

**BIOLOGY
HIGHER LEVEL
PAPER 1**

Thursday 9 May 2002 (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. Which processes occur during interphase?

- I. DNA replication
- II. DNA transcription
- III. Separation of replicated DNA molecules

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

2. What is the ratio of the relative size of a eukaryotic cell, a virus and a prokaryotic cell?

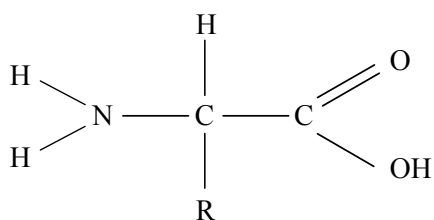
	Eukaryotic cell	Virus	Prokaryotic cell
A.	100	1	1
B.	100	10	10
C.	100	10	1
D.	1000	1	10

3. Which characteristic of water explains its thermal properties?

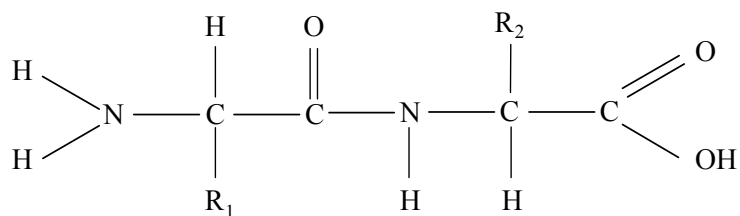
- A. Adhesion
- B. Surface tension
- C. Solvent properties
- D. Hydrogen bonding

4. Which structures represent a generalised amino acid and glycerol?

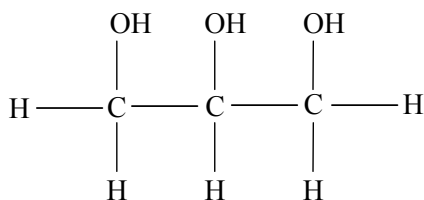
I.



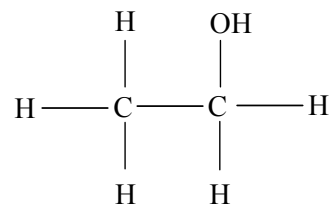
II.



III.



IV.



A.

I

IV

B.

II

III

C.

I

III

D.

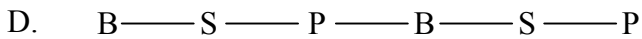
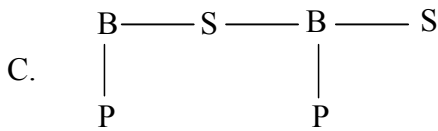
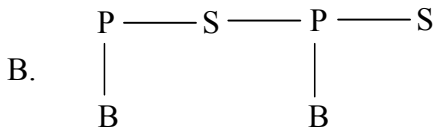
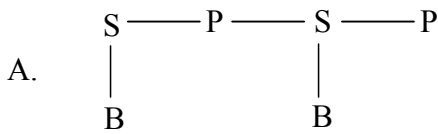
II

IV

	Amino acid	Glycerol
A.	I	IV
B.	II	III
C.	I	III
D.	II	IV

5. What is the arrangement of nucleotides in a single DNA strand?

S = sugar, P = phosphate group, B = organic base



6. Which group of three molecules makes up **one** RNA nucleotide?

- A. Phosphate, ribose, uracil
- B. Phosphorus, ribose, adenine
- C. Uracil, deoxyribose, phosphorus
- D. Guanosine, deoxyribose, phosphate

7. Which techniques of recombinant DNA technology (genetic engineering) require the use of plasmids?

- I. Gene therapy
- II. DNA profiling
- III. Gene transfer by gene cloning

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

8. Which response summarises meiosis?

	Pairing of chromosomes	Number of divisions	Result
A.	No	One	Two diploid cells
B.	No	Two	Four diploid cells
C.	Yes	One	Two haploid cells
D.	Yes	Two	Four haploid cells

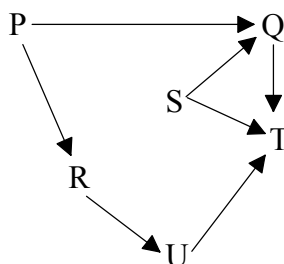
9. A healthy couple have a daughter who has a rare disease caused by a recessive mutation of a gene. They then have two healthy children. What is the probability that a fourth child will have the same rare disease?

- A. 0.00
- B. 0.25
- C. 0.50
- D. 0.75

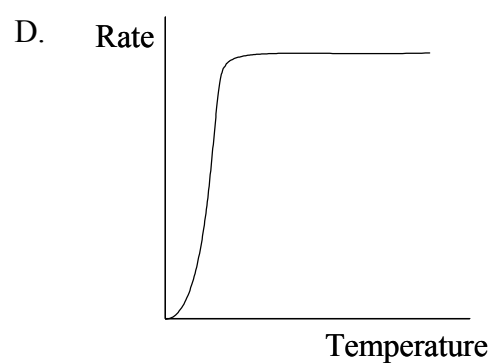
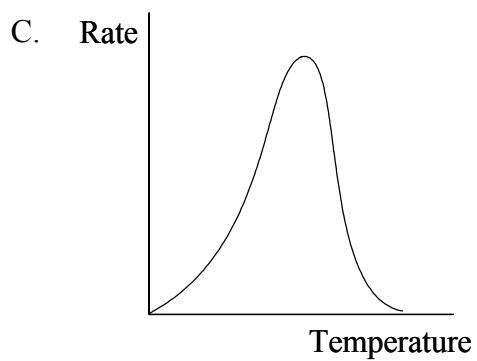
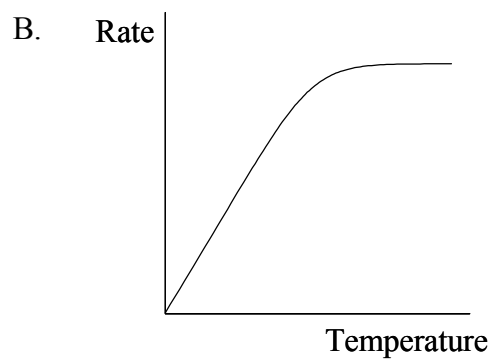
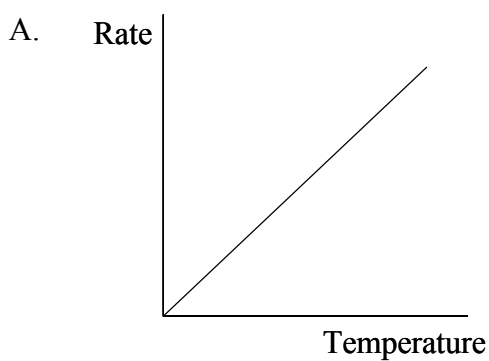
10. What is a *clone*?

- A. A group of organisms which could interbreed and produce fertile offspring.
- B. A group of cells descended from two parent cells.
- C. A group of organisms of the same species living together and interbreeding.
- D. A group of organisms with identical genotype.

11. The diagram below shows a food web. Which organisms in the food web are only primary consumers?



- A. P and S
 - B. Q and R
 - C. T and U
 - D. R and T
12. Which graph shows the effect of temperature on the rate of photosynthesis?



13. Which characteristics apply to all evolving populations?

- I. Overproduction of offspring
- II. Different genotypes in the population
- III. Different chances of survival

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

14. The data below shows the height of two populations of bean seedlings.

Height of Population I / cm	Height of Population II / cm
10	8
11	9
12	9
13	10
13	10
14	10
15	14
16	15
17	16
$\bar{x} = 13.4$	$\bar{x} = 11.2$
$s = 2.3$	$s = 2.9$

Which conclusion is supported by the data?

- A. The median values are 13.4 for I and 11.2 for II.
- B. The median and the mode values for II are the same.
- C. 95 % of the values in I are within 2.3 cm of the mean.
- D. The variability in height is greater for I than for II.

15. Which products are formed by the action of the enzymes listed?

	Protease	Amylase
A.	Amino acids	Maltose
B.	Dipeptides	Disaccharides
C.	Proteins	Starch
D.	Polypeptides	Glucose

16. What are the states of the valves when the ventricles are relaxed?

	Atrio-ventricular valves	Semilunar valves in the arteries
A.	Open	Open
B.	Open	Closed
C.	Closed	Open
D.	Closed	Closed

17. Where are the chemoreceptors that detect the changes in blood pH and levels of glucose found?

	Changes in blood pH	Changes in blood glucose
A.	Brain stem	Small intestine
B.	Carotid vein	Liver
C.	Carotid artery	Pancreas
D.	Venae cavae	Liver

18. Chorionic villus sampling is a prenatal test. What is the sample?

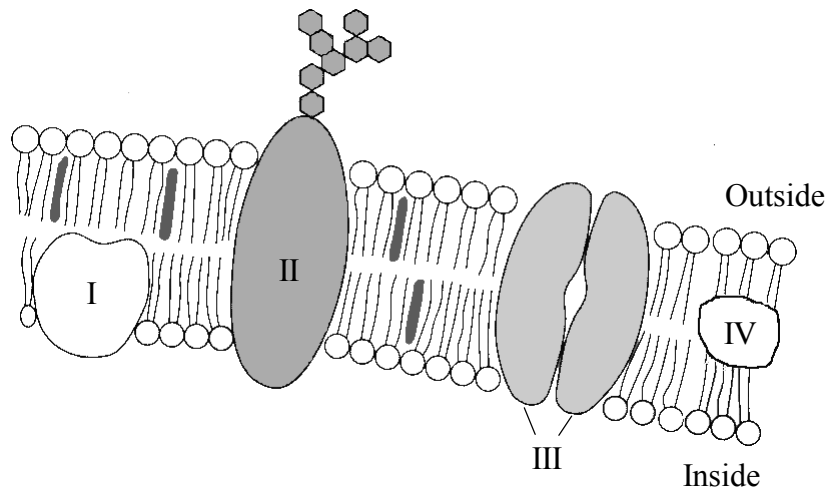
- A. Tissue from the amnion
- B. Fluid from the amniotic sac
- C. Blood from the umbilical artery
- D. Tissue from the placenta

19. What changes occur prior and during labour?

(↑ = increase, ↓ = decrease)

	Nerve impulses from the cervix	Levels of blood progesterone	Levels of blood oxytocin
A.	↑	↓	↑
B.	↓	↓	↓
C.	↑	↑	↑
D.	↓	↑	↓

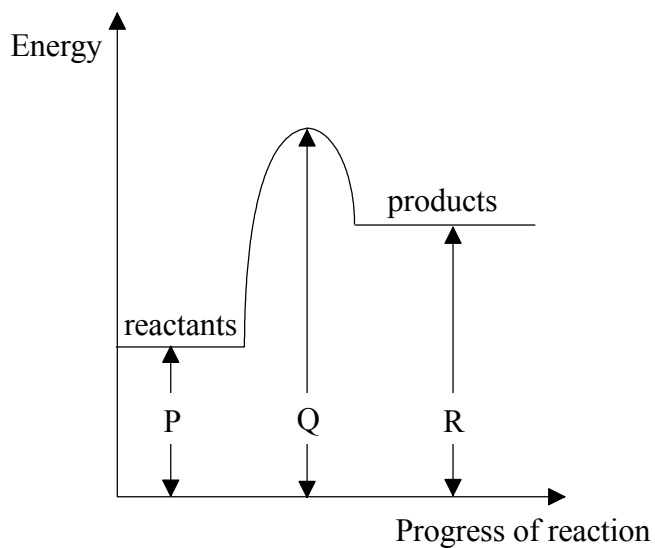
20. The diagram below shows a section across a cell membrane.



Which membrane protein is important for cell recognition by antibodies?

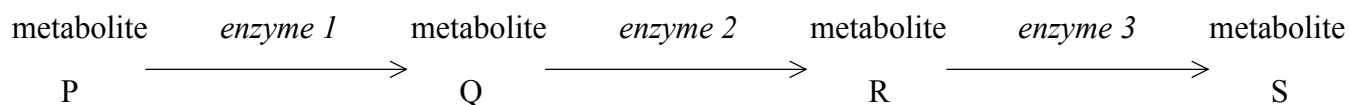
- A. I
 - B. II
 - C. III
 - D. IV
21. Which process involves the removal of introns?
- A. The reaction catalysed by RNA polymerase.
 - B. The formation of mature eukaryotic mRNA.
 - C. The activation of reverse transcriptase.
 - D. The binding of ribosomes to mRNA.

22. The diagram below represents the energy changes in a reaction.



What is the activation energy of the **reverse** reaction?

- A. $Q - R$
 B. $Q - P$
 C. $R - P$
 D. $P + Q$
23. The diagram below illustrates a simple metabolic pathway.



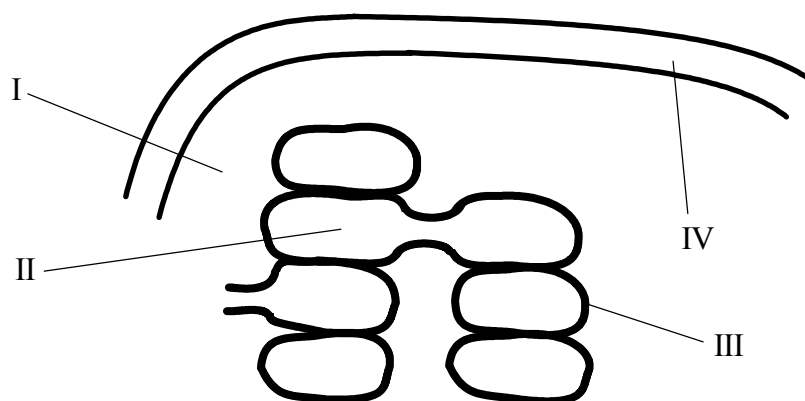
Which response shows allosteric feedback inhibition?

	Metabolite	Site of binding of metabolite
A.	P	Allosteric site of enzyme 1
B.	S	Allosteric site of enzyme 1
C.	S	Active site of enzyme 1
D.	S	Active site of enzyme 3

24. What are the products of one turn of the Krebs cycle?

	ATP	CO ₂	NADH + H ⁺	FADH ₂
A.	1	1	3	1
B.	2	2	2	2
C.	1	2	3	1
D.	2	1	2	2

25. The diagram below shows part of a section across achloroplast.



In which part does photolysis of water occur?

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

26. What adaptations do CAM and C₄ plants have in common?

- A. They only fix carbon dioxide at night.
- B. They only open their stomata at night.
- C. They use PEP carboxylase to fix carbon dioxide.
- D. They are succulents that store water in their tissues.

27. What is a *chiasma*?

- A. A process of exchanging genes between non-homologous chromatids.
- B. A point where gene mutations occur.
- C. A point where the recombination of genetic material always occurs.
- D. A point where homologous chromosomes remain in contact during meiosis.

28. The table below shows the cross over value (COV) data (in centimorgans) for four linked genes.

Genes	COV / cM
P and Q	10
R and S	35
S and P	5
Q and S	15
R and P	30

What is the order of genes on the chromosome?

- A. S, P, Q, R
- B. R, P, Q, S
- C. R, Q, S, P
- D. P, Q, R, S

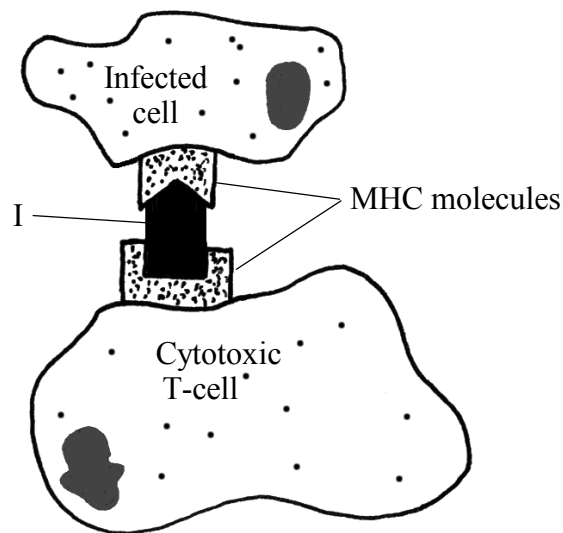
29. What is *interspecific hybridisation*?

- A. Sexual reproduction between heterozygous members of the same species
- B. Sexual reproduction between homozygous members of the same species
- C. The fertilisation of a female by sperm from more than one species
- D. Sexual reproduction between members of different species

30. What is the sequence of processes leading to fertilisation?

- A. Acrosome reaction, cortical reaction, egg membrane penetration
- B. Egg membrane penetration, acrosome reaction, cortical reaction
- C. Acrosome reaction, egg membrane penetration, cortical reaction
- D. Cortical reaction, acrosome reaction, egg membrane penetration

31. The diagram below shows the immune system identifying an infected cell in the body.



What is the structure labelled I?

- A. Antigen
- B. Antibody
- C. IgA
- D. IgM

32. What types of agent cause the diseases listed in the table?

	Measles	Diphtheria	Tetanus
A.	Virus	Bacterium	Bacterium
B.	Virus	Virus	Virus
C.	Bacterium	Bacterium	Bacterium
D.	Bacterium	Virus	Virus

33. An organism has cell walls of chitin, no chlorophyll, stores carbohydrate as glycogen and reproduces by means of spores without flagella. What is its kingdom?

- A. Protoctista
- B. Plantae
- C. Fungi
- D. Prokaryotae

34. Which list shows **four** levels of taxa in decreasing order of hierarchy?

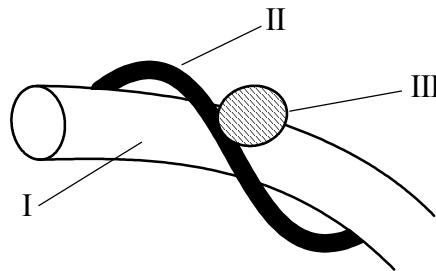
- A. Family Class Genus Order
- B. Order Family Genus Class
- C. Order Class Family Genus
- D. Class Order Family Genus

35. What is the sequence of events when a nerve impulse reaches the synaptic knob of a neuromuscular junction?

- I. Synaptic vesicles release neurotransmitter
- II. Ca^{2+} ions enter the synaptic knob
- III. Neurotransmitter attaches to receptors on the muscular membrane(sarcolemma)
- IV. Na^{+} ions enter the muscular membrane

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

36. The diagram below shows part of an actin filament of skeletal muscle.



What are the names of the labelled parts?

	I	II	III
A.	Actin	Tropomyosin	Troponin
B.	Tropomyosin	Actin	Troponin
C.	Actin	Troponin	Tropomyosin
D.	Troponin	Actin	Tropomyosin

37. Which structure of the kidney responds to ADH by reabsorbing water?

- A. Proximal convoluted tubule
- B. Loop of Henle
- C. Glomerulus
- D. Collecting duct

38. Which processes in angiospermophytes involve active transport?

- I. Mineral ion uptake
- II. Translocation
- III. Transpiration

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

39. What are the functions of xylem in angiospermophytes?

- I. Physical support
- II. Passive transport of water and minerals
- III. Active transport of carbohydrates

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

40. What conditions are needed for the germination of all seeds?

- I. Light
- II. Sufficient water
- III. Oxygen

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