

BIOLOGY

HIGHER LEVEL

SAMPLE EXAM PAPER I

Time allowed: 1 hour

Calculators are not permitted.

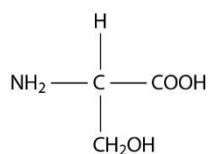
1. In which of these lists are the items listed in the correct order from largest to smallest?

- A. membrane thickness, viruses, organelles, cells
- B. membrane thickness, organelles, viruses, cells
- C. membrane thickness, bacteria, viruses, molecules
- D. bacteria, viruses, membrane thickness, molecules

2. Which of the following terms is the correct definition of organelles?

- A. Specialised structures in an organ that have a specific function
- B. Compartmentalised structures found in all cells that have specific functions
- C. Membrane-bound structures found in eukaryotes that have specific functions
- D. Structures in the cytoplasm of a cell which carry out more than one function

3. What molecular structure is shown in this diagram?



- A. Amino acid
- B. Carbohydrate
- C. Fatty acid
- D. RNA base

4. Catabolism is defined as:

- A. The synthesis of complex molecules from simpler molecules
- B. The web of all enzyme-catalysed reactions in a cell
- C. The breakdown of complex molecules into simpler molecules
- D. The formation of disaccharides from monomers

5. Which feature of water molecules determines their solvent properties?
- A. Ionic bonds
 - B. Polarity
 - C. Hydrophilic interactions
 - D. Hydrogen bonding
6. During the replication of DNA which of the following is responsible for the conservation of the base sequence?
- A. Identical strands are copied.
 - B. DNA polymerase works on both strands at the same time.
 - C. Unpaired bases always pair with complementary nucleotides.
 - D. DNA helicase and DNA polymerase are complementary.
7. Which statement about respiration is true?
- A. Anaerobic respiration requires oxygen and gives a small yield of ATP from glucose.
 - B. Aerobic respiration requires oxygen and gives a large yield of ATP from glucose.
 - C. Anaerobic respiration does not require oxygen and gives a large yield of ATP from glucose.
 - D. Aerobic respiration does not require oxygen and gives a large yield of ATP from glucose.
8. Which are the possible causes of sickle cell anemia?

A.	deletion of a base in DNA	change to the sequence of polypeptide in hemoglobin
B.	substitution of a base in DNA	change to the base sequence of mRNA transcribed from DNA
C.	deletion of a base in DNA	change to the base sequence of mRNA transcribed from DNA
D.	substitution of a base in DNA	replacement of valine by glutamic acid in hemoglobin

9. What does a karyogram show?

- A. All the genes that an organism possesses
- B. The bands produced by gel electrophoresis
- C. The number and appearance of chromosomes from an organism
- D. The alleles that control an organism's characteristics

10. Methane is a greenhouse gas which:

A.	is oxidised to carbon dioxide and water in the atmosphere	is produced by methanogenic archaeans in aerobic conditions
B.	cannot be oxidised and accumulates in the atmosphere	is produced by methanogenic archaeans in aerobic conditions
C.	is oxidised to carbon dioxide and water in the atmosphere	is produced by methanogenic archaeans in anaerobic conditions
D.	cannot be oxidised and accumulates in the atmosphere	is produced by methanogenic archaeans in anaerobic conditions

11. Many cuttings were taken from a flowering plant and grown in a laboratory. There was variation between the new plants. What was the most likely cause of this variation?

- A. Polyploidy
- B. Mutation
- C. Genetic drift
- D. Environmental influence

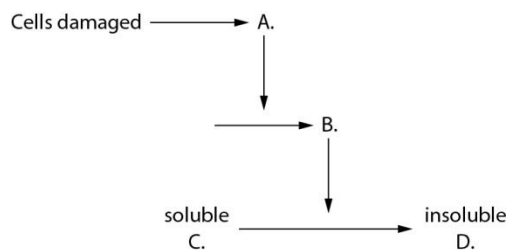
12. Which of the following statements about climate change is **not** correct?

- A. Coral reefs are threatened by warmer atmospheric temperatures.
- B. There is a correlation between global temperature and carbon dioxide concentration on Earth.
- C. Carbon dioxide and water vapour are the most important greenhouse gases.
- D. Longer-wave radiation is absorbed by greenhouse gases so the atmosphere becomes warmer.

- 13.** What is the correct sequence of taxa used in the classification of organisms?
- A. Kingdom, Domain, Phylum, Class, Order, Family, Genus, Species
 - B. Kingdom, Phylum, Domain, Class, Order, Genus, Family, Species
 - C. Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species
 - D. Domain, Kingdom, Phylum, Class, Order, Family, Species, Genus
- 14.** Evidence used to construct a cladogram includes:
- I. Base sequences of a gene
 - II. Amino acid sequences of a protein
 - III. Examination of analogous traits
- A. I, II and III
 - B. I and II only
 - C. II and III only
 - D. I and III only
- 15.** Muscles and elastic fibres in blood vessel walls maintain blood pressure between pumping cycles of the heart in:
- I. Arteries
 - II. Veins
 - III. Capillaries
- A. I, II and III
 - B. I and II only
 - C. I and III only
 - D. I only

16. What does the lack of the hormone melatonin cause?
- A. Clinical obesity as a person cannot control their appetite
 - B. A loss of body mass as a person's appetite is suppressed
 - C. Jet lag and a disruption of circadian rhythms
 - D. Disruption of metabolic rate and ability to control body temperature

17. The diagram below shows the process of clotting. Which letter represents fibrin?

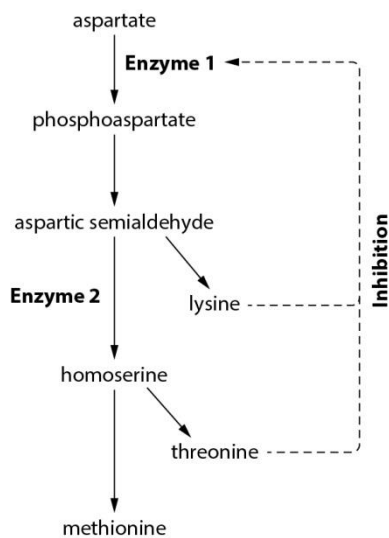


18. The proteins and enzymes involved in DNA replication include:
- I. DNA gyrase and DNA polymerase
 - II. DNA primase and single-stranded binding proteins (SSBs)
 - III. Helicase and mRNA
- A. I, II and III
 - B. I only
 - C. II and III only
 - D. I and II only
19. Which of the following is **not** a function of nucleosomes?
- A. Adding nucleotides to the 3' end of a primer
 - B. Helping to supercoil DNA
 - C. Helping to regulate transcription in eukaryotes
 - D. Controlling the expression of some genes

20. What is the function of DNA gyrase?

- A. To add the appropriate nucleotides in the 3' to 5' direction
- B. To join the Okazaki fragments together
- C. To relieve the tension on a DNA molecule as it is being unwound
- D. To remove RNA primers on the lagging strand

21. The diagram shows a metabolic pathway for the production of an amino acid.



Which of the following would **not** lead to an increase in lysine production?

- A. Increased production of homoserine
- B. Inhibition of enzyme 2
- C. Removal of lysine as it is formed
- D. Increase in level of enzyme 1

22. Which of the following statements best describes a competitive inhibitor?

- A. If the concentration of inhibitor is low, increasing the concentration will increase the inhibition.
- B. The competitive inhibitor occupies and blocks the active site.
- C. The competitive inhibitor binds at a site away from the active site.
- D. The competitive inhibitor is structurally unlike the substrate molecule.

23. Which of these describes the link reaction in eukaryotic respiration?

A.	takes place in the mitochondrial matrix	pyruvate joins with coenzyme A
B.	takes place in the cytoplasm	acetyl coenzyme A passes through mitochondrial membrane
C.	takes place in the mitochondrial matrix	acetyl coenzyme A passes through mitochondrial membrane
D.	takes place in the cytoplasm	pyruvate joins with coenzyme A

24. Which stage of aerobic respiration requires the use of oxygen?

- A. Glycolysis
- B. Formation of water
- C. Phosphorylation
- D. Decarboxylation

25. Which of the following is used during photosynthesis to reduce glycerate 3-phosphate to triose phosphate?

- A. Reduced NADP and ATP
- B. Reduced NAD and FAD
- C. RuBP and ATP
- D. RuBP and FAD

26. Which of these features is or are present in mitochondria but **not** in chloroplasts?

- I. DNA and ribosomes
 - II. Inner and outer membranes
 - III. Cristae
- A. I only
 - B. II only
 - C. III only
 - D. I and III only

27. What is a characteristic of plants which live in deserts?
- A. Absence of roots
 - B. Absence of vascular tissue
 - C. Leaves with a small surface area
 - D. Large numbers of stomata
28. What conditions will lead to the highest rate of transpiration in a watered plant?
- A. Windy, bright sunshine, humid and cool
 - B. Windy, low humidity, hot and bright sunshine
 - C. Hot, humid, bright sunshine and no wind
 - D. Windy, hot, humid and cloudy sky
29. Which process is used to load organic compounds into the phloem at a source?
- A. Diffusion
 - B. Osmosis
 - C. Active transport
 - D. Hydrostatic pressure
30. Cells in an area of onion root tip were examined and the number showing different stages of mitosis were counted. The following results were obtained:

Stage	% of total number of dividing cells
prophase	85.0
metaphase	7.7
anaphase	2.9
telophase	4.4

Which is the best explanation of the data?

- A. The area investigated was very close to the root tip.
- B. The division process was just starting.
- C. Prophase takes longer than the other stages.
- D. The sample was too small to be statistically valid.

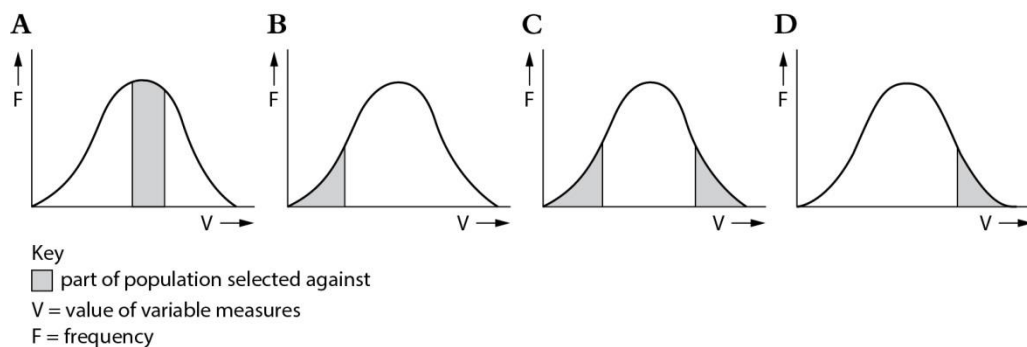
31. Four of the stages in a meiotic division are:
1. Pairing of homologous chromosomes
 2. Chromatids moving apart
 3. Division of centromeres
 4. Replication of DNA

What is the correct order of these steps in a normal meiotic division?

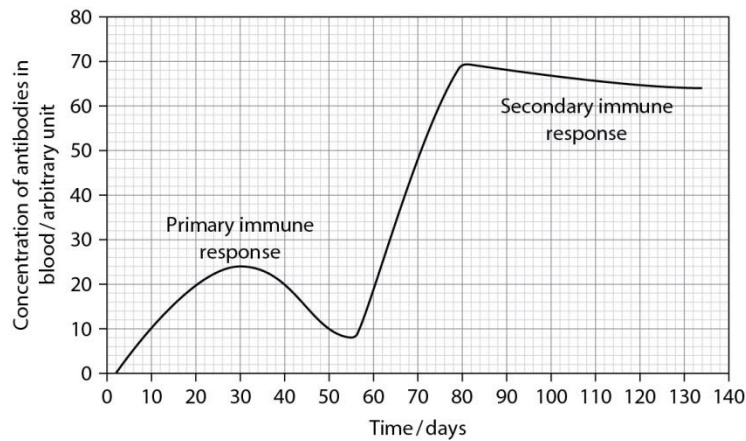
- A. 4, 1, 2, 3
- B. 4, 3, 1, 2
- C. 4, 2, 1, 3
- D. 4, 1, 3, 2
32. In his experiments Mendel crossed pure-breeding (homozygous) tall pea plants which had pink flowers with pure-breeding dwarf pea plants that had white flowers.
- Plants that were produced in the F_1 generation were crossed with pure-breeding dwarf peas with pink flowers. What proportion of tall plants with pink flowers would be expected in the offspring?
- A. $9/16$
- B. $1/2$
- C. $3/8$
- D. $1/4$

33. The graphs show the distribution of inherited variation in four populations.

Which of the graphs show a situation which is most likely to lead to speciation?



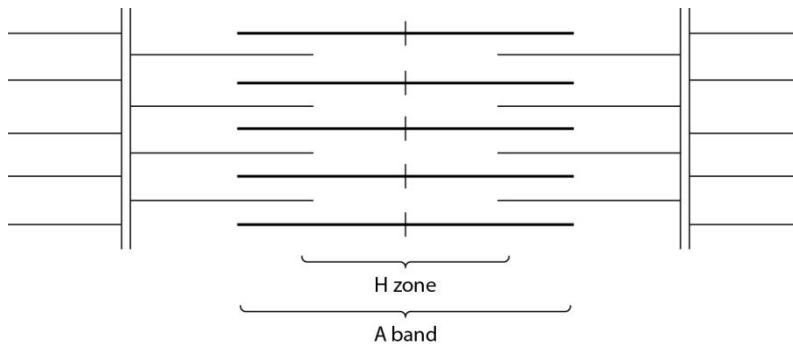
34. The graph shows how a person responds when exposed to an antigen in a vaccine.



When do lymphocytes multiply to produce a clone of plasma cells?

- A. 0–30 days
 - B. 30–35 days
 - C. 55–80 days
 - D. After 80 days
35. Which of the following causes the symptoms of an allergic reaction?
- A. Activated B cells
 - B. Monoclonal antibodies
 - C. White blood cells
 - D. Histamine

36. The diagram shows actin and myosin filaments in a muscle myofibril.



Which of the following would happen to the A band and the H zone when the muscle contracts?

	A Band	H Zone
A.	shorter	shorter
B.	no change	no change
C.	shorter	no change
D.	no change	shorter

37. What is controlled by anti-diuretic hormone (ADH)?
- A. Ultrafiltration in the glomerulus
 - B. Reabsorption of water in the collecting duct
 - C. Active transport in the proximal convoluted tubule
 - D. Sodium ions in the loop of Henle
38. Which process or processes are used for reabsorption of glucose in the proximal convoluted tubule of a nephron?
- A. Active transport and diffusion
 - B. Active transport and osmosis
 - C. Diffusion only
 - D. Osmosis and diffusion

- 39.** What process is stimulated by the hormone HCG (human chorionic gonadotropin)?
- A. Secretion of progesterone
 - B. Secretion of oestrogen
 - C. Ovulation
 - D. Oogenesis
- 40.** What happens to polar bodies formed during oogenesis?
- A. They cause the acrosome reaction.
 - B. They cause the cortical reaction.
 - C. They draw chromosomes apart as the zygote divides.
 - D. They are not used and break down.