IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
PROGRAMA DEL DIPLOMA DEL BI

BIOLOGY
STANDARD LEVEL
PAPER 1

Tuesday 11 May 2004 (afternoon)

45 minutes

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 best describes a virus?

A.	Non-cellular	DNA	No protein
B.	Cellular	RNA	No protein
C.	Non-cellular	RNA	Protein
D.	Cellular	DNA	Protein

2. 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

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 data below shows the concentrations of three ions in a frog.

Ion	Concentration / mmol dm^{-3}	
	Extracellular fluid	**Cytoplasm**
Na^+	110.0	13.0
K^+	138.0	2.5
Cl^-	3.0	90.0

What best explains the distribution of ions?

A. Osmosis

B. Active transport

C. Diffusion

D. Facilitated diffusion

5. Which statement about mitosis in plant and animal cells is correct?

	Plant cells	**Animal cells**
A.	Cell plate present	Cell plate absent
B.	Centriole present	Centriole absent
C.	Spindle absent	Spindle present
D.	Homologous chromosomes pair up	Homologous chromosomes remain unpaired

6. Which of the following elements is most common in living organisms?

A. Sodium

B. Oxygen

C. Iron

D. Nitrogen

7. Which of the following are connected by a hydrogen bond?

A. The hydrogen and oxygen atoms of a water molecule

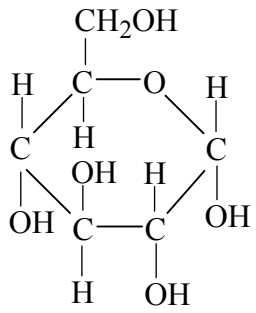
B. A base pair of a DNA molecule

C. Two amino acid molecules of a dipeptide

D. Two glucose molecules in a disaccharide

8. Which molecule represents ribose?

A.



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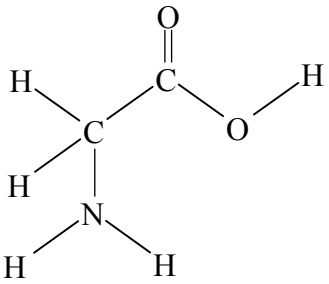

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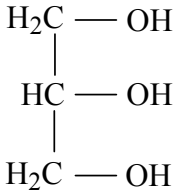

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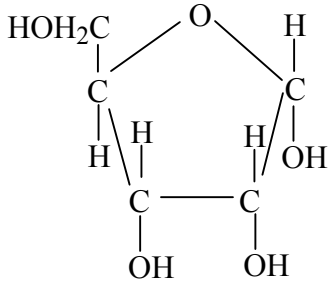
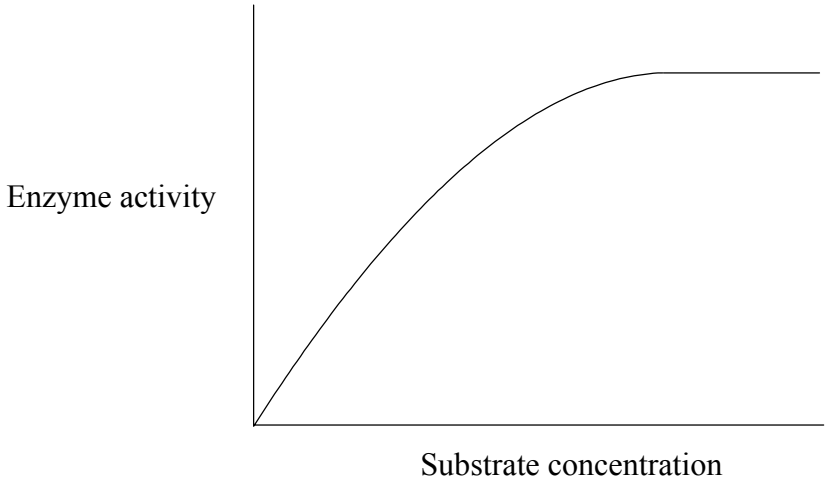


9. The effect of substrate concentration on enzyme activity is shown in the graph below.



What does the plateau of this curve represent?

A. All the enzyme has been consumed by the reaction

B. All the products have been used up by the reaction

C. The products are inhibiting the enzyme molecules

D. All the active sites of the enzyme molecules are occupied

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

Species	Adenine / %	Guanine / %	Cytosine / %	Thymine / %
Allium cepa	31.8	18.4	18.2	31.3
Daucus carota	26.7	23.2	23.3	26.8
Albica punctata	28.4	19.5	19.3	32.8
Clostridium perfringens	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

11. Which of the following involves complementary base pairing?

I. Transcription
II. Translation
III. Replication
IV. Denaturation

A. I and II only

B. III only

C. I, II and III only

D. I, II, III and IV

12. What are eukaryotic chromosomes made of?

	Carbohydrate	**Lipid**	**Protein**	**DNA**	**RNA**
A.	X	X	✓	✓	X
B.	X	X	✓	X	✓
C.	X	✓	X	X	✓
D.	✓	X	X	✓	X

✓ = present X = absent

13. 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

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

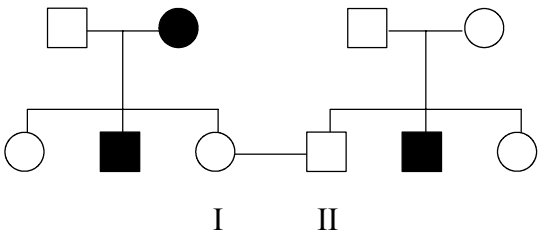
A. 3

B. 6

C. 9

D. 12

15. 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.



Key:
- □ Unaffected male
- ■ Affected male
- ○ Unaffected female
- ● Affected female

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 %

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

A. Polypeptides

B. Polysaccharides

C. Polynucleotides

D. Polyunsaturated fatty acids

17. What is the sequence for the process of gene therapy after the allele is isolated?

I. Delivery of gene to host cell by a vector

II. Gene integrates into host cell genome

III. Insertion of gene into vector

IV. Gene expressed in host cell genome

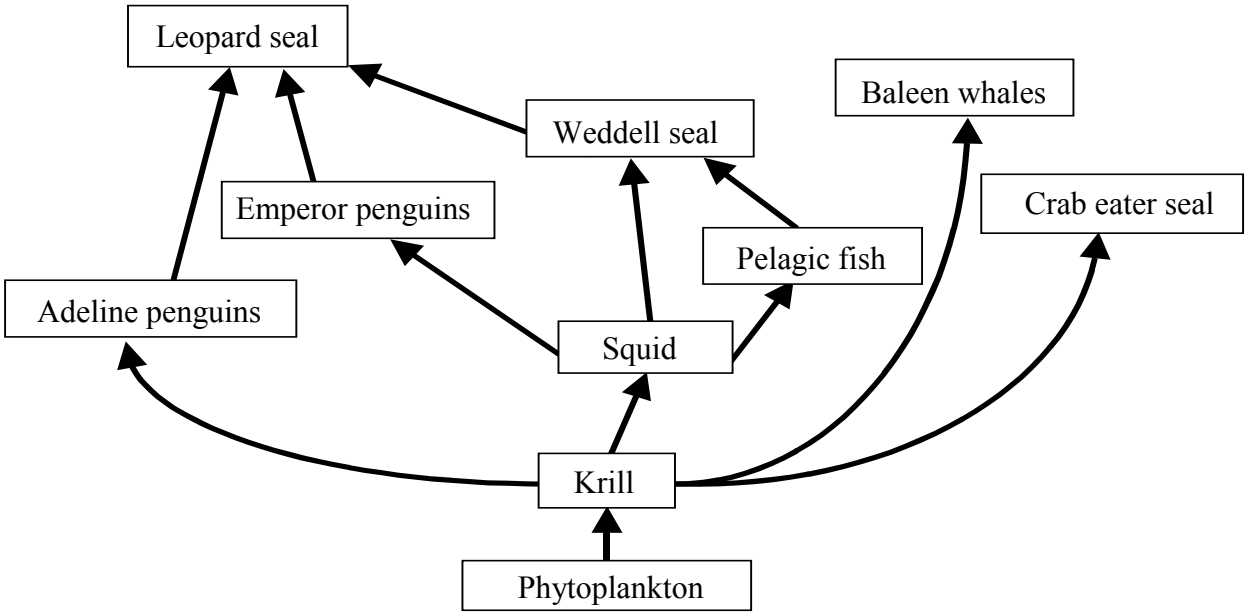
A. I, II, III, IV

B. III, I, II, IV

C. I, II, IV, III

D. III, I, IV, II

The following diagram refers to questions 18 and 19. It shows part of the food web of the community that inhabits Antarctica.



18. What trophic level do squid belong to?

A. Tertiary consumers

B. Secondary consumers

C. Primary consumers

D. Producers

19. Which human activity would have the greatest impact on the food web?

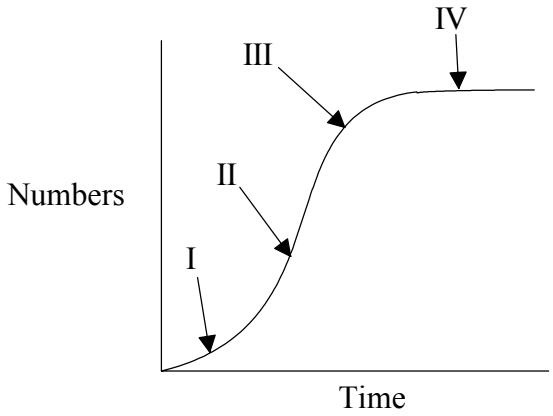
A. Overfishing the krill

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

20. At what point on the population growth curve below is natural selection operating most strongly?



A. I

B. II

C. III

D. IV

21. 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 %

22. 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

23. 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

24. Which hormone affects the heart beat?

A. Glucagon

B. Insulin

C. Adrenalin

D. Oxytocin

25. Why are antibiotics effective against 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

26. Which of the following features of skin protect humans from infection?

I. Skin flora
II. Dead cells
III. Hairs
IV. The presence of phagocytes

A. II only

B. I and II only

C. II, III and IV only

D. I, II and IV only

27. 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

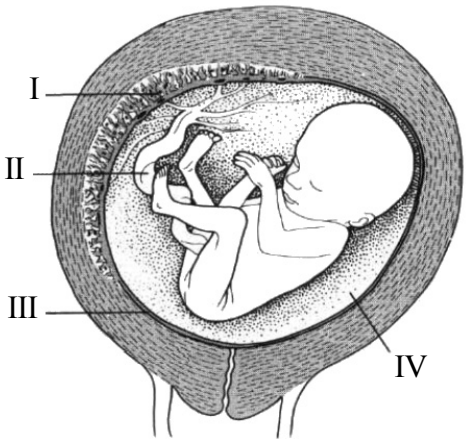
28. How do the following muscles behave when a human inhales?

	Internal intercostal	**External intercostal**	**Diaphragm**
A.	Relax	Contract	Contract
B.	Contract	Relax	Contract
C.	Relax	Contract	Relax
D.	Contract	Contract	Relax

29. 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

30. 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