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**BIOLOGY**  
**STANDARD LEVEL**  
**PAPER 1**

Friday 16 November 2012 (afternoon)

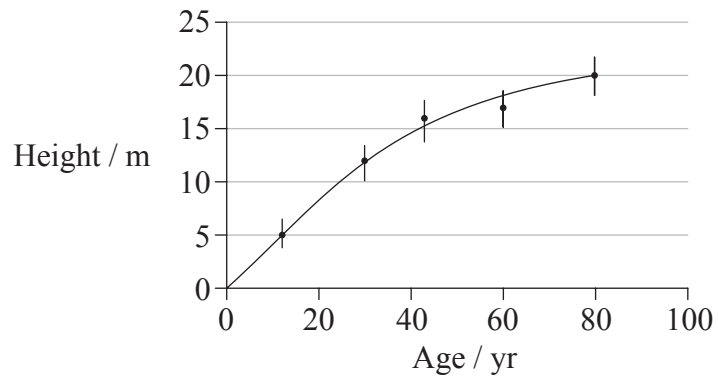
45 minutes

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**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]*.

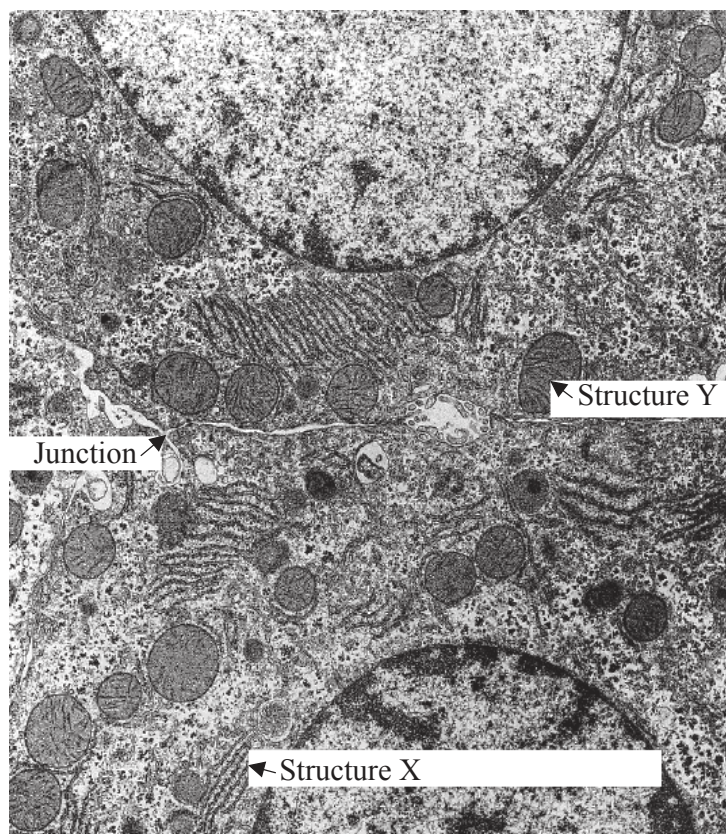
1. A student completed a study on the height of trees of different ages. The results are shown in the following graph.



What could the vertical bars represent?

- A. The median height for each age of tree
- B. The value of  $t$  compared to other species of trees
- C. Plus one to minus one standard deviation
- D. The correlation between the height and diameter of the trees

Questions 2 and 3 refer to the following electron micrograph which shows part of two adjacent liver cells.



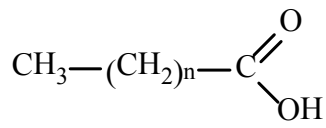
[Source: www.relife.com/Images/ratlivercells.gif]

2. What is happening at the structure labelled X?
- A. Synthesis of proteins
  - B. Transport of proteins to the nucleus
  - C. Modification of proteins prior to export
  - D. Secretion of proteins through the plasma membrane
3. What is the structure labelled Y?
- A. Nucleus
  - B. Starch grain
  - C. Lysosome
  - D. Mitochondrion

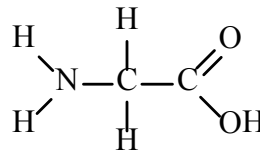
4. What is proportional to a cell's surface area?
- A. Rate of exchange of materials
  - B. Rate of heat production
  - C. Rate of waste production
  - D. Rate of oxygen consumption
5. Which process requires channel proteins?
- A. Simple diffusion
  - B. Facilitated diffusion
  - C. Binding of hormones
  - D. Exocytosis
6. What feature of cell membranes allows endocytosis to occur?
- A. Fluidity of phospholipid bilayer
  - B. Presence of protein pumps
  - C. Presence of carrier proteins
  - D. Glycoprotein binding sites
7. Which element or ion is required for transmission of a nerve impulse?
- A. Phosphorous
  - B. Sodium
  - C. Sulfur
  - D. Iron

8. Which structure represents a fatty acid?

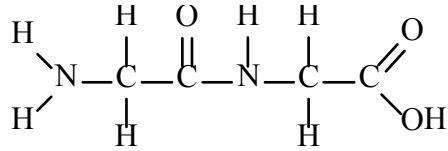
A.



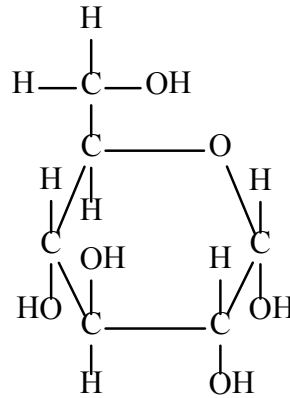
B.



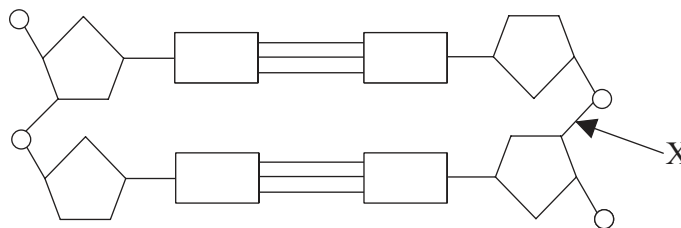
C.



D.



9. The diagram shows part of a DNA molecule.



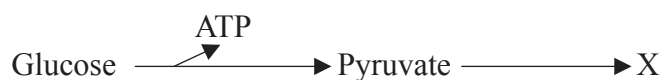
What type of bond does X represent?

- A. Covalent bond
- B. Hydrogen bond
- C. Peptide bond
- D. Semi-conservative bond

10. What will be the sequence on the mRNA molecule that is produced when the DNA base sequence ACTGATGCC is transcribed?

- A. ACTGATGCC
- B. ACUGAUGCC
- C. TGACTACGG
- D. UGACUACGG

11. The diagram shows anaerobic respiration in yeast cells.



What would be produced at X?

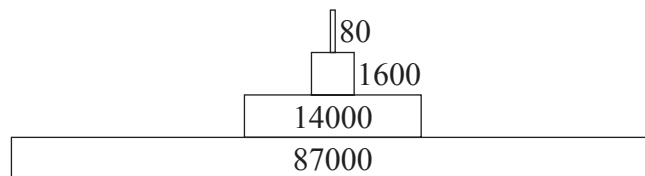
- A. ATP
  - B. Lactate
  - C. Ethanol and CO<sub>2</sub>
  - D. CO<sub>2</sub> and H<sub>2</sub>O
12. What is the energy absorbed by chlorophyll used directly for in plants?
- I. To produce ATP
  - II. To split water
  - III. To fix CO<sub>2</sub>
- A. I only
  - B. III only
  - C. I and II only
  - D. II and III only

13. What is the name given to a heritable factor which controls a specific characteristic?
- A. Allele
  - B. Chromosome
  - C. Gene
  - D. Mutation
14. What would be the expected result if a woman carrier for colour blindness and a colour blind man had many children?
- A. All offspring will be colour blind.
  - B. All male offspring will be colour blind and all females normal.
  - C. All males will be normal and all females will be colour blind.
  - D. All females will be carriers of colour blindness or colour blind.
15. In peas, tall is dominant to dwarf. In a cross between a dwarf plant and a heterozygous tall plant what percentage of the offspring will be dwarf?
- A. 0%
  - B. 25%
  - C. 50%
  - D. 100%
16. What commonly causes Down syndrome in humans?
- A. Non-disjunction
  - B. Base substitution
  - C. Amniocentesis
  - D. Gene mutation

17. When genes are transferred between species, the amino acid sequence of the polypeptide translated from them is unchanged. Why is this so?
- A. All organisms use ribosomes for protein synthesis.
  - B. DNA replication is semi-conservative.
  - C. The enzymes used are substrate specific.
  - D. The genetic code is universal.
18. A biologist exploring an uninhabited island came across an unknown plant. She made the following notes:
- grows in a damp and shady corner of the island
  - has large feathery leaves with spore cases (sporangia) arranged on the underside
  - young leaves are tightly rolled up
  - has roots.

In what phylum should she classify this plant?

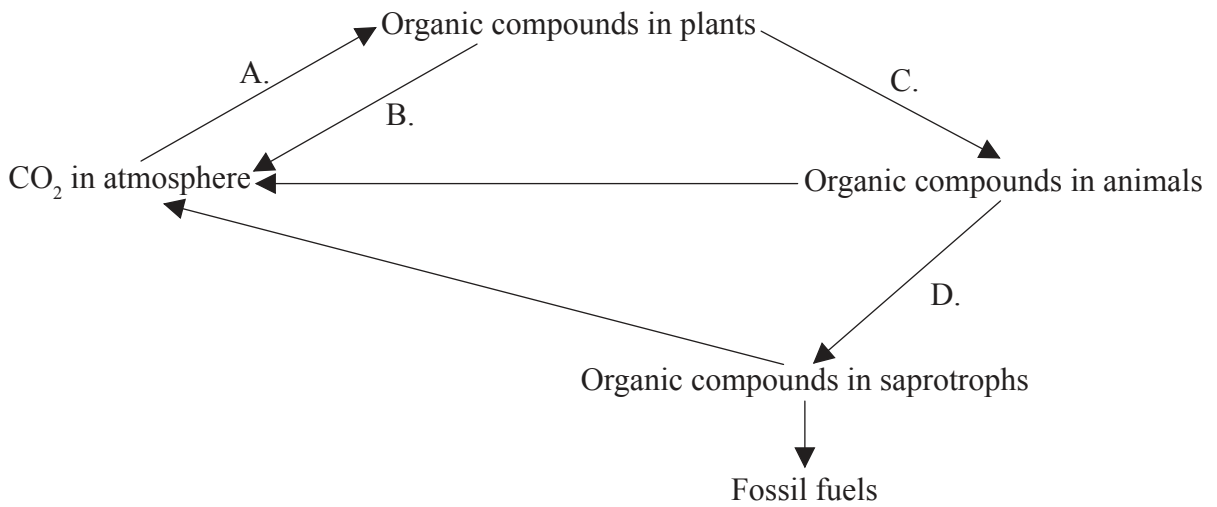
- A. Angiospermophyta
  - B. Bryophyta
  - C. Coniferophyta
  - D. Filicinophyta
19. The diagram shows a pyramid of energy for a wetland environment. What units would be appropriate for the values shown?



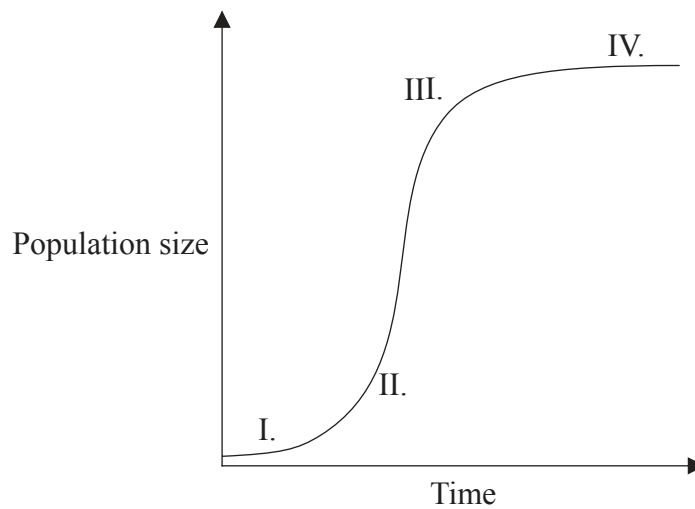
- A.  $\text{kg yr}^{-1}$
- B.  $\text{kJ m}^{-2} \text{yr}^{-1}$
- C.  $\text{J m}^{-2}$
- D.  $\text{mg dry mass m}^{-3}$



20. The diagram shows the carbon cycle. Which letter indicates respiration?

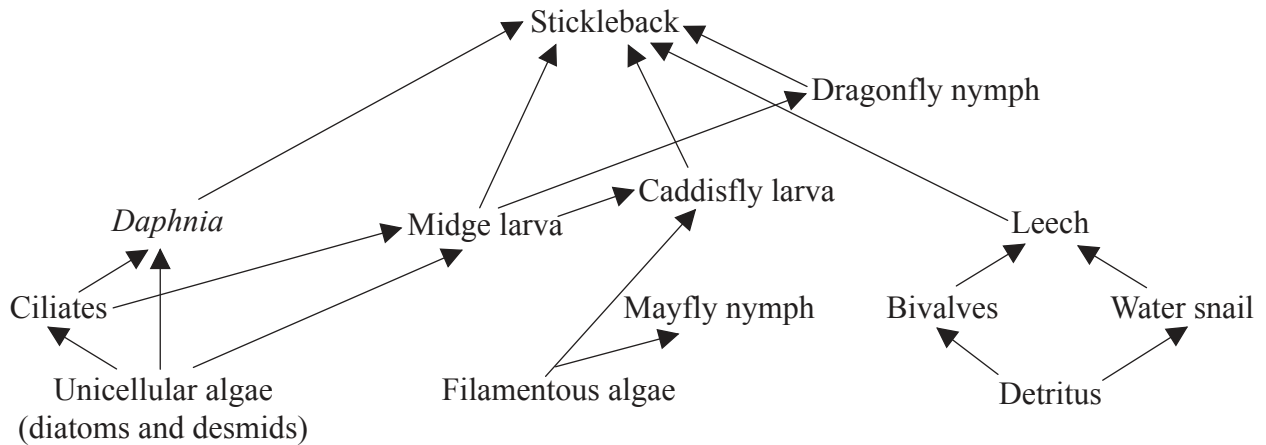


21. Which numbers represent exponential growth in a population of water fleas introduced to a new culture medium?



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

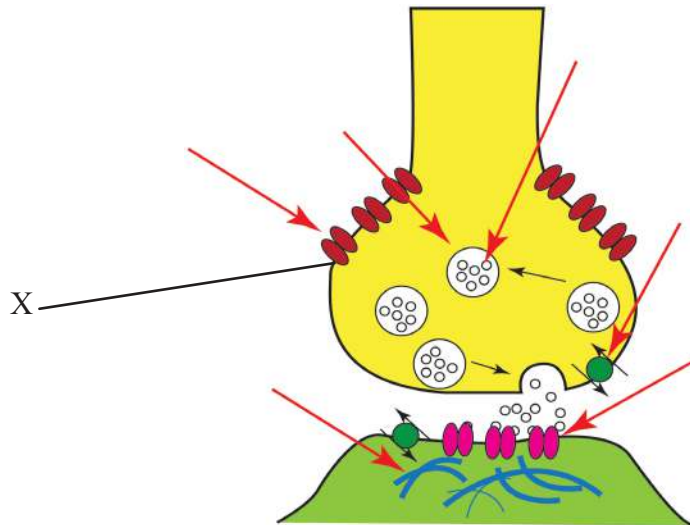
Questions 22 and 23 refer to the following diagram which is part of a food web for a freshwater habitat.



22. What is the mode of nutrition of midge larva?
- A. Autotroph
  - B. Detritivore
  - C. Heterotroph
  - D. Saprotroph
23. Which represents a correct food chain from this web?
- A. stickleback → midge larva → unicellular algae
  - B. ciliates → *Daphnia* → stickleback → dragonfly nymph
  - C. diatom → midge larva → caddisfly larva → stickleback
  - D. filamentous algae → mayfly nymph → leech → stickleback

24. What are antibodies?
- A. Organisms or viruses that cause disease
  - B. Drugs used to treat bacterial diseases
  - C. Substances the body recognizes as foreign
  - D. Proteins that bind to foreign substances
25. A structure has a thin epithelium of one cell layer and contains a lacteal and blood capillaries. It has protein channels and mitochondria to aid absorption. What is this structure?
- A. Alveolus
  - B. Gastric gland
  - C. Pancreas
  - D. Villus
26. Which statement describes the movements of the rib cage during inhalation of air?
- A. External intercostal muscles contract moving the ribs up and outwards.
  - B. Internal intercostal muscles contract moving the ribs down and inwards.
  - C. External intercostal muscles relax moving ribs down and inwards.
  - D. Internal intercostal muscles relax moving ribs up and outwards.

27. The diagram shows events at a synapse.



[Source: Adapted from: [http://en.wikipedia.org/wiki/File:Synapse\\_Illustration\\_unlabeled.svg](http://en.wikipedia.org/wiki/File:Synapse_Illustration_unlabeled.svg)]

What is happening at the point labelled X?

- A. Neurotransmitter binding
  - B. Ca<sup>2+</sup> diffusing
  - C. Neurotransmitter moving across synapse
  - D. Na<sup>2+</sup> binding
28. What is a feature of type I diabetes but not type II diabetes?
- A. Target cells become insensitive to insulin.
  - B.  $\beta$  cells do not produce sufficient insulin.
  - C. Type I diabetes can be controlled through a low carbohydrate diet.
  - D.  $\alpha$  cells produce excess insulin.

29. The concentration of which hormone peaks sharply triggering ovulation?

- A. FSH
- B. LH
- C. Estrogen
- D. Progesterone

30. The diagram shows a section through the male reproductive system. Which structure represents the prostate gland?

