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BIOLOGY
STANDARD LEVEL
PAPER 1

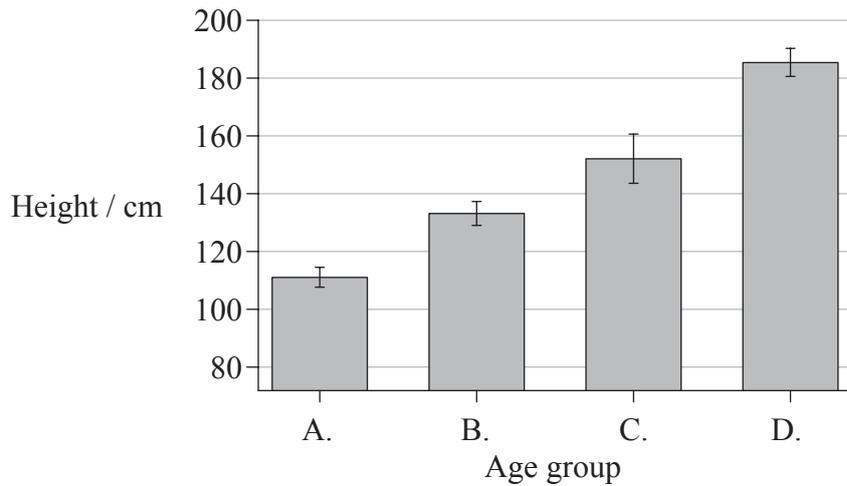
Friday 9 May 2014 (afternoon)

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.
- The maximum mark for this examination paper is *[30 marks]*.

1. Which population group has the greatest variation in height?



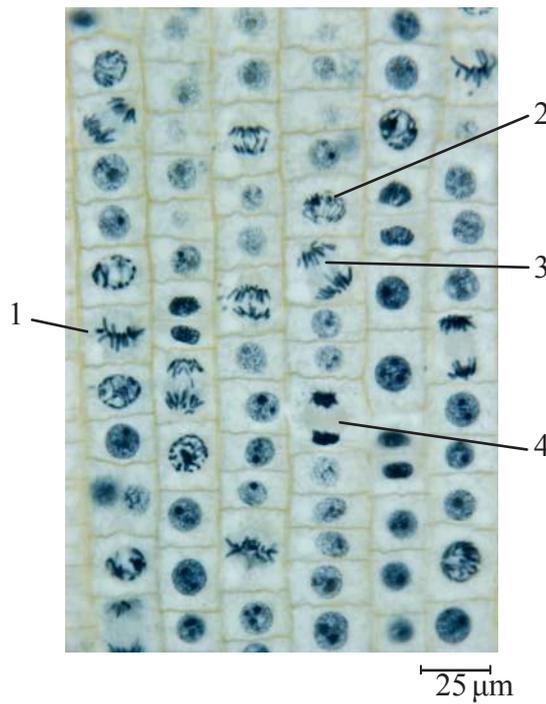
2. What is “naked DNA”?

- A. DNA not surrounded by a nuclear envelope
- B. DNA that is single-stranded due to heat treatment
- C. DNA not associated with proteins
- D. DNA not super-coiled into chromosomes

3. What is the function of proteins in passive transport?

- A. To serve as electron carriers in the membrane
- B. To interact with hormones to influence cell activity
- C. To serve as channels so that specific molecules diffuse across the membrane
- D. To release energy from ATP so that specific substances can cross the membrane

4. The following shows a micrograph.



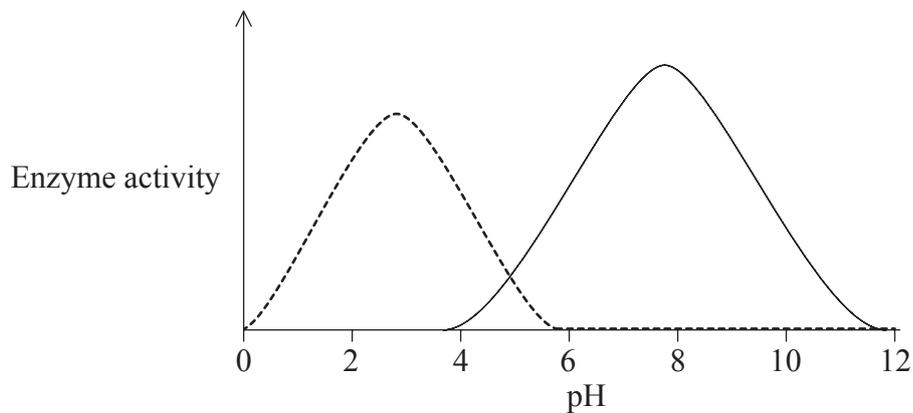
[Source: © Phototake Image 149862. Used with permission.]

In what order do the events in mitosis occur?

- A. 1 2 3 4
 - B. 1 2 4 3
 - C. 2 1 4 3
 - D. 2 1 3 4
5. Which molecule is a monosaccharide?
- A. Maltose
 - B. Fructose
 - C. Starch
 - D. Cellulose

7. How is the sequence of DNA conserved?
- A. Unwinding of the double helix by helicase during DNA replication
 - B. Separation of sister chromatids to opposite poles during mitosis
 - C. Transcription into complementary RNA for protein synthesis
 - D. Complementary base pair matching during DNA replication

8. Enzyme activity has been measured for two enzymes at different pH values.



At which pH is one enzyme optimal and the other enzyme denatured?

- A. pH=5
 - B. pH=6
 - C. pH=8
 - D. pH=10
9. What is the definition of cell respiration?
- A. The controlled release of energy, in the form of ATP, from organic compounds.
 - B. The process used in some organisms to produce their own organic substances.
 - C. The process that uses energy, in the form of ATP, to produce organic compounds.
 - D. The controlled release of energy during the production of food from organic compounds.

10. Which DNA has identical base pair sequences?

- I. DNA that segregates during mitosis
- II. DNA that segregates during meiosis I
- III. DNA that segregates during meiosis II

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

11. A pea plant that is homozygous for purple flowers is crossed with a pea plant having white flowers and the descendants are all plants with purple flowers. One of these F_1 plants is then crossed with a pea plant having white flowers. In the resulting offspring, what can be expected?

- A. 100% of plants with purple flowers
- B. 100% of plants with white flowers
- C. 75% of plants with purple flowers, 25% with white flowers
- D. 50% of plants with purple flowers, 50% with white flowers

12. Which Punnett grid provides evidence of multiple alleles?

A.

	I^B	I^B
I^A	$I^A I^B$	$I^A I^B$
I^A	$I^A I^B$	$I^A I^B$

B.

	I^A	I^B
I^A	$I^A I^A$	$I^A I^B$
I^B	$I^A I^B$	$I^B I^B$

C.

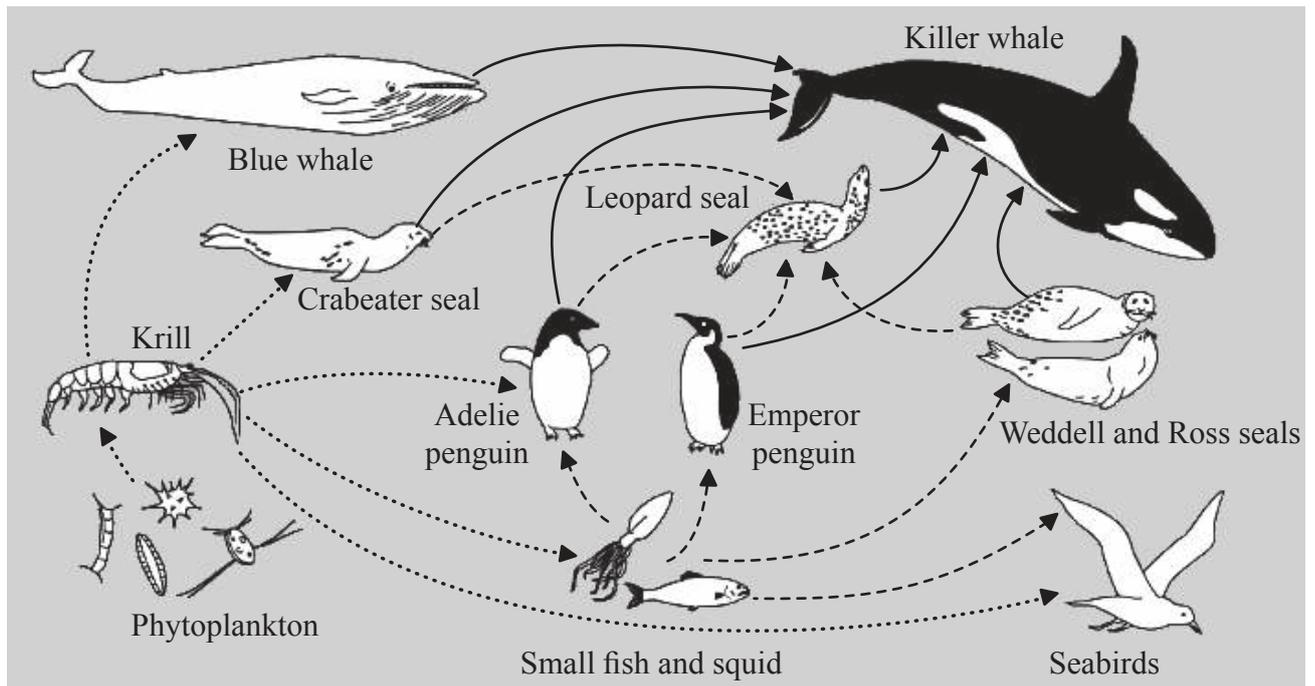
	I^A	I^A
i	$I^A i$	$I^A i$
i	$I^A i$	$I^A i$

D.

	I^B	i
I^A	$I^A I^B$	$I^A i$
i	$I^B i$	$i i$

13. Colour blindness is caused by a recessive allele. A woman and her partner have normal vision. Their first child has colour blindness. What is the probability of their second child having colour blindness if it is a son?
- A. 100%
 - B. 25%
 - C. 50%
 - D. 0%
14. How can forensic scientists obtain sufficient data from one hair follicle to make a reliable identification by DNA profiling?
- A. By performing PCR with DNA from the sample
 - B. By digesting the sample with more than one restriction enzyme
 - C. By performing electrophoresis with many other known samples
 - D. By choosing a hair follicle with a particularly long hair
15. Corn can be genetically modified to kill corn-boring insects when they eat the corn. Why is the use of this genetically modified crop opposed by environmentalists?
- A. Corn-boring insects will feed on wild plants instead of corn crops.
 - B. Over-production of corn could result in poorer soil quality.
 - C. More corn will be produced, lowering corn prices.
 - D. Other insects that eat corn pollen could be killed.
16. What is a plasmid?
- A. Circular DNA found exclusively in the nucleoid region of a prokaryote
 - B. A circular piece of DNA that is separate from a prokaryote's chromosome
 - C. A genetically engineered piece of DNA used for cloning tissues
 - D. A piece of DNA used to insert new genes into the genome of animals

17. The following shows a diagram of a food web.

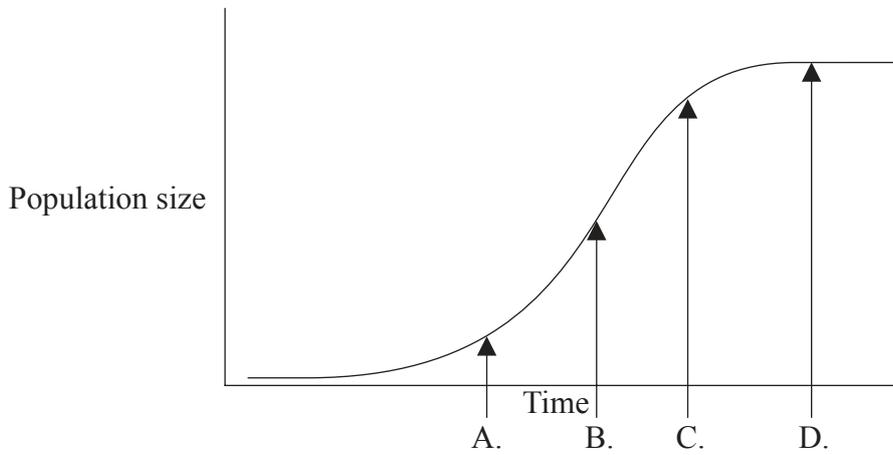


[Source: adapted from <http://amurdoch.tripod.com/yr4/AntFoodWeb.JPG>]

Which members of this food web are tertiary consumers?

- A. penguins, leopard seal, Weddell and Ross seals, seabirds
 - B. crabeater seal, blue whale, Adelie penguin, small fish and squid
 - C. blue whale, killer whale
 - D. krill, small fish and squid, seabirds
18. Which expected effect of temperature increase on arctic ecosystems will increase carbon dioxide in the atmosphere?
- A. Greater production of plants due to warmer temperatures and changing vegetation
 - B. Greater decomposition of organic matter currently stored in permafrost
 - C. Less ice and snow will cause incoming radiation to be absorbed more readily
 - D. Melting ice from glaciers and icebergs will cause sea levels to rise

19. The graph shows a predicted population growth curve when a small number of rats are accidentally introduced to an island where they do not naturally occur. When is there **most** likely to be a balance between natality and mortality?

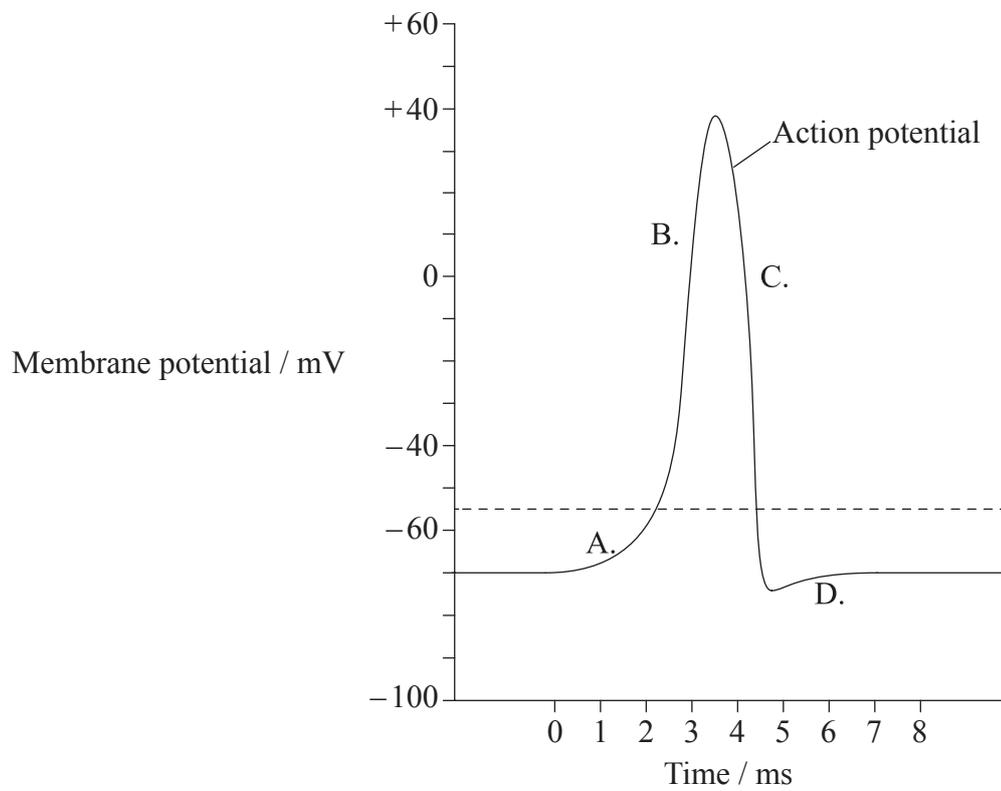


20. When might a favourable variation become unfavourable?
- A. Change of environment
 - B. Isolation
 - C. Over-population
 - D. Failure to adapt
21. How do annelida differ from platyhelminthes?
- A. Annelida have jointed appendages, but platyhelminthes do not
 - B. Platyhelminthes are smooth round worms, but annelida have segments
 - C. Annelida have both a mouth and an anus, but platyhelminthes do not
 - D. Annelida have segmented bodies, but platyhelminthes have sac-shaped bodies and stinging tentacles

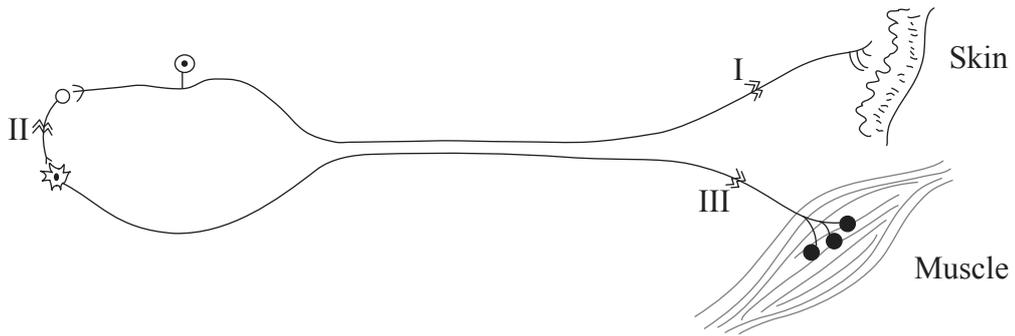
22. What action(s) can phagocytes perform?
- I. Make antibodies
 - II. Leave the blood stream and enter infected tissues
 - III. Kill pathogens that they have engulfed
- A. I only
 - B. III only
 - C. II and III only
 - D. I, II, and III
23. Which blood vessels have thick muscular walls that can resist pressure and assist in pumping blood?
- A. Arteries
 - B. Atria
 - C. Veins
 - D. Ventricles
24. How does the structure of the villus facilitate absorption?
- A. The membrane structure allows macromolecules to diffuse through
 - B. The lacteal facilitates movement of proteins into blood
 - C. It has a shape that provides high surface area to facilitate production of enzymes
 - D. It has capillaries close to its surface to reduce the distance for diffusion

25. What is a relationship between cell respiration and ventilation in humans?
- A. Ventilation is the same process as cell respiration.
 - B. Cell respiration releases CO₂ which is removed from the lungs during ventilation.
 - C. Cell respiration uses O₂ which is carried to cells by ventilation.
 - D. When there is greater ventilation, there is less cell respiration.

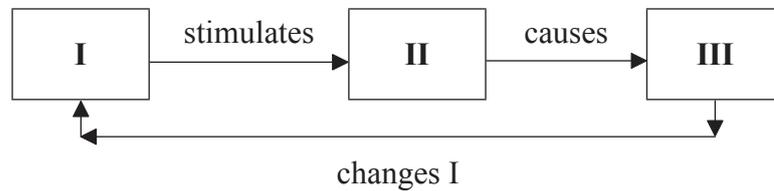
26. Which letter indicates the time when the sodium-potassium pump reestablishes the resting state?



27. A victim of an accident can feel a stimulus to the toes but cannot move them. Which of the indicated cuts could be causing the damage?



- A. I only
 - B. I and II only
 - C. I and III only
 - D. III only
28. Study the diagram of the simplified feedback mechanism below.

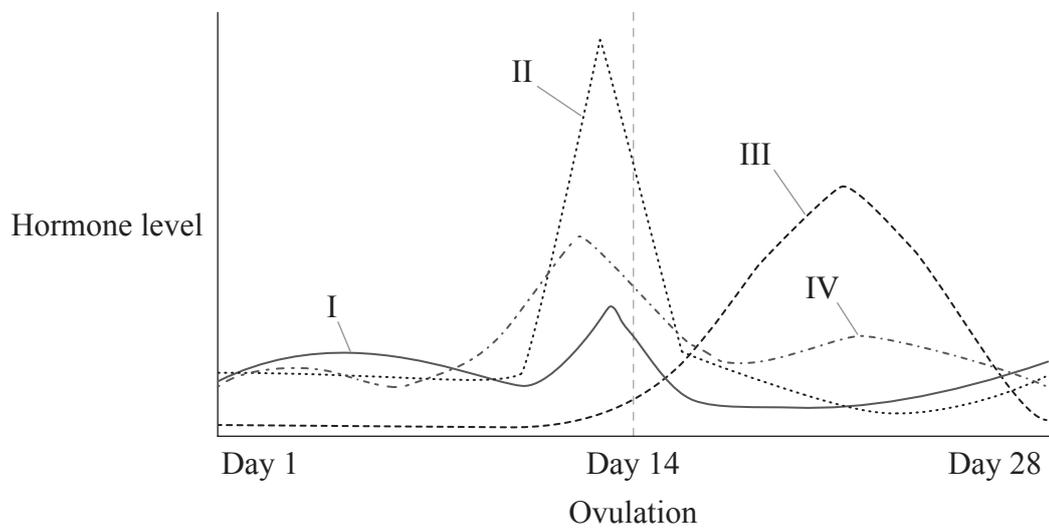


What combination would correctly show a simple feedback mechanism for temperature regulation?

	I	II	III
A.	low blood temperature	hypothalamus	erection of hair and shivering
B.	high blood temperature	hypothalamus	constriction of skin arterioles
C.	high blood temperature	pituitary gland	erection of hair and shivering
D.	low blood temperature	pituitary gland	dilation of skin arterioles

29. How does the inhalation phase of ventilation occur?
- A. Diaphragm relaxes, external intercostal muscles relax
 - B. Diaphragm relaxes, external intercostal muscles contract
 - C. Diaphragm contracts, external intercostal muscles relax
 - D. Diaphragm contracts, external intercostal muscles contract

30. Hormone levels in the blood of a woman during a 28-day menstrual cycle are shown in the graph.



[Source: © International Baccalaureate Organization 2014]

What are the hormones?

	I	II	III	IV
A.	follicle stimulating hormone	estrogen	luteinizing hormone	progesterone
B.	estrogen	luteinizing hormone	progesterone	follicle stimulating hormone
C.	luteinizing hormone	estrogen	follicle stimulating hormone	progesterone
D.	follicle stimulating hormone	luteinizing hormone	progesterone	estrogen