

**BIOLOGY
HIGHER LEVEL
PAPER 1**

Tuesday 11 May 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. Which of the following is a characteristic of organelles?

- A. They are only found in eukaryotic cells
- B. They are only found in prokaryotic cells
- C. They are sub-cellular structures
- D. They are all membrane bound

2. Which processes require membrane proteins?

	Fertilization	Cell respiration	Nerve impulse transmission	Osmoregulation
A.	X	✓	✓	X
B.	X	✓	✓	✓
C.	✓	X	✓	✓
D.	✓	✓	✓	✓

✓ = yes

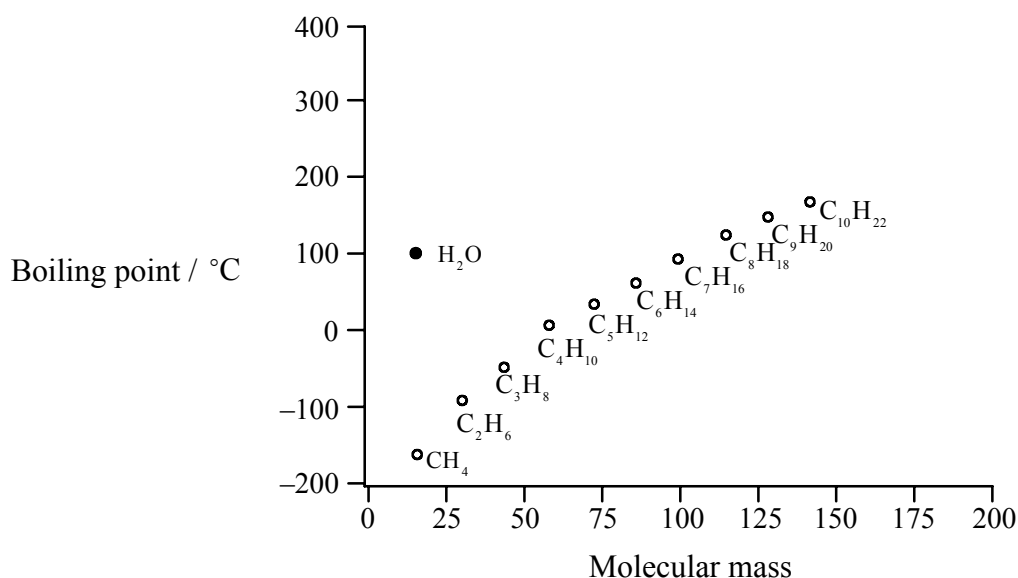
X = no

3. What is the correct sequence of events during exocytosis?

- I. Formation of a vesicle by the Golgi apparatus
- II. Secretion of the vesicle's contents
- III. Fusion of the vesicle with the plasma membrane
- IV. Movement of the vesicle towards the plasma membrane

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

4. The graph below shows the change in boiling point of a series of different organic compounds of different molecular mass compared with water.

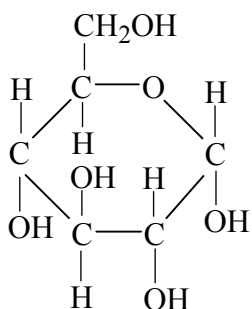


Why is the boiling point of water different from that of the organic molecules?

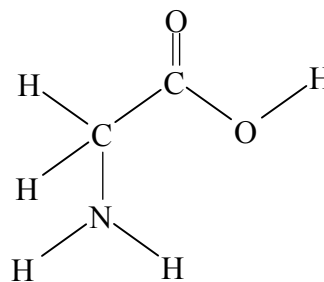
- A. Water is not an organic molecule
- B. Water is a transparent liquid
- C. The organic compounds are soluble in water
- D. Water molecules are polar
5. Which of the following are connected by a hydrogen bond?
- A. The hydrogen and oxygen atoms of a water molecule
- B. A base pair of a DNA molecule
- C. Two amino acid molecules of a dipeptide
- D. Two glucose molecules in a disaccharide

6. Which molecule represents ribose?

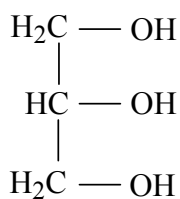
A.



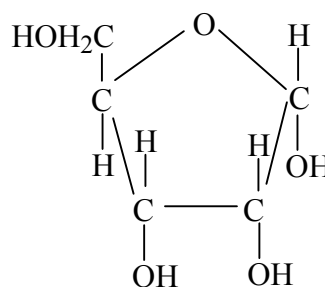
B.



C.



D.



7. What property of enzymes is shown when their substrate concentration changes?

- A. The activity of an enzyme increases constantly with an increase in substrate concentration
- B. Enzyme activity decreases with increased substrate concentration
- C. Enzyme activity increases to an optimum substrate concentration and then decreases
- D. Enzyme activity increases with increased substrate concentration until all the active sites are occupied

8. The data below shows the proportions of the four bases in the DNA of four different organisms.

Species	Adenine / %	Guanine / %	Cytosine / %	Thymine / %
<i>Allium cepa</i>	31.8	18.4	18.2	31.3
<i>Daucus carota</i>	26.7	23.2	23.3	26.8
<i>Albica punctata</i>	28.4	19.5	19.3	32.8
<i>Clostridium perfringens</i>	36.9	14.0	12.8	36.3

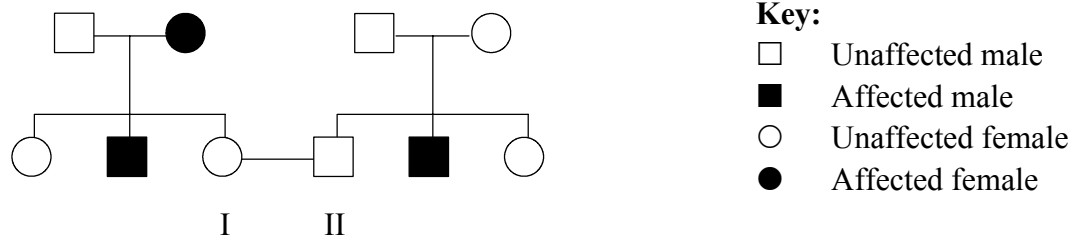
What fact is supported by this evidence?

- A. The bases in an organism are in equal proportions
 - B. The sequence of bases in a molecule of DNA are constant
 - C. The ratio of adenine to guanine is the same as the ratio of adenine to thymine
 - D. The ratio of adenine to thymine is the same as the ratio of guanine to cytosine
9. In the mutation of the hemoglobin gene that produces the sickle cell allele, CTC is converted to CAC on the DNA strand that is to be transcribed. What will be the anticodon sequence of the tRNA molecule for the translation of the mutated allele?
- A. GUG
 - B. GTG
 - C. CAC
 - D. GAG
10. What are homologous chromosomes?
- A. A pair of chromosomes which carry alleles of the same genes
 - B. A pair of chromosomes which are associated with the sex of an individual
 - C. A pair of chromosomes connected at the centromere
 - D. A pair of identical DNA molecules

11. How many genotypes can be made from a gene which has three alleles?

- A. 3
- B. 6
- C. 9
- D. 12

12. The pedigree chart below shows the inheritance of Daltonism in a family. Daltonism (red-green colour blindness) is sex linked. The allele for Daltonism is recessive to normal colour vision.



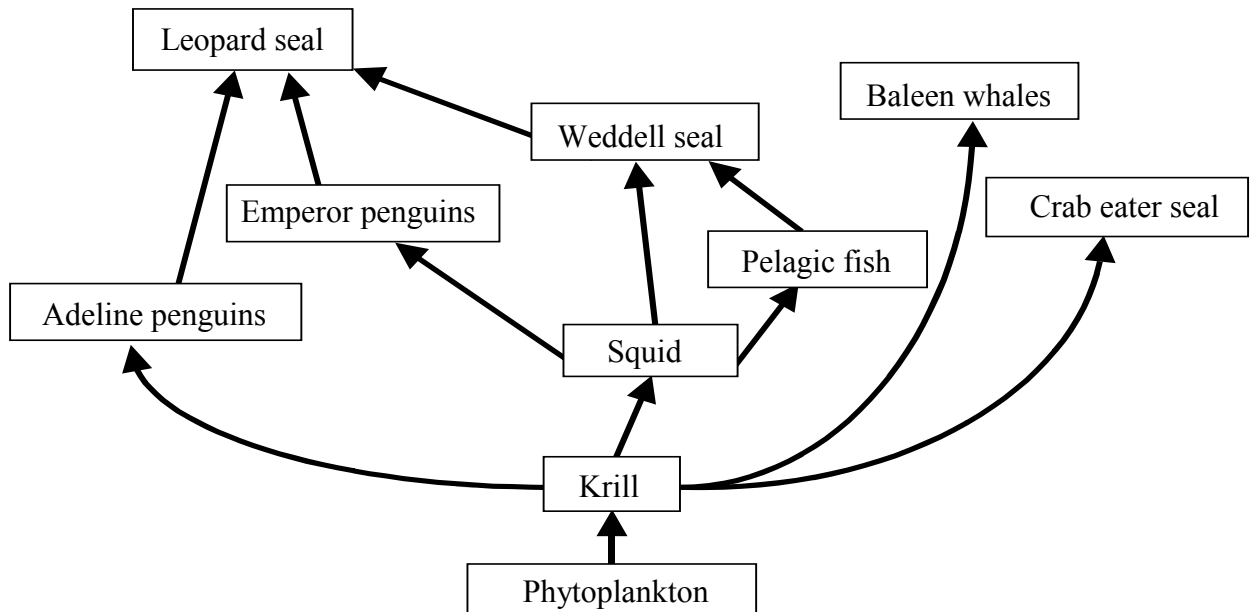
Persons I and II have a child. What is the chance that the child will be colour blind?

- A. 0 %
- B. 25 %
- C. 75 %
- D. 100 %

13. What is copied by the polymerase chain reaction (PCR)?

- A. Polypeptides
- B. Polysaccharides
- C. Polynucleotides
- D. Polyunsaturated fatty acids

The following diagram refers to questions 14 and 15. It shows part of the food web of the community that inhabits Antarctica.



14. What trophic level do squid belong to?
- A. Tertiary consumers
 - B. Secondary consumers
 - C. Primary consumers
 - D. Producers
15. Which human activity would have the greatest impact on the food web?
- A. Overfishing the krill
 - B. Killing crab eater seals for their skins
 - C. A continued ban on hunting whales
 - D. Building an airstrip through the emperor penguin nesting colony

16. The data shows the number of flowers per flower head of a random sample from a white clover (*Trifolium repens*) population.

36

51

56

62

62

63

65

69

73

83

Mean = 62

Standard deviation = 12.5

What statistical percentage of the population has between 49 and 75 flowers per flower head?

- A. 5 %
 - B. 32 %
 - C. 68 %
 - D. 95 %
17. The scientific names of two organisms are shown below.

Lathyrus palustris

Angelica palustris

What is the relationship between these organisms?

- A. They both belong to the same genus but they are different species
- B. They both belong to the same species but different genera
- C. They are both different species and different genera
- D. They both belong to the same species and the same genus

18. Which of the following structures help the absorption of food by the small intestine?

- I. Capillary networks
- II. Villi
- III. Microvilli
- IV. Membrane proteins

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

19. Which hormone affects the heart beat?

- A. Glucagon
- B. Insulin
- C. Adrenalin
- D. Oxytocin

20. Why do antibiotics kill bacteria but not viruses?

- A. Antibiotics stimulate the immune system against bacteria but not viruses
- B. Viruses have a way of blocking antibiotics
- C. Viruses are too small to be affected by antibiotics
- D. Viruses do not have a metabolism

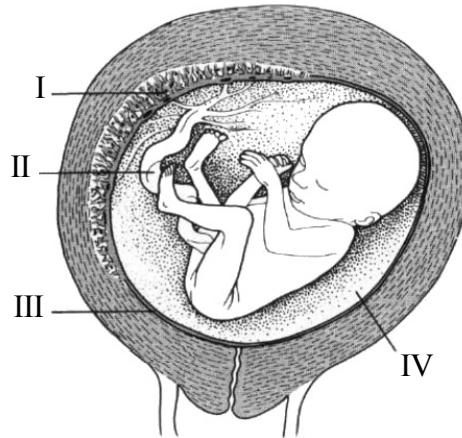
21. Which of the following is an effect of HIV on the human body?

- A. It reduces the number of erythrocytes in the blood
- B. It reduces the number of platelets in the blood
- C. It increases the amount of plasma in the blood
- D. It reduces the number of lymphocytes in the blood

22. In thermoregulation, what would happen over a short period of time in each of these areas, if a person was placed in water at 15°C?

	Peripheral circulation	Sweat glands	Liver	Skeletal muscle
A.	Increased blood flow	Increased secretion	Decreased temperature	Decreased shivering
B.	Decreased blood flow	Decreased secretion	Decreased temperature	Increased shivering
C.	Decreased blood flow	Increased secretion	No change in temperature	Increased shivering
D.	Decreased blood flow	Decreased secretion	No change in temperature	Increased shivering

23. The diagram below shows the uterus of a pregnant woman.

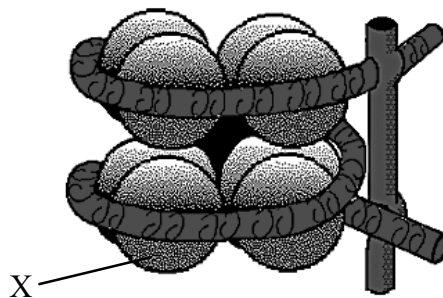


[Source: adapted from M B V Roberts (1986), *Biology for Life*, Nelson, page 348]

Where are samples taken from in amniocentesis?

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

24. The diagram below shows a nucleosome.



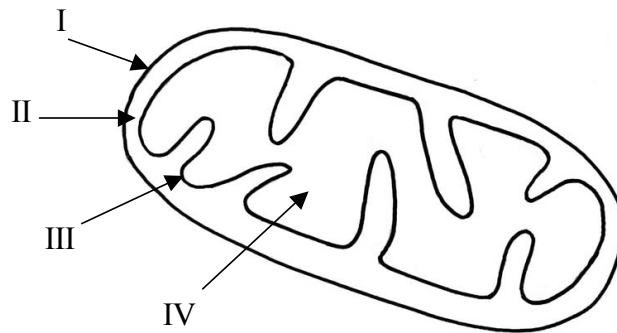
[Source: National Health Museum Graphics Gallery, www.accessexcellence.org/AB/GG/nucleosome.html]

What is structure X?

- A. DNA
- B. RNA
- C. Histone
- D. Deoxyribose

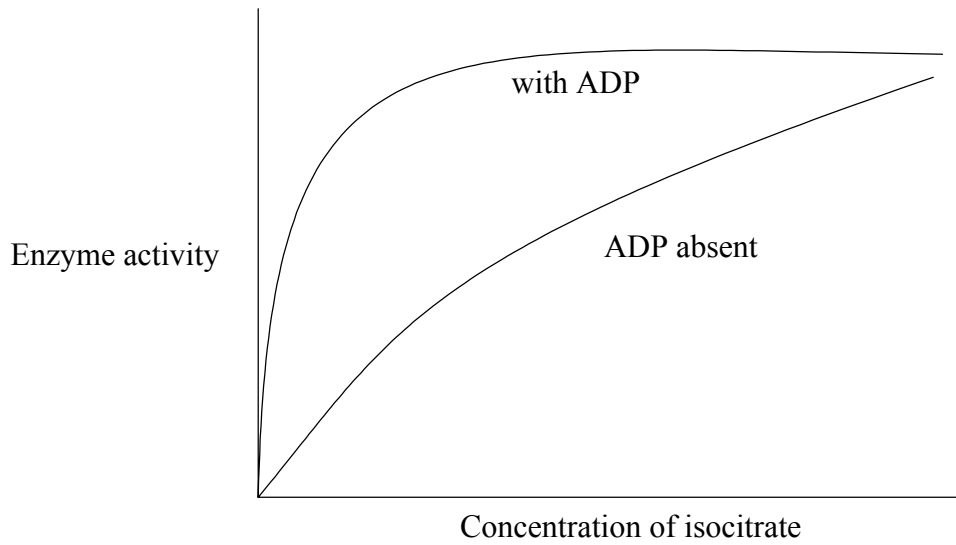
25. Which is the correct comparison of DNA with RNA?
- A. DNA and RNA have the same purines and pyrimidines
 - B. DNA and RNA have the same purines but different pyrimidines
 - C. DNA and RNA have different purines but the same pyrimidines
 - D. DNA and RNA have different purines and different pyrimidines

26. Where is ATP synthetase located in the mitochondrion?



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

27. Isocitrate dehydrogenase is an enzyme of the Krebs cycle. Its activity in the presence and absence of ADP is shown below.



What effect will a high level of energy consumption have on the activity of this enzyme?

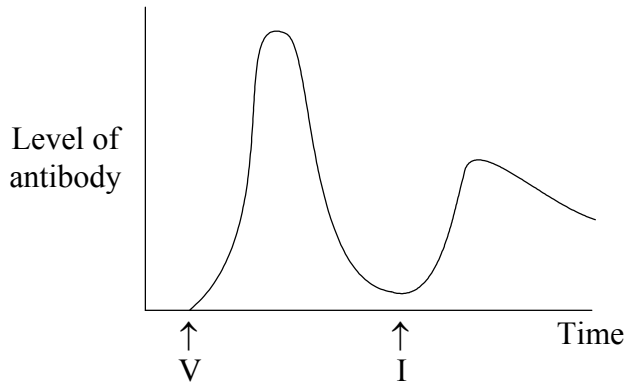
- A. The activity will increase
 - B. The activity will decrease
 - C. The enzyme will maintain a constant activity
 - D. The activity will fluctuate up and down
28. Which way do the protons flow when ATP is synthesized in mitochondria?
- A. From the inner matrix to the intermembrane space
 - B. From the intermembrane space to the inner matrix
 - C. From the intermembrane space to the cytoplasm
 - D. From the cytoplasm to the intermembrane space

29. When does recombination take place?
- A. Only when linked genes cross over
 - B. When non-linked genes cross over and when linked genes show independent assortment
 - C. Only when linked genes show independent assortment
 - D. When non-linked genes show independent assortment and when linked genes show crossing over
30. A polygenic character is controlled by two genes each with two alleles. How many different possible genotypes are there for this character?
- A. 2
 - B. 4
 - C. 9
 - D. 16
31. What is the sequence of events in spermatogenesis?
- A. growth → meiosis → mitosis → differentiation
 - B. mitosis → growth → meiosis → differentiation
 - C. mitosis → meiosis → differentiation → growth
 - D. meiosis → mitosis → growth → differentiation

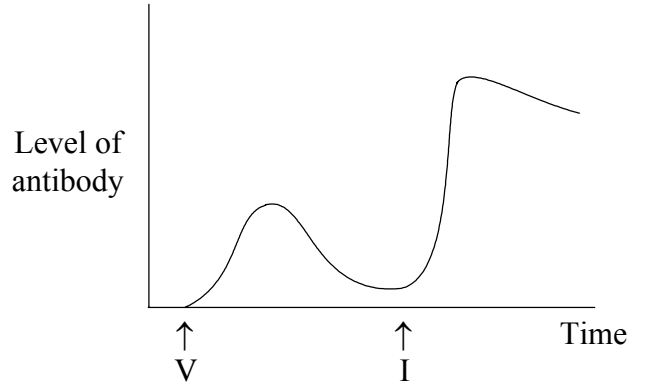
32. Which of the following parts of the male reproductive system contribute to the production of semen?
- I. Epididymis
 - II. Seminal vesicle
 - III. Bladder
 - IV. Prostate
- A. II only
- B. II and IV only
- C. I, II and IV only
- D. I, II, III and IV
-
33. Where is human chorionic gonadotrophin (HCG) produced?
- A. Ovary
 - B. Anterior pituitary
 - C. Embryo
 - D. Posterior pituitary

34. Which curve shows the response of the immune system to a vaccine, followed by an infection?

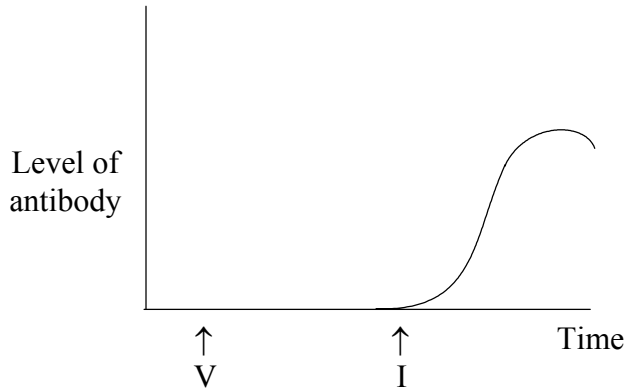
A.



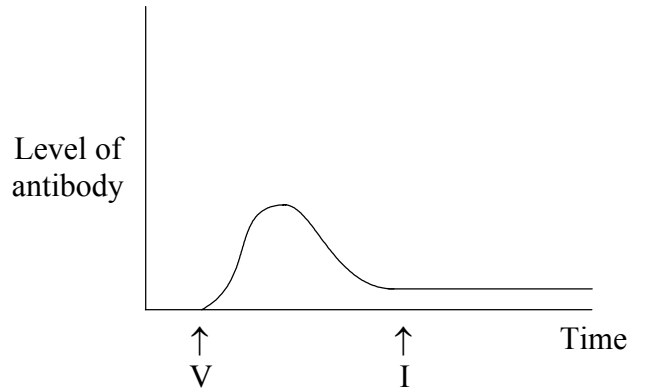
B.



C.



D.



V = Vaccination

I = Infection

35. What are the sequence of events at synaptic transmission?

- I. Neurotransmitter released
- II. Ca^{2+} enters synaptic knob
- III. Neurotransmitter binds with receptor
- IV. Action potential opens Ca^{2+} channels

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

36. What is required to form a blood clot?
- I. Platelets
 - II. Clotting factors
 - III. Antibodies
 - IV. Fibrinogen
- A. I and II only
 - B. I, II and III only
 - C. I, II and IV only
 - D. I, II, III and IV
37. Where in the kidney does ultrafiltration take place?
- A. Glomerulus
 - B. Loop of Henlé
 - C. Proximal tubule
 - D. Collecting ducts
38. Which of the following are moved by active transport in the kidneys?
- I. Glucose
 - II. Water
 - III. Salts
 - IV. Proteins
- A. I only
 - B. I and II only
 - C. I and III only
 - D. I, II, III and IV

39. Which part of a leaf is photosynthetic?

- A. Epidermis
- B. Phloem
- C. Xylem
- D. Cuticle

40. What are the differences between the transport of minerals in the apoplast and the symplast of the root?

	Apoplast	Symplast
A.	They travel through the cytoplasm of the root cells	They travel through the intercellular spaces
B.	Their movement is blocked by the endodermis	Their movement continues across the endodermis
C.	They enter by active transport	They enter by passive transport
D.	They cross between cells by the plasmodesmata	They cannot travel via the plasmodesmata
