BIOLOGY MOCK EXAMINATION SERIES

Written in the style of the IB Diploma Programme (first assessment 2025)

Biology

Standard Level

Paper 1A — Mock Examination

Mock Exam 2

Calculator required

Time allowed: **50 minutes**

Maximum mark: **30 marks**

Candidate information

Candidate name: .....

Session number: .....

Date: .....

Topic emphasis: water and transport, biomolecules, enzymes and inhibition, cell respiration and photosynthesis, cell structure and surface area to volume, the cell cycle, nucleic acids and translation, genetics and pedigrees, digestion, the heart, transpiration, muscles, synapses, disease, energy flow and eutrophication.

Instructions to candidates

- Write your session number in the space on the cover.
- Do not open this examination paper until you are told to do so.
- Answer **all** questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[30 marks]**.

The mark allocation is shown in square brackets at the end of each question; every question in this paper is worth one mark **[1]**. There is no penalty for an incorrect answer, so you should attempt every question. Where a numerical answer is required, you may assume standard laboratory conditions unless stated otherwise in the question.

Mark allocation

Section A (questions 1–15)	[15 marks]
Section A (questions 16–30)	[15 marks]
Total	**[30 marks]**

All questions in this paper are original items written for revision purposes. They follow the style and topic coverage of the Diploma Programme biology guide but are not reproduced from any past examination paper.

Section A

Answer all questions. The maximum mark for each question is given in square brackets.

1. Which property of water allows glucose and amino acids to be transported in blood plasma? **[1]**

A. Water has a high specific heat capacity.

B. Water is polar and forms hydrogen bonds with solutes.

C. Water molecules are cohesive.

D. Water has a high latent heat of vaporization.

2. Which pair of monosaccharides is joined by a glycosidic bond to form maltose? **[1]**

A. Glucose and fructose

B. Glucose and galactose

C. Glucose and glucose

D. Fructose and galactose

3. Which row describes an unsaturated fatty acid? **[1]**

	Bonds between the carbon atoms	**State at 20 °C**
A.	one or more double bonds	liquid
B.	single bonds only	liquid
C.	one or more double bonds	solid
D.	single bonds only	solid

Turn over

4. What determines the tertiary structure of a globular protein? **[1]**

A. The number of polypeptide chains in the molecule

B. The formation of α-helices and β-pleated sheets only

C. The number of peptide bonds in the polypeptide

D. Interactions between the R groups of the amino acids

5. An enzyme-catalysed reaction is taking place at the optimum temperature and pH, with the enzyme in excess.
Which change would increase the rate of reaction? **[1]**

A. Adding a competitive inhibitor

B. Lowering the temperature by 10 °C

C. Increasing the substrate concentration

D. Increasing the pH by two units

6. Which statement describes a competitive inhibitor? **[1]**

A. It binds to the active site and its effect is reduced by adding more substrate.

B. It binds away from the active site and its effect cannot be reduced by adding more substrate.

C. It permanently breaks the peptide bonds of the enzyme.

D. It lowers the activation energy of the reaction it inhibits.

Turn over

7. What are the products of glycolysis in the cytoplasm of a human cell? **[1]**

A. Carbon dioxide and water

B. Pyruvate, ATP and reduced NAD

C. Lactate and oxygen

D. Glucose and ATP

8. Yeast cells are respiring in a sealed flask containing glucose solution and no oxygen.
What are the products of respiration in these cells? **[1]**

A. Lactate only

B. Lactate and carbon dioxide

C. Carbon dioxide and water

D. Ethanol and carbon dioxide

9. The rate of photosynthesis of a plant increases as light intensity increases, but above a certain intensity the rate stays constant.
What explains this observation? **[1]**

A. All of the chlorophyll in the leaves has been destroyed by bright light.

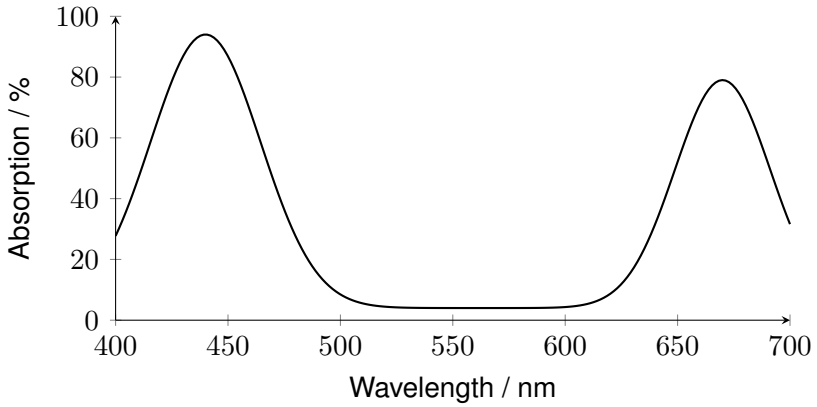
B. Oxygen produced by the plant inhibits the enzymes of photosynthesis.

C. Another factor, such as carbon dioxide concentration, has become limiting.

D. Light is no longer required once glucose has been produced.

Turn over

10. The graph shows the absorption spectrum of chlorophyll. **[1]**



Which explains why most leaves appear green?

A. Green light is absorbed least by chlorophyll and is reflected.

B. Green light provides the most energy for photosynthesis.

C. Chlorophyll absorbs green light more strongly than any other wavelength.

D. Green light has the shortest wavelength reaching the leaf.

11. What is a function of the cellulose cell wall of a plant cell? **[1]**

A. It controls which substances enter and leave the cell.

B. It is the site of the light-dependent reactions.

C. It stores starch as an energy reserve.

D. It resists the pressure of water entering by osmosis, preventing the cell from bursting.

12. A cube of agar has sides of length 2 mm.
What is the surface area to volume ratio of the cube? **[1]**

A. 1.5 : 1

B. 3 : 1

C. 6 : 1

D. 12 : 1

Turn over

13. Which row describes a prokaryotic cell? **[1]**

	Ribosomes	**Location of the DNA**
A.	80S	enclosed in a nucleus
B.	80S	free in the cytoplasm
C.	70S	free in the cytoplasm
D.	70S	enclosed in a nucleus

14. Why are stem cells useful in medical therapies? **[1]**

A. They can divide repeatedly and differentiate into several types of cell.

B. They already have the specialized structure of the damaged tissue.

C. They cannot be recognized or rejected by the immune system.

D. They divide by meiosis, producing genetically varied cells.

15. What happens during the S phase of interphase? **[1]**

A. Chromosomes condense and become visible.

B. DNA is replicated.

C. The cytoplasm divides to form two cells.

D. Spindle microtubules attach to the centromeres.

Turn over

16. In a stained root tip squash, 120 cells were counted and 30 of them were in a stage of mitosis.
What is the mitotic index of this tissue? **[1]**

A. 0.25

B. 0.30

C. 3.0

D. 4.0

17. A sample of double-stranded DNA contains 20 % adenine.
What percentage of the bases in this sample is guanine? **[1]**

A. 20 %

B. 25 %

C. 30 %

D. 40 %

18. What is the role of tRNA during translation? **[1]**

A. It carries a copy of the gene from the nucleus to the ribosome.

B. It catalyses the formation of peptide bonds between amino acids.

C. It unwinds the mRNA so that codons can be read.

D. Its anticodon binds to a complementary codon while it carries a specific amino acid.

Turn over

19. What is the difference between a gene and an allele? **[1]**

A. A gene occupies a specific locus, and an allele is one of its alternative forms.

B. A gene is one of the alternative forms of an allele.

C. Genes are found on chromosomes, while alleles are found only in gametes.

D. A gene codes for one amino acid, while an allele codes for a whole protein.

20. In guinea pigs, black coat colour (B) is dominant to white coat colour (b). Two heterozygous black guinea pigs are crossed.
What proportion of the offspring is expected to be white? **[1]**

A. 0 %

B. 25 %

C. 50 %

D. 75 %

21. In snapdragons, flower colour shows incomplete dominance: plants with the genotype $\mathrm{C^RC^R}$ are red, $\mathrm{C^WC^W}$ are white and $\mathrm{C^RC^W}$ are pink.
Two pink-flowered plants are crossed. What is the expected phenotypic ratio of the offspring? **[1]**

A. All offspring pink

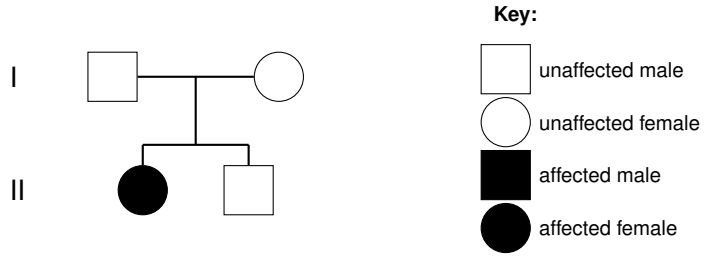
B. 3 pink : 1 white

C. 1 red : 2 pink : 1 white

D. 1 red : 1 white

Turn over

22. The pedigree chart shows the inheritance of a genetic condition in one family. **[1]**



What is the most likely mode of inheritance of this condition?

A. Autosomal dominant

B. X-linked dominant

C. Y-linked

D. Autosomal recessive

23. Which adaptation of the small intestine increases the rate of absorption of digested food? **[1]**

A. A thick muscular wall that mixes food with enzymes

B. Villi and microvilli that greatly increase the surface area

C. An impermeable lining that protects the cells from enzymes

D. Secretion of digestive enzymes into the lumen

Turn over

24. Which valves are open and which are closed during ventricular systole? **[1]**

	Atrioventricular valves	**Semilunar valves**
A.	closed	open
B.	open	closed
C.	closed	closed
D.	open	open

25. Which change increases the rate of transpiration from a leaf? **[1]**

A. An increase in humidity

B. A decrease in temperature

C. An increase in wind speed

D. A decrease in light intensity

26. The biceps and triceps are an antagonistic pair of muscles.
What happens when the arm bends at the elbow? **[1]**

A. Both the biceps and the triceps contract.

B. The triceps contracts and the biceps relaxes.

C. Both the biceps and the triceps relax.

D. The biceps contracts and the triceps relaxes.

Turn over

27. What happens when a nerve impulse arrives at the presynaptic membrane? **[1]**

A. Calcium ions enter and vesicles release neurotransmitter by exocytosis.

B. Sodium ions are actively pumped into the synaptic cleft.

C. Neurotransmitter is synthesized in the postsynaptic neuron.

D. The impulse passes directly across the cleft as an electrical current.

28. Why are antibiotics ineffective in the treatment of viral infections? **[1]**

A. Viruses reproduce too rapidly for the antibiotic to act.

B. Viruses are too small to be reached by antibiotic molecules.

C. Viruses lack the metabolic pathways and structures that antibiotics target.

D. Antibiotics are broken down by enzymes in the protein coat of the virus.

29. In a grassland ecosystem the producers contain $20\,000\,\text{kJ}\,\text{m}^{-2}\,\text{y}^{-1}$ of energy and the primary consumers contain $1600\,\text{kJ}\,\text{m}^{-2}\,\text{y}^{-1}$.
What percentage of the energy is transferred between these two trophic levels? **[1]**

A. 4 %

B. 8 %

C. 12.5 %

D. 20 %

30. Nitrate fertilizer drains from farmland into a lake.
What is the most likely consequence for the lake ecosystem? **[1]**

A. Dissolved oxygen increases permanently because algae photosynthesize.

B. The number of decomposers falls because nitrate is toxic to bacteria.

C. Algal growth is prevented because the water becomes hypertonic.

D. An algal bloom is followed by decomposition, raising the biochemical oxygen demand and killing fish.

End of examination.

Total: 30 marks

Turn over

Answer sheet

Write the letter of your chosen answer in the box next to each question number.

Q	Ans	Q	Ans	Q	Ans
1		11		21	
2		12		22	
3		13		23	
4		14		24	
5		15		25	
6		16		26	
7		17		27	
8		18		28	
9		19		29	
10		20		30	

Candidate name: .....

Session number: .....

Total mark: _____ / **30**