



22066013

**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.

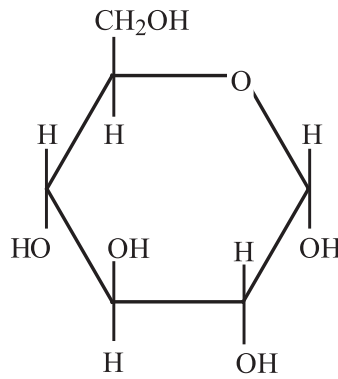
1. If a cell plate is beginning to form and nuclei are re-forming at opposite ends of a cell, what kind of cell is this?
  - A. An animal cell in prophase
  - B. A plant cell in prophase
  - C. An animal cell in telophase
  - D. A plant cell in telophase
  
2. The width of a human hair is 0.1 mm. What is the width in  $\mu\text{m}$ ?
  - A. 10  $\mu\text{m}$
  - B. 100  $\mu\text{m}$
  - C. 1000  $\mu\text{m}$
  - D. 10 000  $\mu\text{m}$
  
3. What process involves the movement of solvent through a semi-permeable membrane from a region of low solute concentration to a region of high solute concentration?
  - A. Active transport
  - B. Osmosis
  - C. Simple diffusion
  - D. Facilitated diffusion
  
4. Which of the following is an organic compound found in both plant and animal cells?
  - A. Cellulose
  - B. Carbonate
  - C. Water
  - D. Pyruvate

5. Which of the following features are correct for hydrogen bonding?

- I. It is involved in the cohesion of water.
- II. It results in the thermal properties of water.
- III. It is a bond within the water molecule.

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

6.



Which of the following terms correctly describe(s) the molecule above?

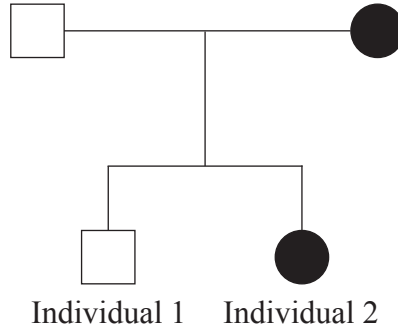
- I. Monosaccharide
- II. Glucose
- III. Component of triglyceride

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

7. What is a role of carbohydrates in animal cells?
- A. As channels for passive transport
  - B. As enzymes
  - C. As energy storage
  - D. As components of the animal cell wall
8. Which property of water is most important to plants living below the surface of water?
- A. Cohesion
  - B. Oxygen solubility
  - C. Surface tension
  - D. Transparency

The following information refers to questions 9 and 10.

Hypophosphataemia is a disorder involving poor re-absorption of phosphate from glomerular filtrate in humans. It shows a sex-linked dominant pattern of inheritance as illustrated in the following pedigree.



**Key:**

□ = unaffected male                      ● = affected female

9. Which row in the table identifies the genotypes of individuals 1 and 2?

	Individual 1	Individual 2
A.	$X^H X^h$	$X^H Y$
B.	$X^h Y$	$X^H X^H$
C.	$X^h Y$	$X^H X^h$
D.	unaffected	affected

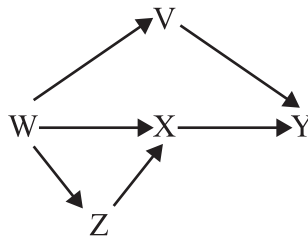
10. Which characteristic could be used to diagnose hypophosphataemia?

- A. Low levels of phosphate in the blood
- B. Low levels of phosphate in the urine
- C. Raised levels of phosphate in the filtrate leaving the Bowman's capsule
- D. Higher levels of ADH in the blood

11. What is the genetic cross called between an individual of unknown genotype and an individual who is homozygous recessive for a particular trait?
- A. Test-cross
  - B. Hybrid cross
  - C. Dihybrid cross
  - D. F<sub>1</sub> cross
12. What is the usual cause of Down's syndrome?
- A. 21 pairs of chromosomes
  - B. Trisomy 21
  - C. Non-disjunction of sex chromosomes
  - D. Fertilization of the egg by two sperm
13. Which of the following conditions has been treated by gene therapy?
- A. Emphysema
  - B. SCID
  - C. Coronary heart disease
  - D. Colon cancer
14. Which enzyme is used to produce complementary DNA (cDNA) from mRNA?
- A. Restriction endonuclease
  - B. Reverse transcriptase
  - C. DNA ligase
  - D. RNA primase

15. Why is it possible for a gene from one organism to be introduced and function in a different organism?
- A. All organisms are made of cells.
  - B. All organisms have nuclei.
  - C. The genetic code is universal.
  - D. All organisms have ribosomes.
16. Natural selection is based on which of the following?
- I. Variation exists within populations.
  - II. There is differential reproductive success within populations.
  - III. Individuals must adapt to their environment.
- A. I only
  - B. I and II only
  - C. II and III only
  - D. I, II and III
17. For the following 10 measurements 4,5,5,6,6,6,6,7,7,8 the mean value is 6. What is the best estimate of the standard deviation?
- A. 8
  - B. 6
  - C. 3
  - D. 1

18. Which of the following represents a kingdom?
- A. Eukaryote
  - B. Viruses
  - C. Protoctista
  - D. Mammals
19. Which of the following statements describe a “population”?
- A. All the autotrophs and heterotrophs living in a certain area
  - B. Individuals belonging to the same species in a certain area
  - C. Two geographically isolated groups belonging to the same species
  - D. A group of different species living in the same area at the same time
20. The diagram below is a food web and each letter represents a species.



Which is the best prediction about biomass?

- A. The biomass of X is more than the biomass of W.
- B. The biomass of X is less than the biomass of Y.
- C. The biomass of V + X + Z is equal to the biomass of W.
- D. The biomass of Y is less than the biomass of Z.



21. Which of the following changes occur with the onset of exercise?
- A. Increase in pH of blood
  - B. Increase in rate of cellular respiration
  - C. Decrease in rate of contraction of the diaphragm
  - D. Decrease in carbon dioxide concentration of the blood
22. In which part of the digestive system is most water re-absorbed?
- A. The kidneys
  - B. The stomach
  - C. The small intestine
  - D. The large intestine
23. Which of the following is part of the process of ventilation?
- A. Changes in the volume of the thoracic cavity
  - B. Exchange of gases across the surface of the alveoli
  - C. Exchange of gases across the surface of capillaries
  - D. Cellular respiration
24. Which of the following occur(s) at birth in the mother's body?
- I. Increase in oxytocin
  - II. Increase in uterine contractions
  - III. Increase in levels of progesterone
- A. I only
  - B. I and II only
  - C. II and III only
  - D. I, II and III

25. Which of the following is regulated by positive feedback?
- A. Blood sugar
  - B. Temperature
  - C. Oxytocin levels
  - D. Progesterone levels
26. Which of the following is a secondary sexual characteristic in human females?
- A. Increasing relative width of hips
  - B. Presence of mammary glands
  - C. Presence of a uterus
  - D. Presence of a bladder
27. According to the induced fit model of enzyme function, which of the following statements is correct?
- A. Active sites on enzymes are specific to a single substrate.
  - B. The shape of the active site can be changed by the binding of an allosteric inhibitor.
  - C. The binding of the substrate changes the shape of the active site slightly.
  - D. Competitive inhibitors can change the shape of enzymes.
28. Which of the following statements about pyruvate is true?
- A. It contains less energy than glucose per molecule.
  - B. Every molecule of glucose is converted to one molecule of pyruvate.
  - C. Pyruvate is produced in the mitochondria.
  - D. Under aerobic conditions, pyruvate is converted to lactate.

29. At which stage of photosynthesis is light involved most directly?
- A. Reduction of  $\text{NADP}^+$  to  $\text{NADPH}_2$
  - B. Chemiosmosis
  - C. The synthesis of chlorophyll
  - D. The photoactivation of chlorophyll
30. During which process are oxygen molecules directly involved during cellular respiration?
- A. Glycolysis
  - B. Krebs cycle
  - C. Oxidation of pyruvate to acetyl CoA
  - D. Accepting electrons at the end of the electron transport chain
31. Which of the following is/are necessary to produce monoclonal antibodies?
- I. Tumour cells
  - II. Plasma (B) cells
  - III. Macrophages
- A. II only
  - B. I and II only
  - C. II and III only
  - D. I, II and III
32. In which of the following structures does meiosis take place?
- A. Epididymis
  - B. Prostate gland
  - C. Testis
  - D. Seminal vesicle

33. Membrane proteins are critical components of nerve function.

Which process in nerves does **not** require a membrane protein?

- A. Diffusion of neurotransmitter
- B. Active transport of sodium
- C. Propagation of an action potential
- D. Binding of neurotransmitter

34. Which of the following has vascular tissue?

- A. Algae
- B. Chlorophyta
- C. Bryophyta
- D. Angiospermophytes

35. What treatment is most likely to lead to germination?

- A. Soaking the seeds in a solution of gibberellins
- B. Increasing CO<sub>2</sub> concentration
- C. Increasing light intensity
- D. Dehydrating the seeds

36. Which of the following explains clonal selection?

- A. Memory cells are present at birth.
- B. Antigens activate specific immune responses.
- C. The body selects which antigens it will respond to.
- D. People with similar genes respond to antigens in a similar way.

37. Where is an anti-codon located?
- A. tRNA
  - B. mRNA
  - C. DNA
  - D. Ribosomes
38. Which human trait shows a pattern of polygenic inheritance?
- A. ABO blood type
  - B. Sickle cell anemia
  - C. Skin colour
  - D. Co-dominant alleles
39. All seven of the characteristics of pea plants studied by Mendel displayed independent assortment. What does this necessarily indicate?
- A. The seven different pairs of alleles were on the same chromosome.
  - B. The seven different pairs of alleles behaved as if they were on different chromosomes.
  - C. Each parent had two alleles for each trait, but gave only one to the progeny.
  - D. All seven pairs of alleles were on a single set of homologous chromosomes.
40. If the haploid number of an organism is 8, how many different varieties of gametes are possible, not considering the effects of crossing over?
- A. 16
  - B. 64
  - C. 128
  - D. 256