

FORM TP2007166

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

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 Signature

TEST CODE **02207010**  
 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.

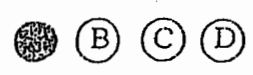
- In addition to this test booklet, you should have an answer sheet.
- Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
- On your answer sheet, find the number which corresponds to your item and shade 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 blackened.

- If you want to change your answer, be sure to erase your old answer completely and fill in your new choice.
- 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 item later. Your score will be the total number of correct answers.
- You may do any rough work in this booklet.
- Figures are not necessarily drawn to scale.
- The use of non-programmable calculators is allowed.
- This test consists of 45 items. You will have 90 minutes to answer them.
- 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. 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

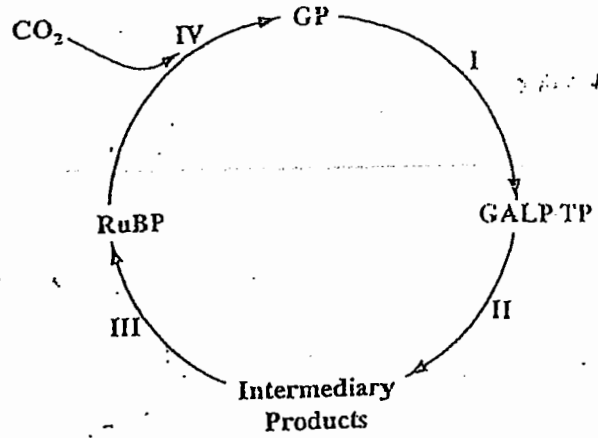
2. The spongy mesophyll is the chief site of gaseous exchange in a dicotyledonous leaf. This is possible because the cells are

- (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.

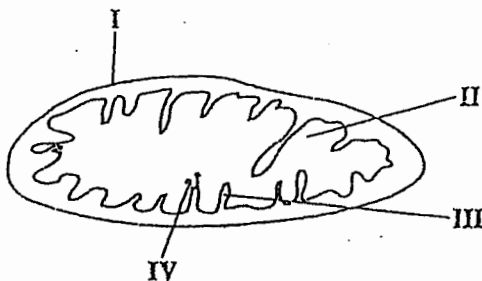
An investigation of the effect of light intensity and temperature on the rate of photosynthesis of a suspension of *Chlorella* cells showed that at higher light intensities, the cells photosynthesized much faster at 20° C than at 15° C. This is because

- (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

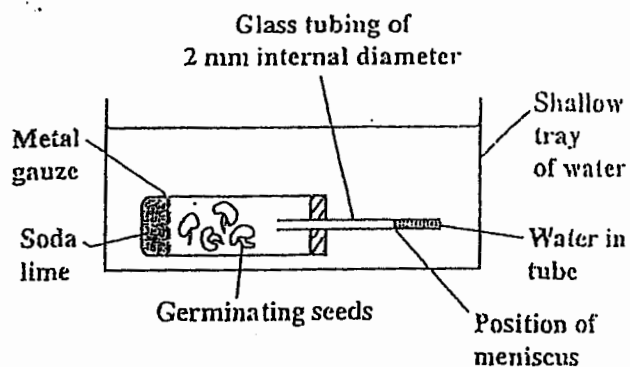


- (A) I
- (B) II
- (C) III
- (D) IV

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
(A)	O <sub>2</sub> is not consumed	O <sub>2</sub> is consumed
(B)	CO <sub>2</sub> not produced	CO <sub>2</sub> produced
(C)	Site of action is the inner membrane of the mitochondrion	Site of action is the inner layer of the grana
(D)	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>

$$\frac{4.2 \text{ cm}^3}{20 \text{ min}} = 0.21 \text{ cm}^3 \text{ min}^{-1}$$

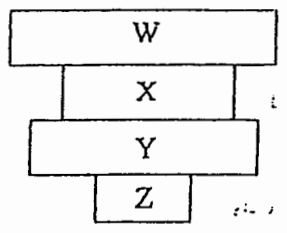
10. In muscle tissue undergoing strenuous contractions, the formation of lactate is due to the

- (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

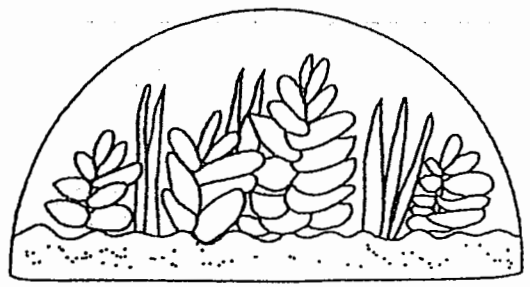
13. The figure below represents an ecological pyramid of numbers. The species of organisms in the pyramid are blackbirds, aphids, lice and cherry trees.



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
<input checked="" type="checkbox"/> (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

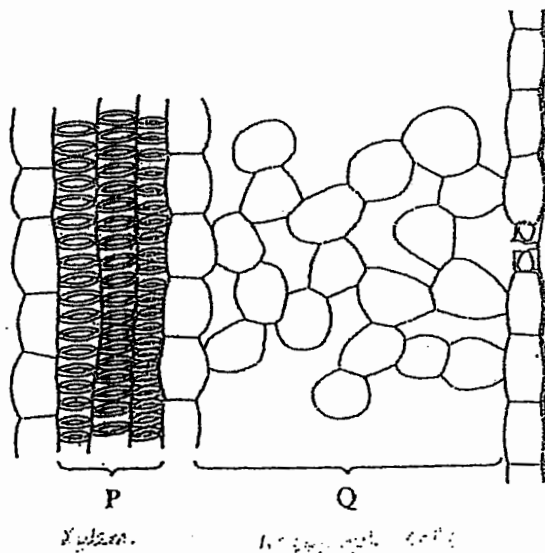
16. Which of the following describes the function of the endodermis?

- (A) It controls the movement of water and ions to the xylem using a Casparian 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.



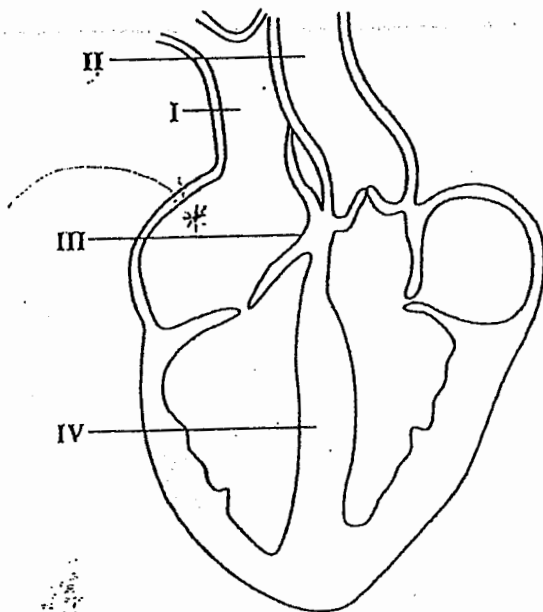
17. Which of the following correctly identifies the regions labelled P and Q?

	Region P	Region Q
<input checked="" type="checkbox"/> (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 if phloem are cut.
- (D) Appropriate gradients between 'source' and 'sink' tissues do not exist.

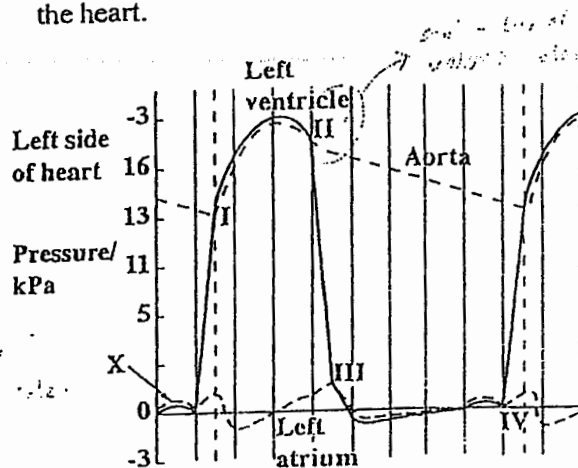
Item 20 shows a diagram of a longitudinal section of the heart.



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

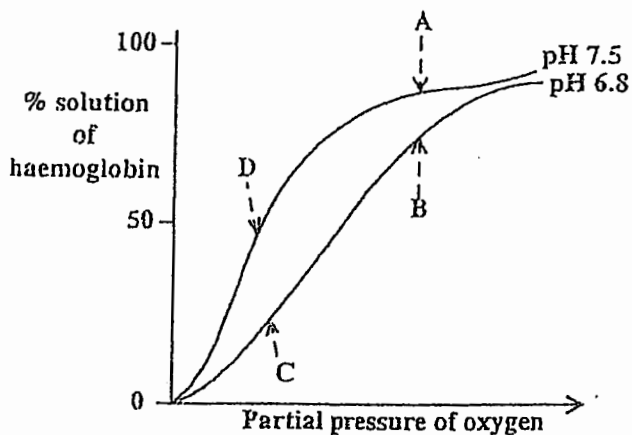
Item 23 refers to the photograph below which shows a human blood smear.



23. What is the approximate magnification of this photograph?

- (A) x 700

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

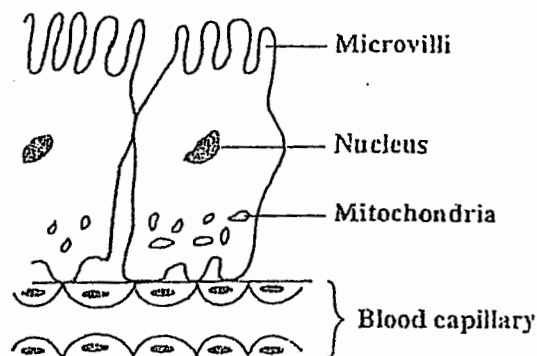
- (A) A
- (B) B
- (C) C
- (D) D

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.



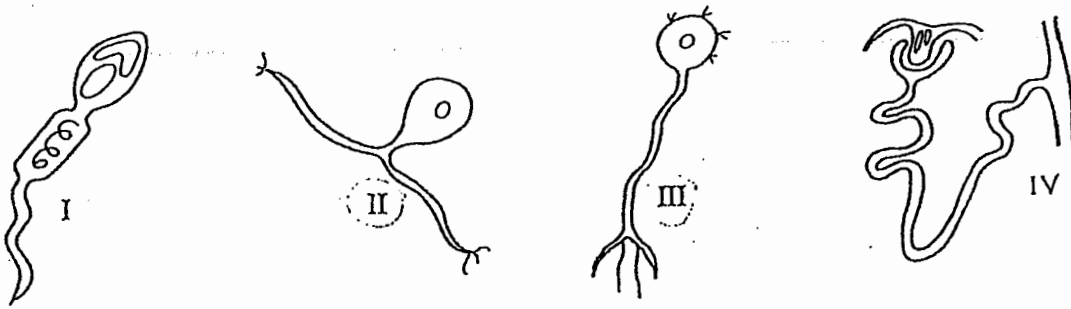
26. The region of the nephron shown is the

- (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?

- I. It decreases the blood glucose level. ✗
  - II. It increases the blood glucose level. ✓
  - III. 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

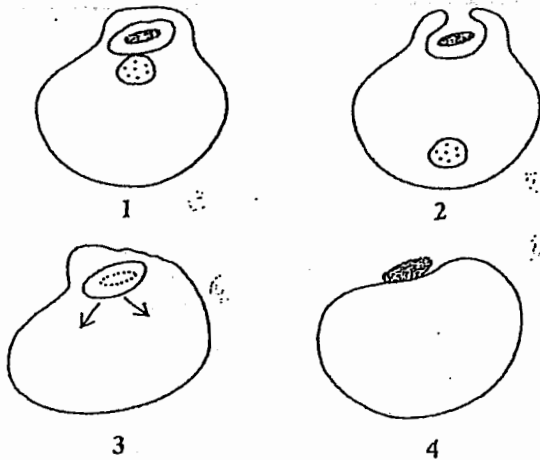
35. Which of the following combinations correctly describe the pathogens responsible for malaria, dengue fever and AIDS?

	Malaria	Dengue Fever	AIDS
<input checked="" type="checkbox"/> (A)	Eukaryotic parasite	Virus	Virus
(B)	Bacterium	Eukaryotic parasite	Virus
(C)	Virus	Bacterium	Eukaryotic parasite
(D)	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

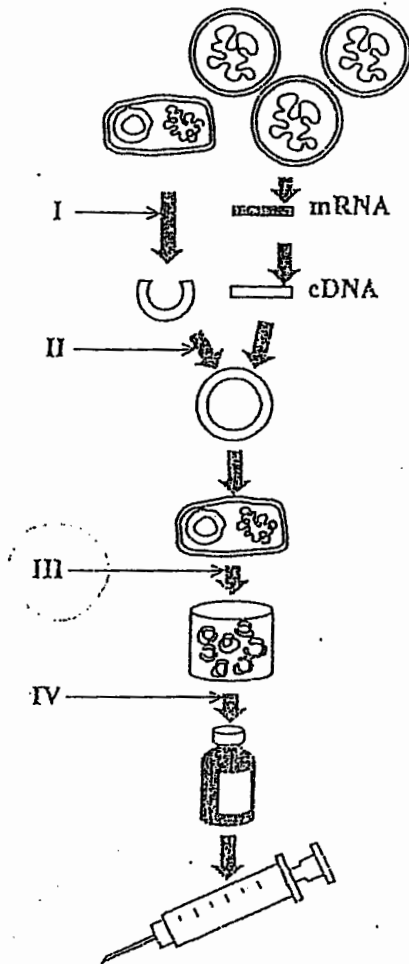
41. Which of the following is NOT an example of an application for monoclonal antibodies?

- (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.