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**BIOLOGY
HIGHER LEVEL
PAPER 1**

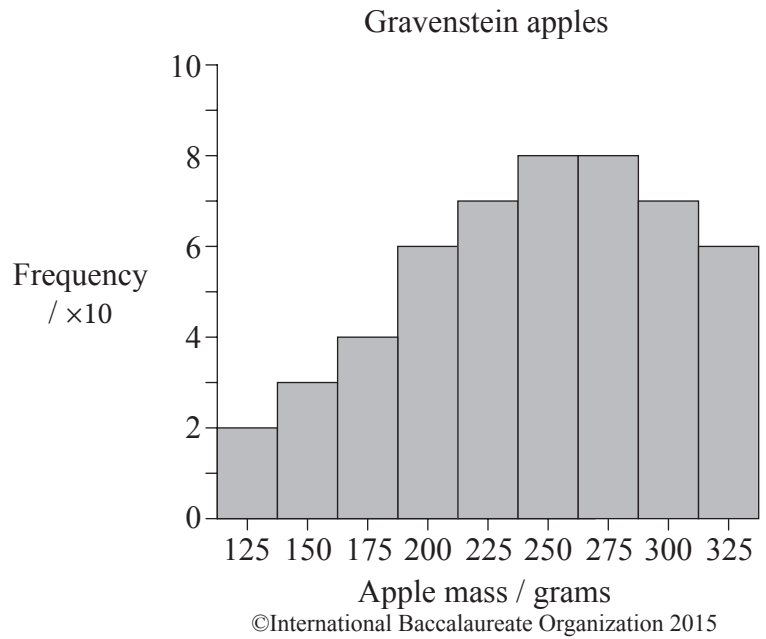
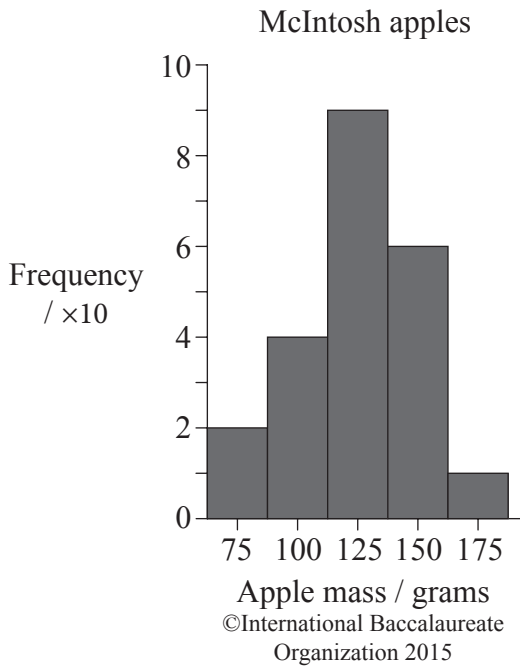
Monday 10 November 2014 (afternoon)

1 hour

INSTRUCTIONS TO CANDIDATES

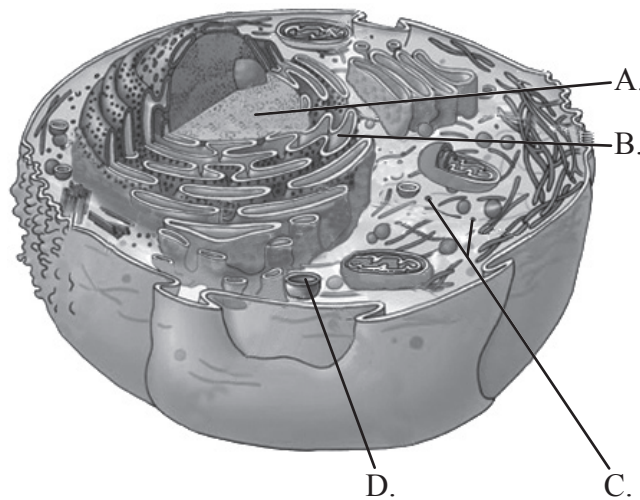
- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.
- The maximum mark for this examination paper is *[40 marks]*.

1. What can be predicted from the histogram comparing the mass of McIntosh apples and the mass of Gravenstein apples?



- A. More fertiliser had been used to grow the McIntosh apples.
- B. The mass of the McIntosh apples has a smaller standard deviation than the Gravenstein apples.
- C. The electronic balance used to obtain the data was only accurate to 5 grams.
- D. The distribution of the two apple masses overlaps by 68%.
2. What evidence supports the cell theory?
- A. Living organisms are made up of cells.
- B. Unicellular organisms carry out all the functions of life.
- C. Multicellular organisms show emergent properties.
- D. Cells can develop from inorganic molecules.

3. What is a difference between prokaryotic cells and eukaryotic cells?
- A. Ribosomes are found only in prokaryotic cells.
 - B. Cell walls are found only in eukaryotic cells.
 - C. Mitochondria are found only in eukaryotic cells.
 - D. Flagella are found only in prokaryotic cells.
4. What causes cell differentiation in multicellular organisms?
- A. Each cell having different genes.
 - B. The expression of certain genes but not others.
 - C. The recognition by antibodies of some cells but not others.
 - D. The cellular recognition of a specific function.
5. Which structure synthesizes proteins for use primarily within the cell?



[Source: adapted from [http://faculty.irsc.edu/FACULTY/TFischer/images/cell organelles.png](http://faculty.irsc.edu/FACULTY/TFischer/images/cell%20organelles.png)]

6. What transport method is used in the reabsorption of glucose in the proximal convoluted tubule of the kidney?
- A. Diffusion
 - B. Osmosis
 - C. Endocytosis
 - D. Active transport
7. What characteristic(s) of water allow(s) effective transport of nutrients around the body by blood?
- I. Solvent properties
 - II. Thermal capacity
 - III. Transparency
- A. I only
 - B. I and II only
 - C. II and III only
 - D. I, II and III
8. Which is a function of sucrose in plants?
- A. Protection
 - B. Transport
 - C. Support
 - D. Photosynthesis
9. What happens when the substrate concentration is increased in an enzyme-catalysed reaction?
- A. The enzyme is denatured.
 - B. Competitive inhibition is reduced.
 - C. End-product inhibition occurs.
 - D. The allosteric site in non-competitive inhibition is blocked.

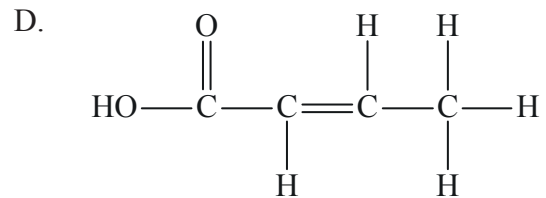
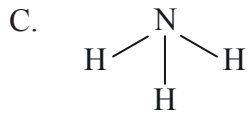
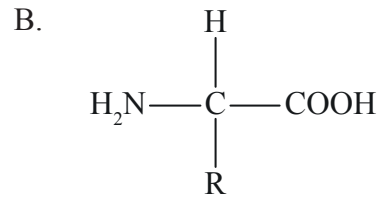
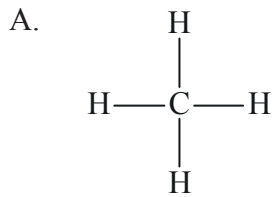
10. During replication of the DNA lagging strand, which enzyme is responsible for removing RNA primers and replacing them with DNA?
- A. Helicase
 - B. DNA polymerase I
 - C. DNA polymerase III
 - D. RNA primase

11. What is the correct site of anaerobic respiration in yeast and one of its end products?

	Site	End product
A.	cytoplasm	pyruvate
B.	cytoplasm	ethanol
C.	matrix	lactate
D.	matrix	carbon dioxide

12. What causes cyclic photophosphorylation to occur in photosynthesis?
- A. Reduced NADP is accumulating in the stroma.
 - B. Photoactivation of photosystem II is inhibited.
 - C. Light-dependent reactions are slower than light-independent reactions.
 - D. ATP is not required for the Calvin cycle.

13. Which compound is inorganic?



14. After chorionic villus sampling, how is the material processed for karyotyping?

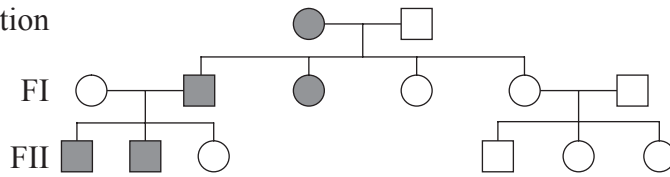
- A. DNA is fingerprinted.
- B. Genes are photographed.
- C. Alleles are compared.
- D. Homologous chromosomes are paired.

15. When could non-disjunction occur?

- A. Prophase
- B. Meiosis
- C. Interphase
- D. Cytokinesis

16. What are the genotypes of the parental generation?

Parental generation

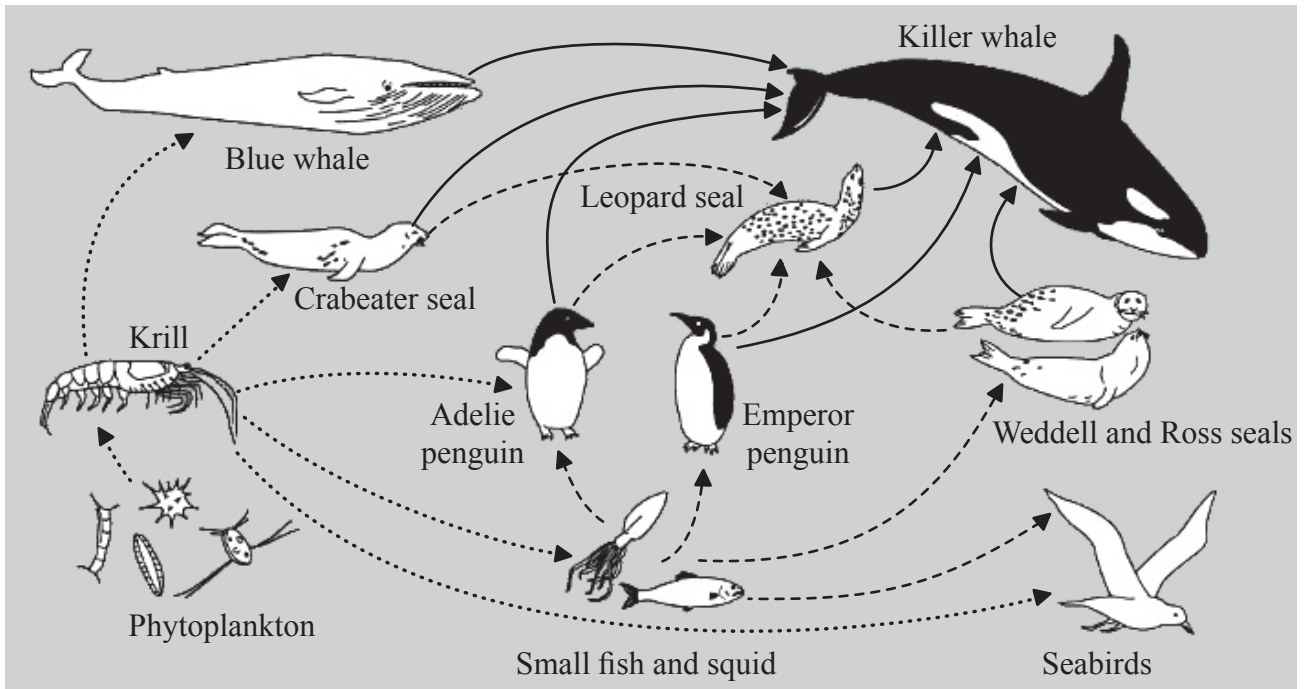


Key:

- male with trait
- female with trait
- male without trait
- female without trait

- A. Male is homozygous dominant and female is homozygous recessive.
 - B. Male is heterozygous and female is homozygous dominant.
 - C. Male is homozygous recessive and female is homozygous dominant.
 - D. Male is homozygous recessive and female is heterozygous.
17. If both parents are heterozygous for sickle-cell anemia ($Hb^A Hb^S$), what percentage of their offspring will have a homozygous genotype?
- A. 25
 - B. 50
 - C. 75
 - D. 0
18. After gene transfer between species, what ensures that the amino acid sequence of the polypeptide made using the transferred gene remains unchanged?
- A. The genetic code is semi-conservative.
 - B. The genetic code is degenerate.
 - C. The genetic code is universal.
 - D. The genetic code can be cloned.

19. What is the trophic level of the Leopard seal?



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

- I. Secondary consumer
- II. Tertiary consumer
- III. Quaternary consumer

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

20. In ecology, how is community defined?

- A. Different species living and interacting with each other in a specific area.
- B. Different families cooperating with each other.
- C. A group of organisms of the same species who live in a specific area at the same time.
- D. A specific area in which a group of species normally live.

21. On sites polluted with heavy metals, some grasses show tolerance to concentrations of those metals that are normally toxic. What explains this tolerance?
- A. Grasses continually exposed to high doses of heavy metals mutate.
 - B. Rapid reproduction rate of grasses produces little genetic variation.
 - C. Grasses not killed by the heavy metals reproduce and pass on their genes.
 - D. Heavy metals become less toxic over time.
22. What is the phylum of the organism?

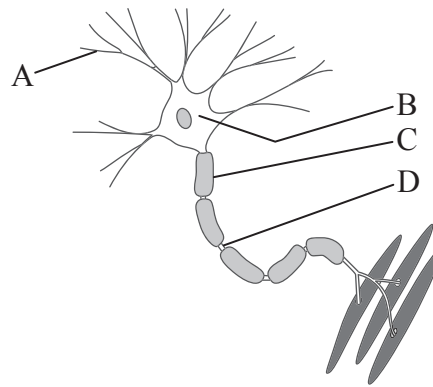


[Source: adapted from <http://en.wikipedia.org/wiki/Earthworm#mediaviewer/File:Earthworm.jpg>]

- A. Porifera
 - B. Cnidaria
 - C. Platyhelminthes
 - D. Annelida
23. Colonic irrigation involves regularly flushing the large intestine with water. Why should this practice be avoided?
- A. The large intestine absorbs water.
 - B. Vitamin-producing bacteria are eliminated.
 - C. It will stimulate the production of toxins.
 - D. Undigested remains of food are removed.

- 24.** How has the transmission of HIV been reduced?
- A. Delaying the progression of HIV to AIDS
 - B. Single use of disposable needles
 - C. Treatment with antibiotics
 - D. Vaccination
- 25.** What is the difference between movement of the knee joint and hip joint?
- A. The knee only allows flexion whereas the hip allows flexion and extension.
 - B. The knee allows more rotation than the hip.
 - C. The knee is used to walk forwards whereas the hip is used for running around corners.
 - D. The knee allows movement in one plane whereas the hip allows movement in three planes.
- 26.** Which condition is associated with type II diabetes?
- A. A lack of beta cells in the pancreas
 - B. Excess glucagon in the blood
 - C. Obesity
 - D. Early onset

27. The image shows a diagram of a motor neuron.

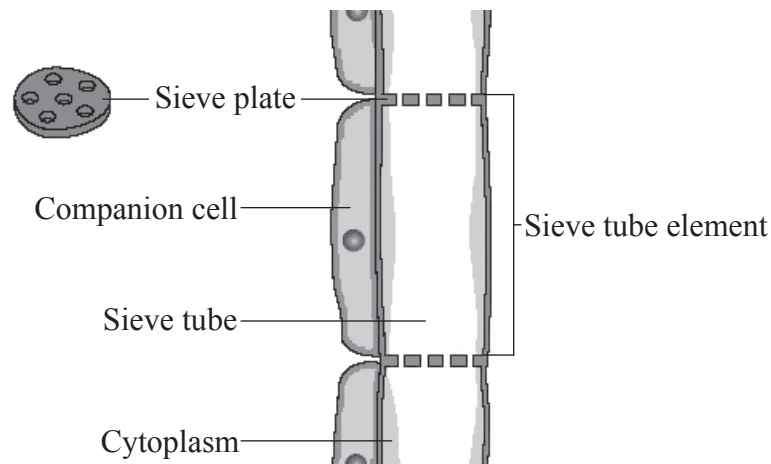


[Source: adapted from www.d.umn.edu/~jfitzake/Lectures/DMED/MotorControl/Organization/MotorUnit.jpg]

Which structure is correctly labelled in the diagram?

- A. Cell body
 - B. Axon
 - C. Dendrite
 - D. Node of Ranvier
28. Which describes the function of a nucleosome?
- A. Connects the 5' to 3' linkages in nucleic acids.
 - B. Regulates the removal of exons during transcription.
 - C. Helps to supercoil the DNA molecule.
 - D. Synthesizes histone proteins during interphase.
29. What level of protein structure stabilizes the three-dimensional conformation that contributes to an enzyme's specificity?
- A. Primary
 - B. Secondary
 - C. Tertiary
 - D. Quaternary

30. In a section of DNA separated during transcription, which complementary base pairing will occur on the antisense strand?
- A. Cytosine and adenine
 - B. Adenine and thymine
 - C. Thymine and uracil
 - D. Uracil and adenine
31. What is a characteristic of dicotyledonous plants?
- A. Parallel venation
 - B. Floral organs in multiples of three
 - C. Tap roots with lateral branches
 - D. Random distribution of vascular tissue in the stem
32. What is the role of the plant structure in the diagram?



[Source: adapted from <http://www.mrcbiology.com>]

- A. Carries water for the transpiration stream.
- B. Active translocation of sugars.
- C. Filters waste material from the light-independent reaction.
- D. Reduces turgor pressure in stems.

33. What does the plant hormone auxin help to regulate?
- A. Seed germination
 - B. Flowering
 - C. Phototropism
 - D. Reproduction in angiospermophytes

34. A cross is performed including two linked genes.

$$\begin{array}{c} \text{A B} \\ \hline \\ \hline \text{a b} \end{array} \times \begin{array}{c} \text{a b} \\ \hline \\ \hline \text{a b} \end{array}$$

If the genes are far enough apart for crossing over to occur between the genes, which of the offspring would be recombinants?

- I. AaBb
 - II. Aabb
 - III. aaBb
- A. I only
 - B. I and II only
 - C. II and III only
 - D. I, II and III
35. Which phenotypic variation results partly from polygenic inheritance in humans?
- A. Skin colour
 - B. Hemophilia
 - C. Sex determination
 - D. Hair length

36. In a healthy individual, what would be the expected concentration of glucose in blood plasma, glomerular filtrate and urine?

	Glucose concentration in blood plasma / mg 100 cm⁻³ blood	Glucose concentration in glomerular filtrate / mg 100 cm⁻³ blood	Glucose concentration in urine / mg 100 cm⁻³ urine
A.	100	100	0
B.	100	0	0
C.	100	50	50
D.	100	50	0

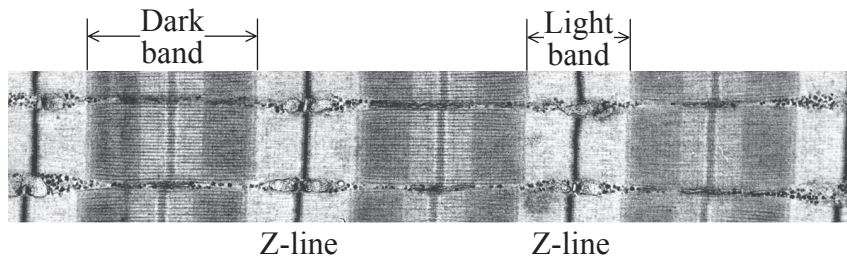
37. What is the sequence of events in blood clotting after the platelets have been activated?

- A. Thrombin to prothrombin which catalyses fibrinogen to fibrin.
- B. Prothrombin to thrombin which catalyses fibrinogen to fibrin.
- C. Fibrinogen to fibrin which catalyses thrombin to prothrombin.
- D. Fibrinogen to fibrin which catalyses prothrombin to thrombin.

38. What are fused together to produce monoclonal antibodies?

- A. Antigens and tumour cells
- B. Antibodies and hybridomas
- C. B-cells and tumour cells
- D. Antigens and hybridomas

39. What change(s) will occur when the muscle fibre contracts?



[Source: adapted from www.ks.uiuc.edu/Research/telethonin/MuscleL1.jpg]

- A. The dark band will decrease.
 - B. The light band will decrease.
 - C. The light band and dark band will both decrease.
 - D. The Z-lines will decrease.
40. Which hormone is paired with one of its correct functions during pregnancy and birth?

	Hormone	Function
A.	estrogen	maintains the corpus luteum in the ovary
B.	HCG	initiates uterine contractions
C.	oxytocin	promotes development of the placenta
D.	progesterone	maintains the endometrium