

**BIOLOGY
HIGHER LEVEL
PAPER 1**

Wednesday 13 November 2002 (afternoon)

1 hour

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. What is the correct order of increasing size for the following biological structures?
 - I. The diameter of a virus
 - II. The diameter of a bacterium
 - III. The thickness of a cell surface membrane
 - IV. The diameter of a eukaryotic cell
 - A. $I < III < II < IV$
 - B. $I < III < IV < II$
 - C. $III < I < II < IV$
 - D. $III < II < I < IV$

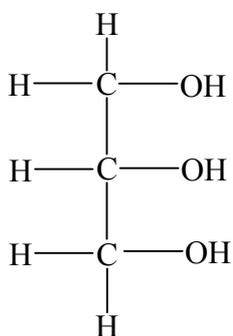
2. Which of the following is a feature of exocytosis but **not** endocytosis?
 - A. Lipid bilayer fusion
 - B. Vesicle formation
 - C. Lipid bilayer adhesion
 - D. Secretion

3. What is the function of a plasmid?
 - A. The site of respiration in prokaryotes
 - B. The site of photosynthesis in eukaryotes
 - C. The site of protein synthesis in prokaryotes and eukaryotes
 - D. The site of hereditary material in prokaryotes

4. Which of the following is the **most** soluble in water?

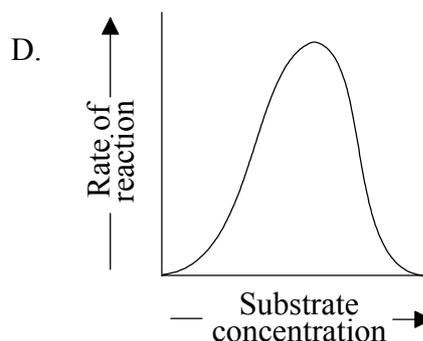
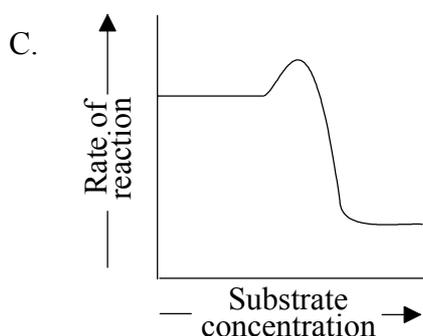
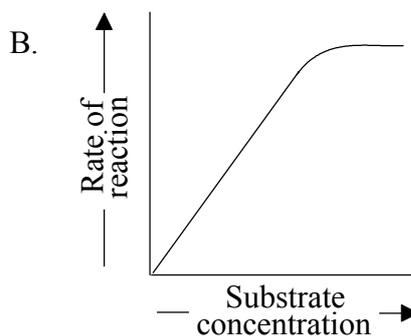
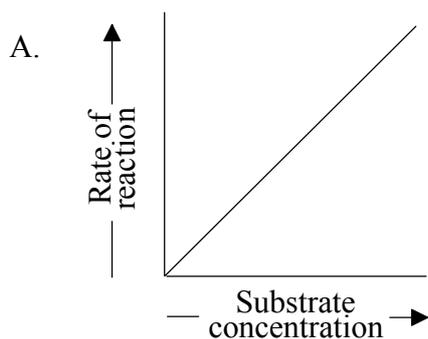
- A. Olive oil
- B. Glycogen
- C. Glucose
- D. Cellulose

5. What molecule does the following structure represent?



- A. Glycerol
- B. Glucose
- C. An amino acid
- D. A fatty acid

6. Which graph illustrates the effect of increasing the substrate concentration of an enzyme controlled reaction?



7. If mRNA has a codon CAU, what would be the corresponding anticodon on the tRNA molecule?

- A. CAT
- B. GUA
- C. CAU
- D. GTA

8. The fur colour of a cat is sex-linked. The allele for black fur is codominant with the allele for ginger fur, producing fur which is tortoiseshell (or calico) in colour. Which fur colour can **only** be found in female cats?

- A. Black
- B. Ginger
- C. Tortoiseshell (calico)
- D. None of the above colours.

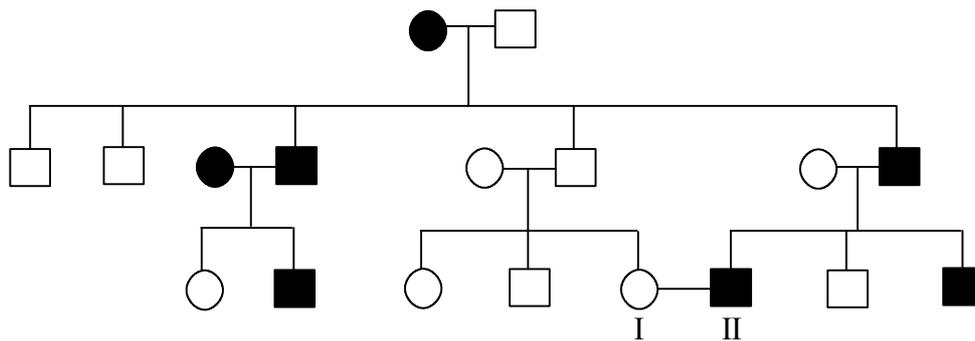
9. A mutation results in a change in the sequence of bases in a DNA molecule, as illustrated below.

Normal DNA: ACCTGCATTG
Mutated DNA: ACGCTGCATTG

What is this type of mutation?

- A. Insertion
- B. Substitution
- C. Inversion
- D. Deletion

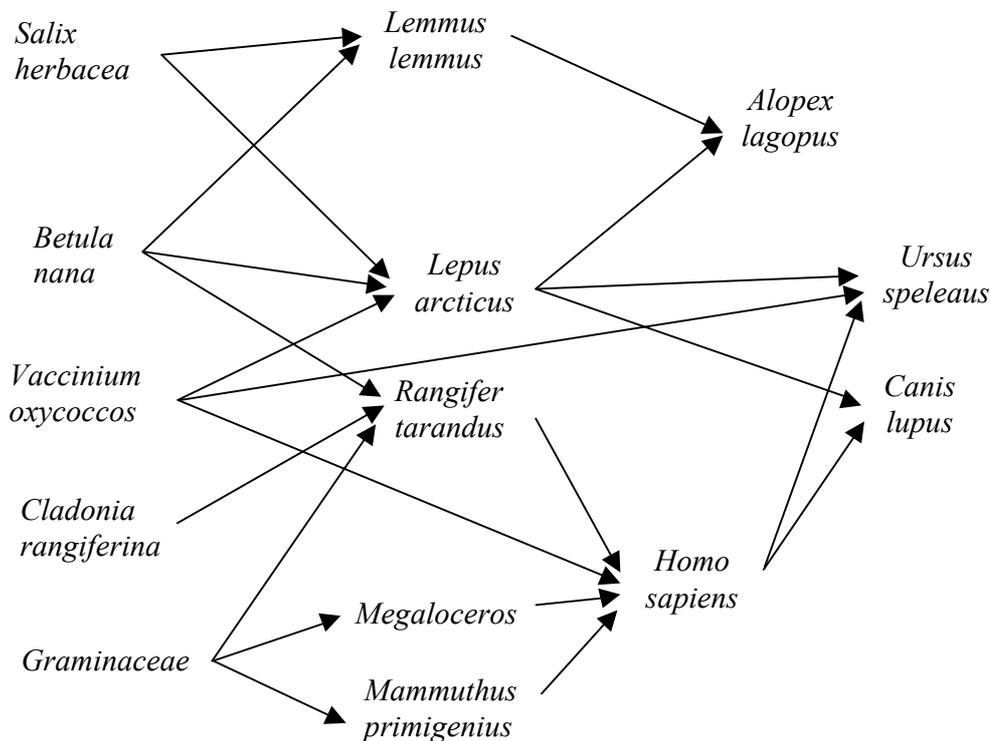
10. The pedigree chart below shows a family affected by brachydactyly. This is a hereditary condition which results in short hands and feet. It is caused by a dominant allele.



What is the chance that the first child of individuals I and II will be normal?

- A. 0 %
- B. 25 %
- C. 50 %
- D. 100 %

11. The food web below shows a community in central France 24 000 years ago.



Which statement is a correct description of *Ursus speleaus*?

- A. It is a top carnivore and a primary consumer.
 - B. It is a producer preyed upon by *Vaccinium oxycoccos*.
 - C. It is an omnivore which feeds on *Lemmus lemmus*.
 - D. It is a decomposer and it competes with *Rangifer tarandus*.
12. Which substance(s) is (are) used to make organic molecules during photosynthesis?
- I. Carbon dioxide
 - II. ATP
 - III. Oxygen
 - IV. Water
- A. I only
 - B. I and IV only
 - C. I, II and IV only
 - D. I, III and IV only

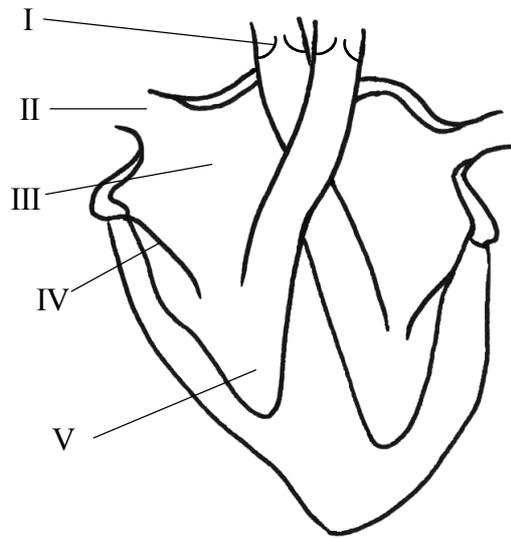
13. White clover (*Trifolium repens*) is a plant which has a flower head made up of many florets. 17 plants were sampled at random in a field and their flower heads were counted. The results are shown below.

29, 32, 34, 35, 36, 43, 45, 45, 47, 52, 53, 54, 57, 62, 64, 65, 70

What is the median number of florets in this sample of white clover?

- A. 45.0
 - B. 46.0
 - C. 47.0
 - D. 48.5
14. Which of the following factors need to be considered when establishing a balanced diet for a person?
- I. Age of the person
 - II. Daily activity of the person
 - III. Health of the person
 - IV. Climate where the person lives
- A. I only
 - B. I and II only
 - C. I, II and III only
 - D. I, II, III and IV

15. Which structures in the heart cause the blood to flow in one direction?



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

16. Which part of the blood is responsible for the transport of gases?

- I. Plasma
- II. Erythrocytes
- III. Leucocytes
- IV. Platelets

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

17. Which processes release the products of excretion?

- I. Urinating
- II. Sweating
- III. Breathing
- IV. Egestion

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

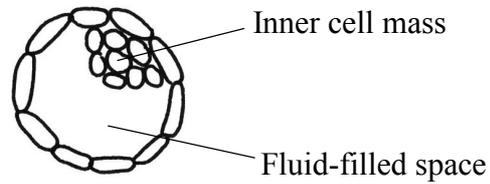
18. What is *copulation*?

- A. When sperms are released inside a female genital system.
- B. When sperms meet and fuse with an egg.
- C. When sperms are stopped from fusing with an egg.
- D. When an early embryo attaches to the wall of the uterus.

19. What messenger is responsible for maintaining a normal blood sugar level at night while we sleep?

- A. Glucagon
- B. Glycogen
- C. Glucose
- D. Glycerol

20. The diagram below shows a cross section of a stage in the early development of a human embryo. At what state of development is the embryo at?

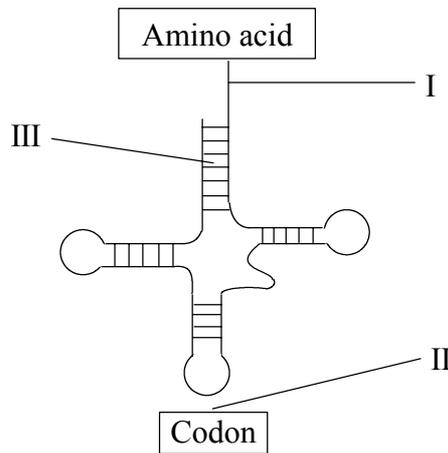


- A. Zygote
 - B. Blastomere
 - C. Morula
 - D. Blastocyst
21. Where are electron carriers found within the cell?
- A. In the chloroplast envelope
 - B. In the chloroplast thylakoid membrane
 - C. In the mitochondrial outer membrane
 - D. In the rough endoplasmic reticulum (rough ER)
22. What term describes a group of cells with a similar structure and function?
- A. A tissue
 - B. An organ
 - C. An organ-system
 - D. An organism

23. A cell in a photomicrograph is 10 cm in diameter. The scale of magnification of the photomicrograph is $\times 4000$. What is the actual size of the cell?

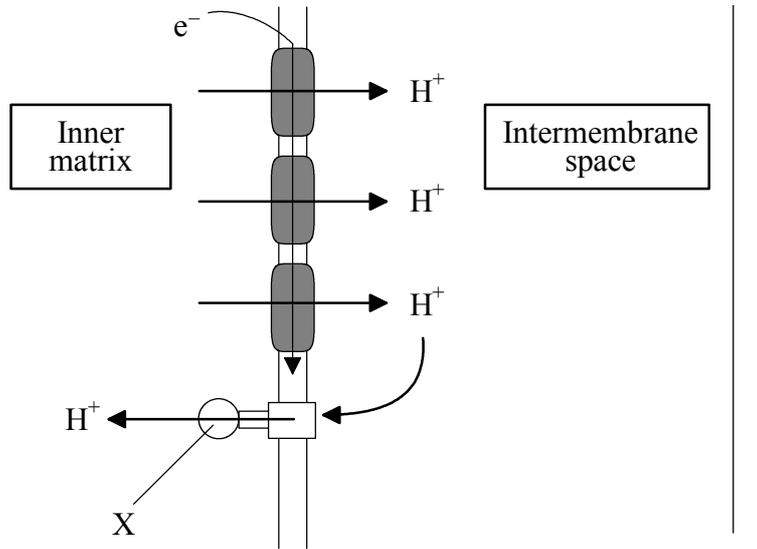
- A. 2500 mm
- B. 2.5 mm
- C. 250 μm
- D. 25 μm

24. Where does hydrogen bonding occur in the structure below?



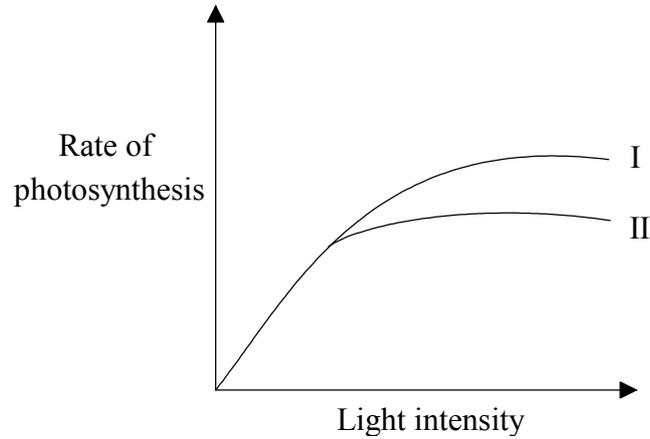
- A. II only
- B. I and II only
- C. II and III only
- D. I, II and III

25. What happens when protons (H^+ ions) move across the membrane at X?



- A. The pH of the intermembrane space falls.
 - B. The pH of the inner matrix rises.
 - C. ATP is synthesized from ADP and phosphate.
 - D. ATP is hydrolysed into ADP and phosphate.
26. What is the net production of ATP per molecule of glucose consumed during the fermentation of glucose to lactate?
- A. 36 molecules
 - B. 4 molecules
 - C. 2 molecules
 - D. None

27. What changes in carbon dioxide levels and temperature will most likely produce curve I instead of curve II?



	Carbon dioxide levels	Temperature
A.	increase	decrease
B.	decrease	increase
C.	decrease	decrease
D.	increase	increase

28. What is the difference between the amount of chromatin in each of the daughter cells at the end of meiosis and the mother cell at the beginning of meiosis?

- A. There is double the amount of chromatin in each of the daughter cells.
- B. There is no change in the amount of chromatin in each of the daughter cells.
- C. There is half the amount of chromatin in each of the daughter cells.
- D. There is quarter the amount of chromatin in each of the daughter cells.

29. What are the functions of the epididymis?

✓ = yes × = no

	Spermatogenesis	Storage of sperms	Transport of sperms
A.	✓	×	×
B.	✓	✓	×
C.	×	✓	✓
D.	✓	✓	✓

30. Which hormone does the placenta secrete?

- A. Oxytocin
- B. FSH
- C. Prolactin
- D. Progesterone

31. Deficiency in which vitamin may lead to poor blood clotting?

- A. Vitamin A
- B. Vitamin B₁₂
- C. Vitamin E
- D. Vitamin K

32. What kind of immunity is acquired by the fetus from its mother across the placenta?

- A. Active
- B. Passive
- C. Natural
- D. Artificial

33. If four organisms belong to the same order, which taxonomic group must they also belong to?

- A. Class
- B. Family
- C. Genus
- D. Species

34. Which metabolic activities are shown by the prokaryotes?

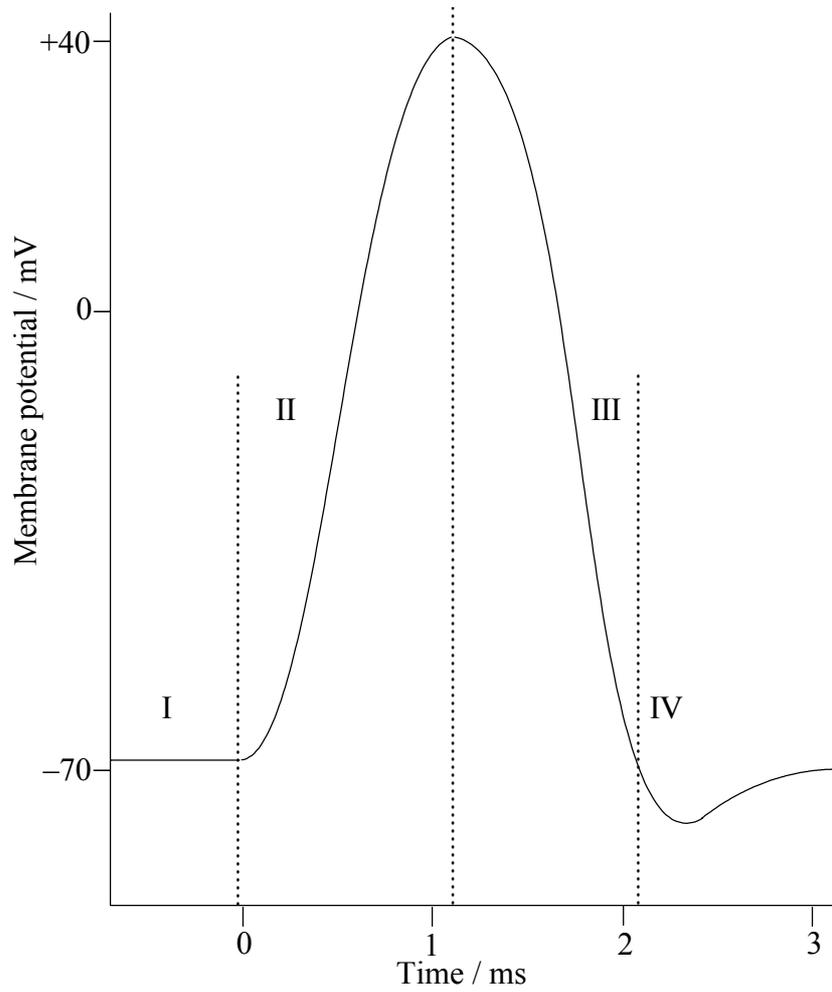
✓ = yes × = no

	Fermentation	Photosynthesis	Nitrogen fixation
A.	✓	×	×
B.	×	✓	×
C.	✓	✓	✓
D.	×	×	✓

35. Which organisms belong to the kingdom Protocista?

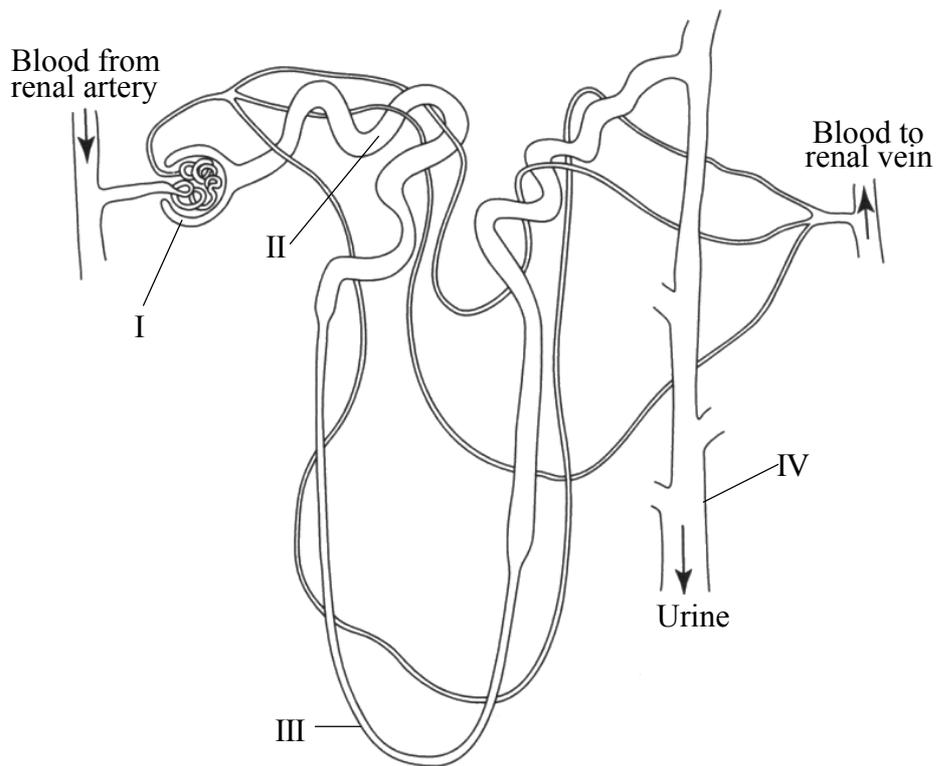
- A. Bacteria
- B. Algae
- C. Bryophytes
- D. Earthworms

The diagram below should be used in answering questions 36 and 37.



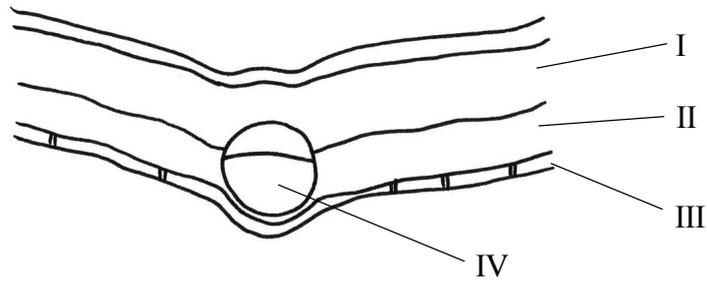
36. The curve above shows a nerve impulse. Which part(s) of the curve represent(s) the action potential?
- A. I and II only
 - B. II and III only
 - C. II only
 - D. IV only
37. If ATP synthesis was inhibited in a neurone, which parts of the nerve impulse would be affected?
- A. I and II only
 - B. I and III only
 - C. II and IV only
 - D. I and IV only

38. Where is water reabsorbed in the kidney tubule?



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

39. Which tissues shown in the cross section of the leaf below may contain chloroplasts?



- A. II only
 - B. II and III only
 - C. I, II and III only
 - D. I, II, III and IV
40. What is the pathway taken by minerals across the tissues in the root of an angiosperm?
- A. epidermis, cortex, endodermis, xylem
 - B. endodermis, cortex, epidermis, xylem
 - C. epidermis, endodermis, cortex, xylem
 - D. cortex, epidermis, endodermis, xylem