22146013

International Baccalaureate®
Baccalauréat International
Bachillerato Internacional

BIOLOGY
HIGHER LEVEL
PAPER 1

Friday 9 May 2014 (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.
- The maximum mark for this examination paper is *[40 marks]*.

1. What information could a biologist use to add error bars to a graph?

	Range	Correlation	Standard deviation	Mean
A.	Yes	Yes	—	—
B.	Yes	—	Yes	—
C.	—	—	Yes	Yes
D.	—	Yes	—	Yes

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 active transport?

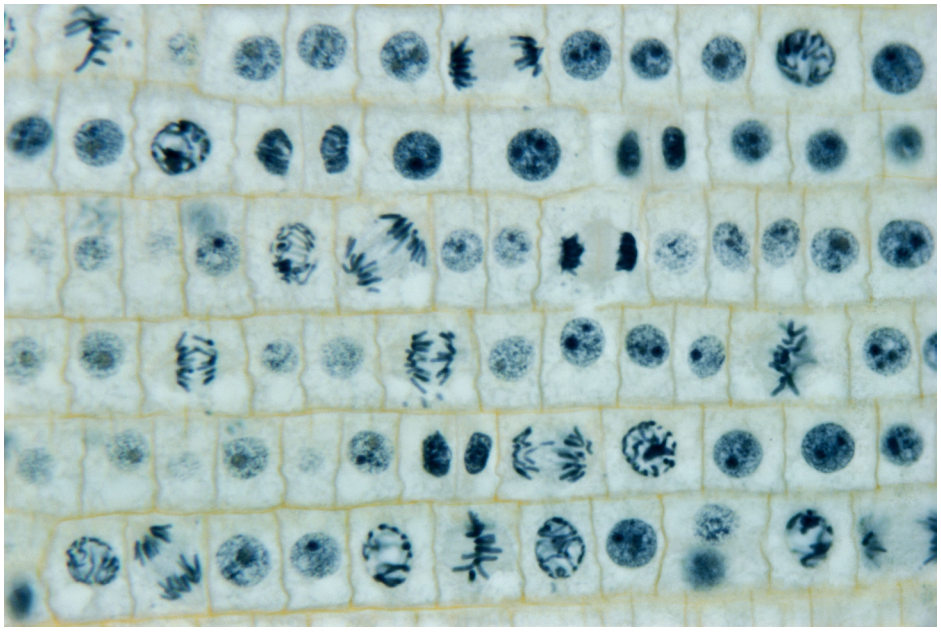
A. To serve as electron carriers in the membrane

B. To interact with hormones to influence cell activity

C. To serve as channels so that proteins can 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.]

How many cells are in metaphase?

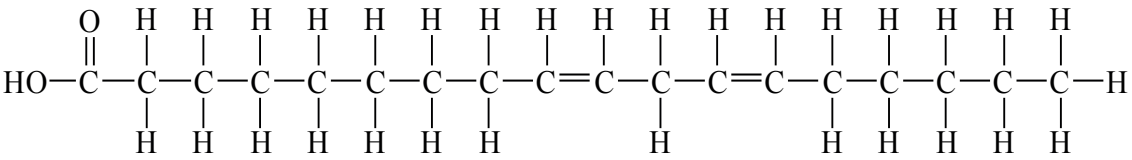
A. 2

B. 3

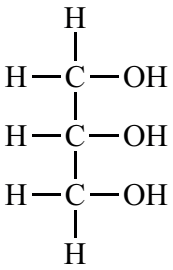
C. 5

D. 7

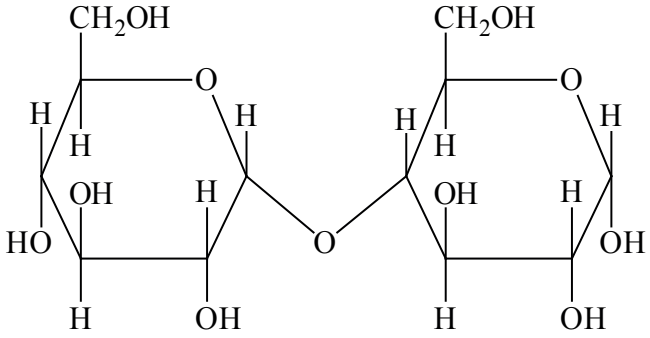
5. I.



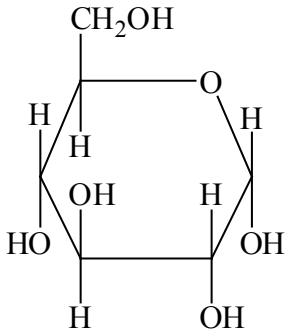
II.



III.



IV.



Which of the above chemical structures represent fatty acids and carbohydrates?

	Fatty acid	Carbohydrate
A.	I and II	III and IV
B.	I only	III and IV
C.	I and II	IV only
D.	I only	II and IV

6. How is the sequence of DNA conserved?

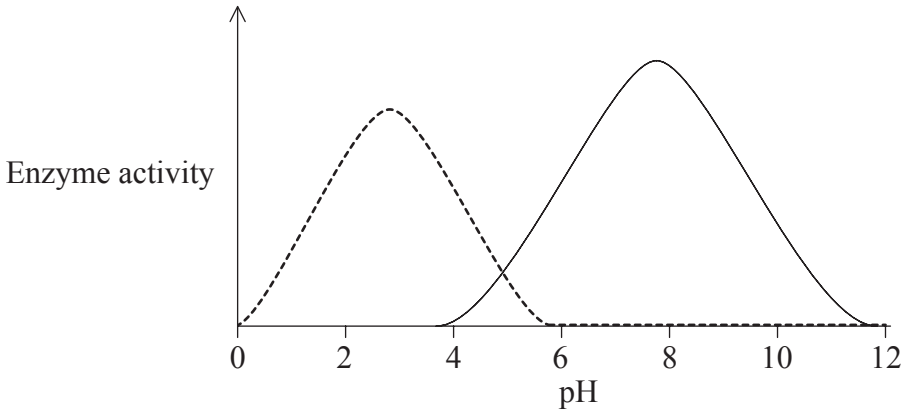
A. Unwinding of the double helix by helicase during DNA replication

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

7. 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

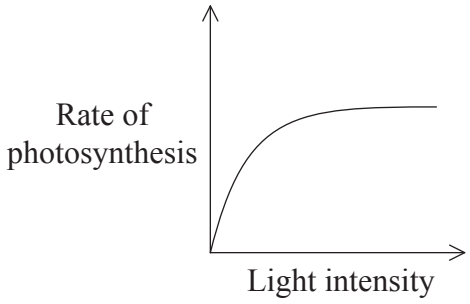
B. pH = 6

C. pH = 8

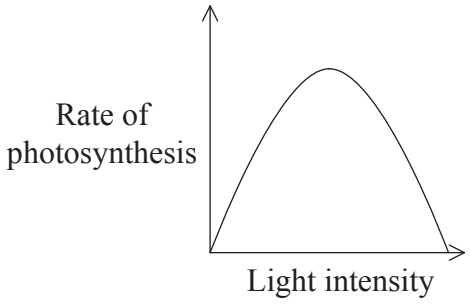
D. pH = 10

8. Which graph shows the effect of light intensity on the rate of photosynthesis if other factors are kept constant?

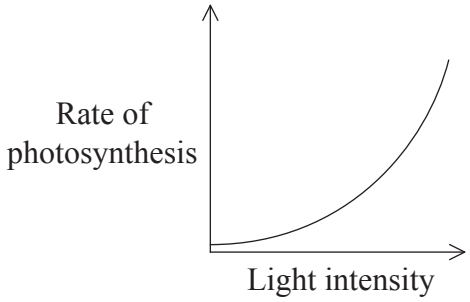
A.



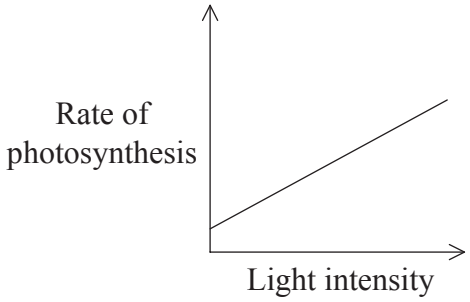
B.



C.



D.



9. 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

10. 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

11. 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

12. 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 %

13. 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

14. 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.

15. Consider the food chain shown below.

[Source: © Young People's Trust for the Environment. Used with permission.]

Which terms describe the ground beetle?

	Autotroph	Heterotroph	Secondary consumer	Tertiary consumer
A.	Yes	—	Yes	—
B.	Yes	—	—	Yes
C.	—	Yes	Yes	—
D.	—	Yes	—	Yes

16. 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

17. In an animal population, what could cause the exponential phase of population growth to level out to the plateau phase?

A. Increased species diversity

B. Increased resources

C. Increased natality

D. Increased predation

18. What is essential for natural selection to occur?

A. Variation between members of a species

B. Large population size

C. High mortality rate

D. Environmental catastrophe

19. In classification, which statement is true?

A. If two organisms belong to the same order, then they are in the same genus.

B. If two organisms are in different orders, then they cannot be in the same class.

C. If two organisms are in the same class, then they must be in the same phylum.

D. If organisms have the same genus name, they must also have the same species name.

20. 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

21. Which small blood vessels have walls that are only one cell thick and are leaky enough to allow molecules carried by blood to diffuse into tissues?

A. Lacteals

B. Veins

C. Arterioles

D. Capillaries

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. What is a relationship between cell respiration and ventilation in humans?

A. Ventilation is the same process as cell respiration.

B. Cell respiration releases CO_2 which is removed from the lungs during ventilation.

C. Cell respiration uses O_2 which is carried to cells by ventilation.

D. When there is greater ventilation, there is less cell respiration.

24. What is a function of neurotransmitters?

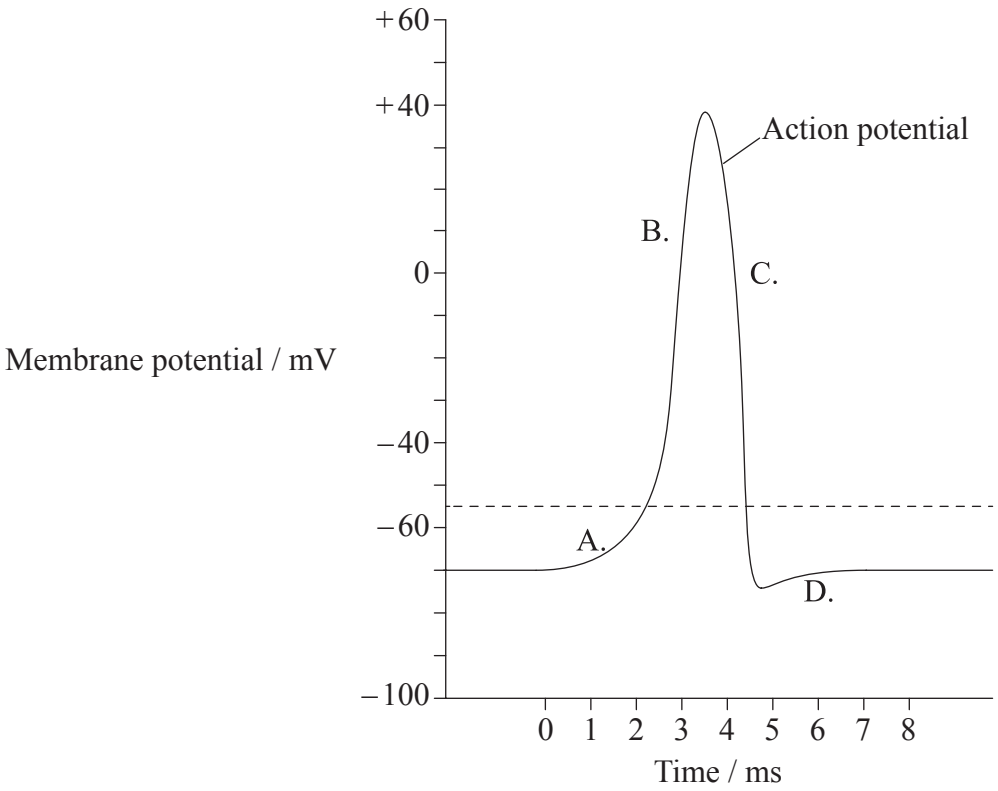
A. To stimulate the axon of a neuron

B. To destroy hormones in a post-synaptic membrane

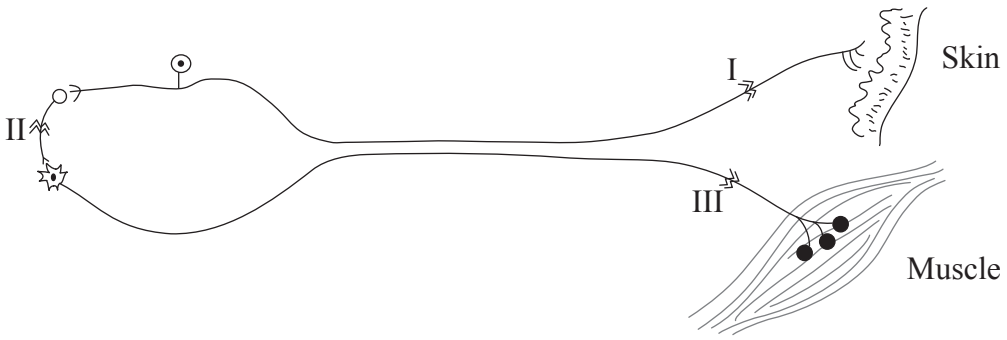
C. To diffuse across the synapse and affect the permeability of a neuron

D. To block calcium uptake in a pre-synaptic axon

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



26. 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?



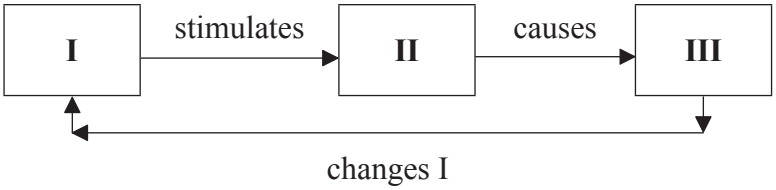
A. I only

B. I and II only

C. I and III only

D. III only

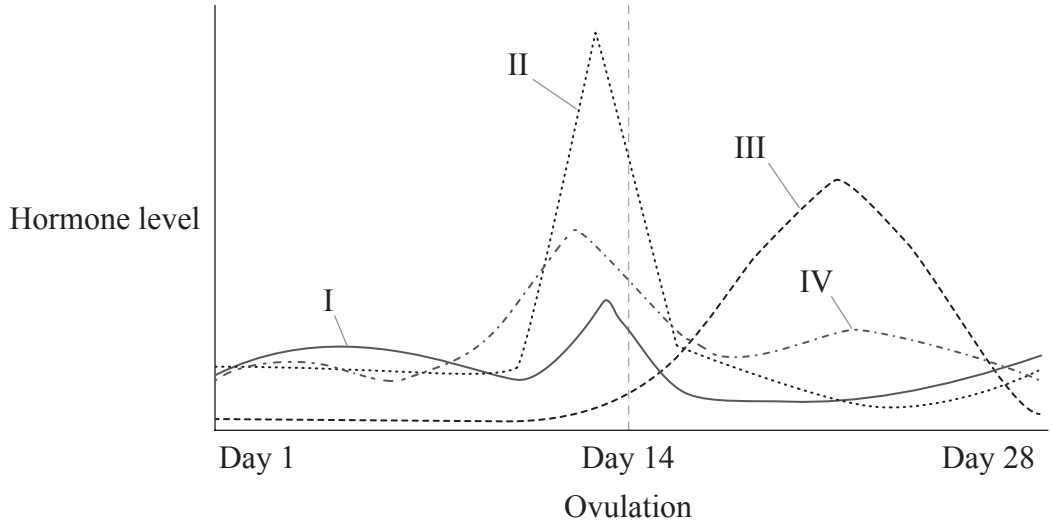
27. Study the diagram of the simplified feedback mechanism below.



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

28. 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

29. Actin is a protein involved in muscle contraction. Where is actin produced?

A. At ribosomes bound to the endoplasmic reticulum

B. At free ribosomes

C. Within the Golgi Apparatus

D. In the sarcoplasmic reticulum

30. What is the function of DNA polymerase I?

A. It forms Okazaki fragments

B. It initiates replication on the lagging strand of DNA

C. It adds nucleotides in the 5′ to 3′ direction

D. It excises RNA primers and replaces them with DNA

31. Which process is a reduction reaction?

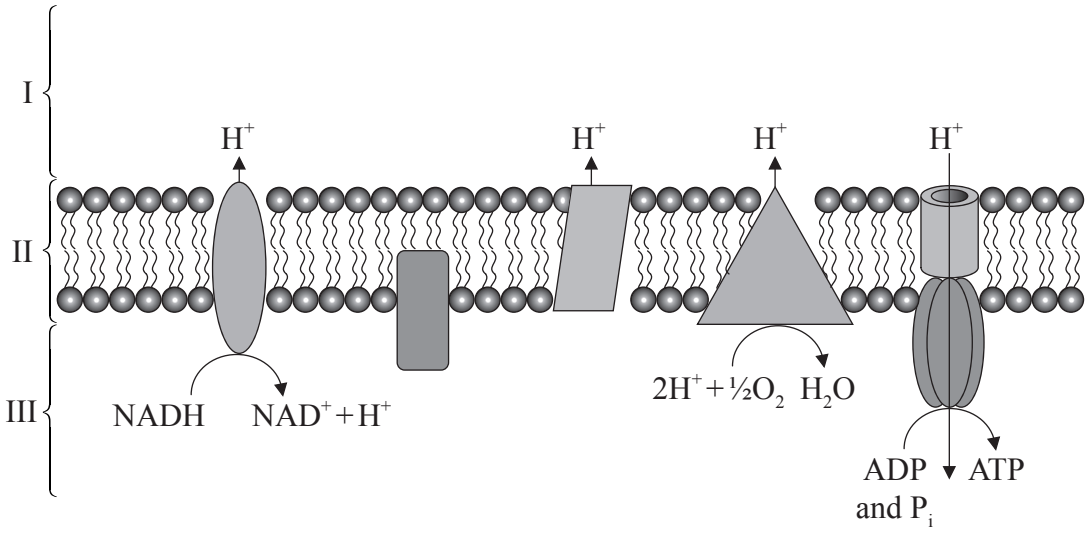
A. FADH changing to FAD

B. ATP changing to ADP

C. NAD changing to NADH

D. NADP changing to NAD

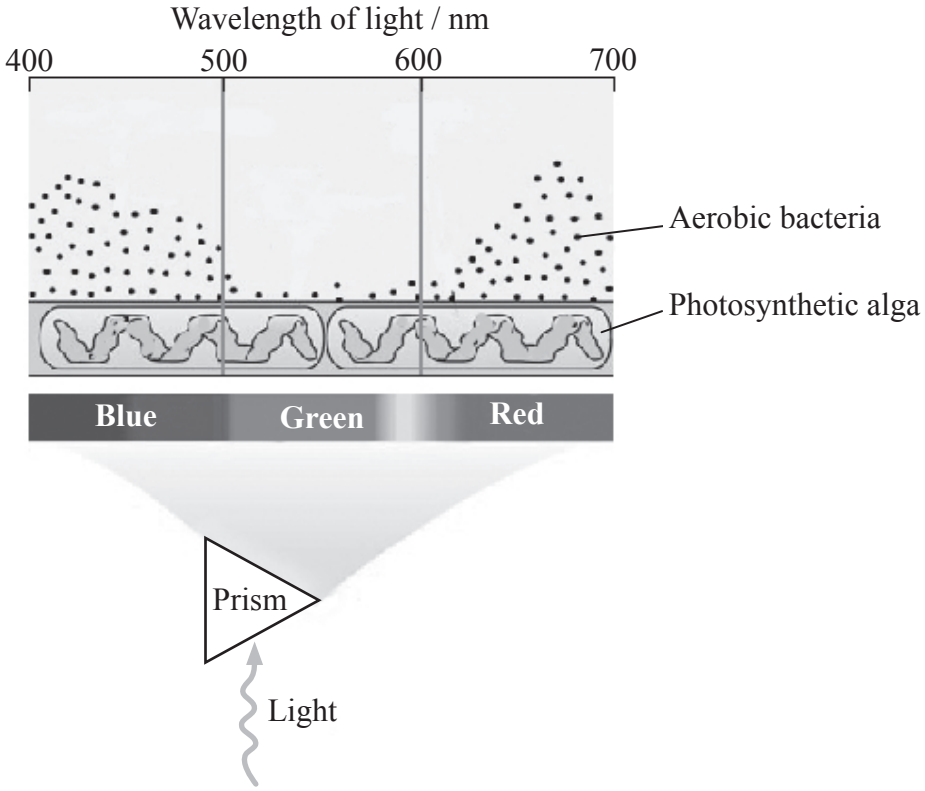
32. What are I, II, III?



[Source: © International Baccalaureate Organization 2014]

	I	II	III
A.	thylakoid space	thylakoid membrane	stroma
B.	stroma	thylakoid membrane	thylakoid space
C.	inter-membrane space	inner membrane	matrix
D.	matrix	inner membrane	inter-membrane space

33. Engelmann added aerobic bacteria to a dish of pond water containing a filament of a photosynthetic alga. He illuminated the filament with different wavelengths of light.



[Source Web Figure 7.1.D, Topic 7.1 from the companion website of Taiz and Zeiger: Plant Physiology, Fifth Edition. Used with permission from Sinauer.]

What is the explanation for the distribution of the aerobic bacteria?

A. Aerobic bacteria reproduce more in light with wavelengths at 500 nm and at 600 nm.

B. Photosynthesis is greatest at 550 nm and aerobic bacteria avoid oxygen.

C. There is more oxygen produced in wavelengths of light at 425 nm and 670 nm.

D. Aerobic bacteria supply carbon dioxide needed for photosynthesis.

34. Transpiration is affected by abiotic factors. Which condition causes the **least** transpiration?

A. High humidity because there is less evaporation

B. High light intensity because there is more photosynthesis

C. Fast air movement because there is more evaporation

D. High temperature because water evaporates quickly

35. What promotes seed dispersal?

A. Anthers shaken by wind

B. Bees visiting a flower

C. Embryo roots breaking out of a seed coat

D. Bean pods popping open

36. What are linked genes?

A. Expression of a trait that requires two genes

B. One gene that affects the expression of another gene

C. Genes on the same chromosome

D. Genes that are on the X chromosome but not on the Y chromosome

37. What is the function of the protein thrombin?

A. It is a hormone that stimulates the immune system.

B. It is an enzyme that is required for blood clotting.

C. It is a structural protein that heals a wound.

D. It is a protein secreted by platelets.

38. Where does ADH (vasopressin) have its primary effect?

A. Proximal convoluted tubule

B. Bowman’s capsule

C. Loop of Henle

D. Collecting duct

39. In which part of a mature spermatozoan are mitochondria **most** numerous?

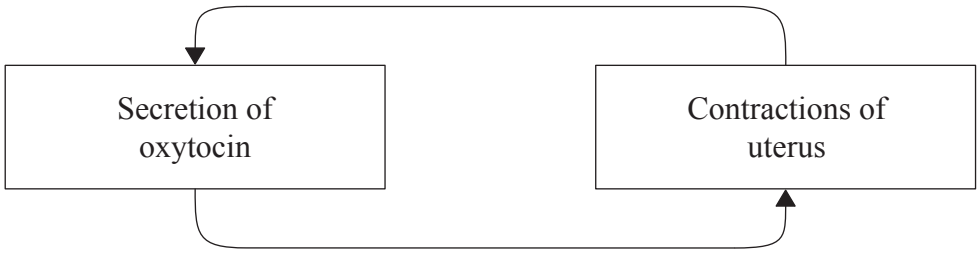
A. The head

B. The tail

C. The mid-piece

D. Mitochondria are evenly spaced throughout the cell

40. What kind of feedback mechanism does the flowchart show?



A. Negative feedback as increase in contractions of uterus reduces oxytocin secretion

B. Negative feedback as increase in contractions of uterus increases oxytocin secretion

C. Positive feedback as increase in contractions of uterus increases oxytocin secretion

D. Positive feedback as increase in contractions of uterus reduces oxytocin secretion