



BIOLOGY
HIGHER LEVEL
PAPER 1

Monday 21 May 2001 (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.

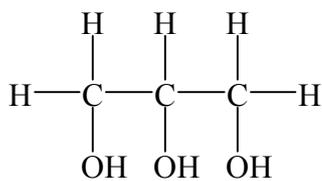
1. The maximum magnification of many light microscopes is $\times 400$. What does this mean?
 - A. Two objects can be distinguished as separate if they are 400 nm apart.
 - B. The smallest object that can be seen has a diameter of 400 nm.
 - C. Specimens can only be seen if they are made 400 times larger.
 - D. The image produced by the microscope is up to 400 times larger than the specimen.

2. What moves the chromosomes during mitosis in animal cells?
 - A. Microtubules crossing the equator of the cell.
 - B. Microtubules connecting the replicated DNA molecules to the poles of the cell.
 - C. Mesosomes attached to replicated DNA molecules at the equator of the cell.
 - D. Mesosomes attached to the centrioles at the poles of the cell.

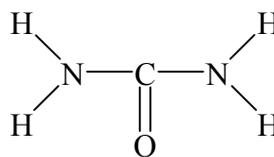
3. Which compounds are organic?
 - I. glucose
 - II. oxygen
 - III. water
 - A. I only
 - B. I and II only
 - C. II and III only
 - D. I, II and III

4. What is the general structure of an amino acid?

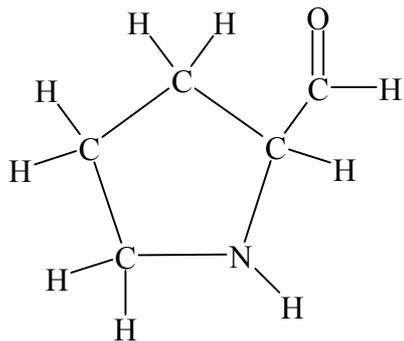
A.



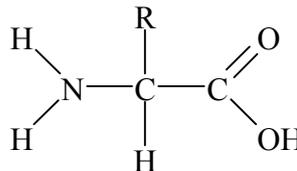
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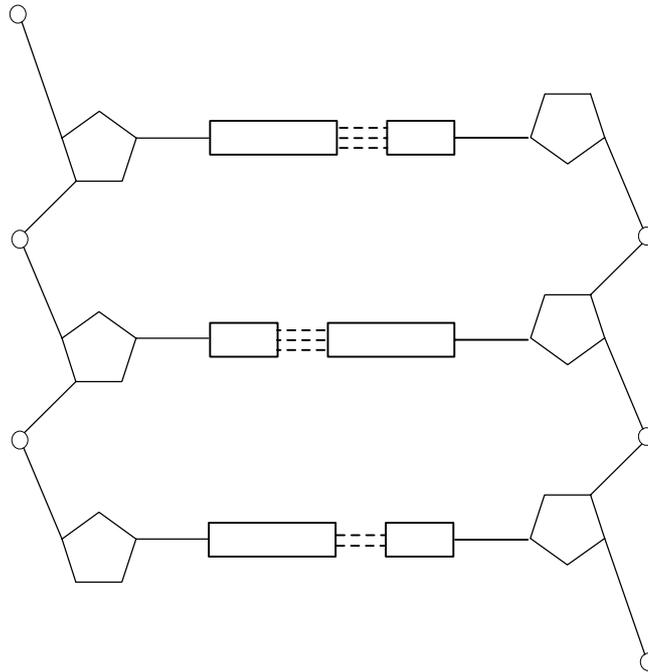
C.



D.



5. The diagram below shows the structure of a small section of DNA.



What is represented by the shapes in the diagram?

	○	⬠	▭
A.	base	ribose	phosphate
B.	deoxyribose	phosphate	base
C.	phosphate	deoxyribose	base
D.	base	phosphate	deoxyribose

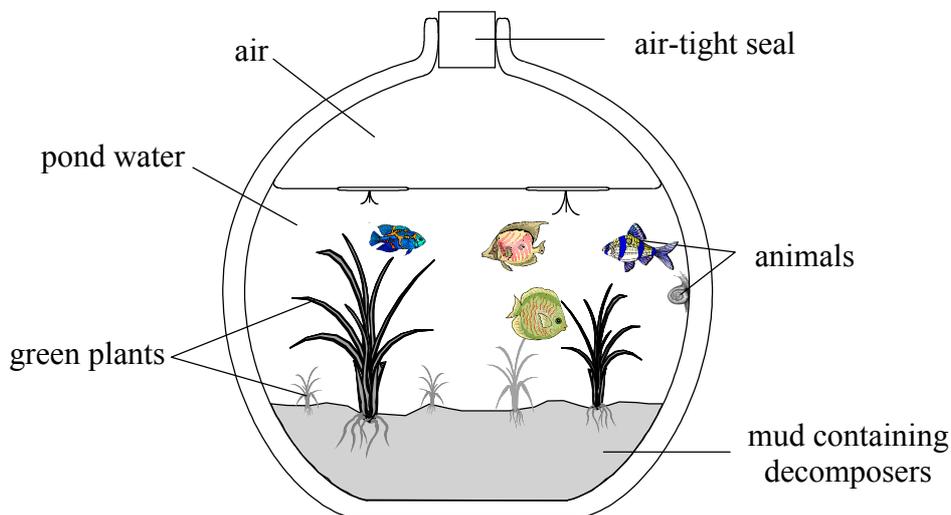
6. The genetic code is *degenerate*. What does this mean?

- A. It is not universal.
- B. The code is not stable.
- C. It contains both codons and anticodons.
- D. There is more than one codon for some amino acids.

7. What could be achieved by DNA profiling using gel electrophoresis?
- A. The chromosome number of an organism could be counted.
 - B. It could be proved that human tissue found at the site of a crime did not come from a person suspected of having committed the crime.
 - C. The quality of a new breed of farm animal or a new variety of crop plant could be assessed.
 - D. Extinct species of living organism could be brought back to life.
8. The zygote produced by sexual reproduction in mice (*Mus musculus*) contains 40 chromosomes. How many chromosomes are there in cells produced by the first division of meiosis in mice?
- A. 10
 - B. 20
 - C. 40
 - D. 80
9. If there are two co-dominant alleles of a gene, there are three possible genotypes: homozygous for one of the co-dominant alleles, homozygous for the other co-dominant allele or heterozygous. How much effect would **one** of the co-dominant alleles have in the phenotype of heterozygous and homozygous individuals?

	Heterozygous Individuals	Homozygous individuals
A.	Some effect	Greater effect
B.	Greater effect	Some effect
C.	No effect	Large effect
D.	Large effect	No effect

10. There are ethical arguments for and against the cloning of human embryos. Which is the strongest argument **for** cloning?
- A. Cloning is needed to complete the Human Genome Project.
 - B. Mothers would be able to have children and return to work more quickly, if their embryos were cloned.
 - C. Cloning allows parents to choose the characteristics of their children.
 - D. Cloning happens naturally when identical twins are formed.
11. What is investigated in ecology?
- A. All of the characteristics of living organisms on Earth.
 - B. Only the physical and chemical properties of the environment.
 - C. Only the relationships between organisms and their environment.
 - D. Only the ways in which humans can exploit the Earth's resources.
12. The diagram below shows an aquarium, set up in a laboratory in a large glass bottle.



What must be supplied from outside the bottle to allow the organisms inside to survive?

- A. Sufficient light only.
- B. Sufficient light and mineral ions only.
- C. Sufficient light, mineral ions and food only.
- D. Sufficient light, mineral ions, food and oxygen only.

13. The following statements are parts of the theory of evolution by natural selection.

- I. Only the best adapted individuals survive and pass on their genes.
- II. More offspring are produced than the environment can support.
- III. As one generation follows another the characteristics of the species gradually change.
- IV. There is a struggle for survival in which some individuals are more successful than others.

What is the correct sequence of statements?

- A. I, II, III, IV
 - B. II, IV, I, III
 - C. III, I, IV, II
 - D. IV, III, II, I
14. What human action could have an impact on the whole biosphere?
- A. Burning fuel in vehicle engines.
 - B. Releasing crude oil from an oil tanker into the sea.
 - C. Building a dam across a major river.
 - D. Establishing a national park in a desert area.
15. What is a quadrat used for in investigations of ecosystems?
- A. To measure the size of animal populations by trapping and release.
 - B. To compare the means of two pairs of frequency distributions.
 - C. To evaluate graphical representations of ecological data.
 - D. To estimate the size of plant populations by random sampling.

16. What are the products of the reactions catalysed by the enzymes shown in the table?

	Lipases	Proteases
A.	lactic acid	polypeptides
B.	fatty acids	amino acids
C.	nucleic acids	hydrochloric acid
D.	triglycerides	polysaccharides

17. How does heart muscle contraction differ from the contraction of other muscles in the human body?

- A. It can contract without stimulation from nerves or hormones.
- B. It is stimulated to contract by hormones but not nerves.
- C. It is stimulated to contract by nerves but not hormones.
- D. Nerves speed up its rate of contraction but hormones slow it down.

18. What is the function of phagocytic leucocytes?

- A. To form a barrier against infection.
- B. To move to sites of infection and ingest microbes.
- C. To divide by mitosis to produce more leucocytes.
- D. To secrete platelets.

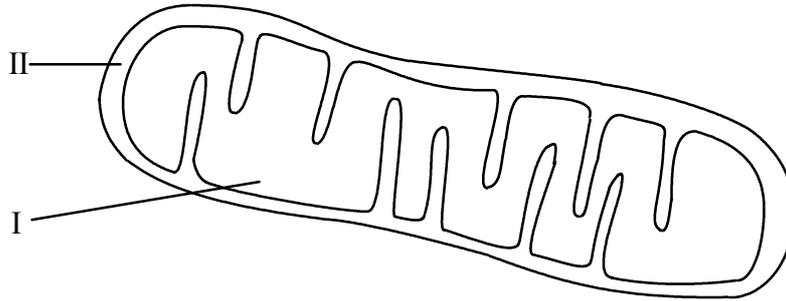
19. The kidney carries out the process of excretion by producing urine, which passes out of the body. What is contained in urine?

- A. Toxic waste products of metabolism.
- B. Indigestible foods and harmful bacteria.
- C. Excess glucose and amino acids.
- D. Water and plasma proteins.

20. What does amniocentesis involve?
- A. Removal of amniotic fluid, culturing of cells and karyotyping.
 - B. Bursting of the amniotic sac before childbirth.
 - C. Bursting of the amniotic sac, removal of embryos and resealing of the amniotic sac.
 - D. Production of amniotic fluid to protect the fetus.
21. In which cells can mitosis occur?
- A. Haploid only.
 - B. Diploid only.
 - C. Haploid and diploid only.
 - D. Haploid, diploid and polyploid.
22. What happens in the process of splicing mRNA in cells?
- A. Addition of nucleotides to the 5' end of the mRNA.
 - B. Addition of nucleotides to the 3' end of the mRNA.
 - C. Removal of exons from the initial mRNA transcript.
 - D. Removal of introns from the initial mRNA transcript.
23. What are the special features of allosteric enzymes that are controlled by feedback inhibition by end-products?

	Position in a metabolic pathway	Number of binding sites
A.	At the beginning	1
B.	At the end	1
C.	At the beginning	2
D.	At the end	2

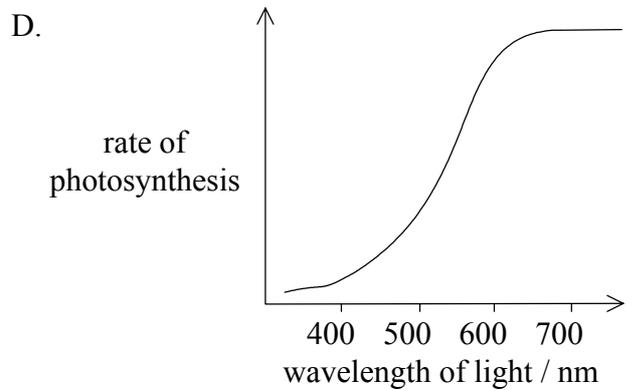
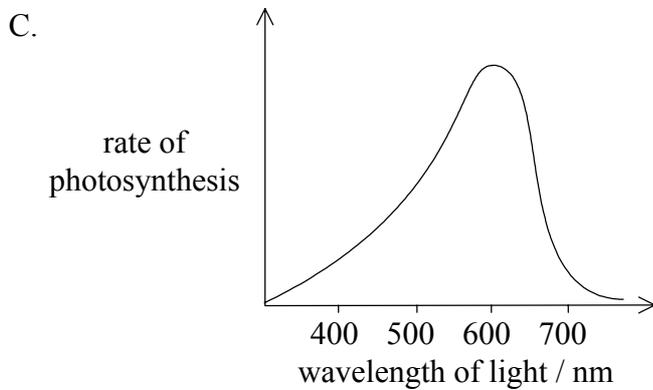
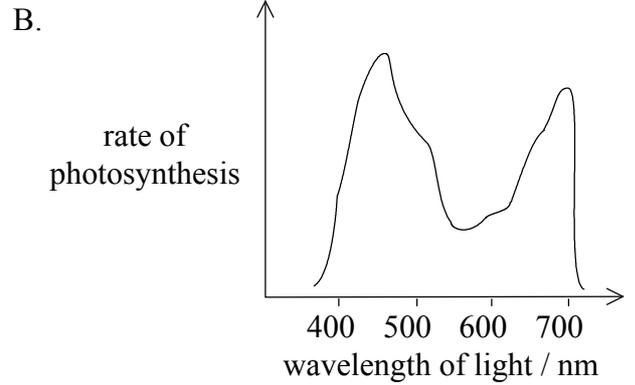
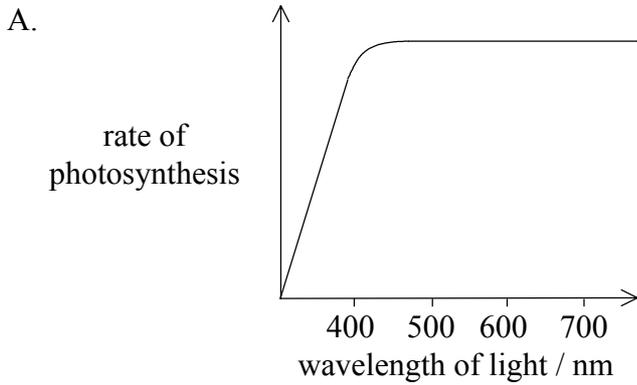
24. The diagram below shows a mitochondrion as seen under the electron microscope.



What movement of protons occurs as a result of electron transport in the mitochondrion?

- A. From I to II against a concentration gradient.
 - B. From I to II down a concentration gradient.
 - C. From II to I against a concentration gradient.
 - D. From II to I down a concentration gradient.
25. Which substance is produced when fatty acids are oxidised?
- A. glucose
 - B. triose phosphate
 - C. ethanoyl (acetyl) CoA
 - D. glycerate 3-phosphate (GP)

26. Which graph represents the action spectrum of photosynthesis?



27. What is a *centimorgan*?

- A. The distance between two loci that will give an average of 100 crossovers per gamete.
- B. The distance between two loci that will give an average of one crossover in 100 gametes.
- C. The number of gametes that will give an average of 100 crossovers between two loci.
- D. The number of gametes that will give an average of one crossover between 100 loci.

28. In the Japanese Morning Glory plant (*Pharbitis nil*), flowers can be red, blue or purple. The genotypes which give each of the three flower colours are shown below:

Red	aabb
Blue	A-B-
Purple	A-bb or aaB-

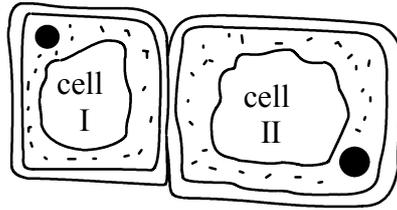
Which cross would give a ratio of 2 red:6 blue:8 purple in the offspring?

- A. AaBb × AaBb
- B. AaBb × aabb
- C. AaBB × AABb
- D. AaBb × Aabb
29. Which statement defines the term *polygenic inheritance*?
- A. A characteristic controlled by two identical genes on the same chromosome.
- B. A characteristic controlled by three or more different alleles of a gene on the same chromosome.
- C. A characteristic controlled by more than one gene on the same or different chromosomes.
- D. A gene that controls more than one characteristic.
30. What is the function of the Sertoli cells?
- A. They divide mitotically to form spermatogonia.
- B. They produce and secrete testosterone.
- C. They support and nourish the newly formed spermatozoa.
- D. They differentiate into spermatozoa.
31. What are **two** enzymes involved in the blood clotting process?
- A. Thrombokinase and prothrombin
- B. Thrombin and thrombokinase
- C. Fibrinogen and prothrombin
- D. Thrombin and fibrinogen

32. Which characteristic feature is possessed by angiospermophytes but not by coniferophytes?
- A. Leaves
 - B. Seeds
 - C. Xylem
 - D. Flowers
33. Which structure is used for locomotion in the earthworms but not in arthropods, bony fishes or birds?
- A. Muscles attached to a rigid skeleton
 - B. Chaetae
 - C. Antagonistic muscles
 - D. Jointed legs
34. Which type of membrane protein is required for transmission of the nerve impulse along the axon?
- A. Channel proteins
 - B. Carrier proteins
 - C. Receptor proteins
 - D. Enzymes
35. What is the function of the cartilage in the elbow joint?
- A. To reduce friction
 - B. To join bones together at the joint
 - C. To join the muscles to the bones
 - D. To act as a lubricant

- 36.** How does the composition of the blood in the renal artery and the renal vein differ?
- A. The renal artery contains less glucose than the renal vein.
 - B. The renal artery contains more carbon dioxide than the renal vein.
 - C. The renal vein contains less oxygen than the renal artery.
 - D. The renal vein contains more urea than the renal artery.
- 37.** Which process is used in renal dialysis by kidney machines?
- A. Ultrafiltration
 - B. Passive diffusion
 - C. Active transport
 - D. Carrier-assisted diffusion
- 38.** What structural adaptation is found in hydrophytes but not in xerophytes?
- A. Leaves reduced to spines
 - B. Thick waxy cuticles
 - C. Reduced root system
 - D. Hairy leaves

39. The diagram shows two plant cells. The water potential of cell I is high and cell II low.



In which direction would water and solutes move?

	Water movement	Solute movement
A.	II to I	II to I
B.	I to II	I to II
C.	II to I	no movement
D.	I to II	no movement

40. What is the sequence of metabolic events in the germination of the broad bean seed?

- A. absorption of water → breakdown of starch into maltose → production of amylase → formation of gibberellin
 - B. absorption of water → formation of gibberellin → production of amylase → breakdown of starch into maltose
 - C. formation of gibberellin → absorption of water → production of amylase → breakdown of starch into maltose
 - D. absorption of water → formation of gibberellin → breakdown of starch into maltose → production of amylase
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