ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

BIOLOGY 9190/1

PAPER 1 Multiple Choice

NOVEMBER 2012 SESSION 1 hour

Additional materials:

- Multiple Choice answer sheet
- Soft clean eraser
- Soft pencil (type B or HB is recommended)
- Ruler
- Calculators

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your name, Centre number and candidate number on the answer sheet in the spaces provided unless this has already been done for you.

There are **forty** questions in this paper. Answer **all** questions. For each question there are four possible answers, **A, B, C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the separate answer sheet.

Read very carefully the instructions on the answer sheet.

INFORMATION FOR CANDIDATES

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

This question paper consists of 27 printed pages and 1 bank page.

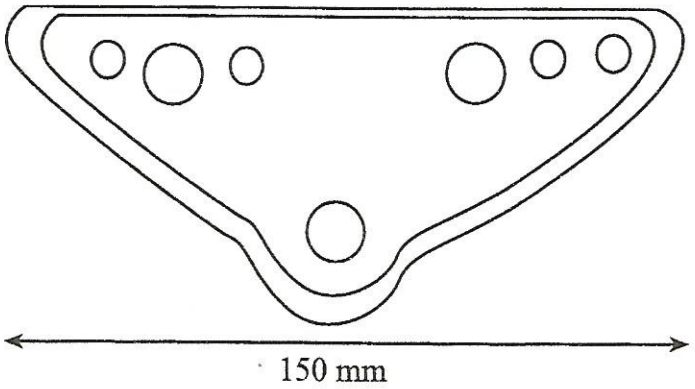
1 Phospholipid molecules move about in the cell membrane giving membrane its characteristic fluidity. Some membranes are more fluid than others because of the presence of

A unsaturated phospholipids and high levels of cholesterol.
B saturated phospholipid molecules and high levels of cholesterol.
C saturated phospholipids and low levels of cholesterol.
D unsaturated phospholipid molecules and low levels of cholesterol.

2 Which organelle is involved in the control of Ca^{2+} concentration in the skeletal muscle cells?

A rough endoplasmic reticulum
B smooth endoplasmic reticulum
C microtubules
D Golgi body

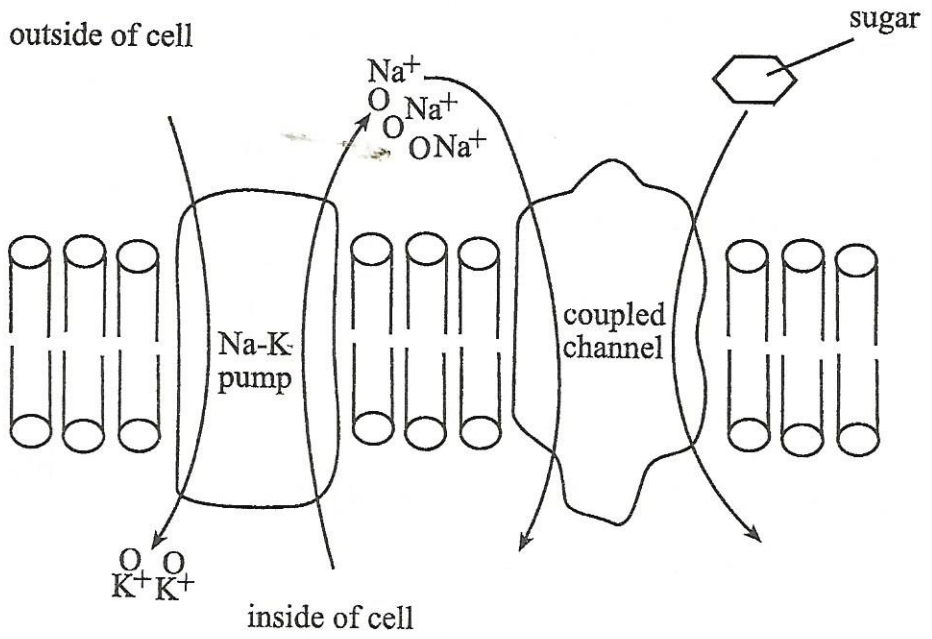
3 The diagram is a plan or a transverse section through a leaf, drawn using a x5 eye piece and a x8 objective lens of a microscope. The actual distance across the leaf section is 7.5 mm.



What is the magnification of the diagram?

A x5
B x8
C x20
D x40

4 Which statement is true about what is shown as taking place in the diagram below.



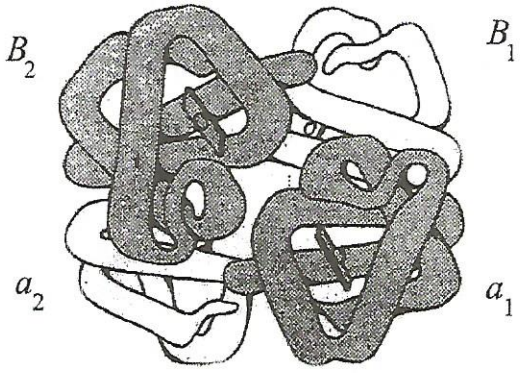
A Both the sugar and the Na^+ are translocated to the inside of the cell down their concentration gradient.

B The sugar is using energy from the Na^+ to move down it's concentration gradient.

C Both the sugar and the Na^+ are translocated to the inside of the cell against their concentration gradient.

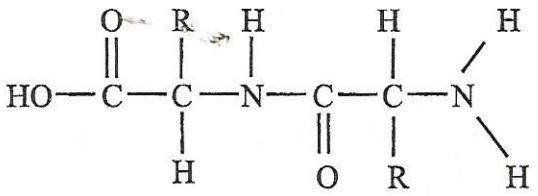
D Both the sugar and the Na^+ are translocated to the inside, but in the process Na^+ moves down its concentration gradient while the sugar moves against its concentration gradient.

5 Which levels of protein structure are demonstrated by this molecule?



	primary	secondary	tertiary	quaternary
A	√	X	√	√
B	X	√	√	√
C	√	√	√	√
D	√	√	√	X

6 The diagram shows the structure of a molecule.



Which test on a polymer of this molecule would give a positive result?

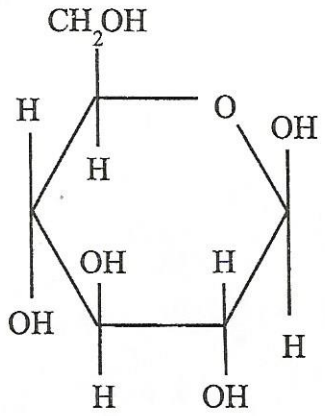
A Adding dilute NaOH and few drops of copper sulphate.

B Adding iodine in potassium iodide solution.

C Adding Benedict's solution and heat in a water bath.

D Shaking with ethanol then pouring cold water.

7 The diagram shows a monosaccharide.



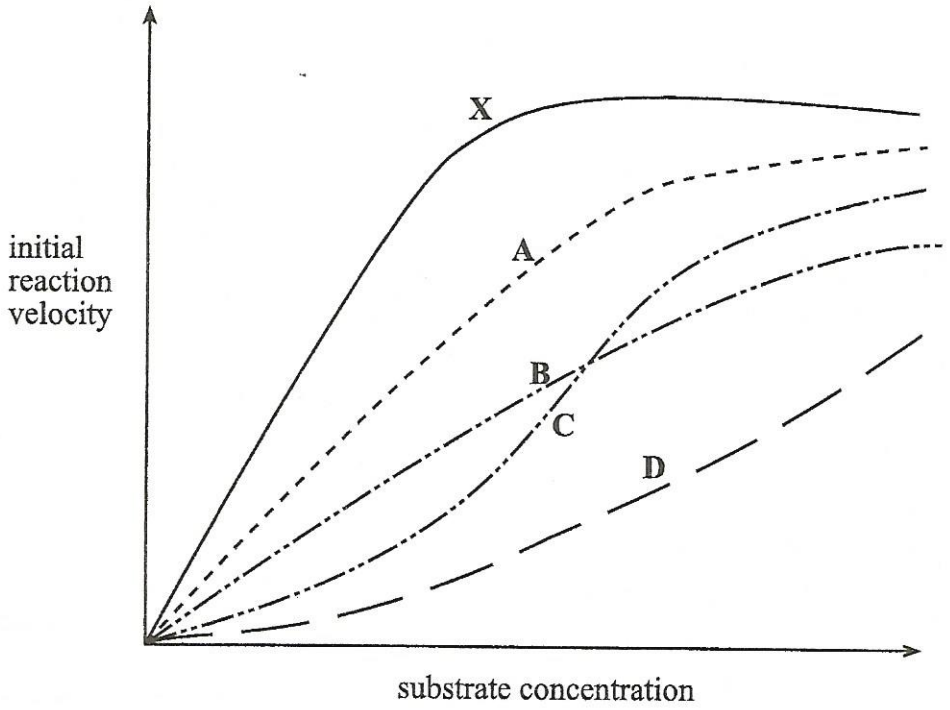
Which is formed from this monosaccharide.

A starch
B glycogen
C cellulose
D maltose

8 In the graph, X, represents the relationship between an enzyme activity and the concentration of the substrate under optimal conditions and without an inhibitor.

The same experiment was repeated in the presence of a fixed, low concentration of a competitive inhibitor.

Which curve represents the expected result?



9 An enzyme increases the rate of a reaction by

A supplying the energy required to start the reaction.
B increasing the rate of random collisions of molecules.
C shifting the point of equilibrium of the reaction.
D bringing the reacting molecules into precise orientation with each other.

10 The reaction rate of salivary amylase on starch decreases as the concentration of chloride ions is reduced.

Which of the following describes the role of the chloride ions?

A competitive inhibitors
B co-enzyme
C co-factors
D non-competitive inhibitors

11 If x units of DNA are present in the nucleus of a cell that has just divided, what would be the relative amount of DNA present in this cell during prophase of the next mitosis?

A $x/4$

B $\frac{x}{2}$

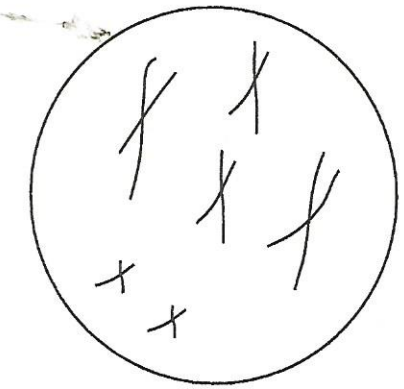
C $\frac{x}{\lambda}$

D $\frac{2x}{\lambda}$

12 Which statement is **not** true about homologous chromosomes?

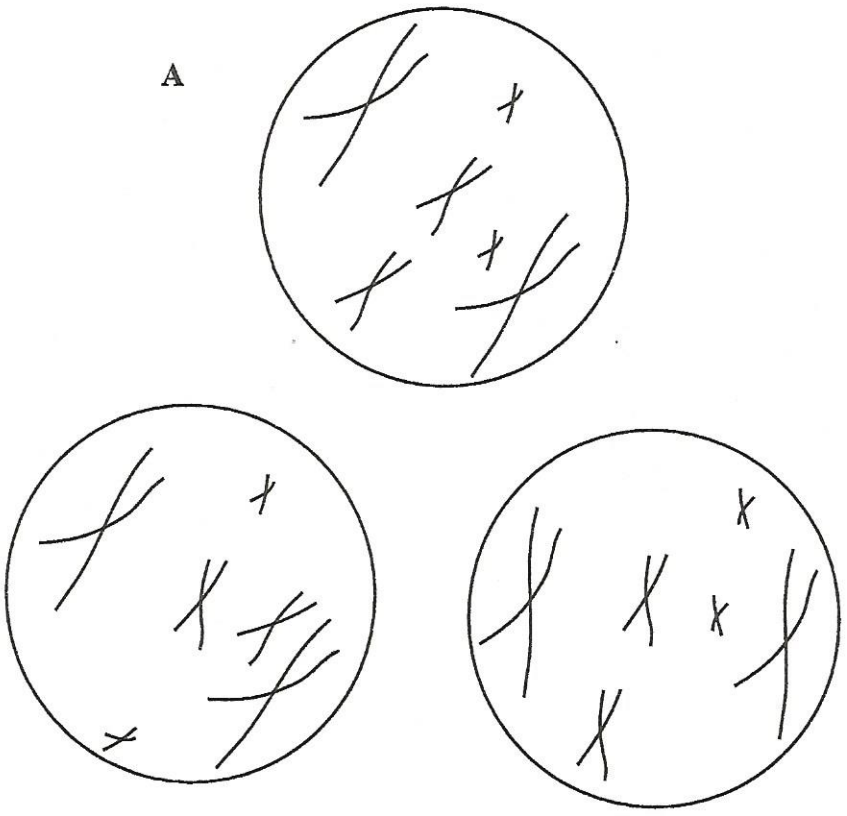
A They have the same genes in both chromosomes.
B Each gene can be represented by the same or different alleles at each locus.
C One of the pair is paternal and the other maternal.
D They have the same type of alleles at each loci.

13 The diagram shows the chromosomes of a cell at prophase of mitosis.

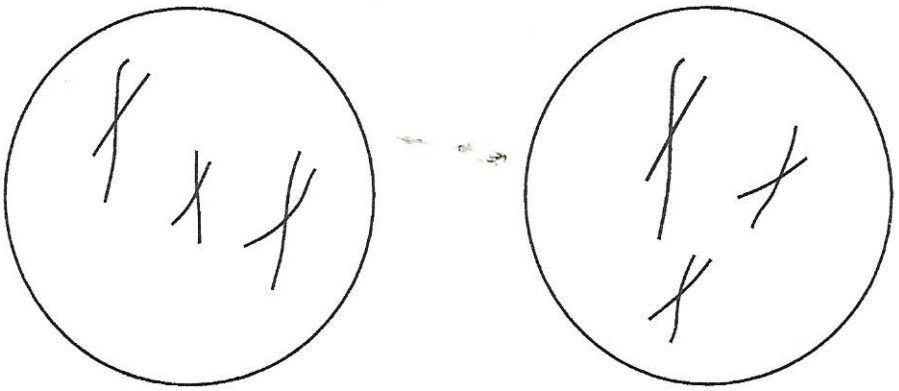


What will be the appearance of the products of this cell division as they enter telophase of their next meiotic division?

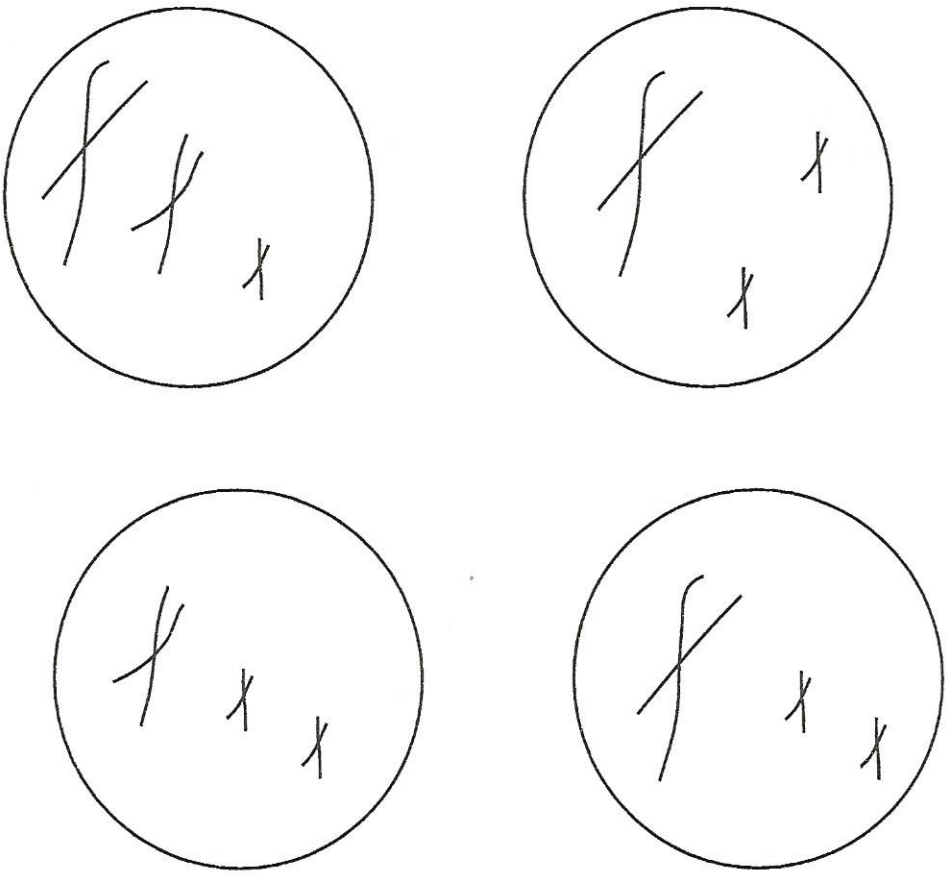
A



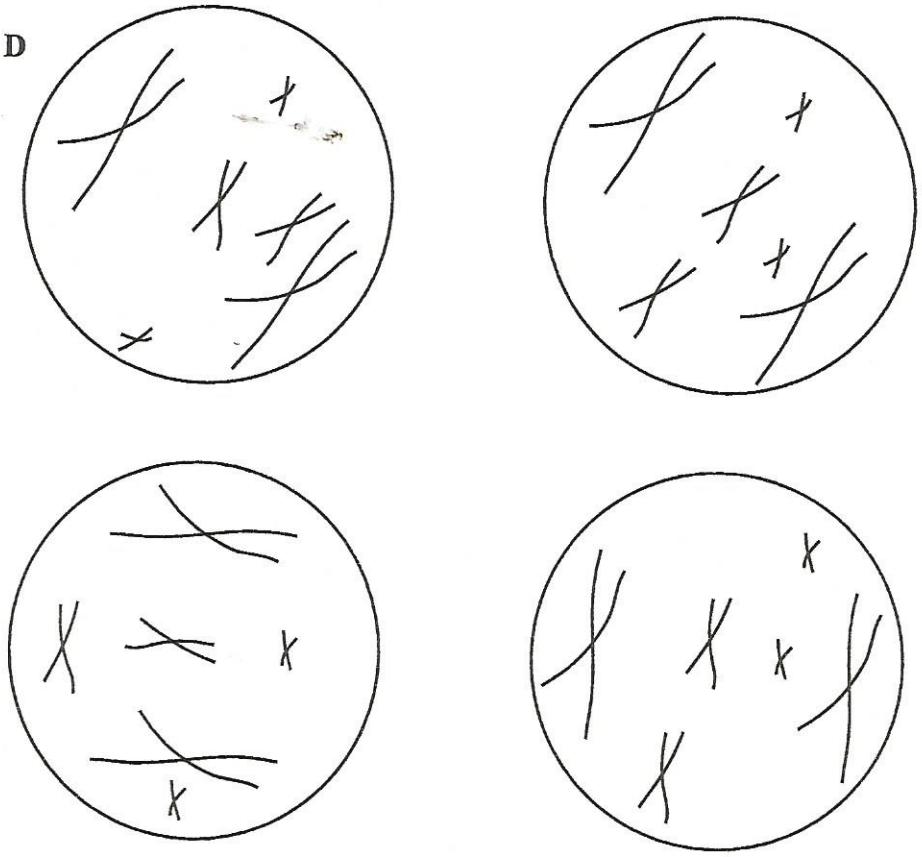
B



C

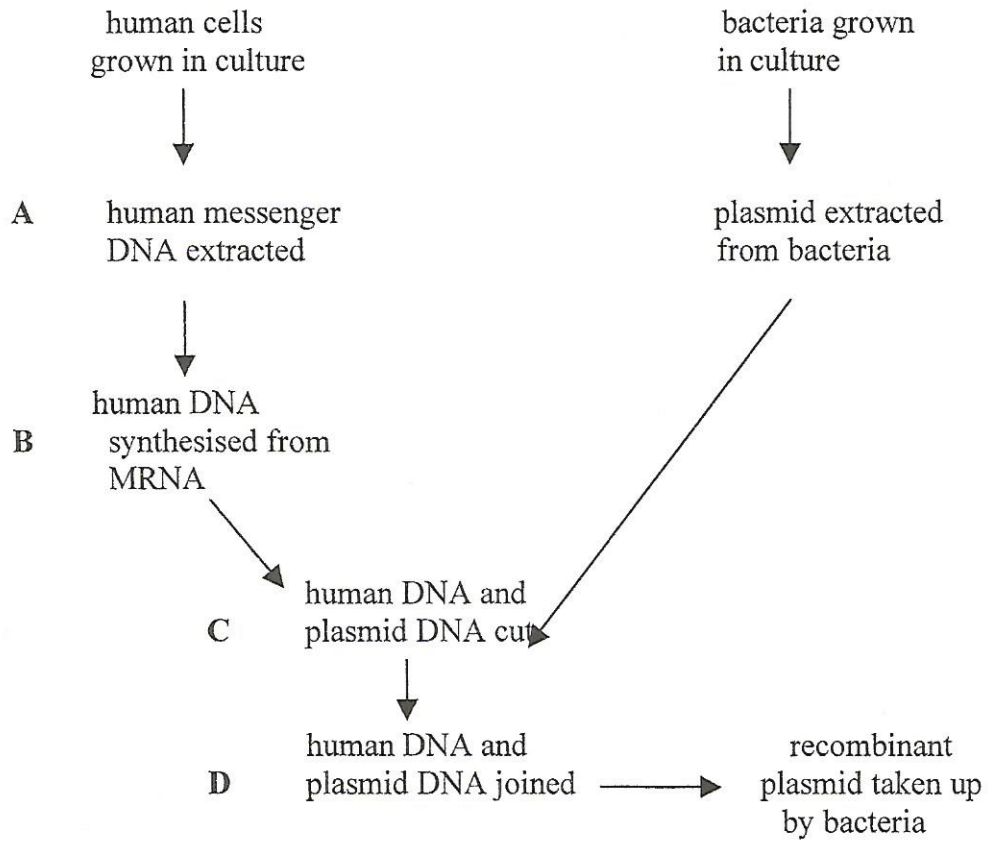


D

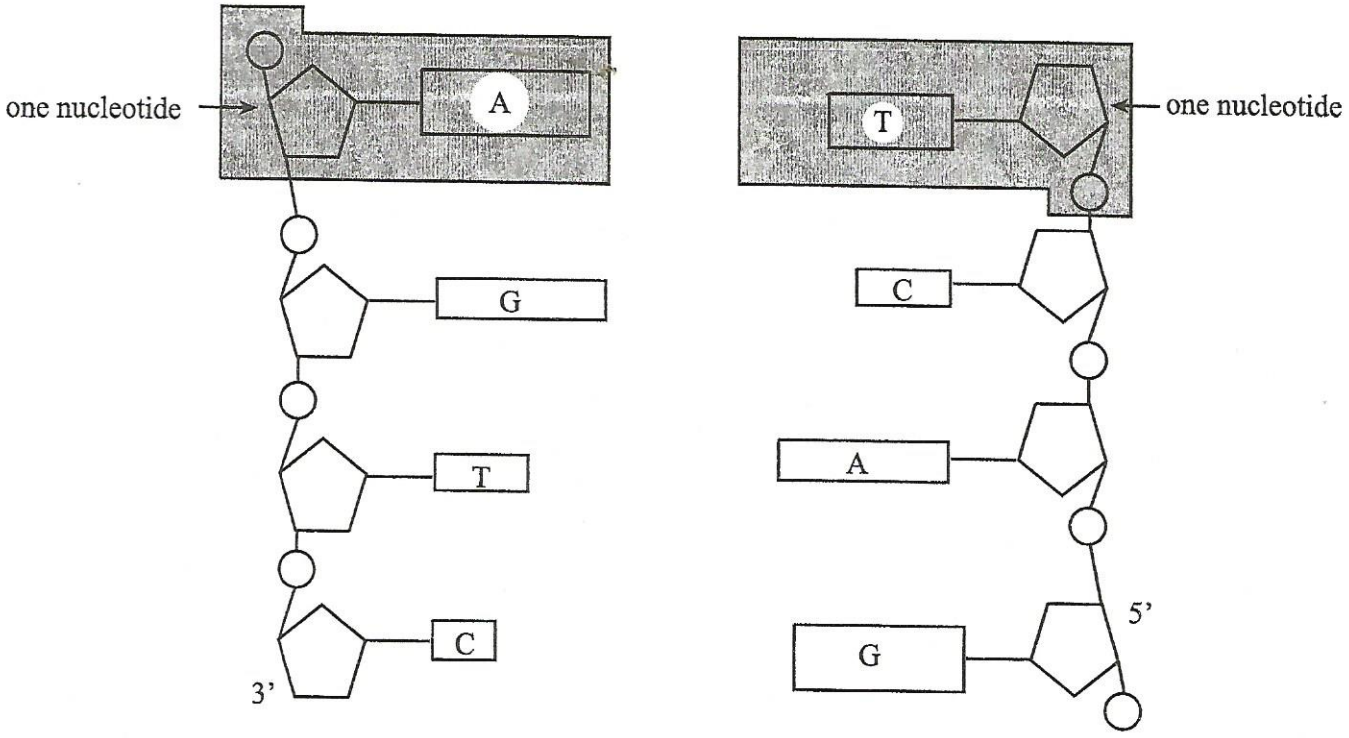


14 The flow diagram shows some of the events in the production of a human hormone by genetic engineering.

At which stage in the process is a restriction enzyme used?



15 The diagram shows part of a DNA molecule.



How many hydrogen bonds are involved in holding these strands of DNA together?

A 4
B 5
C 8
D 10

16 Which condition results in the addition of an extra chromosome to the chromosome complement of a cell, as in Down's Syndrome?

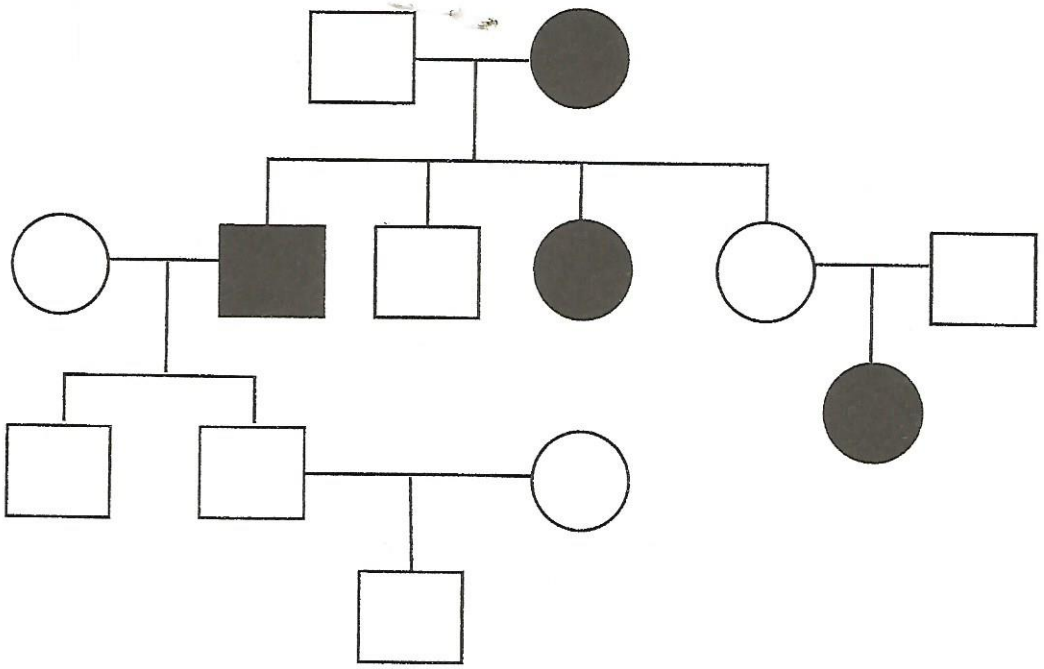
A allopolyploidy
B auto polyploidy
C non-dysjunction
D polygenic inheritance

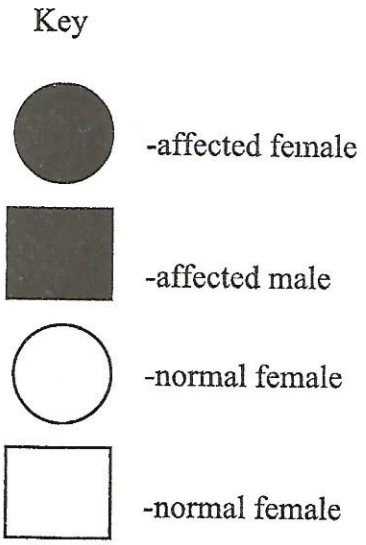
17 During the formation of an ovum, non disjunction of the sex chromosomes occurred. The ovum was then fertilised by a normal Y-bearing sperm cell.

Which set shows the sex chromosome complement of the resulting zygote?

A XXY
B XY
C XO
D XXYY

18 The pedigree below traces the inheritance of alkaptonuria, a biochemical disorder. Affected individuals are unable to break down a substance called alkapton, which colours the urine and stains body tissues. Affected individuals are indicated by the circles and boxes.





The inheritance of alkaptonuria is caused by

A sex-linked recessive allele.
B an autosomal recessive allele.
C an autosomal dominant allele.
D a sex-linked dominant allele.

19 A cross between two red-flowered plants, Rr x Rr, gave the following results:

156 red flowered plants
44 white flowered plants

The expected results were:
150 red flowered plants
50 white flowered plants

The formula for calculating Chi-squared test (χ^2) is $\chi^2_{cal} = \sum \frac{(O-E)^2}{E}$

What is the χ^2_{cal} value?

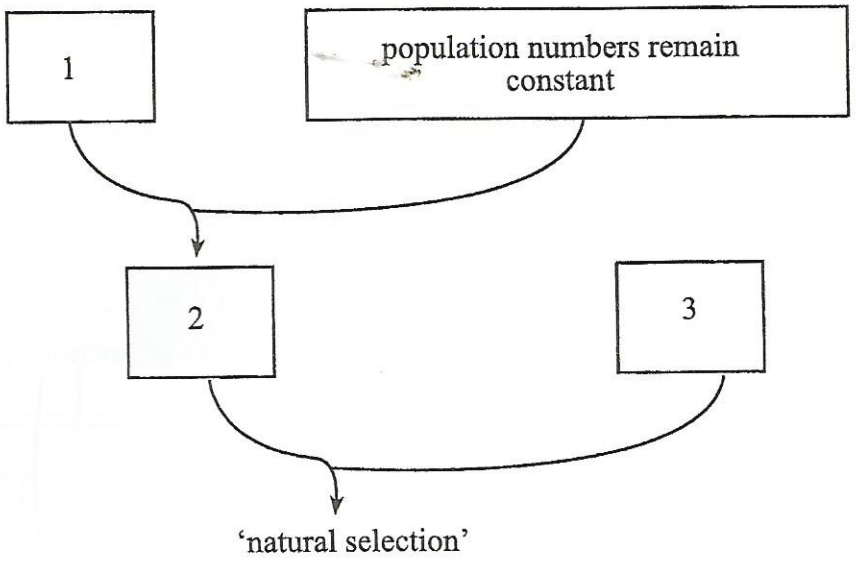
A 0.24
B 0.74
C 0.96
D 1.05

20 In a population of 200 small mammals there were 72 albinos. It can be assumed that the gene for albinism is recessive to the gene for normal hair, that there is random mating and that no mutation occurs.

What is the frequency of the gene for albinism in the population?

A 30 %
B 36 %
C 40 %
D 72 %

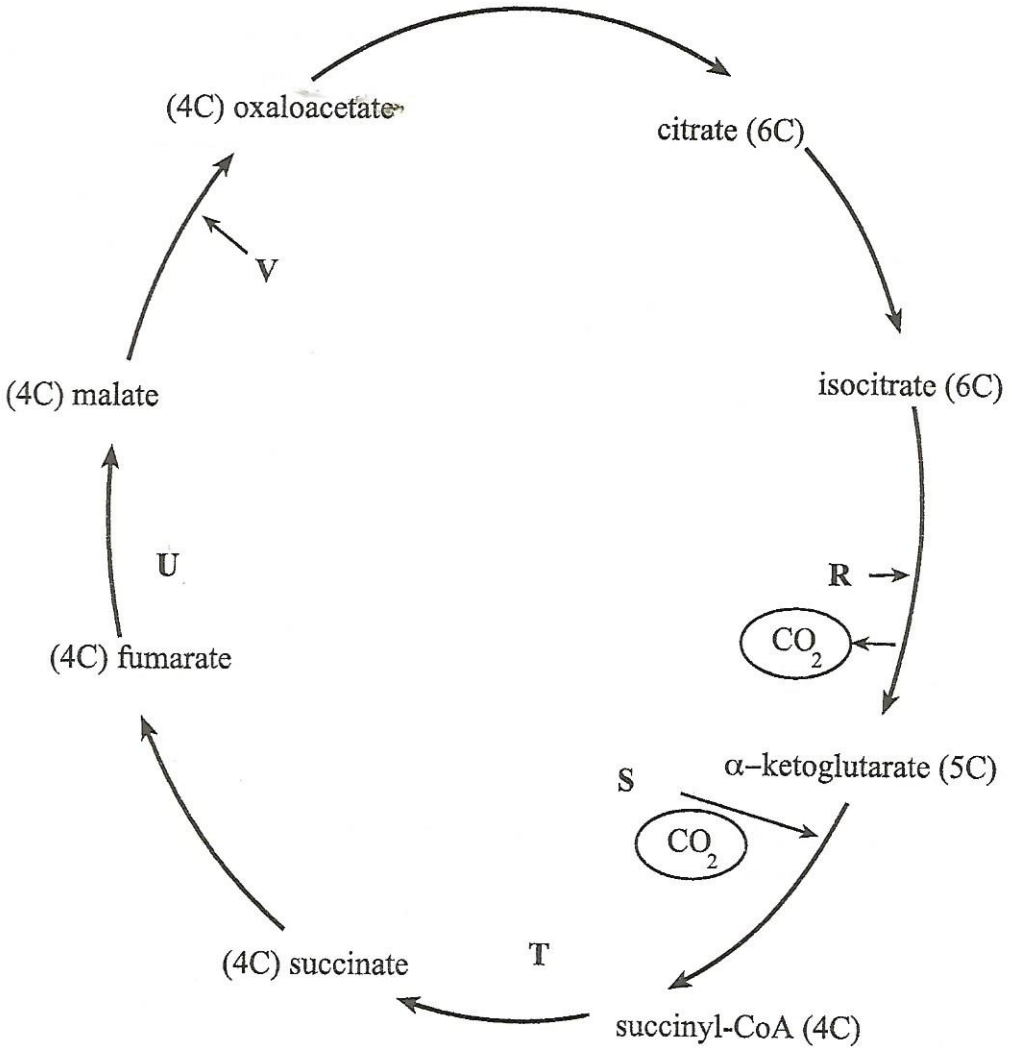
21 The diagram shows a summary of Darwin's Theory of natural selection.



Which statement should be placed in boxes 1, 2, and 3?

	there is a struggle for existence	**variation shown in all populations**	**individuals show great reproductive capacity**
A	1	2	3
B	2	1	3
C	2	3	1
D	3	1	2

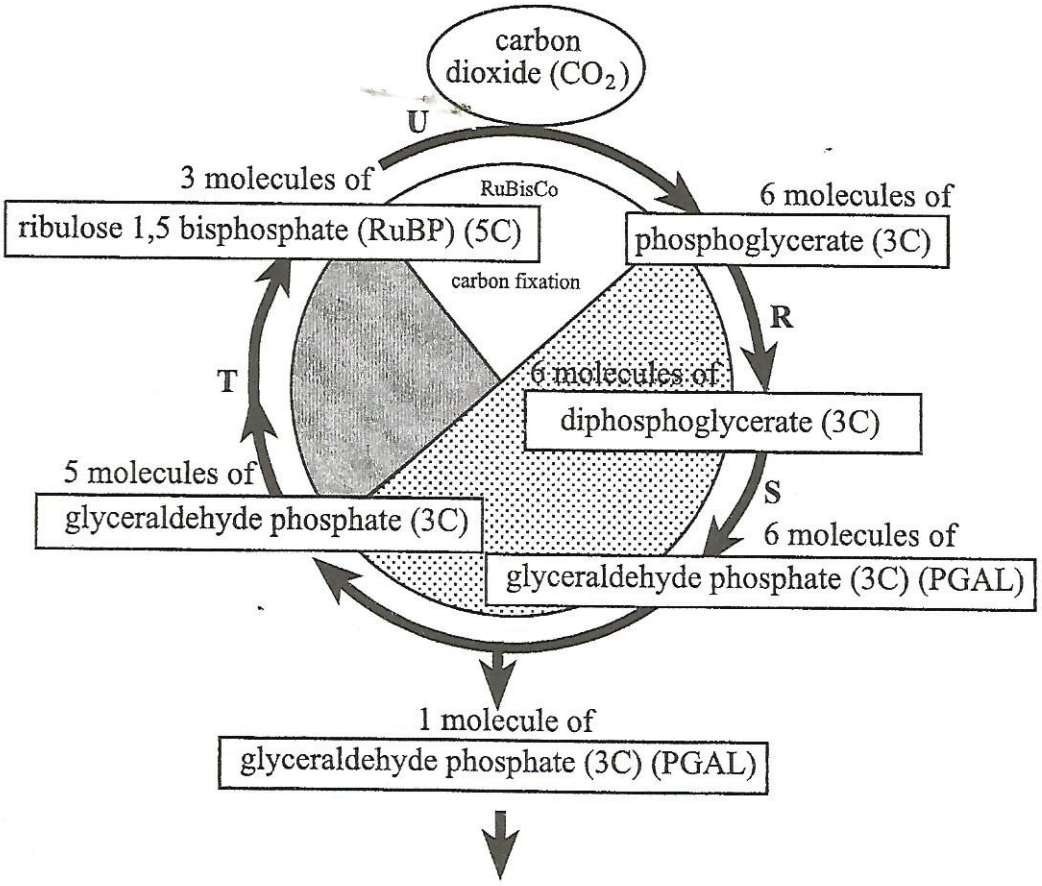
22 The diagram shows some of the reactions following glycolysis during aerobic respiration.



Identify the correct stages where dehydrogenation is taking place.

A	**R;**	**S;**	**T**
B	**R;**	**S;**	**U**
C	**R;**	**T;**	**V**
D	**R;**	**S;**	**V**

23 The diagram shows an outline of the main stages of the Calvin cycle.



At which stages are NADPH oxidised and ATP used?

	NADPH oxidised	ATP used
A	S	R and T
B	U	R and T
C	S	R and T
D	R	U and T

24 An equation for aerobic respiration of a lipid molecule included the production of 102 units of carbon dioxide. The respiratory quotient was calculated as 0.7.

What is the number of oxygen units needed in the aerobic respiration of the lipid molecule?

A 71
B 108
C 144
D 146

25 A water potential gradient causes water to move through xylem.

Which process is mainly responsible for this water potential gradient?

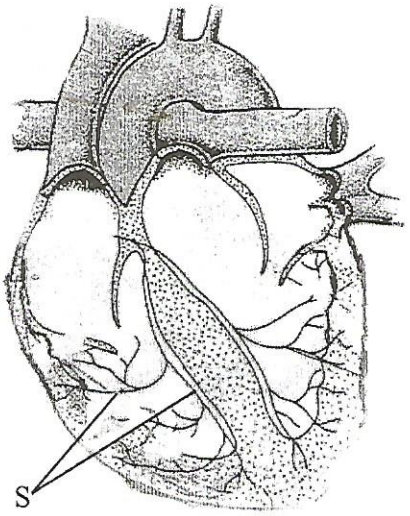
A capillary
B osmosis
C transpiration
D translocation

26 When climbing a very high mountain there is a risk of altitude sickness.

What causes altitude sickness?

A A high concentration of carbon dioxide accumulates in the blood.
B Oxygen partial pressures decreases.
C Red blood cell production increases.
D The proportion of oxygen in the air decreases.

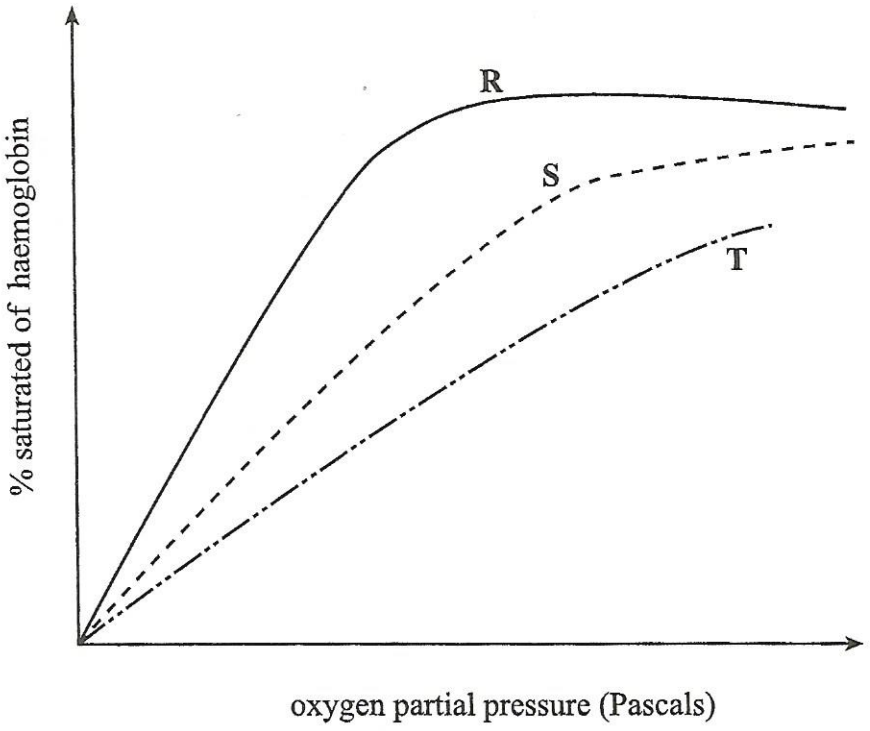
27 The diagram shows a vertical section through the human heart.



What is the function of the part labelled S?

A conducts a wave of electrical excitation over atria
B conducts a wave of electrical excitation over the ventricles
C reduces the spontaneous contraction rate of the heart muscles
D separates oxygenated blood from deoxygenated blood

28 The diagram shows three dissociation curves for haemoglobin in the lungs, kidneys and muscle tissues.

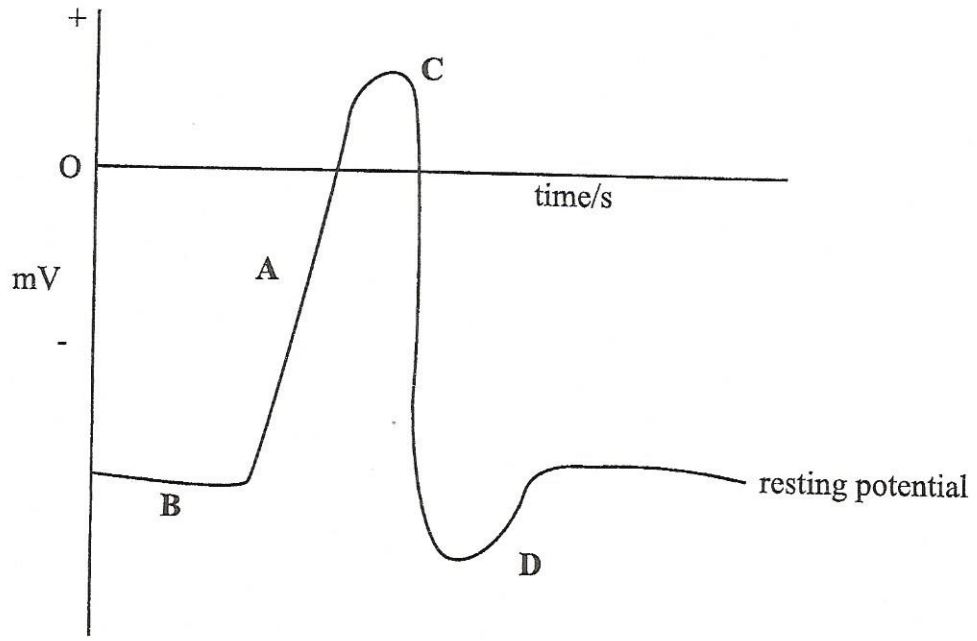


Which line correctly corresponds to the correct carbon dioxide partial pressure?

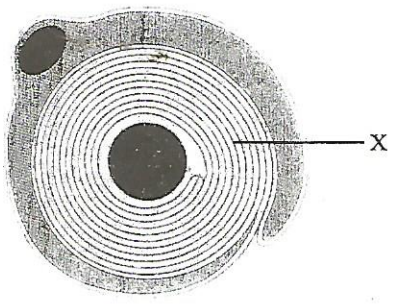
	CO_2 partial pressure (Pascals)		
A	R	T	S
B	R	S	T
C	T	R	S
D	S	R	T

29 The diagram shows a nerve action potential.

At which point on the graph is the membrane most permeable to sodium ions?



30 The diagram represents a transverse section through a neurone as seen under an electron microscope.

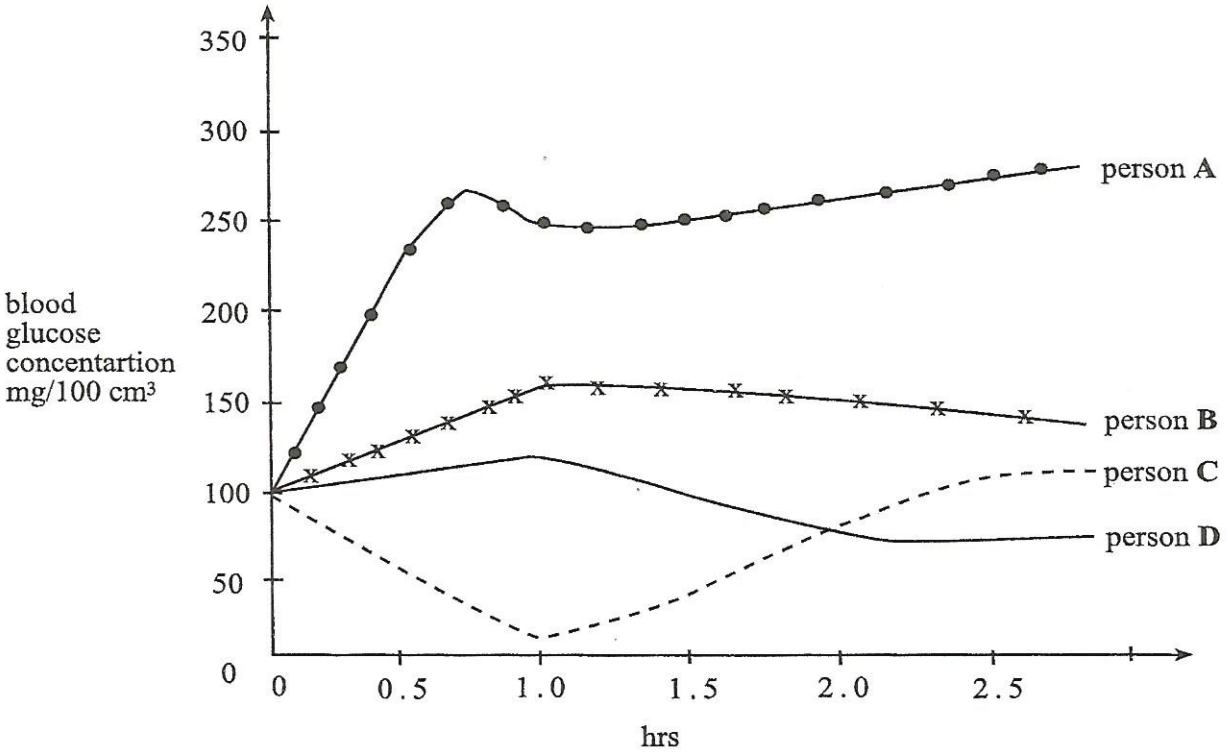


What is the function of the labelled structure **X**?

A forms myelin sheath
B provides nourishment to the nerve cell
C prevents movement of Na^+ and K^+ ions in and out of the nerve fibre
D conducts nerve impulses

31 The blood glucose concentration of four people was measured over a 2.5 hr period after drinking the same amount of concentrated glucose solution. The graph shows the results.

Which person is least likely to have problems associated with insulin secretion?



[Turn over

32 Twenty-four hours after removing a liver of a mammal the concentrations of urea and amino acids in the blood would be changed.

In which way would the changes take place?

A Both urea and amino acid level would have risen.
B Both urea and amino acid levels would have fallen.
C The urea level would have risen while the amino acid level would have fallen.
D The amino acid level would have risen while urea level would have fallen.

33 In an ecosystem, at which stage is most energy lost?

A sunlight → trophic level 1
B trophic level 1 → trophic level 2
C trophic level 2 → trophic level 3
D trophic level 3 → trophic level 4

34 Competition between species will be greatest if they attempt to occupy the same

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

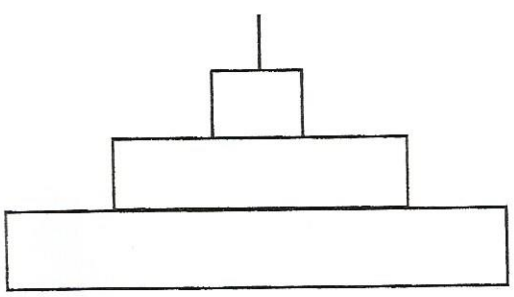
35 The flow chart shows a food chain

grass → rabbits → dogs → fleas

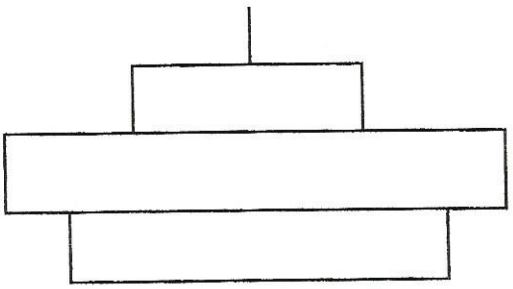
The biomass of the organisms was measured over a period of one year.

Which pyramid of biomass represents this food chain?

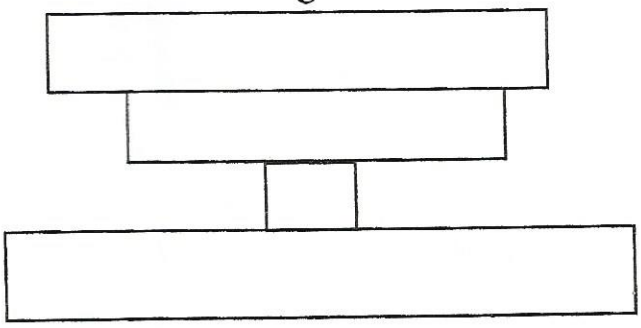
A



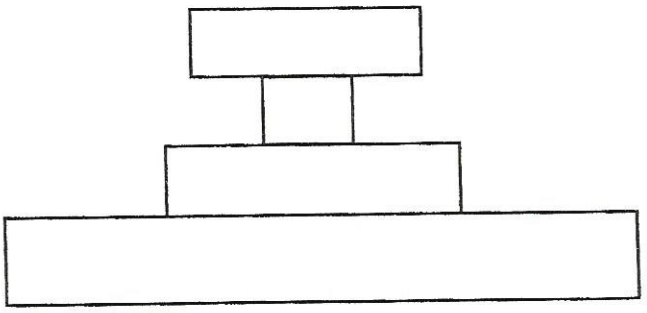
B



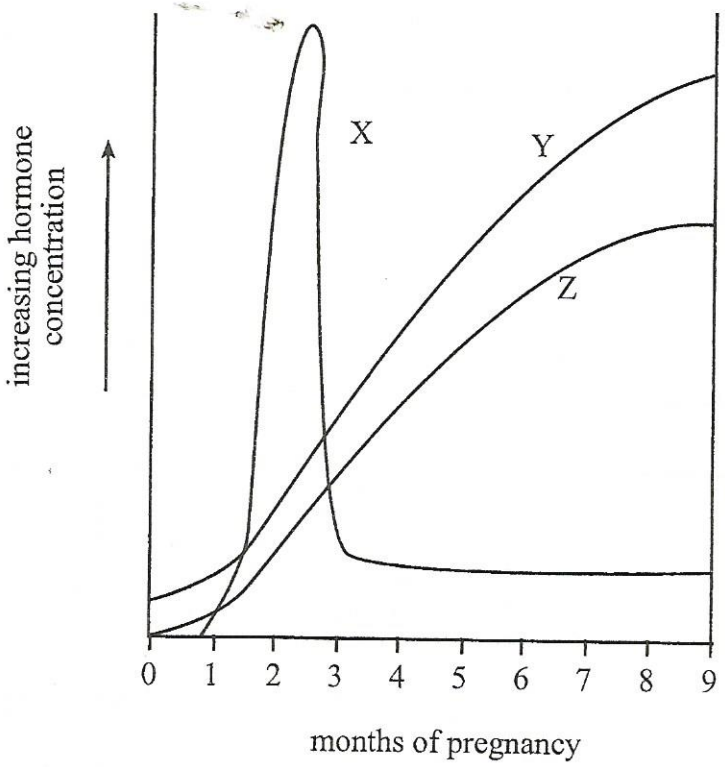
C



D



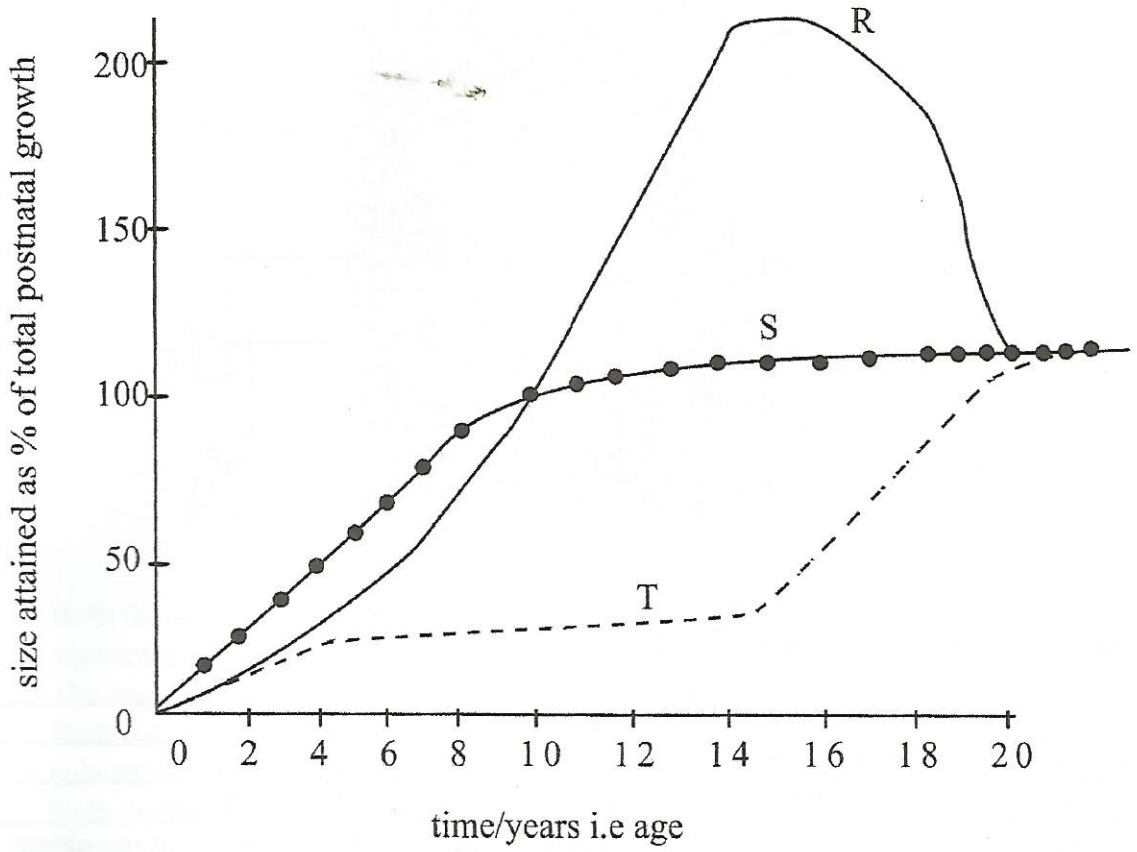
36 The graph shows three hormones (oestrogen, chorionic gonadotropin and progesterone) secreted by the placenta during months of pregnancy.



Which hormones are X, Y and Z.

	human chorionic gonadotropin	oestrogen	progesterone
A	Z	X	Y
B	X	Z	Y
C	X	Y	Z
D	Y	X	Z

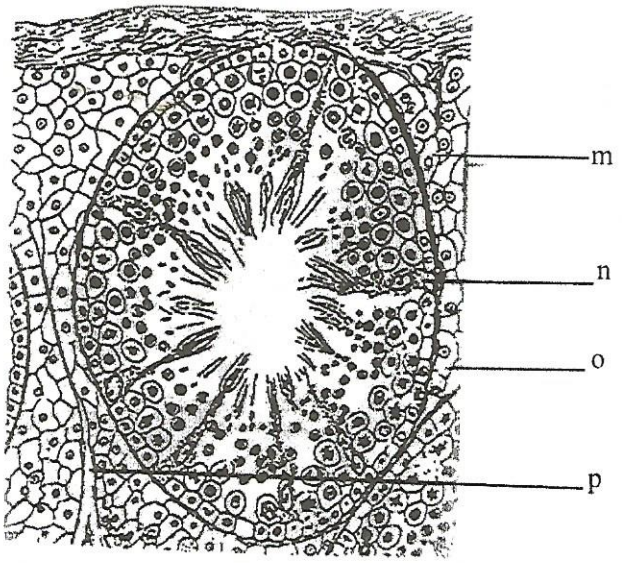
37 In mammals the growth of lymphoid tissue, reproductive organs, brain and head is allometric..



From the graph which represents lymphoid tissue, reproductive organs, brain and head?

	lymphoid Tissue	brain and head	reproductive organs
A	R	T	S
B	S	R	T
C	R	S	T
D	S	T	R

38 The diagram shows a cross section of a seminiferous tubule.



What are parts labelled **m, n, o** and **p**.

	m	n	o	p
A	basement membrane	Leydig cell	Sertoli cell	capillary
B	basement membrane	Sertoli cell	Leydig cell	capillary
C	capillary	Leydig cell	Sertoli cell	basement membrane
D	capillary	Sertoli cell	Leydig cell	basement membrane

39 The table shows classification of two birds, mistle-thrush and sony-thrush.

mistle thrush	**song thrush**
Animalia chordata Aves Passeriformes Turdidae Turdus Viseivorus	Animalia chordata Aves Passeriformes Turdidae Turdus ericetorum

To which order do these birds belong?

A Aves
B Passeriformes
C Turdidae
D Chordata

40 The following key distinguishes between the five kingdoms, Prokaryotae, Protoctista, Animalia, Fungi and Plantae.

1	organisms without membrane bound organelle	P
	organisms with membrane bound organelles	2
2	organisms have hyphae	Q
	organisms do not have hyphae	3
3	organisms unicellular or colonial	R
	organisms not unicellular or colonial	4
4	organisms multicellular and have thylakoid membranes in some cells	S
	organisms multicellular and have no thylakoid membranes in any cells	T

Identify kingdoms P,Q,R,S and T.

	animalia	plantae	fungi	protoctista	prokaryotae
A	R	S	Q	T	P
B	T	S	Q	R	P
C	S	T	Q	R	P
D	S	T	Q	P	R