



**BIOLOGY
HIGHER LEVEL
PAPER 1**

Wednesday 10 November 2004 (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.

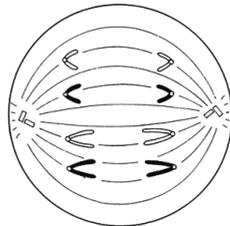
1. If a red blood cell has a diameter of 8 μm and a student shows it with a diameter of 40 mm in a drawing, what is the magnification of the drawing?

- A. $\times 0.0002$
- B. $\times 0.2$
- C. $\times 5$
- D. $\times 5000$

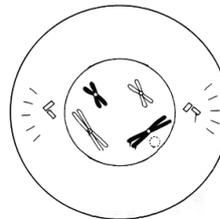
2. How do animals use cholesterol?

- A. To form part of the structure of cell membranes
- B. To increase the blood pressure during exercise
- C. To insulate neurones between nodes of Ranvier
- D. To help in the storage of energy

3. Which phases of mitosis are shown in diagrams I and II?



I

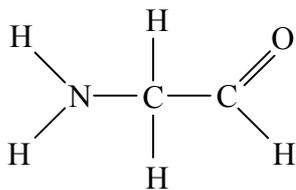


II

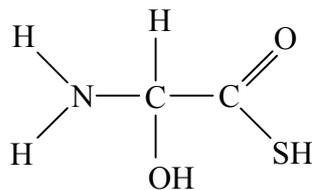
	I	II
A.	metaphase	prophase
B.	metaphase	telophase
C.	anaphase	prophase
D.	anaphase	metaphase

4. Which structure represents an amino acid?

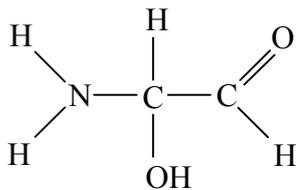
A.



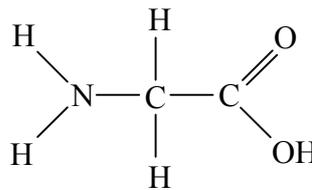
B.



C.



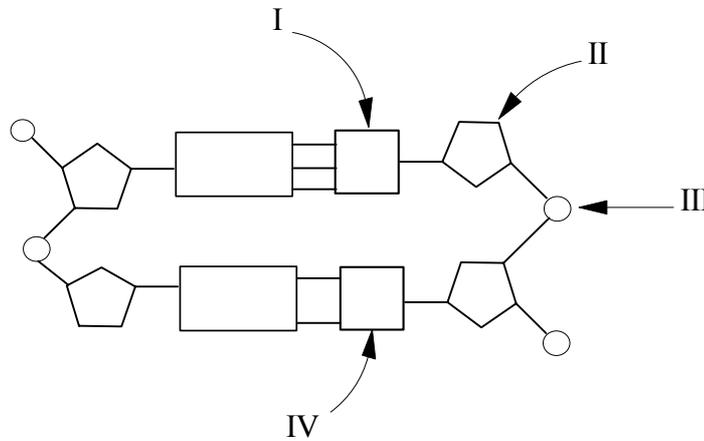
D.



5. What is the advantage of using pectinase in fruit juice production?

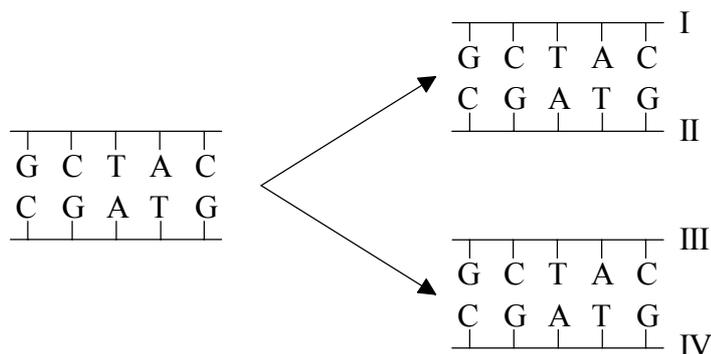
- A. The pectin content of the fruit is increased, making the nutritional value of the juice higher.
- B. The pectin content of the fruit is reduced, making the energy content of the juice lower.
- C. The pectin content of the fruit is reduced, making the juice easier to extract.
- D. The pectin content of the fruit is increased, giving the juice a thicker texture.

6. The diagram below represents a short section of DNA. If the sub-unit labelled I is cytosine, what could the sub-units labelled II, III and IV be?



	II	III	IV
A.	G (guanine)	sugar	C (cytosine)
B.	G (guanine)	phosphate	C (cytosine)
C.	phosphate	sugar	T (thymine)
D.	sugar	phosphate	T (thymine)

7. The diagram below shows a short section of DNA molecule before and after replication. If the nucleotides used to replicate the DNA were radioactive, which strands in the replicated molecules would be radioactive?

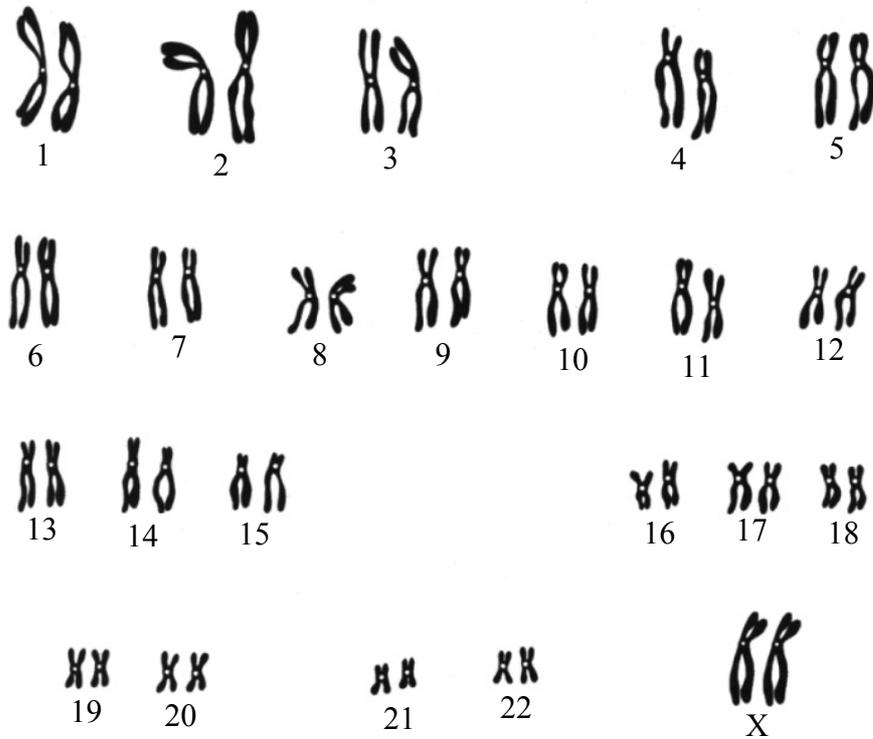


- A. II and III only
 B. I and III only
 C. I and II only
 D. I, II, III and IV

8. What is needed in photosynthesis to convert carbon dioxide into organic molecules?

- A. Light and hydrogen from the splitting of water
- B. Light and oxygen from the splitting of water
- C. ATP and hydrogen from the splitting of water
- D. ATP and oxygen from the splitting of water

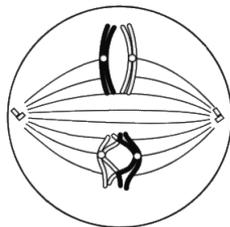
9. The diagram below shows the karyotype of a fetus.



What conclusion can be drawn from it?

- A. There was non-disjunction during meiosis in the mother.
- B. There was non-disjunction during meiosis in the father.
- C. The fetus is male.
- D. The fetus is female.

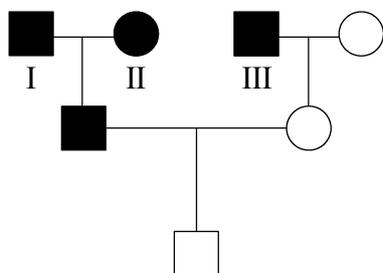
10. The diagram below shows a cell during meiosis.



How many chromosomes would each daughter cell have at the end of meiosis?

- A. 1
- B. 2
- C. 4
- D. 8

11. The pedigree below shows which members of a family were Rhesus positive (■ and ●) and Rhesus negative (□ and ○). The allele for Rhesus positive blood (Rh^+) is dominant over the allele for Rhesus negative blood (Rh^-).

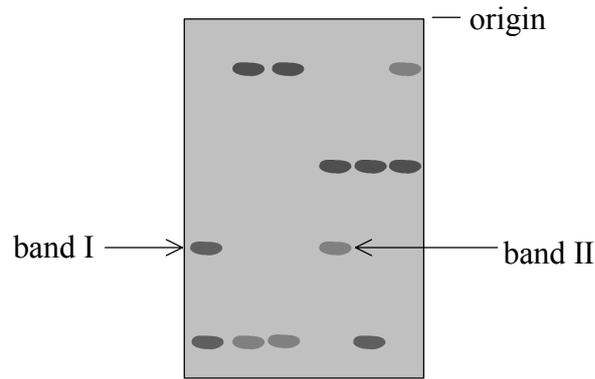


- Rhesus positive male
- Rhesus negative male
- Rhesus positive female
- Rhesus negative female

Which are possible genotypes of the individuals numbered I, II and III?

	I	II	III
A.	$Rh^+ Rh^+$	$Rh^+ Rh^+$	$Rh^+ Rh^-$
B.	$Rh^+ Rh^+$	$Rh^+ Rh^-$	$Rh^+ Rh^+$
C.	$Rh^+ Rh^+$	$Rh^+ Rh^-$	$Rh^+ Rh^-$
D.	$Rh^+ Rh^-$	$Rh^+ Rh^-$	$Rh^+ Rh^+$

12. The diagram below shows the results of DNA profiling using gel electrophoresis.



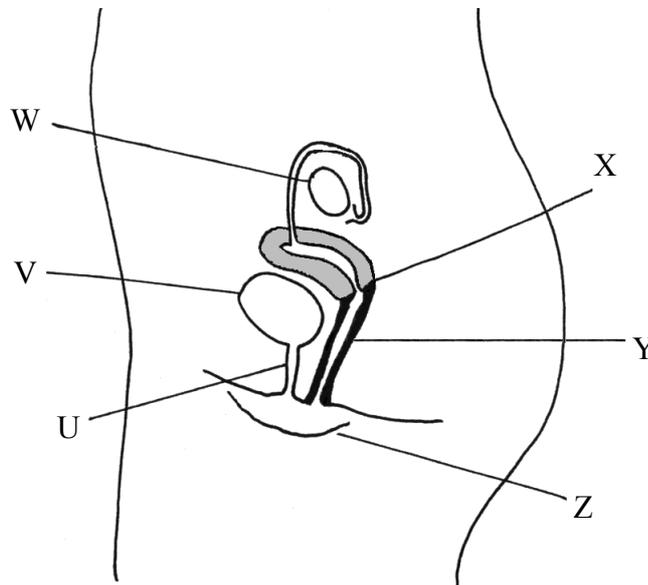
What conclusion can be drawn about the DNA in bands I and II?

- A. The DNA in the two bands has the same base sequence.
 - B. The DNA in the two bands consists of fragments of the same length.
 - C. The DNA in the two bands has the same ratio of bases.
 - D. The DNA in the two bands came from the same source.
13. What are the **two** components of an ecosystem?
- A. community and abiotic environment
 - B. species and habitat
 - C. habitat and abiotic environment
 - D. species and community
14. At which trophic level is most energy available in ecosystems?
- A. Primary consumers
 - B. Top consumers
 - C. Saprotrophs
 - D. Producers

15. Which factors promote evolution in a species?
- I. Sexual reproduction
 - II. Environmental change
 - III. Overproduction of offspring
- A. I and II only
 - B. II and III only
 - C. I and III only
 - D. I, II and III
16. Classification in biology involves putting organisms that share characteristics together in groups. In which type of group do the organisms share most characteristics?
- A. Class
 - B. Family
 - C. Genus
 - D. Order
17. What is the function of the right ventricle?
- A. Pumping blood into the pulmonary artery
 - B. Pumping blood into the pulmonary vein
 - C. Pumping blood into the aorta
 - D. Pumping blood into the coronary artery
18. Which is a method of transmission of HIV?
- A. Swimming in a pool with an HIV positive person
 - B. Bites from a mosquito that had previously bitten an HIV positive person
 - C. Inhaling air that has been exhaled by an AIDS patient
 - D. Contact between the penis of an HIV negative male and the vagina of an HIV positive female during sexual intercourse

19. Which best describes the role of the kidney in homeostasis?
- A. Storage of urine
 - B. Producing urine at a constant rate
 - C. Removing urea from the blood
 - D. Maintaining the water content of the blood between narrow limits

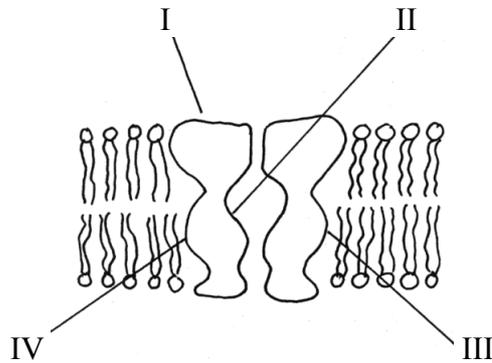
20. The diagram below shows the human female reproductive system and associated organs.



Which of the labelled structures are the bladder, cervix and vagina?

	Bladder	Cervix	Vagina
A.	W	Z	U
B.	V	Z	Y
C.	W	X	U
D.	V	X	Y

23. The diagram below shows a channel protein in a membrane. Which parts of the surface of the protein would be composed of polar amino acids.



- A. I and II only
 B. II and III only
 C. III and IV only
 D. I and IV only
24. What effect do enzymes have on the activation energy of exergonic and endergonic reactions?

	Activation energy of exergonic reactions	Activation energy of endergonic reactions
A.	increases	increases
B.	decreases	decreases
C.	increases	decreases
D.	decreases	increases

25. What is the sequence of stages during the conversion of glucose into pyruvate in glycolysis?
- A. lysis → phosphorylation of sugar → oxidation
 B. lysis → oxidation → phosphorylation of sugar
 C. phosphorylation of sugar → lysis → oxidation
 D. phosphorylation of sugar → oxidation → lysis

26. How is the proton gradient generated in chloroplasts during photosynthesis?
- A. Flow of electrons from carrier to carrier in the thylakoid membrane causes pumping of protons across the thylakoid membrane.
 - B. Light causes protons to flow through protein channels in the thylakoid membrane.
 - C. Light splits water molecules in the stroma, causing the release of protons.
 - D. Protons are pumped across the thylakoid membrane using energy from ATP.
27. Why is the action spectrum for photosynthesis similar to the absorption spectra of photosynthetic pigments?
- A. Photosynthetic pigments have the same optimum temperature as the enzymes used in photosynthesis.
 - B. Plants absorb the same photosynthetic pigments for use in photosynthesis.
 - C. Only wavelengths of light absorbed by pigments can be used in photosynthesis.
 - D. The amount of energy absorbed by photosynthetic pigments is equal to the activation energy for photosynthesis.
28. The diagram below shows chromosomes during prophase I of meiosis. How many chromosomes and chiasmata are visible?



	Number of chromosomes	Number of chiasmata
A.	2	2
B.	4	2
C.	2	4
D.	4	4

29. In peas the allele for round seed (R) is dominant over the allele for wrinkled seed (r). The allele for yellow seed (Y) is dominant over the allele for green seed (y).

If two pea plants with the genotypes $YyRr$ and $Yyrr$ are crossed together, what ratio of phenotypes is expected in the offspring?

- A. 9 round yellow : 3 round green : 3 wrinkled yellow : 1 wrinkled green
 - B. 3 round yellow : 3 round green : 1 wrinkled yellow : 1 wrinkled green
 - C. 3 round yellow : 1 round green : 3 wrinkled yellow : 1 wrinkled green
 - D. 1 round yellow : 1 round green : 1 wrinkled yellow : 1 wrinkled green
30. What is a difference between autosomes and sex chromosomes?
- A. Autosomes are not found in gametes but sex chromosomes are.
 - B. Sex chromosomes are found in animal cells and autosomes are found in plant cells.
 - C. Autosomes are diploid and sex chromosomes are haploid.
 - D. Sex chromosomes determine gender and autosomes do not.
31. What happens to the polar bodies formed during oogenesis?
- A. They cause the acrosome reaction.
 - B. They cause the cortical reaction.
 - C. They pull chromosomes to the ends of the cell when the zygote divides.
 - D. They are not used and break down.
32. How can testis tissue be distinguished from ovary tissue, when seen using a light microscope?
- A. Testis tissue has a layer of muscle fibres and ovary tissue does not.
 - B. Testis tissue is cooler than ovary tissue.
 - C. Testis tissue contains tubules and ovary tissue does not.
 - D. Testis tissue contains pain receptors and ovary tissue does not.

33. Which types of cells in the immune system destroy body cells that have been infected by viruses?
- A. Activated B-cells
 - B. Cytotoxic T-cells
 - C. Phagocytic macrophages
 - D. Plasma cells formed by clonal selection
34. What are monoclonal antibodies?
- A. Antibodies produced artificially that bind to one type of antigen only
 - B. Antibodies produced naturally in response to infection by one type of pathogen only
 - C. Antibodies produced artificially in response to inoculation with one vaccine only
 - D. Antibodies produced naturally by cells formed from one B-cell only, by mitosis
35. What is the role of active transport in the transmission of nerve impulses by neurones?
- A. Propagates an action potential by pumping sodium ions across the membrane out of the neurone.
 - B. Propagates an action potential by pumping sodium ions across the membrane into the neurone.
 - C. Initiates the action potential needed for the transmission of an impulse by pumping calcium ions out of the endoplasmic reticulum.
 - D. Establishes the resting potential needed for the transmission of an impulse by pumping sodium and potassium ions across the membrane.
36. What is the difference between the light and dark bands visible in electron micrographs of skeletal muscle?
- A. Dark bands contain myosin fibres and light bands do not.
 - B. Dark bands contain sarcomeres and light bands do not.
 - C. Light bands contain sarcoplasmic reticulum and dark bands do not.
 - D. Light bands contain mitochondria and dark bands do not.

37. What are the excretory products of birds, mammals and freshwater fish?

	Birds	Mammals	Freshwater fish
A.	ammonia	uric acid	urea
B.	urea	uric acid	ammonia
C.	ammonia	urea	uric acid
D.	uric acid	urea	ammonia

38. What can be changed in the kidney over a period of time in order to carry out the process of osmoregulation?

- A. The amount of blood flowing to the kidney
- B. The amount of fluid filtered from the blood in the glomeruli
- C. The amount of solutes selectively reabsorbed in the proximal convoluted tubule
- D. The amount of water reabsorbed in the collecting ducts

39. When a farmer sprays a chemical on to crop plants, how does the chemical travel to the roots of the plants?

- A. In the phloem, by active translocation
- B. In the phloem, by transpiration pull
- C. In the xylem, by transpiration pull
- D. In the xylem, by active translocation

40. Fertilization, pollination and seed dispersal all occur during the reproduction of a flowering plant. In what sequence do these processes occur?

- A. seed dispersal → pollination → fertilization
- B. fertilization → pollination → seed dispersal
- C. pollination → fertilization → seed dispersal
- D. seed dispersal → fertilization → pollination