



**BIOLOGY  
HIGHER LEVEL  
PAPER 1**

Thursday 4 May 2006 (afternoon)

1 hour

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**INSTRUCTIONS TO CANDIDATES**

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.

1. Using a light microscope, what determines the ability to distinguish between two points lying close together?
- A. The magnification
  - B. The preparation
  - C. The fixation
  - D. The resolution

2. Which of the following processes may be found in prokaryotes?

- I. Photosynthesis
- II. Nitrogen fixation
- III. Respiration
- IV. Protein synthesis

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

3. Which of the following correctly describes exocytosis?

|    | <b>Plasma membrane increases in size</b> | <b>Plasma membrane is pulled inwards</b> | <b>Membranes fuse</b> | <b>Vesicles move away from plasma membrane</b> |
|----|--|--|-----------------------|--|
| A. | No                                       | Yes                                      | No                    | Yes  |
| B. | Yes                                      | No                                       | Yes                   | No   |
| C. | No                                       | Yes                                      | Yes                   | Yes  |
| D. | No                                       | No                                       | No                    | Yes  |

4. Which of the following processes take place during interphase?

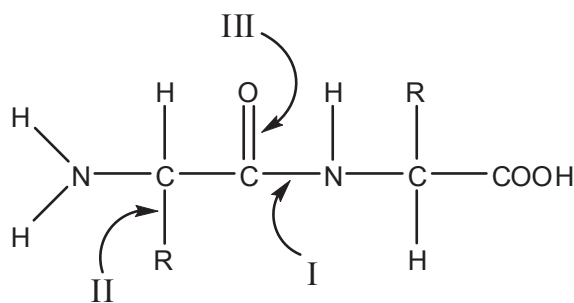
- I. Respiration
- II. Active transport
- III. Protein synthesis
- IV. Replication of DNA

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

5. What is **one** role of the element phosphorus?

- A. It forms part of the structure of amino acids.
- B. It forms part of the structure of fatty acids.
- C. It forms part of the structure of ribose.
- D. It forms part of the structure of nucleotides.

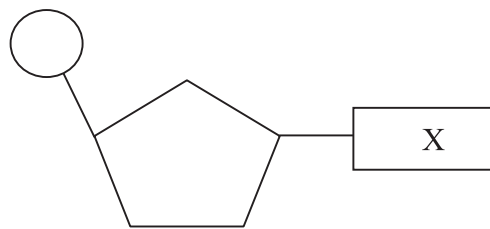
6. Which of the following represents the peptide linkage of a dipeptide?



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

7. What determines the specificity of an enzyme for its substrate?
- A. The temperature at which it is operating
  - B. The optimum pH of the enzymes
  - C. The concentration of the substrate
  - D. The structure of the enzyme molecule

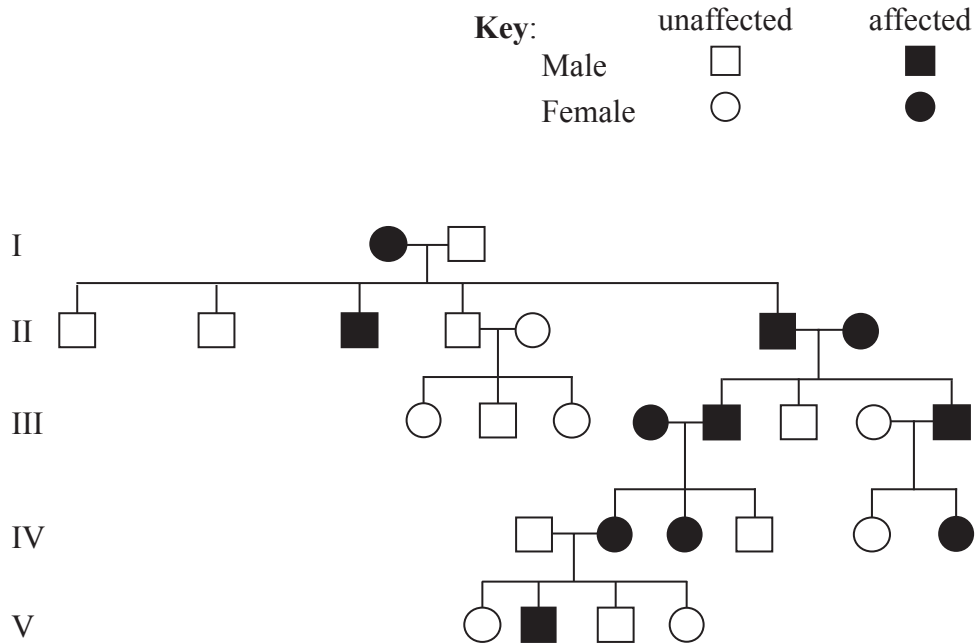
8. The diagram below represents a DNA nucleotide. What could the part labelled X represent?



- A. Ribose
  - B. Uracil
  - C. Guanine
  - D. Phosphate
9. During aerobic respiration in the cytoplasm of a cell what is produced from glucose?
- I. Pyruvate
  - II.  $\text{CO}_2$
  - III. ATP
  - IV. Lactic acid
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. II and IV only

10. What are the chromosomes of fungi made of?
- A. DNA only
  - B. DNA and protein only
  - C. DNA and RNA only
  - D. DNA, RNA and protein
11. In the offspring what are the maternal and paternal pairs of chromosomes known as?
- A. Sex chromosomes
  - B. Autosomes
  - C. Sister chromatids
  - D. Homologous chromosomes
12. A gene has three alleles. How many different genotypes can be found for this gene?
- A. 3
  - B. 6
  - C. 9
  - D. 12

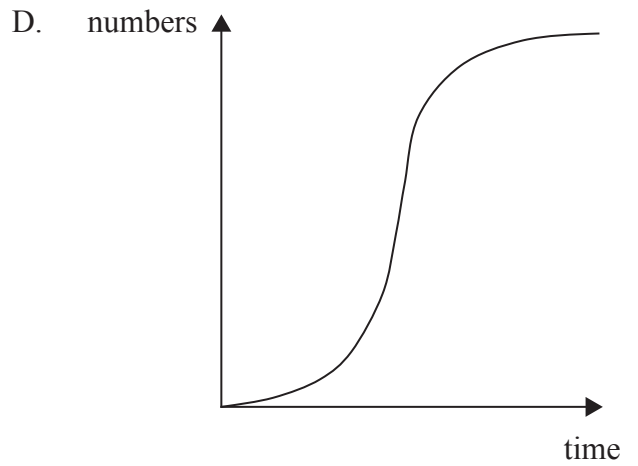
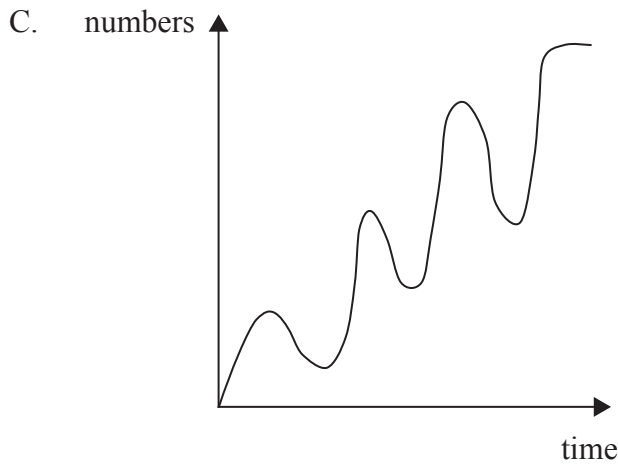
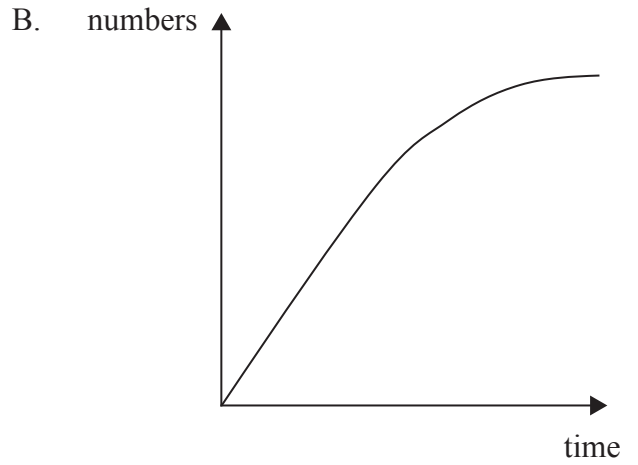
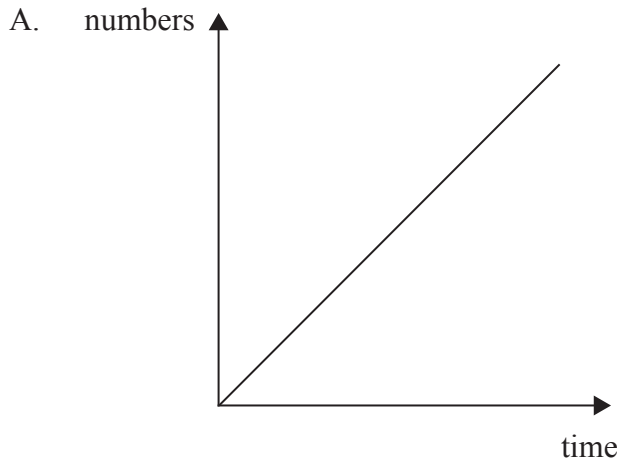
13. The pedigree chart below shows the inheritance of a genetic disease in a family. What is the nature of the allele that causes this disease?



- A. Dominant and sex linked
  - B. Dominant and non-sex linked
  - C. Recessive and sex linked
  - D. Recessive and non-sex linked
14. Which characteristics are used to identify chromosomes when constructing a karyotype?
- I. The length of the chromosome
  - II. The position of the centromere on the chromosome
  - III. The pattern of bands on the chromosome
  - IV. The position of the chromosome on the spindle
- A. I only
  - B. I and II only
  - C. I, II and III only
  - D. I, II, III and IV

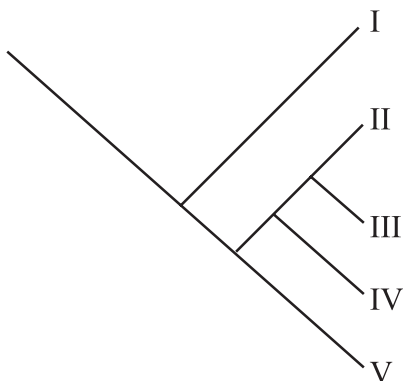
15. What units are used when constructing pyramids of energy?
- A. J
  - B.  $\text{J m}^{-2}$
  - C.  $\text{J m}^{-2} \text{ year}^{-1}$
  - D.  $\text{J kg}^{-1} \text{ m}^{-2} \text{ year}^{-1}$
16. Tropical savannah is where large herds of herbivores live. It has been estimated that this ecosystem could be covered in a layer of animal faeces 5 cm thick in 24 hours. What stops this happening?
- A. The faeces are broken down by decomposers.
  - B. Heavy rainfall washes it away.
  - C. The faeces are absorbed by the vegetation.
  - D. Local farmers collect it to use as a fertilizer.
17. When estimating the size of a plant population in an area a random sample is often used. What is a random sample?
- A. A sampling method that covers every part of the area being investigated.
  - B. A sampling method that ensures that each part of the area being sampled has an equal chance of being measured.
  - C. A sampling method that systematically visits evenly spaced sites in the area being investigated.
  - D. A sampling method that only visits the parts of the area where the species is growing.

18. Which graph below best predicts the change in numbers of a population which arrives in an unoccupied habitat?





19. The evolutionary tree shown below classifies five species I to V. Which pair of species are the most closely related?



- A. I and II only
  - B. II and III only
  - C. III and IV only
  - D. IV and V only
20. Which human activities may increase or decrease the greenhouse effect?

|    | <b>Increases greenhouse effect</b> | <b>Decreases greenhouse effect</b> |
|----|------------------------------------|------------------------------------|
| A. | Deforestation                      | More use of fossil fuels           |
| B. | Reforestation                      | More use of solar power            |
| C. | Less use of air conditioning       | Less use of public transport       |
| D. | More cattle farming                | Reforestation                      |

21. Which of the following molecules does not need digesting?
- A. Ribose
  - B. Polynucleotides
  - C. Polypeptides
  - D. Disaccharides

22. Which is the correct sequence of events in a heart beat?

- A. Atria contract → Ventricles contract → Semi-lunar valves close → Atrio-ventricular valves close
- B. Atria contract → Atrio-ventricular valves close → Ventricles contract → Semi-lunar valves close
- C. Atria contract → Ventricles contract → Atrio-ventricular valves close → Semi-lunar valves open
- D. Ventricles contract → Atria contract → Atrio-ventricular valves close → Semi-lunar valves close

23. What are the characteristics of blood flowing in arteries and veins?

|    | Arteries          | Veins          |
|----|-------------------|----------------|
| A. | Slow velocity     | Fast velocity  |
| B. | High pressure     | Low pressure   |
| C. | Deoxygenated      | Oxygenated     |
| D. | Greater than 37°C | Less than 37°C |

24. What makes the skin a barrier to infectious diseases?

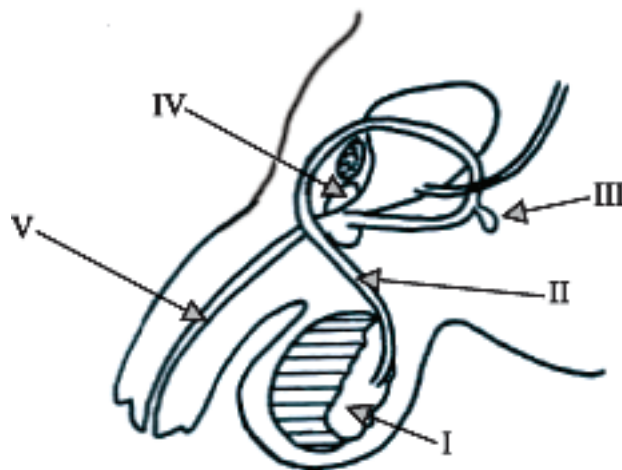
- A. Impermeable cells which are frequently replaced
- B. Patrolling phagocytes
- C. Cells coated in antibody molecules
- D. Cells which secrete lysozyme enzyme

25. Which is the correct sequence of events during the phagocytosis of a bacterium by a leucocyte?

- I. Food vacuole forms
- II. Plasma membrane receptors detect antigen on the surface of the bacterium
- III. Lysosomes fuse with the food vacuole
- IV. Engulfs bacterium

- A. II → I → IV → III
- B. II → I → III → IV
- C. II → IV → I → III
- D. I → II → IV → III

26. Which labelled structures represent the epididymis and the prostate gland?

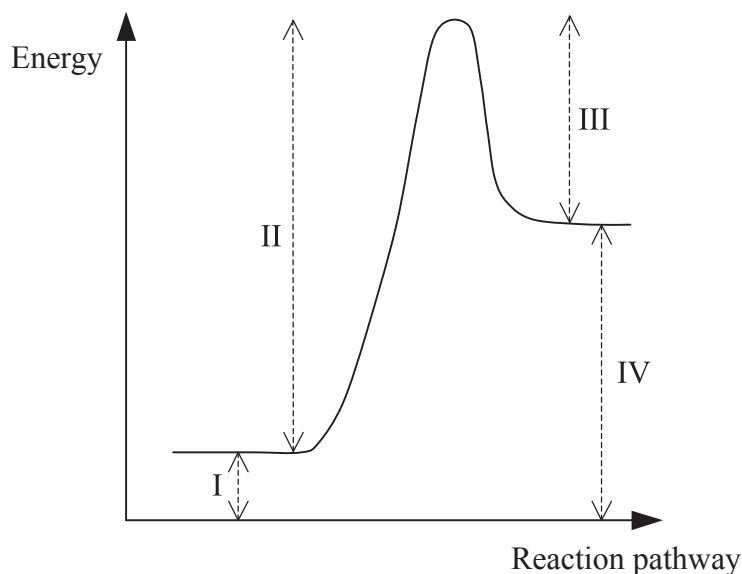


|    | Epididymis | Prostate gland |
|----|------------|----------------|
| A. | I          | III            |
| B. | II         | III            |
| C. | I          | IV             |
| D. | IV         | I              |

27. In the bacterium *Escherichia coli* the DNA can be replicated at nearly 2000 base pairs per second. Human DNA is replicated at more than 5 million base pairs per second.

Why is the replication of human DNA so much faster?

- A. Human cells have a higher concentration of DNA nucleotides in their cytoplasm.
  - B. Human cells have a faster form of DNA polymerase.
  - C. Human cells operate at a higher temperature.
  - D. Human cell DNA replication starts at several points simultaneously.
28. The reaction below shows the energy changes in a chemical reaction.

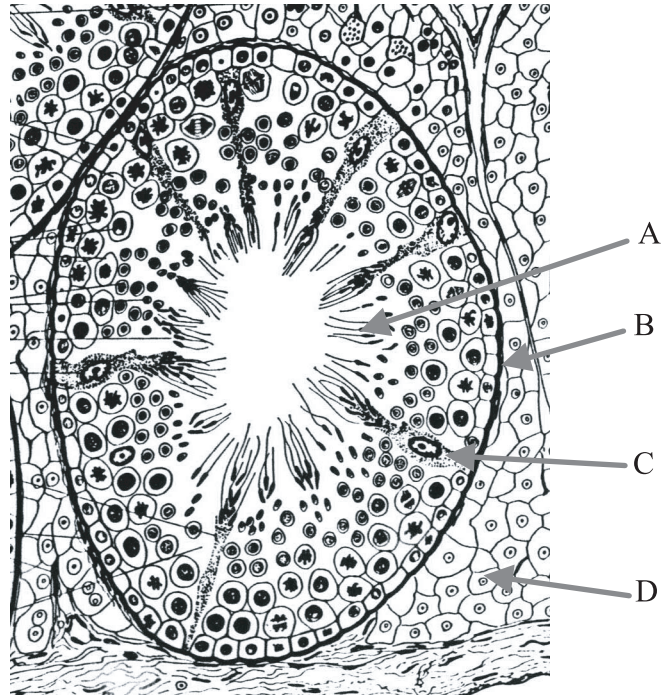


What would happen to the changes in energy if this reaction was controlled by an enzyme?

- A. I would increase.
- B. II would decrease.
- C. I and IV would decrease.
- D. II and III would decrease.

29. Which of the following reactions is an oxidation reaction?
- A. Pyruvate  $\rightarrow$  Acetate + CO<sub>2</sub>
  - B. FAD + 2H<sup>+</sup> + 2e<sup>-</sup>  $\rightarrow$  FADH<sub>2</sub>
  - C. Ribulose biphosphate + CO<sub>2</sub>  $\rightarrow$  2  $\times$  Phosphoglycerate
  - D. NADP<sup>+</sup> + 2H<sup>+</sup> + 2e<sup>-</sup>  $\rightarrow$  NADPH + H<sup>+</sup>
30. The average surface area for the inner membranes of mitochondria in a epithelial cell is 40 m<sup>2</sup>g<sup>-1</sup>. The surface area of the inner membrane of mitochondria from heart muscle cells is over 200 m<sup>2</sup>g<sup>-1</sup>.
- What is the reason for the large surface area of the inner membranes of the mitochondria in the heart muscle cells?
- A. They contain enzymes to hydrolyse ADP and inorganic phosphate to ATP.
  - B. They contain enzymes to oxidize ADP and inorganic phosphate to ATP.
  - C. They contain enzymes to reduce ADP and inorganic phosphate to ATP.
  - D. They contain enzymes to condense ADP and inorganic phosphate to ATP.
31. A cross is carried out between two heterozygous individuals (AaBb) where the genes A and B are not linked genes. What would be the proportions of genotypic recombinants amongst the offspring of this cross?
- A. 0 %
  - B. 25 %
  - C. 75 %
  - D. 100 %

32. Which of the structures labelled in the diagram below provide nourishment for developing sperm cells?



[Source: Freeman and Bracegirdle (1976), *An atlas of histology*, Heinemann, page 91]

33. Which hormone maintains the corpus luteum in the ovary of a woman at implantation?

- A. FSH
- B. LH
- C. HCG
- D. Progesterone

34. What is the difference between natural and artificial immunity?

|    | <b>Natural</b>           | <b>Artificial</b>         |
|----|--------------------------|---------------------------|
| A. | Uses a vaccine           | Uses synthetic antibodies |
| B. | Response to an infection | Response to a vaccination |
| C. | Memory cells formed      | No memory cells formed    |
| D. | Only active immunity     | Only passive immunity     |

35. When an impulse arrives at a synapse which way do calcium ions move?
- A. Into the synaptic knob from the synaptic cleft
  - B. Into the post synaptic nerve cell from the synaptic cleft
  - C. Out from the synaptic knob into the synaptic cleft
  - D. Out from the post synaptic nerve cell into the synaptic cleft

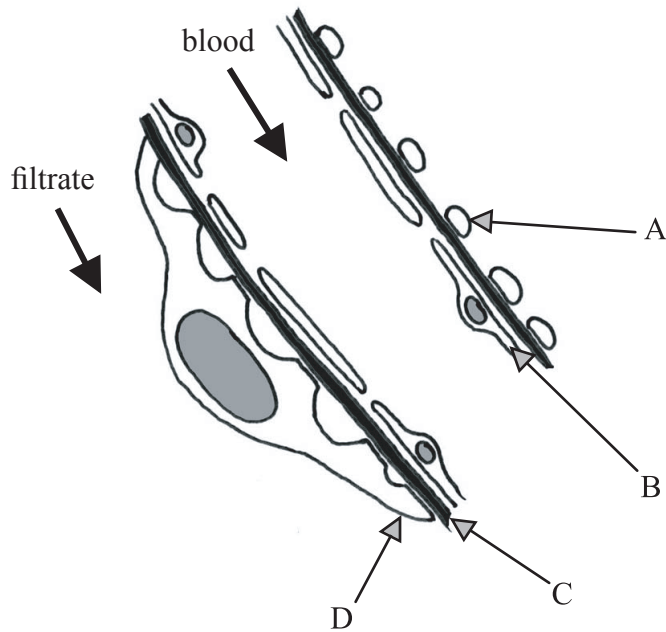
36. What are the characteristics of the skeletal systems of the following animals?

|    | <b>Earthworm</b>   | <b>Bird</b>        | <b>Insect</b>      | <b>Bony fish</b>   |
|----|--------------------|--------------------|--------------------|--------------------|
| A. | Solid and internal | Solid and internal | Solid and internal | Fluid and internal |
| B. | Fluid and internal | Solid and internal | Fluid and internal | Solid and external |
| C. | Fluid and internal | Solid and internal | Solid and external | Solid and internal |
| D. | Solid and internal | Solid and external | Solid and internal | Solid and external |

37. What are the main excretory products of birds?

- I. Urea
  - II. Uric acid
  - III. Ammonia
  - IV. Carbon dioxide
- A. I and III only
  - B. II and IV only
  - C. III and IV only
  - D. II, III, and IV only

38. The diagram below shows part of the glomerulus from a kidney as seen under the electron microscope. Which part is the basement membrane?



39. Xerophytes and hydrophytes are adapted to their environments. Which pair of adaptations is correct?

|    | <b>Xerophytes</b>   | <b>Hydrophytes</b>     |
|----|---------------------|------------------------|
| A. | Air spaces in roots | Water storage in roots |
| B. | No stomata          | No stomata             |
| C. | Stomata in pits     | Thin or no cuticle     |
| D. | Thick cuticle       | Stomata in pits        |

40. Which direction does the phloem transport materials?
- A. Up the plant at night and down the plant during the day
  - B. Up and down the plant all the time
  - C. Up the plant only
  - D. Down the plant only