UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATION SYNDICATE
General Certificate of Education Advanced Level

BIOLOGY **9266/2**
PAPER 2 Multiple Choice

NOVEMBER SESSION 2000 **1 hour**

1. Which of the following correctly explains the term resolution as used in microscopy?

   A. the ability to distinguish between two objects that are very close together
   B. the clarity of the image formed by the microscope
   C. the number of times the image has been magnified by the objective lens
   D. the power of the microscope to resolve very small objects

2. What is the function of nucleoli?

   A. The formation and breakdown of the nuclear membrane
   B. The formation of centromeres
   C. The formation of ribosomes
   D. The organization of the spindle during nuclear division

3. What is the approximate width of the cell surface membrane?

   A. 7.5 nm b. 75 nm C. 7.5 μm D. 75 μm

4. Which cell components, when appropriately stained, will be clearly visible under the high power of the light microscope?

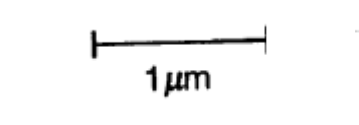
	lysosomes	mitochondria	ribosomes	Starch grains
A	√	√	√	√
B	√	√	X	X
C	X	√	√	√
D	X	X	X	√

5. In eukaryotic cells, transcription occurs in the nucleus.

   In which other organelle does transcription occur?

   A. endoplasmic reticulum
   B. Golgi apparatus
   C. mitochondrion
   D. ribosome

6. An electron micrograph shows this scale bar that measures 2 cm



What is the magnification of the electron micrograph?

A. 2×10^{-2} B. 2×10^{2} C. 2×10^{3} D. 2×10^{4}

7. Which combination describes a triglyceride?

	Soluble in water	Provides energy	Produces water when respired
A	X	√	√
B	√	X	√
C	√	√	X
D	X	√	X

8. Which statement correctly describes a property of water?

A. A relatively large amount of energy is needed to increase its temperature.
B. At normal room temperatures, its molecules are bound together by ionic bonds.
C. The highest density of water occurs below its freezing point.
D. Water acts as solvent for non-polar molecules.

9. Some germinating seeds are crushed with water and the extract is tested. The table shows the results of these tests.

test	results
Barford's test for disaccharides	positive
Benedict's test	yellow precipitate
biuret test	purple colour
Clinistix test for glucose	negative
emulsion test	clear solution
iodine test	blue-black colour

Which molecules are present in the extract?

A. Fat, maltose, starch only
B. Fat, protein, sucrose only
C. Glucose, protein, starch only
D. Maltose, protein, starch only

10. How many different polypeptides, each consisting of r amino acids, can be made if the number of different amino acids available is n?

A. n^r B. r^n C. nr D. n

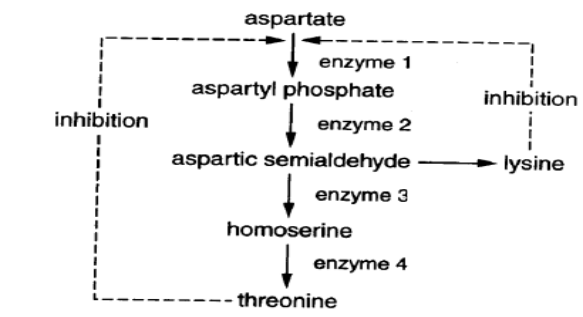
11. Which description applies to cellulose?

	molecule	Glycosidic bond linkage	structure
A	Linear and branched	α 1.6 and β 1.4	Fibrous
B	Linear and branched	α 1.6 and β 1.4	Non-fibrous
C	Linear and unbranched	β 1.4	Fibrous
D	Linear and unbranched	α 1.6	Non-fibrous

12. What is the effect of increasing substrate concentration on the degree of inhibition of an enzyme controlled reaction?

	Competitive inhibition	Non-competitive inhibition
A	Decreased	Increase
B	Decreased	No change
C	Increased	Decreased
D	No change	incresed

13. A culture of bacteria produces the food supplement lysine by the metabolic pathway shown.



Which change is enzyme activity will result in the greatest increase in lysine yield?

	enzyme	change in activity
A	1	decrease
B	2	increase
C	3	increase
D	4	decrease

14. Which statement correctly describes homologous chromosomes?

A. They are formed during meiosis.
B. They are held together by centromeres.
C. They are identical.
D. They carry the same gene loci.

15. At which stage of mitosis do these events occur?

	spiralisation and condensation of DNA	nuclear envelope breaks down	centromeres separate
A	Interphase	Interphase	Metaphase
B	Interphase	Prophase	Metaphase
C	Prophase	Metaphase	Anaphase
D	prophase	prophase	anaphase

16. What is carried by a molecule of transfer RNA?

A. an amino acid molecule
B. enzymes for protein synthesis
C. information from the DNA
D. sequence of codons

17. Which process does not occur during the formation of messenger RNA?

A. condensation
B. polymerization
C. replication
D. transcription

18. Synthesis of human insulin by genetically manipulated bacteria involves the use of the enzyme reverse transcriptase.

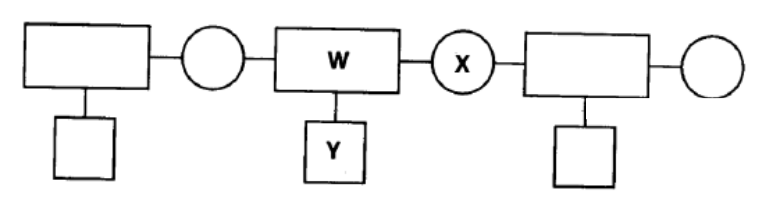
What is the role of this enzyme?

A. it adds 'sticky ends' to insulin genes.
B. it causes complementary DNA to be formed from mRNA.
C. it causes production of mRNA in the pancreases cells.
D. it causes single-stranded DNA to convert to double-stranded DNA.

19. The table shows the percentages of nitrogenous bases in four samples of nucleic acids.

sample	bases				
	A	B	C	D	uracil
1	19	31	30	19	Nil
2	27	23	24	26	Nil
3	25	25	Nil	25	25
4	17	32	33	18	nil

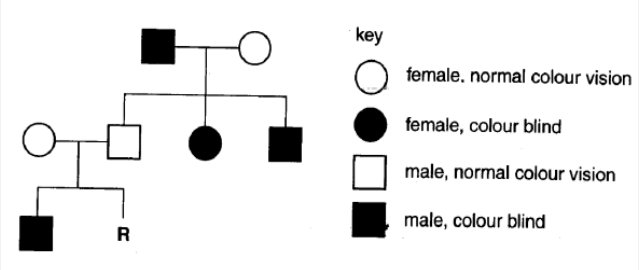
20. The diagram represents an anticodon.



What do W, X and Y represent?

	W	X	Y
A	Deoxyribose	Base	Phosphate
B	Deoxyribose	Phosphate	Base
C	Ribose	Base	Phosphate
D	ribose	phosphate	base

21. The diagram shows the inheritance of red-green colour blindness in a family. This condition is caused by a sex-linked recessive allele.



What is the probability that individual R will be a colour-blind boy?

A. 0 B. 0.125 C. 0.25 D. 0.5

22. A tall, pink-flowered plant is self-fertilized and produces the offspring shown.

	Flower colour		
	red	pink	white
tall plants	73	157	67
dwarf plants	21	53	25

When self-fertilised, which type of plant will only produce identical offspring?

A. dwarf, pink-flowered
B. dwarf, white-flowered
C. tall, red-flowered
D. tall, white-flowered

23. In Drosophila, ebony body colour and vestigial wings are recessive to the wild type and are not linked. Crossing two flies, heterozygous for both characters, produced 256 offspring.

How many offpring would be expected to have ebony body colour and normal wings?

A. 16 B. 48 C. 96 D. 144

24. Potato plants are propagated asexually by tubers. Twenty tubers are collected from on plant and are grown, producing 20 second generation plants. All the tubers from these plants are collected and weighed. The twenty largest are grown under the same conditions as before. All the third generation tubers are collected and are weighed.

How will the mean mass of these tubers and their genetic variation compare with the second generation?

	Third generation tubers	
	Mean mass	Genetic variation
A	Greater	Increased
B	Greater	Unchanged
C	Unchanged	Reduced
D	unchanged	unchanged

25. Radioactive carbon dioxide (1^4CO_2) is added to a suspension of a photosynthesizing green alga.

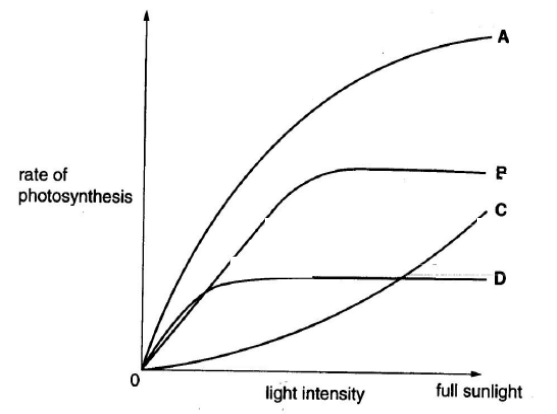
Which compound will be labeled first with ^{14}C?

A. glucose
B. GP (PGA)
C. RuBP
D. triose phosphate

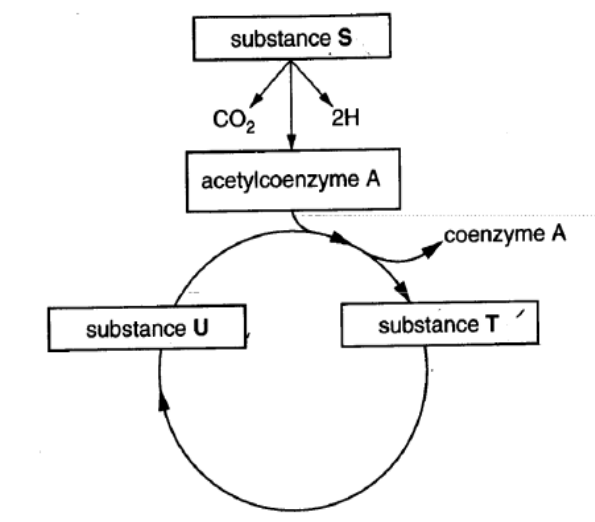
26. During photosynthesis, which process releases electrons that return chlorophyll molecules to their reduced state?

A. activation of photosystem I
B. oxidation of reduced NADP
C. phosphorylation of ADP
D. photolysis of water

27. Plants of the rainforest floor are adapted to grow in conditions of permanently low light intensity.



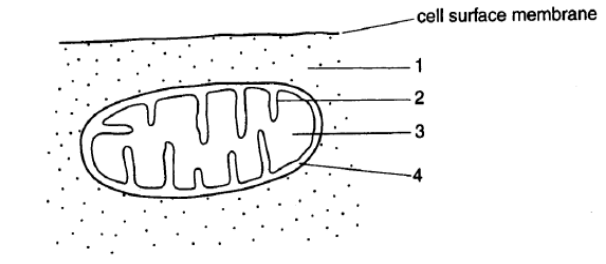
28. The diagram shows some of the reactions following glycolysis during aerobic respiration.



How many carbon atoms are in each of the substances S, T and U?

	S	T	U
A	2	4	6
B	2	6	4
C	3	4	6
D	3	6	4

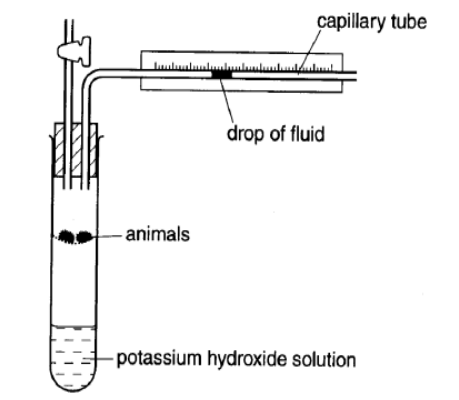
29. The diagram shows a mitochondrion in a cell.



Where is ATP produced from ADP during respiration?

A. 1 and 2 only
B. 1, 2 and 3
C. 2 and 3 only
D. 2, 3 and 4

30. The diagram shows a simple respirometer.

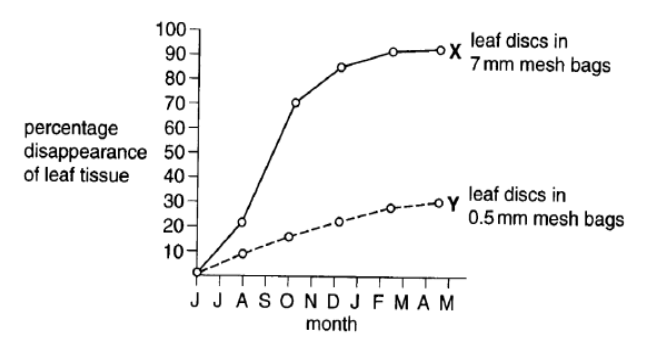


What is being measured by this apparatus?

A. carbon dioxide production
B. carbon dioxide production minus oxygen uptake

C. oxygen uptake
D. oxygen uptake minus carbon dioxide production

31. Leaf discs were placed in bags of two mesh sizes and were buried 2.5 cm deep in newly cultivated soil. Every 2 months, the bags were dug up and the area of the discs was measured to calculate the percentage disappearance of tissue.



What is the main cause of the disappearance of the leaf tissue as shown incurve X?

A. action of putrefying bacteria in the soil
B. activity of small invertebrates in the soil
C. decaying action of soil acids on the plant tissue cells
D. saprophytic action of soil bacteria and fungi

32. The trees in an area of forest are cut down. The table shows four ways of treating the trees and the cleared land.

	Use of cleared land	
	Cultivated for crops	Made into a road
Trees burnt on site	1	2
Trees left to rot	3	4

What would be the order of the treatments in their effects on atmospheric carbon dioxide concentration in the region in the first year?

	least effect → greatest effect			
A	1	2	3	4
B	2	1	4	3

C	3	4	1	2
D	4	3	2	1

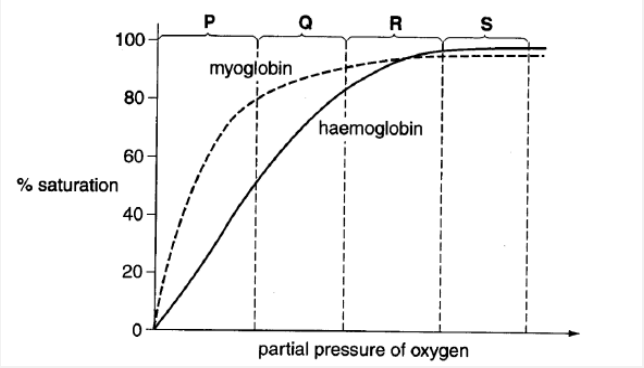
33. Which ecological term refers to more than one species?

A. community
B. habitat
C. niche
D. population

34. What is the main function of a companion cell in mature phloem tissue?

A. containing the nucleus for cell division
B. providing structural support of the sieve tube element
C. storing the products of photosynthesis
D. supply energy for transport

Questions 35 and 36 refer to the graph, which shows the oxygen dissociation curves for haemoglobin and myoglobin.



35. Over which range of partial pressures will both myoglobin and haemoglobin release oxygen to respiring tissues at the greatest rate?

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

36. Which conclusion about myoglobin can be made from the graph?

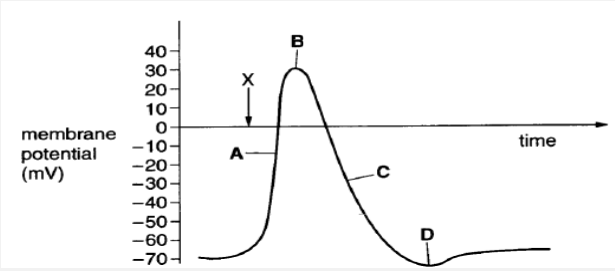
A. It binds one oxygen molecule but haemoglobin binds four oxygen molecules.
B. It will donate oxygen to haemoglobin.
C. It will only release oxygen when the partial pressure is low.
D. It will pick up oxygen less readily than will haemoglobin after exercise.

37. How does insulin act on its target cells?

A. It activates enzyme conversion of glycogen to glucose.
B. It alters specific receptor sites on the cell surface membrane.
C. It enters the cell and stimulates transcription of DNA.
D. It stimulates the intracellular hydrolysis of lipids.

38. The graph shows the changes in membrane permeability when a stimulus X is applied to a neurone.

Where is the point of maximum permeability to sodium ions?



39. Diabetes insipidus is a condition in which a person is unable to produce sufficient levels of the hormone ADH. The hormone increases the permeability to water of the second (distal) convoluted tubule and collecting duct in the kidney nephrons.

What is produced as a result?

A. large volumes of concentrated urine
B. large volumes of dilute urine
C. small volumes of concentrated urine

D. small volumes of dilute urine

40. Where, in the nephron, is most glucose reabsorbed?

A. in the ascending loop of Henle
B. in the descending loop of Henle
C. in the proximal (first) convoluted tubule
D. in the distal (second) convoluted tubule