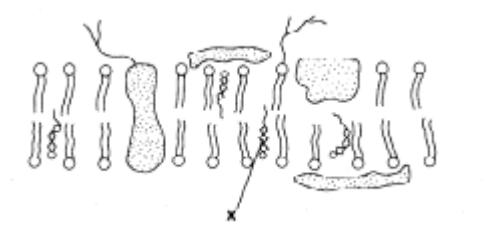
ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Advanced Level

BIOLOGY **9190/1**
PAPER 1

NOVEMBER SESSION 2003 **1 hour**

1. The diagram shows the fluid mosaic model of a membrane.



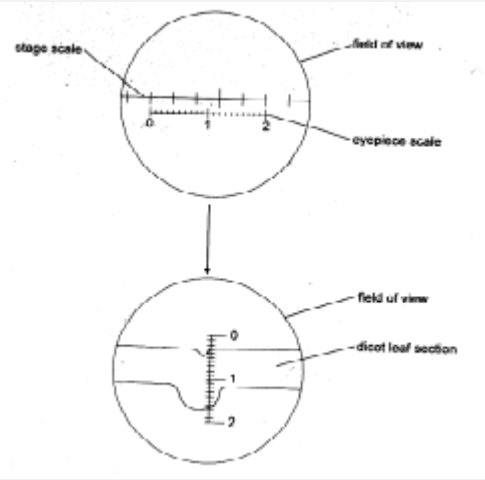
What is the name and function of molecule X?

	Name	**Function**
A.	glycolipid	decreases membrane fluidity at high temperatures
B.	cholesterol	increases membrane fluidity at low temperatures
C.	glycolipid	decreases membrane fluidity at low temperatures
D.	cholesterol	increases membrane fluidity at high temperatures

2. Where in an animal cell is alcohol detoxified?

A. Golgi body
B. lysosomes
C. rough endoplasmic reticulum
D. smooth endoplasmic reticulum

diagrams show the main steps involved in measuring the width of a leaf at the sing a light microscope.



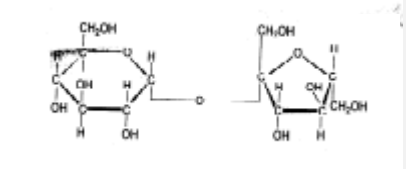
If the smallest division on the stage graticule is 1 mm long, what is the width of the leaf in micrometers?

A. 3 500 µm.
B. 2 5000 µm.
C. 56 µm.
D. 3.5 µm.

4. Which of the following properties of water allows homoiotherms to adapt to environments?

   A. universal solvent
   B. high surface tension
   C. high heat capacity
   D. maximum density at $4^{o}c$

5. The diagram represents a disaccharide.



What is the disaccharide and the type of bond between its monometer residues?

	Identity of disaccharide	**Bond between monomers**
A	lactose	1 – 4 glycosidic
B	maltose	1 – 2 glycosidic
C	sucrose	1 – 4 glycosidic
D	lactose	6 – 2 glycosidic

6. What is the theoretical number of different dipeptides that can be made using 20 different amino acids?

A. 400
B. 64
C. 40
D. 10

7. What is the temperature co-efficient of most enzyme – controlled reactions?

A. 10.0
B. 2.0
C. 1.5
D. 1.0

8. The diagram illustrates enzyme action.

What type of action is demonstrated?

A. competitive inhibition
B. irreversible inhibition
C. induced fit
D. lock and key

9. Which of the following statements is true about all cancer cells?

A. They do not strongly adhere to each other therefore they can break and move freely in the body fluids.
B. They require less energy to divide hence multiply at a fast rate.
C. They continue to multiply only when they are tightly packed in the body.
D. In culture media they eventually stop growing.

10. At which phase of meiosis does crossing over take place and which chromatids are involved?

	Phase	**Chromatids involved**
A	prophase I	non-sister chromatids
B	prophase II	sister chromatids
C	metaphase I	sister chromatids
D	metaphase II	non-sister chromatids

11. In what ways do polyribosomes make protein synthesis efficient?

A. Different protein molecules are made simultaneously from a single mRNA molecule.
B. Each copy of the same protein is made more rapidly.

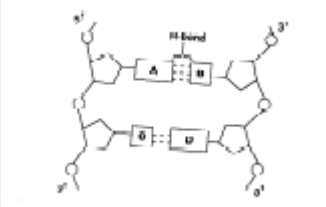
C. Several mRNA copies are made at the same time.
D. Several copies of the same protein are made simultaneously from a single mRNA molecule.

12. Which of the following enzymes protect bacteria from foreign DNA?

A. DNA polymerase
B. ligase enzymes
C. helicase enzymes
D. restriction enzymes

13. The diagram illustrates complementary base pairing in a segment of DNA, where the small rectangles represent pyrimidine's and large rectangles represent purines.

Which rectangle correctly identifies guanine?



14. From the chromosome sets of different male organisms shown, which male animal is homogametic?

A. drosophila 2n = 6 + XY
B. grasshopper 2n = 16 + XO
C. man 2n = 44 +XY
D. pheasant 2n = 14 + XX

15. The following are the main assumptions of Darwin's theory of evolution through natural selection.

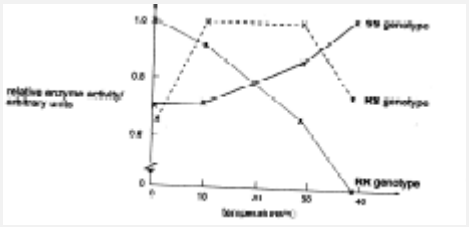
1 Variation exists within a population.
2 Carrying capacity is always constant.
3 Individuals which are better adapted survive to reproductive age.

4 Individuals

Which is a logical sequence of these assumptions in order to best explain the theory of evolution?

A. 4 → 1 → 3 → 2
B. 4 → 2 → 1 → 3
C. 2 → 3 → 1 → 4
D. 1 → 4 → 2 → 3

16. The graph shows the effect of temperature on the activity of three forms of a vital enzyme whose synthesis is controlled by two alleles designated R and S. the three possible genotypes RR, RS and SS lead to the three different enzymes forms whose response to temperature is as shown in the diagram.



When the mean annual temperature is 20^{o}C for several years which of the following is correct?

A. The heterozygotes and the homozygotes will have the same selective advantage.
B. Allele R will have the same frequency as allele S.
C. No genotype will have a selective advantage.
D. There will be complete dominance of R by S.

17. With reference to the substances given in the table, what are the immediate effects of removing carbon dioxide from chloroplasts which are exposed to light?

	Adenosine triphosphate	Ribulose biphosphate RuBp	Phosphoglyceric acid (PGA)

A	no change	decrease	increase
B	decreases	increases	no change
C	no change	increases	decreases
D	increases	increases	decreases

18. The oxidation of triolein is shown by the following equation:

$C_{57}H_{104}O_6 + 80O_2 \rightarrow 57CO_2 + 52H_2O$

What is the theoretical respiratory quotient (RQ) value for triolein?

A. $^{52}/_{57}$
B. $^{80}/_{57}$
C. $^{57}/_{80}$
D. $^{52}/_{80}$

19. What is the main reaction which occurs during the Krebs cycle?

A. oxidative decarboxylation
B. oxidative phosphorylation
C. photophosphrylation
D. photorespiration

20. DCPIP is decolourised when reduced and this can be used to demonstrate photosynthesis.

Which process directly leads to the reduction of the DCPIP?

A. photolysis
B. conversion of GP to TP
C. cyclic photophosphorylation
D. non-cyclic photophosphorylation

21. Which substance in red blood cells acts as a buffer against low pH?

A. bicarbonate ions
B. chloride ions
C. haemoglobinic acid
D. oxy-haemoglobin

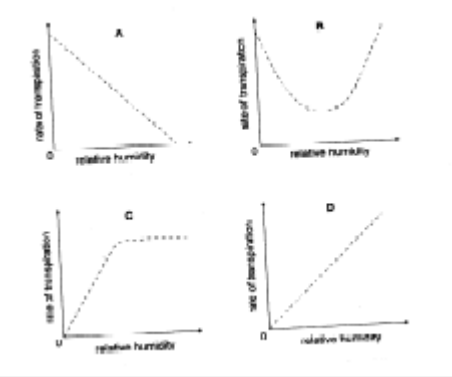
22. Which tissue is present in the walls of both capillaries and arteries?

A. connective
B. elastic
C. endothelial
D. muscle

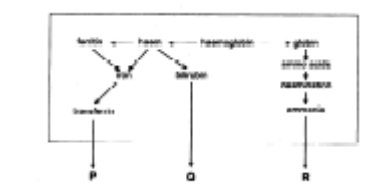
23. Which process is enzyme catalysed and occurs in the cytoplasm of red blood cell?

A. dissociation of carbonic acid, releasing carbonate ions
B. dissociation of oxyhaemoglobin, releasing oxygen
C. reaction between carbon dioxide and haemoglobin forming carboaminohaemoglobin
D. reaction between water and carbon dioxide forming carbonic acid

24. Which graph represents the relationship between the rate of transpiration of a mesophytic leaf and atmospheric humidity?



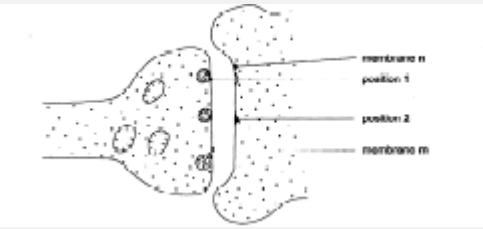
25. The diagram summarizes the breakdown of hemoglobin in the hepatocytes.



What happens to compounds P, Q and R?

	P	Q	R
A.	used in protein synthesis	excreted	stored in muscles
B.	excreted	used in protein synthesis	used in protein synthesis
C.	excreted	stored in muscles	used in protein synthesis
D.	used in protein synthesis	excreted	excreted

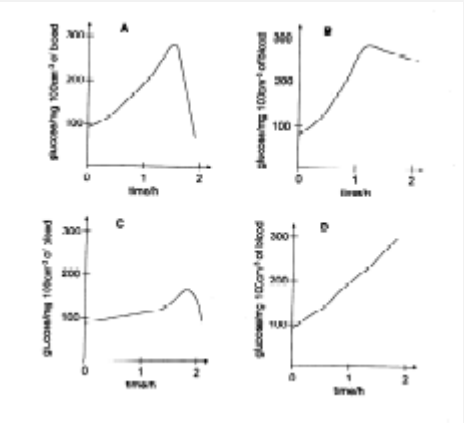
26. The diagram shows a cholinergic synapse.



Which of the following is correct about the position of acetylcholine receptors and the membrane which becomes hyper-polarized due to over stimulation.

	Position of acetylcholine receptors	Hyper-polarised membrane
A	1	m
B	2	n
C	2	m
D	1	n

27. Which graph correctly represents changes in the blood sugar levels of a diabetic person after drinking a glass of glucose solution?



28. The graph represents the concentration of fluid within various parts of a nephron and the collecting duct into which it empties.

Which labeled portion is most likely to represent concentration within the loop of Henle?

29. In which of the following ecological units would you expect the greatest competition between two species?

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

30. Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) is an example of conservation of biodiversity by

A. creation of new habitats.
B. Management of biodiversity.
C. Preservation of existing biodiversity.
D. Reclamation of biodiversity.

31. The table shows the results of a field study of four species in an ecosystem forming a food chain.

Species	**Number of individuals**	**Dry mass of one Individual (arbitrary units)**	**Energy value per unit mass (arbitrary units)**
E	2 500	0.06	0.1
F	6	1.5	3
G	300	3	0.02
D	4	10 000	0.004

What is the correct food chain?

A. G → E → F → H
B. F → E → G → H
C. H → F → G → E
D. H → G → F → E

32. In angiosperms, through which part does the vascular strand of an ovule pass from the placenta?

A. embryo sac
B. funicle
C. integuments
D. micro Pyle

33. What is the correct order in which hormones are released during the menstrual cycle?

First → Last

A.	FSH	oestrogen	progesterone
B.	FSH	progesterone	oestrogen
C.	progesterone	FSH	oestrogen
D.	oestrogen	FSH	progesterone

34. The table gives the results of one experiment to find the effect of red light and darkness on breaking dormancy and the germination of raddish seeds.

Conditions before germination	Germination of type X seed (%)	Germination of type Y seeds (%)
Continuous red light	79.8	92
Continuous darkness	70	40
Alternate red light and darkness	20	35

What conclusion can be drawn from the results?

A. Red light has no effect on germination of type X seeds.
B. Darkness enhances effect of red light in both seeds.
C. Red light has a greater effect on germination of type Y seeds.
D. Darkness has no effect in both seeds.

35. Which of the following mechanisms favour out breeding in plants?

A. hermaphrodite
B. flower buds never open
C. self-sterility
D. stigma below anthers

36. The following events occur during fertilization in humans:

1. lysosomes are released into the zona pellucida
2. proteases and hyaluronidase enzymes are released
3. glycoproteins on the surface of the sperm are digested
4. second meiotic division is completed

Which is the correct sequence in which these events occur during fertilization?

A. 2 → 3 → 4 → 1

B. 3 → 2 → 1 → 4
C. 1 → 3 → 2 → 4
D. 3 → 4 → 2 → 1

37. Which of the following describe the changes to the epithelial lining of the airways during the development of chronic bronchitis?

A. Cilia are destroyed.
B. Goblet cells produce less mucus.
C. Mucus glands become smaller.
D. Epithelial lining becomes thinner.

38. During exercise, the tidal volume of a person increased to 1.3 dm^3 and the breathing rate was 20 breaths for every 30 seconds

What volume of air was taken into the lung in one minute?

A. 78 dm^3
B. 52 dm^3
C. 39 dm^3
D. 26 dm^3

39. What is the common feature about the body plan of chordates and cnidarians?

A. an endoderm lining the enteron
B. bilateral symmetry
C. a mouth and an anus
D. triploblastic

40. The diagram shows the life cycle of a plant in which the sporophyte is the dominant generation.

Which plant group is represented by this cycle?

A. algae
B. bryophytes
C. pteridophytes
D. spermatophytes