International Baccalaureate®
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BIOLOGY
HIGHER LEVEL
PAPER 1

Thursday 17 May 2012 (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. The mean height for adult men in the United States is 1.78 m with a standard deviation of 8 cm. Which statement is true?

A. The tallest man in the United States is 1.86 m tall.

B. 68 % of men in the United States are between 1.74 m and 1.82 m tall.

C. 68 % of men in the United States are between 1.70 m and 1.86 m tall.

D. 100 % of men in the United States are within two standard deviations of 1.78 m.

2. Which functions are carried out by **all** unicellular organisms?

A.	growth	homeostasis	photosynthesis	response
B.	growth	homeostasis	metabolism	response
C.	metabolism	photosynthesis	reproduction	response
D.	growth	nutrition	reproduction	ventilation

3. Which property makes stem cells suitable for therapeutic use?

A. They can divide by meiosis to form gametes.

B. They contain chemicals that can kill bacteria.

C. Their chromosomes are suitable for gene transfer and cloning.

D. They can differentiate into specialized cells.

4. Which features are present in prokaryotic cells?

A. DNA, plasma membrane and mitochondria

B. DNA, cell wall and pili

C. ribosomes, chloroplasts and cell wall

D. cytoplasm, ribosomes and rough endoplasmic reticulum

5. Which process is possible due to the fluidity of cell membranes?

A. Endocytosis

B. Osmosis

C. ATP production

D. Cell recognition

6. Which statements correctly explain properties of water?

I. Water is a useful medium for metabolic reactions as many substances dissolve in water.

II. Water is useful as a coolant as it takes a small amount of heat energy to change its temperature.

III. Water molecules are cohesive which helps water transport in the roots and stems of plants.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

7. Which sugars are both disaccharides?

A. maltose and lactose

B. lactose and fructose

C. fructose and galactose

D. galactose and maltose

8. What occurs during DNA replication?

A. DNA polymerase separates the two DNA strands.

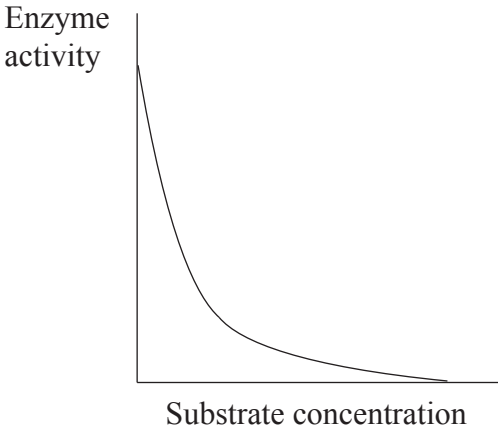
B. DNA molecules containing nucleotides from the original molecule are produced.

C. Adenine forms a base pair with either thymine or uracil.

D. New bases attach to the original sugar-phosphate backbone.

9. Which graph shows the effect of increasing the substrate concentration on enzyme activity?

A.



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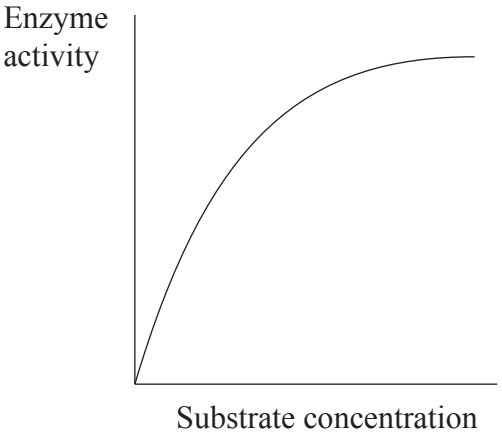

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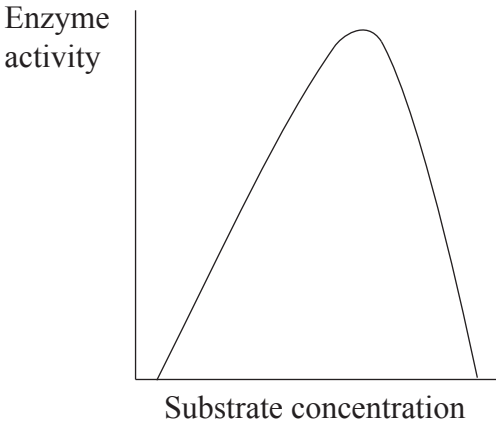

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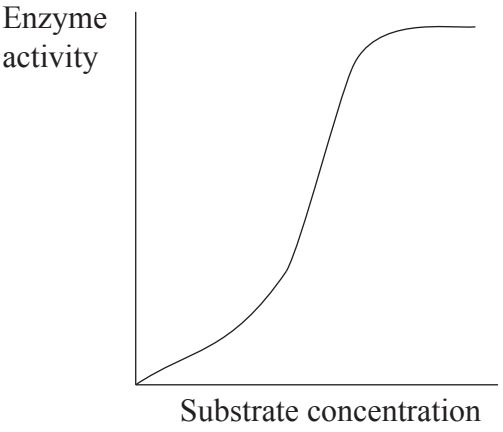


10. How is oxygen produced during photosynthesis?

A. Water molecules are split with energy from ATP.

B. Water molecules are split with energy from light.

C. Carbon dioxide molecules are split with energy from ATP.

D. Carbon dioxide molecules are split with energy from light.

11. The sequence of the first six amino acids of the normal β hemoglobin (Hb^A) chain are listed.

valine – histidine – leucine – threonine – proline – glutamic acid

Which sequence of amino acids could there be in the first six amino acids of the sickle-cell β hemoglobin (Hb^S) chain?

A. glutamic acid – histidine – leucine – threonine – proline – valine

B. valine – valine – histidine – leucine – threonine – proline

C. glutamic acid – histidine – leucine – threonine – proline – glutamic acid

D. valine – histidine – leucine – threonine – proline – valine

12. What makes gene transfer between species possible?

A. All species use the same genetic code.

B. All species have the same genetic material.

C. All species produce the same polypeptides.

D. All species transcribe genes using plasmids.

13. A certain breed of mouse can have fur that is either black or brown. A mouse breeder performs a test cross using a brown mouse to determine the unknown genotype of a black mouse. There are four offspring produced by the cross. What conclusions can be drawn?

A. If the black mouse is homozygous, one of the four offspring must be brown.

B. If the black mouse is heterozygous, three of the four offspring must be black.

C. The black mouse must be homozygous if all four offspring are black.

D. The black mouse must be heterozygous if any of the offspring are brown.

14. In a pond, two species of fish feed on insects and worms. The insects feed on the green plants that live in the water. What constitutes a population in this ecosystem?

A. All the living organisms

B. All the animals

C. All the fish

D. All the fish of one species

15. The fungus *Calocera viscosa* obtains its nutrients from decaying conifer trees. Which pair of terms describes *C. viscosa*'s nutrition?

A.	autotroph	herbivore
B.	autotroph	saprotroph
C.	heterotroph	herbivore
D.	heterotroph	saprotroph

16. What is an example of the precautionary principle?

A. Avoiding cigarettes as they increase the chances of lung cancer

B. Reducing carbon dioxide emissions as they may cause global warming

C. Avoiding strong sunlight as it increases the chances of skin cancer

D. Reducing cod fishing to increase fish stocks

17. In a population of rabbits studied over a period of six months, it was found that natality was greater than mortality and emigration was greater than immigration. What can be concluded about the final population of rabbits?

A. It will have increased.

B. It will have decreased.

C. It will be exactly the same.

D. There is not enough information to make a valid conclusion.

18. Based on binomial nomenclature, which two species are most closely related?

I. Common barberry (*Berberis vulgaris*)

II. Canadian bunchberry (*Cornus canadensis*)

III. Smooth blackberry (*Rubus canadensis*)

IV. Canadian barberry (*Berberis canadensis*)

A. I and IV

B. II and III

C. II and IV

D. III and IV

19. What is the condition of the valves of the heart when the right ventricle is contracting?

	Atrio-ventricular valve	Semilunar valve
A.	open	open
B.	open	closed
C.	closed	closed
D.	closed	open

20. What effect does HIV have on the immune system?

A. It prevents leucocytes from fighting bacteria by phagocytosis.

B. It causes excessive production of leucocytes in bone marrow.

C. It destroys antibodies produced by leucocytes.

D. It lowers the number of leucocytes, reducing antibody production.

21. What is a feature of alveoli?

A. They occur in all animals because they are needed for gas exchange.

B. They have a higher oxygen concentration than air in the atmosphere to increase the rate of diffusion.

C. They have walls that are one cell thick for faster diffusion.

D. They are small so keep the gases inside them more concentrated.

22. What is a characteristic of axons in motor neurons?

A. When there is a resting potential, the outside of the axon is negative relative to the inside.

B. During an action potential, Na^+ ions diffuse out of the axon.

C. K^+ ions diffusing out of the axon repolarizes it.

D. Impulses in the axon travel towards the cell body.

23. Which response takes place when blood glucose levels are low?

A. Glucagon is released from the α cells of the pancreatic islets.

B. Glucagon is released from the β cells of the pancreatic islets.

C. Insulin is released from the α cells of the pancreatic islets.

D. Insulin is released from the β cells of the pancreatic islets.

24. During the menstrual cycle, what occurs in response to a fall in the progesterone level?

A. Growth of the uterus lining

B. Growth of the follicle surrounding the egg

C. Ovulation

D. Menstruation

25. Which statement applies to transcription in eukaryotic cells but **not** to prokaryotic cells?

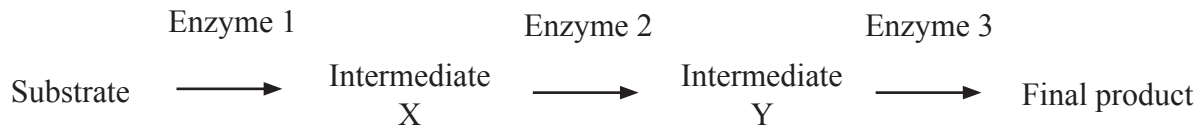
A. RNA polymerase transcribes the antisense strand of DNA to produce a strand of RNA.

B. During transcription, uracil replaces thymine in RNA.

C. Transcription takes place in the cell nucleus.

D. Initiation of transcription requires a promoter sequence of DNA.

26. A substrate undergoes a series of enzyme-catalysed reactions to form intermediate substances X, Y and then the final product.



What would be the effect on the reaction of adding a **competitive** inhibitor to enzyme 2?

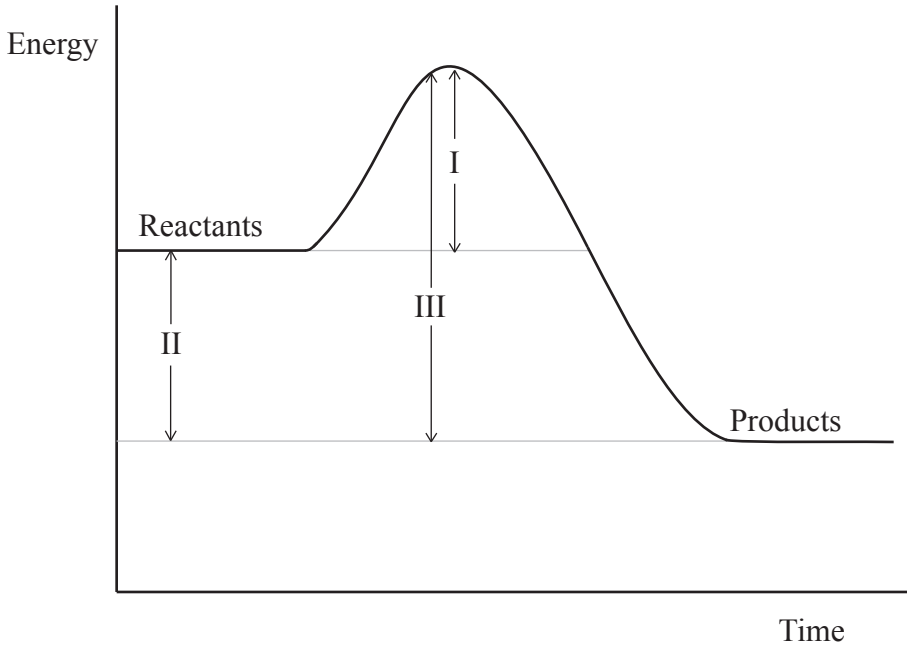
A. The substrate would not react to form intermediate X.

B. The concentration of intermediate X would increase.

C. The activity of enzyme 3 would increase to compensate.

D. No final product would be formed.

27. What effect would adding an enzyme have on energy changes during the reaction?



A. Reduce energy change I

B. Reduce energy change II

C. Increase energy change II

D. Increase energy change III

28. What is the total number of ATP molecules used and produced during glycolysis?

	ATP used during glycolysis	ATP produced during glycolysis
A.	2	2
B.	0	2
C.	2	4
D.	4	4

29. Where precisely in the cell do the reactions of the Krebs cycle take place?

A. In the cytoplasm

B. In the space between the inner and outer membrane of the mitochondria

C. On the surface of cristae in the mitochondria

D. In the fluid matrix of the mitochondria

30. What occurs during the light-independent reactions of photosynthesis?

A. ATP is produced.

B. Ribose reacts with carbon dioxide to form glucose.

C. Energy for the cycle is provided by the light-dependent reaction.

D. Darkness stimulates the conversion of glucose to starch.

31. A man attaches a bird box to the trunk of a dicotyledonous tree. A few years later he returns to the tree and finds that his bird box is still attached and the tree is much taller. How high will his bird box be from the ground?

A. Unchanged as growth from the apical meristem would be above the box.

B. Unchanged as growth from the lateral meristem would be above the box.

C. Higher as growth from the apical meristem would be below the box.

D. Higher as growth from the lateral meristem would be below the box.

32. Under which conditions would the rate of transpiration be greatest?

A. Humid and cool with wind

B. Dry and hot with wind

C. Dry and hot with no wind

D. Humid and cool with no wind

33. Maize (*Zea mays*) contains 20 chromosomes in a diploid cell. How many chromosomes will be in each cell after the first and second division of meiosis?

	After first meiotic division	**After second meiotic division**
A.	10	10
B.	20	10
C.	40	20
D.	10	5

34. What causes variation in **both** sexually and asexually reproducing organisms?

A. Mutations

B. Polygenic inheritance

C. Crossing over

D. Independent assortment

35. Which reaction during blood clotting is catalysed by the enzyme thrombin?

A. Soluble fibrin to fibrous fibrinogen

B. Soluble fibrinogen to fibrous fibrin

C. Fibrous fibrinogen to soluble fibrin

D. Fibrous fibrin to soluble fibrinogen

36. Which types of immunity are acquired by each of the following actions?

	Antigens injected into a child by vaccination	**Antibodies crossing the placenta to the fetus**	**Antibodies received by baby from breastfeeding**
A.	passive	passive	active
B.	passive	active	passive
C.	active	active	active
D.	active	passive	passive

37. What is the function of the synovial fluid in the elbow joint?

A. It removes waste products from the surrounding tissue.

B. It provides glucose and oxygen to the cartilage.

C. It lubricates the joint and prevents friction.

D. It prevents the bone from becoming brittle.

38. What would result from drinking large quantities of water?

	ADH	**Permeability of the collecting duct to water**
A.	secreted	increased
B.	secreted	decreased
C.	not secreted	increased
D.	not secreted	decreased

39. What is the role of calcium ions during muscle contraction?

A. To block the myosin binding site on actin when the muscle is not contracting

B. To move the molecules blocking the myosin binding site on actin

C. To form cross-bridges between the actin and myosin filaments

D. To provide the energy for resetting the myosin heads

40. What is a blastocyst?

A. An unfertilized egg surrounded by follicle cells

B. An unfertilized egg cell expelled by menstruation

C. The follicle when it has swelled up with fluid

D. The embryo when it has become a hollow ball of cells