) Sperm bank
- (B) Botanic garden
- (C) Protected reserve
- (D) Genetic engineering

16. Which of the following substances are correctly paired for the cells given in the table?

- I. Suberin
- II. Lignin
- III. Cellulose
- IV. Pectin

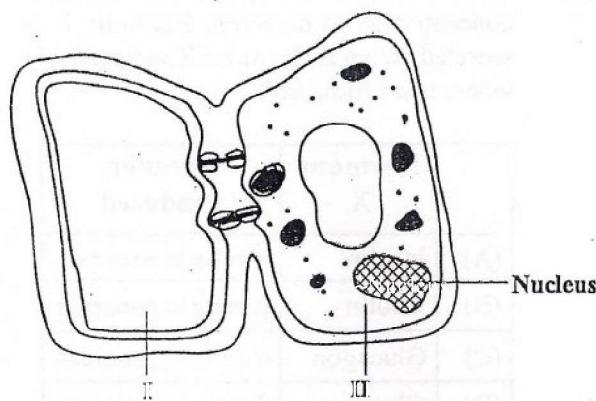
(A)	Endodermis	I and II
(B)	Guard cells	I and IV
(C)	Xylem	II and III
(D)	Phloem	III and IV

17. In a study of water movement in plants, the cut end of a leafy shoot is placed in a dilute solution of a dye. After a few hours, deposits of the dye accumulate in the leaves.

The rate of movement of the dye up the stem is NOT increased by

- (A) humidity
- (B) wind speed
- (C) temperature
- (D) darkness

Items 18–19 refer to the following diagram which shows a representation of an electron micrograph of a transverse section of two cells in the phloem tissue of the stem of a plant.



18. The cell labelled I is a

- (A) fibre cell
- (B) companion cell
- (C) parenchyma cell
- (D) sieve tube element

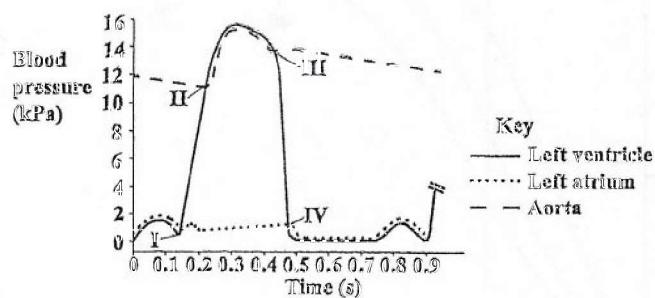
19. Which of the following is NOT an indication of how Cell II is specially adapted to its function?

- (A) It is very active metabolically.
- (B) The walls are impregnated with lignin.
- (C) The end walls are perforated by plasmodesmata.
- (D) It has an exceptionally high density of mitochondria.

20. Which of the following processes facilitates the loading of sugar into phloem vessels?

- (A) Osmosis
- (B) Endocytosis
- (C) Active transport
- (D) Facilitated diffusion

Items 21–22 refer to the following graph which shows blood pressure changes in the heart during the cardiac cycle.



21. The atrioventricular valves open at

- (A) I
- (B) II
- (C) III
- (D) IV

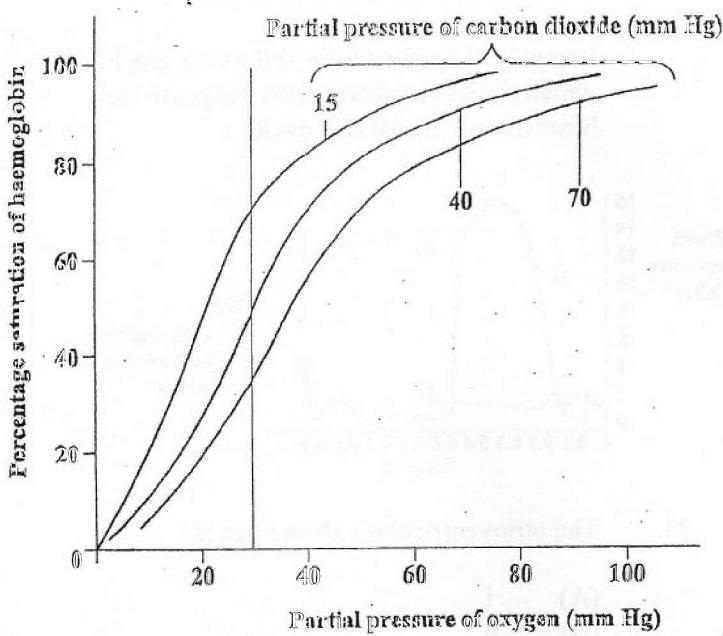
22. At which of the following stages are the heart sounds, 'lub' and 'dub' produced?

- (A) I and II
- (B) I and III
- (C) II and III
- (D) II and IV

23. Which of the following structures must be stimulated to increase heart rate?

- (A) Vena cava
- (B) Sinoatrial node
- (C) Cardiac muscle
- (D) Atrioventricular node

Item 24 refers to the following graph which shows the oxygen dissociation curves of haemoglobin at three different partial pressures of carbon dioxide.



24. From the graph, it can be deduced that
- (A) at high partial pressures of carbon dioxide, the rate of release of oxygen from haemoglobin increases
  - (B) at low partial pressures of carbon dioxide, the rate of release of oxygen from haemoglobin increases
  - (C) at low partial pressures of oxygen, the rate of release of oxygen from haemoglobin decreases
  - (D) at high partial pressures of oxygen, the rate of release of oxygen from haemoglobin increases

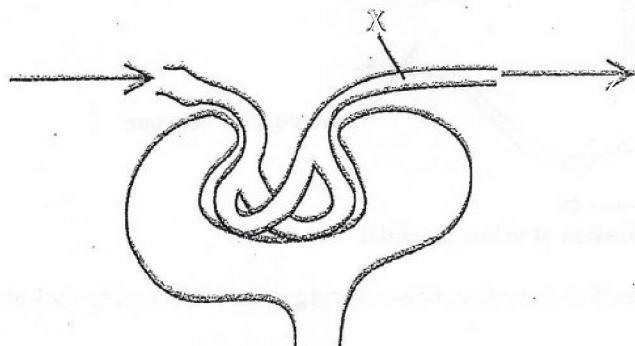
25. Which of the following is an example of positive feedback?

- (A) Temperature regulation
- (B) Blood glucose regulation
- (C) Generation of an action potential
- (D) Regulation of water levels in the body by ADH

26. When a decrease in normal blood glucose concentration is detected, Hormone X is secreted. What is Hormone X and precisely where is it produced?

	Hormone X	Location Produced
(A)	Insulin	$\alpha$ cells in pancreas
(B)	Insulin	$\beta$ cells in pancreas
(C)	Glucagon	$\alpha$ cells in pancreas
(D)	Glucagon	$\beta$ cells in pancreas

Item 27 refers to the following diagram of the glomerulus and Bowman's capsule of a nephron.

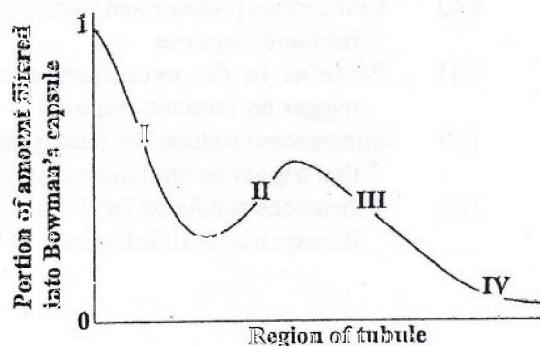


27. If the diameter of the blood vessel is made smaller at X, a possible outcome is that

- (A) the rate of ultrafiltration will be increased
- (B) the rate of ultrafiltration will be decreased
- (C) water re-absorption will be decreased
- (D) the rate of urine production will be reduced

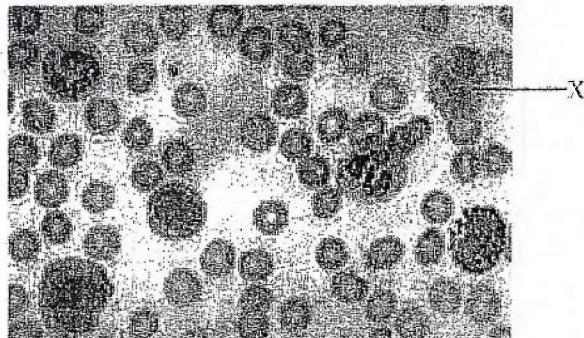
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Item 28 refers to the following graph which shows the sodium ion concentration as fluid passes along the kidney tubule.



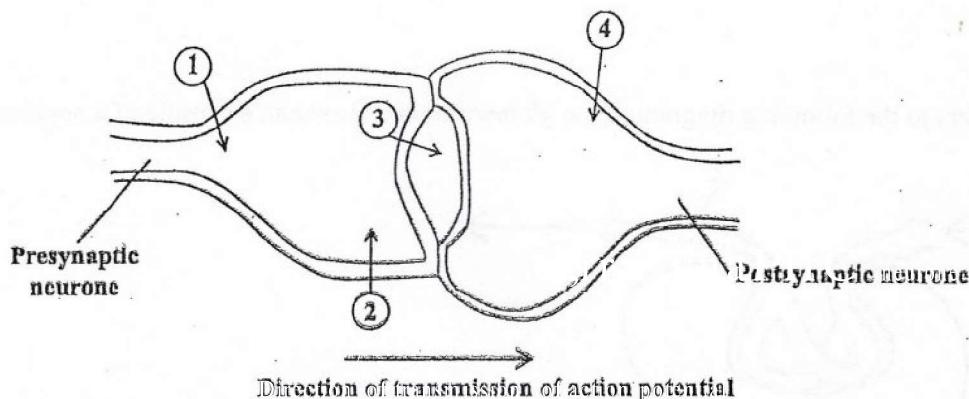
28. The region of the descending loop of Henlé is
- (A) I
  - (B) II
  - (C) III
  - (D) IV

Item 29 refers to the following photomicrograph of a human blood smear showing erythrocytes and leucocytes.



29. The blood cell labelled X is
- (A) an erythrocyte
  - (B) a granulocyte
  - (C) a lymphocyte
  - (D) a monocyte

Item 30 refers to the following diagram which shows a synapse. The numbered arrows represent movement of substances across the neurone membranes.



30. Which of the following correctly identifies the substances moving across the membranes at points 1, 2, 3 and 4?

	1	2	3	4
(A)	K <sup>+</sup>	Ca <sup>2+</sup>	Ca <sup>2+</sup>	Na <sup>+</sup>
(B)	K <sup>+</sup>	Na <sup>+</sup>	Acetylcholine	Ca <sup>2+</sup>
(C)	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>2+</sup>	Acetylcholine
(D)	Na <sup>+</sup>	Ca <sup>2+</sup>	Acetylcholine	Na <sup>+</sup>

Item 31 refers to the following table which shows the number of cases of dengue haemorrhagic fever (per 100 000 inhabitants) reported in the Americas for 2001 and 2002.

2001	2002
5 000	15 000

31. Which of the following represents the incidence rate for the period 2001 to 2002?

- (A) 0.05  
(B) 0.10  
(C) 0.15  
(D) 0.20

32. Which of the following BEST describes antigens?

- (A) Cell surface proteins that trigger an immune response  
(B) Proteins in the cytoplasm that trigger an immune response  
(C) Substances produced by pathogens that trigger an immune response  
(D) Substances produced by the body in response to an infection

33. A highly malignant tumour linked to ultraviolet radiation is a
- (A) sarcoma  
(B) melanoma  
(C) lymphoma  
(D) papilloma
34. T-lymphocytes mature in the
- (A) bone marrow  
(B) lymph nodes  
(C) spleen  
(D) thymus
35. The monomers that make up the heavy and light chains of an antibody molecule are joined by
- (A) peptide bonds  
(B) hydrogen bonds  
(C) glycosidic bonds  
(D) disulphide bonds
36. Which of the following is a possible response of the immune system to an invading pathogen?
- (A) T-lymphocytes produce antibodies.  
(B) B-lymphocytes produce antigens.  
(C) T-lymphocytes become activated.  
(D) B-lymphocytes phagocytose the pathogen.
37. Passive artificial immunity is effective but only for a short time. Which of the following is the BEST explanation for this?
- (A) Antigens are rapidly destroyed.  
(B) Antibodies are rapidly broken down.  
(C) Phagocytes have a short life span.  
(D) Memory cells have a short life span.
38. The presence of a hormone is used as the basis for a pregnancy test. Which of the following hormones is present in the urine of a pregnant woman?
- (A) Oestrogen  
(B) Progesterone  
(C) Follicle-stimulating hormone  
(D) Human chorionic gonadotropin
39. Cerebral haemorrhage MOST likely describes
- (A) stroke  
(B) angina  
(C) hypertension  
(D) coronary heart disease
40. Which of the following is NOT a health benefit of exercise?
- (A) Enhanced utilization of fat  
(B) Speeding up of atherosclerosis  
(C) Improved resistance to infection  
(D) Reduced risk of coronary heart diseases
41. One per cent of the human population is not susceptible to HIV. This is due to
- (A) phagocytosis of the virus by macrophages  
(B) the development of antibodies against the virus  
(C) a mutation preventing binding of HIV to T-cells  
(D) a mutation preventing binding of HIV to B-cells

42. Which of the following BEST describes the disease atherosclerosis?
- (A) Extensive damage to the endothelial lining of the arteries  
(B) Formation of large blood clots in arteries  
(C) Build-up of plaque in the walls of arteries  
(D) Calcification of the walls of arteries
43. The progressive decrease in response to a drug as the human body adapts to its presence is called
- (A) craving  
(B) adaptation  
(C) tolerance  
(D) dependence
44. Which of the following is likely to be the MOST effective in preventing a person from becoming infected with the dengue virus?
- (A) A poster describing the life cycle of the dengue virus  
(B) Ensuring that all water storage drums are securely covered  
(C) Introducing fish into garden ponds  
(D) Regular personal use of insect repellents
45. Which two stages of alcoholic liver disease are reversible?
- (A) Liver becomes swollen and fatty, and liver cirrhosis.  
(B) Liver becomes swollen and fatty, and inflammation of the liver.  
(C) Liver cells are replaced by fibrous scar tissue, and inflammation of the liver.  
(D) Liver cells are replaced by fibrous scar tissue, and liver becomes swollen and fatty.

END OF TEST

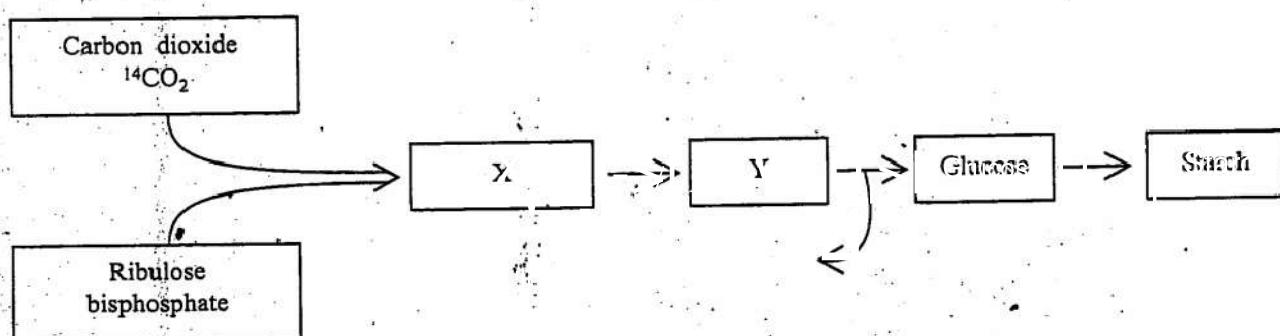
**IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.**

Cape Biology  
Unit 2

- 2 -

1. Which of the following combinations of functions correctly describes the role of a dicotyledonous leaf?
- I. Control of transpiration
  - II. Removal of poisonous gases from the air
  - III. Absorption of radiant energy
  - IV. Food storage
- (A) I and II only  
 (B) I, II, and III only  
 (C) I, III, and IV only  
 (D) I, II, III and IV
2. Which of the following are products of photophosphorylation?
- I. ATP
  - II. ADP
  - III. NADP
  - IV. NADPH
- (A) I and III only  
 (B) I and IV only  
 (C) II and III only  
 (D) III and IV only

Item 3 refers to the following diagram which outlines the events of the Calvin cycle.



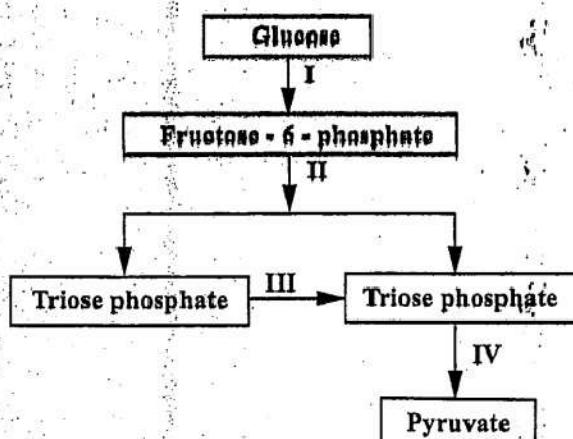
3. Which of the following correctly identifies the compounds, X and Y?

- |     | X                    | Y                    |
|-----|----------------------|----------------------|
| (A) | Phosphoglyceric acid | Triose phosphate     |
| (B) | Triose phosphate     | Phosphoglyceric acid |
| (C) | Simple sugars        | Proteins             |
| (D) | Acetyl CoA           | Succinic acid        |

4. On a warm, sunny day, photosynthesis is limited by

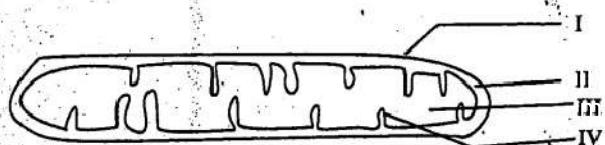
- (A) temperature
- (B) light intensity
- (C) oxygen availability
- (D) carbon dioxide availability

- Item 5 refers to the following schematic diagram which summarizes the main steps in glycolysis.



5. At what stage does oxidative phosphorylation occur?
- (A) I  
(B) II  
(C) III  
(D) IV

- Item 6 refers to the following diagram of a mitochondrion.



6. Decarboxylation during respiration occurs at
- (A) I  
(B) II  
(C) III  
(D) IV

7. Which of the following lists the chemical groupings found within an ATP molecule?

- (A) Base, sugar, phosphate group  
(B) Base, protein, phosphate group  
(C) Amino acid, base, phosphate group  
(D) Amino acid, sugar, phosphate group

8. Yeast is a key component in wine making. The MAIN purpose of the yeast is to

- (A) ferment starch to release ethanol and oxygen  
(B) promote carbon dioxide production to aerate wine  
(C) ferment sugar to form ethanol and carbon dioxide  
(D) promote glycerol production to make the wine sweeter

9. Which of the following contributes the MOST electrons to the electron transport chain?

- (A) Glycolysis  
(B) Kreb's cycle  
(C) Calvin cycle  
(D) Fermentation

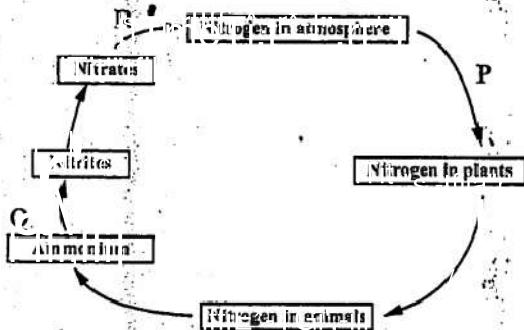
10. When a species plays a role in its community, it is said to be in its

- (A) habitat  
(B) population  
(C) ecosystem  
(D) ecological niche

11. Which of the following combinations represent limitations of using pyramids of energy to describe relationships between trophic levels in ecosystems?

- A single grass plant has the same status as a tree.
  - It requires combustion of representative samples, which may be time-consuming.
  - It may be difficult to assign a species to one trophic level, for example, omnivores.
  - True pyramid shapes are not always obtained as some may be inverted.
- (A) I and II only  
 (B) I and III only  
 (C) II and III only  
 (D) II, III and IV only

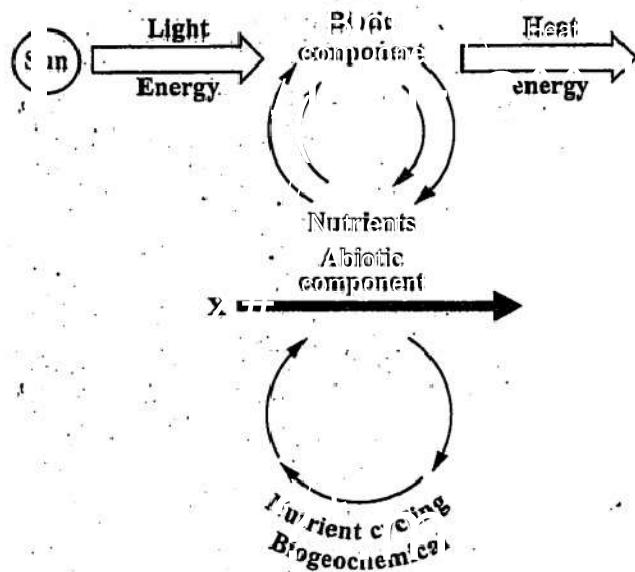
Item 12 refers to the following diagram, where P, Q and R represent bacteria that are active in the nitrogen cycle.



12. Which of the following combinations correctly identifies the bacteria P, Q and R?

	P	Q	R
(A)	Nitrifying	Denitrifying	Nitrogen-fixing
(B)	Nitrifying	Nitrogen-fixing	Denitrifying
(C)	Nitrogen-fixing	Denitrifying	Nitrifying
(D)	Nitrogen-fixing	Nitrifying	Denitrifying

Item 13 refers to the following diagram which is a schematic summary of the operational processes in an ecosystem.



13. The arrow labelled X MOST likely represents

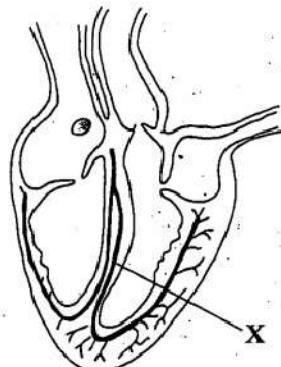
- (A) energy flow  
 (B) water flow  
 (C) recycling of faecal wastes  
 (D) positive feedback mechanisms

14. Which of the following does NOT explain how deforestation might increase the risk of flooding?

- (A) The water cycle is disrupted.  
 (B) Tree roots bind soil particles.  
 (C) Tree canopy prevents rain beating down on the soil.  
 (D) Soil nutrients are lost through leaching and run-off water.

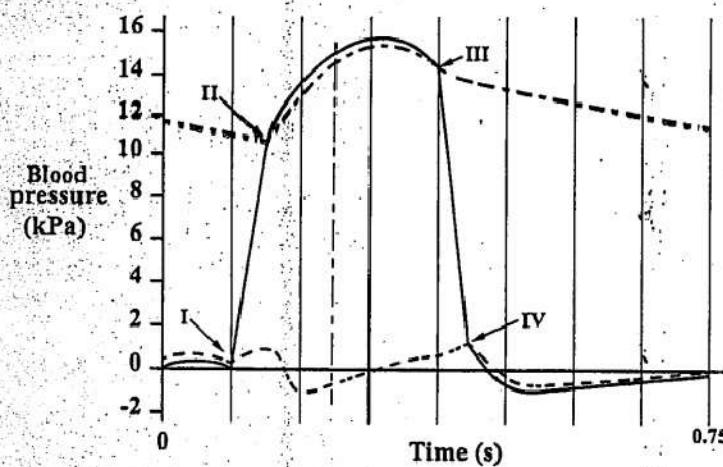
15. Which of the following is NOT a conservation method used to maintain biodiversity?
- (A) Sperm bank  
(B) Botanic garden  
(C) Protected reserve  
(D) Genetic engineering
16. The active uptake of many ions occurs at the roots of green plants. If the respiratory enzymes of the roots of a plant are inhibited, at which of the following tissues of the roots would the movement of ions be totally stopped?
- (A) Xylem  
(B) Epidermis  
(C) Endodermis  
(D) Cortex parenchyma
17. In a study of water movement in plants, the cut end of a leafy shoot is placed in a dilute solution of a dye. After a few hours, deposits of the dye accumulate in the leaves. The rate of movement of the dye up the stem is NOT increased by
- (A) darkness  
(B) humidity  
(C) temperature  
(D) wind speed
18. Companion cells are connected to sieve tube elements by
- (A) small plastids  
(B) protein fibres  
(C) plasmodesmata  
(D) polymer molecules
19. Which of the following statements is true according to the mass (pressure) flow hypothesis?
- (A) Sucrose moves in the phloem against a concentration gradient.  
(B) The loading of sugars into the phloem in the leaf is achieved by osmosis.  
(C) A source is a site where sugars are utilized, while a sink is a site where sugars are produced.  
(D) Water is actively transported from the intercellular spaces into the cell sap at the root end of the system.

Item 20 refers to the following diagram of a longitudinal section of a mammalian heart.



20. Which of the following is true for the structure labelled X?
- (A) Receives impulses from the brain to initiate contraction of the atria.  
(B) Delays impulses for a fraction of a second before they travel down into the ventricles.  
(C) Separates the right ventricle from the left ventricle.  
(D) Conducts impulses very rapidly to the base of the ventricles.

Item 21 refers to the following graph which shows changes in blood pressure in the left ventricle during the cardiac cycle.



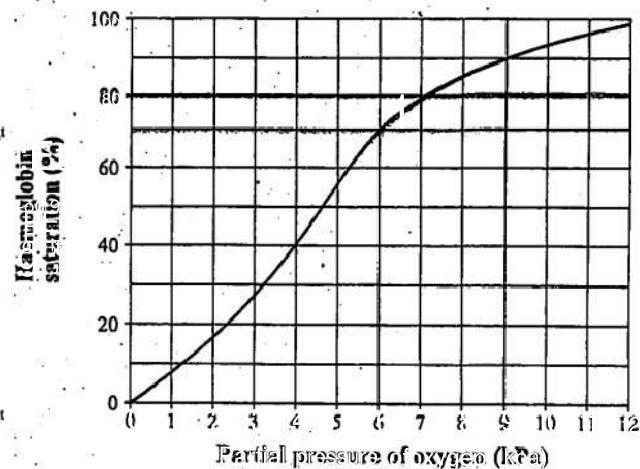
21. Valves open and close due to changes in pressure. Which of the labels, I, II, III and IV, correctly identifies the point on the graph when the aortic valve closes?

- (A) I
- (B) II
- (C) III
- (D) IV

22. In the mammalian heart, heartbeat is initiated in the

- (A) Purkinje fibres
- (B) sinoatrial node
- (C) anterior vena cava
- (D) atrioventricular node

Item 23 refers to the following graph which shows the sigmoid (S-shaped) dissociation curve for haemoglobin of a human adult.



23. During cycling, the partial pressure of oxygen found in the pulmonary vein leaving the lungs and in a vein leaving a muscle is MOST likely

	pO <sub>2</sub> (kPa) in Pulmonary Vein Leaving Lungs	pO <sub>2</sub> (kPa) in Vein Leaving Muscle
(A)	0	12
(B)	2	12
(C)	6	6
(D)	12	2

24. Which of the following explains the physiological significance of the Bohr effect in mammalian muscle?

- (A) Myoglobin releases oxygen more rapidly to respiring cells.
- (B) Higher carbon dioxide partial pressures favour unloading of oxygen from haemoglobin.
- (C) Myoglobin becomes fully saturated at lower oxygen partial pressures.
- (D) Haemoglobin becomes fully saturated at lower oxygen partial pressures.

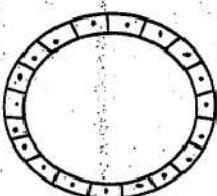
25. Which of the following are NOT regulated by a negative feedback mechanism?

- (A) Heart rate and blood pressure
- (B) Water balance and blood pH
- (C) Labour during birth and action potential
- (D) Blood glucose concentration and body temperature

26. Which of the following functions as an endocrine gland?

- (A) Testis
- (B) Liver
- (C) Kidney
- (D) Salivary gland

Item 27 refers to the following diagrams representing regions of a nephron as seen in a transverse section of the kidney when viewed under a light microscope.



I



II



III



IV

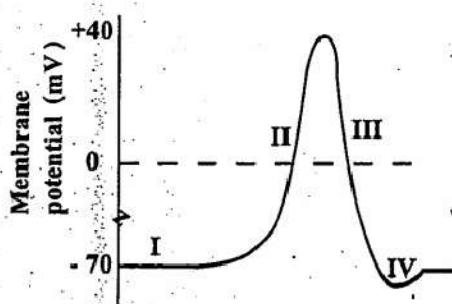
27. Which diagram represents the loop of Henle?

- (A) I
- (B) II
- (C) III
- (D) IV

28. The target cells of the antidiuretic hormone are cells of the

- (A) loop of Henle and distal convoluted tubule
- (B) glomerular capillary and renal capsule
- (C) proximal convoluted tubule and collecting duct
- (D) collecting duct and distal convoluted tubule

Item 29 refers to the following diagram.



29. Diffusion of sodium ions into the axon occurs at

- (A) I
- (B) II
- (C) III
- (D) IV

30. Which of the following are functions of a mammalian synapse?

- I. Acts as a junction
  - II. Filters out low-level stimuli
  - III. Passes impulses in both directions
  - IV. Transmits information between neurones
- (A) I and III only
  - (B) II and IV only
  - (C) I, II and IV only
  - (D) II, III and IV only

31. Which of the following is an example of an infectious disease spread via blood or in secretions?

- (A) AIDS
- (B) Diabetes
- (C) Bronchitis
- (D) Dengue fever

32. A highly malignant tumour linked to ultraviolet radiation is a

- (A) sarcoma
- (B) melanoma
- (C) lymphoma
- (D) papilloma

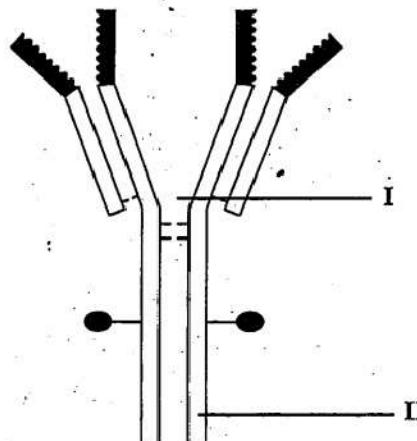
33. Which of the following is true for mast cells?

- (A) They are found in lymph nodes only.
- (B) They are the smallest circulating granulocytes.
- (C) They are large granulocytes which engulf pathogens.
- (D) They contain many granules rich in histamine and heparin.

34. Which of the following is NOT a function of phagocytes in the human body?

- (A) Secretion of antibodies
- (B) Removal of dead cells
- (C) Cleaning of debris in the plasma
- (D) Engulfing invading microorganisms

Item 35 refers to the following diagram of an antibody molecule.



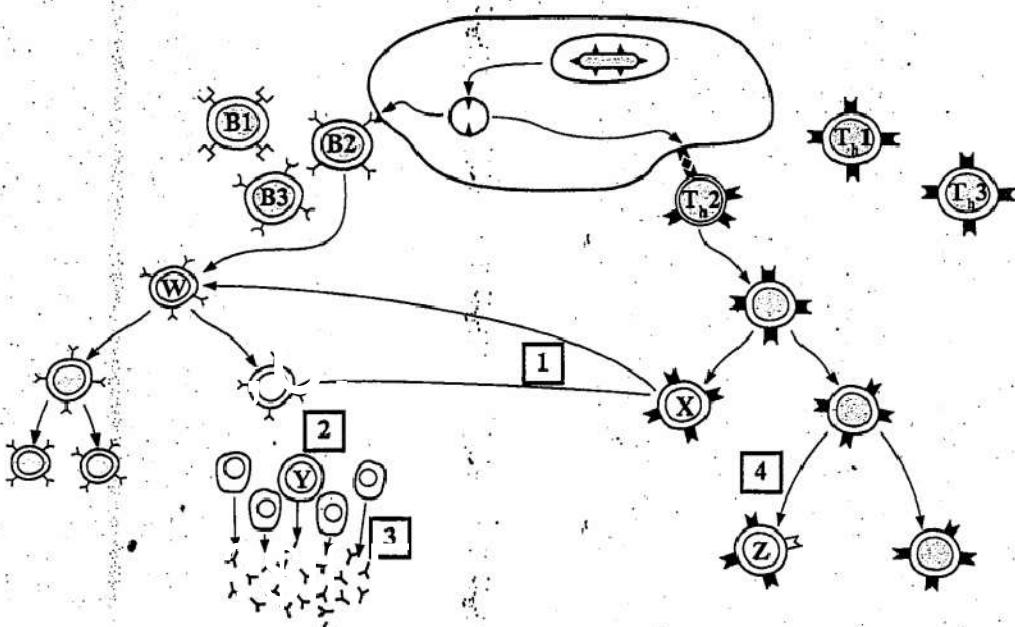
35. Which of the following combinations correctly identifies the labelled regions?

	I	II
(A)	Hinge region	Heavy polypeptide chain
(B)	Antigen binding site	Chain of sugar molecules
(C)	Heavy polypeptide chain	Light polypeptide chain
(D)	Hinge region	Variable region

36. Which of the following is NOT an appropriate definition of the immune response?

- (A) Involves specific and non-specific responses which attempt to destroy an invading pathogen
- (B) Any response of the immune system to an antigenic stimulus
- (C) Adverse effects on the functioning of the immune system due to allergens
- (D) Involves responses that allow the body to distinguish self from non-self

Items 37-38 refer to the following diagram showing clonal selection and expansion as seen in the immune response.



37. Which of the cells, labelled W, X, Y or Z, are plasma cells?

- (A) W
- (B) X
- (C) Y
- (D) Z

38. During which of the stages labelled 1, 2, 3 and 4, are cytokines involved?

- (A) 1
- (B) 2
- (C) 3
- (D) 4

39. Which of the following is NOT an example of the use of monoclonal antibodies?

- (A) Locating tumours
- (B) Detecting pregnancy
- (C) Diagnosing AIDS
- (D) Diagnosing dengue fever

40. Which of the following are health benefits of exercise?

- I. Enhanced utilization of fat
  - II. Speeding up of atherosclerosis
  - III. Improved resistance to infection
- (A) I and II only
  - (B) I and III only
  - (C) II and III only
  - (D) I, II and III

41. Which of the following are the main cells infected by the human immunodeficiency virus?

- (A) T-helper cells
- (B) Erythrocytes
- (C) Platelets
- (D) Mast cells

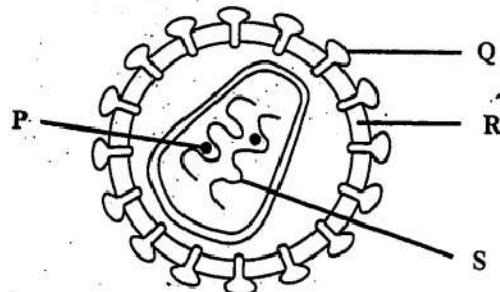
42. Body Mass Index (BMI) may be used as an indicator for obesity. Which of the following BMI values BEST reflects that of an obese individual?

- (A) 25
- (B) 27
- (C) 29
- (D) 31

43. Which of the following BEST describes the disease atherosclerosis?

- (A) Build-up of plaque in the walls of arteries
- (B) Calcification of the walls of arteries
- (C) Formation of large blood clots in arteries
- (D) Extensive damage to the endothelial lining of the arteries

Items 44-45 refer to the following diagram which shows the structure of the human immunodeficiency virus (HIV).



44. The parts labelled P and S are

	P	S
(A)	reverse transcriptase	RNA
(B)	reverse transcriptase	DNA
(C)	RNA polymerase	RNA
(D)	RNA polymerase	DNA

45. Which part would MOST likely be of importance in producing a vaccine for the virus?

- (A) P
- (B) Q
- (C) R
- (D) S

END OF TEST.

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.