Hee Xin Wei
OVERMUGGED
O Level Mock Paper

BIOLOGY

Paper 1 Multiple Choice

6093/01
September 2021
1 hour

INSTRUCTIONS TO CANDIDATES

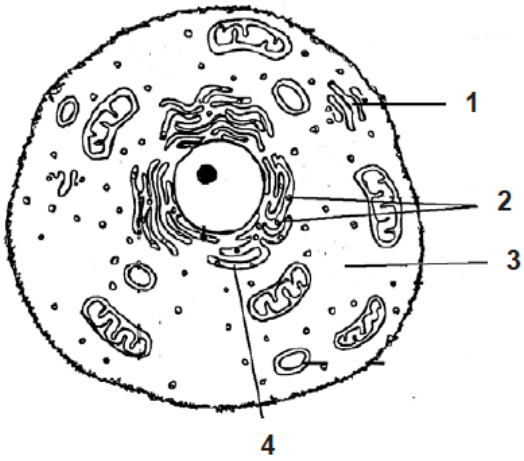
There are **forty** questions in this paper. Answer **all** questions. For each question, there are 4 possible answers, **A, B, C and D**.

Choose the one you consider correct.

Each correct answer wills score one mark. A mark will not be deducted for a wrong answer.
The use of an approved scientific calculator is expected, where appropriate.

Questions in reference to Zhong Hua Secondary School, Dunearn Secondary School, Kuo Chuan Presbyterian Secondary School and Catholic High School. Credits to these school! ☺

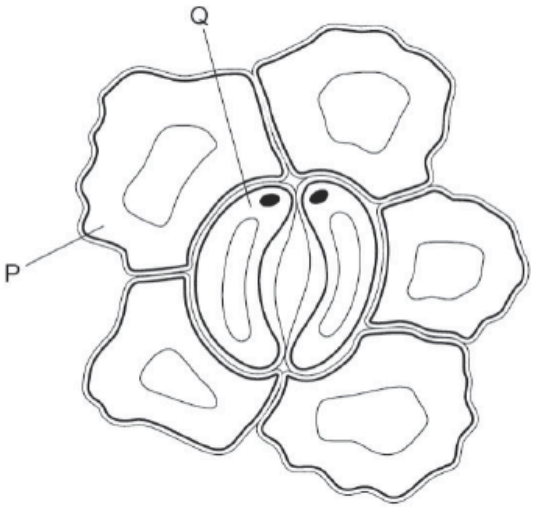
1 The diagram shows a typical animal cell with cell components involved in the synthesis and secretions of an enzyme.



Which is the correct route taken by an amino acid molecule during enzyme production?

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

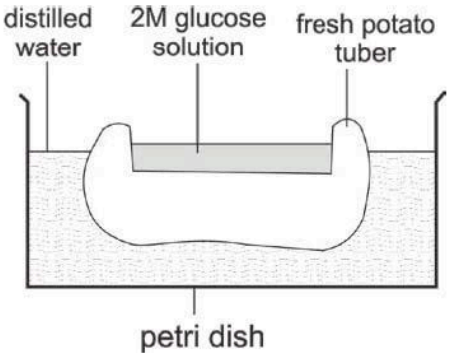
2 The diagram shows cells in the epidermis of a leaf.



To complete the diagram, which structural features should be added to the cells P and Q?

	P		Q	
	chloroplast	nucleus	chloroplast	nucleus
A	✓	✓	✗	✗
B	✓	✗	✓	✓
C	✗	✓	✓	✗
D	✗	✗	✗	✓

3 A student created the setup shown below.



However, he forgot all about it and left the setup overnight.

Which of the following correctly states the appearance of the potato tuber after 12 hours?

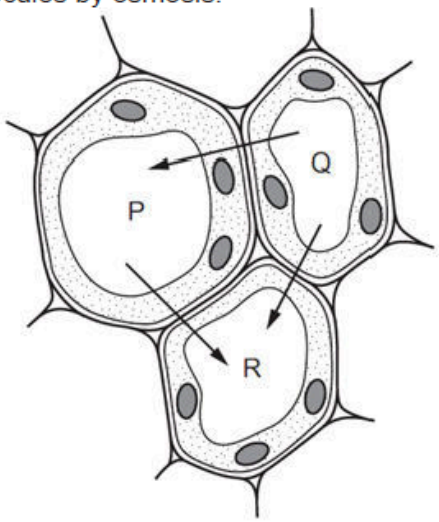
A The bottom half would be flaccid while the top half will be turgid.

B The bottom half would be turgid while the top half will be flaccid.

C It would have uniform turgidity.

D It cannot be inferred from the given data.

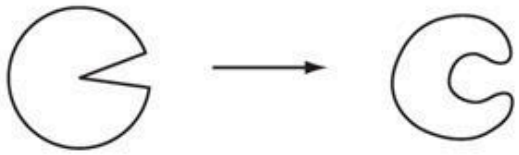
4 The diagram shows three plant cells labelled P, Q and R. The arrows show the direction of net movement of water molecules by osmosis.



What is the correct order of salt concentration in the cells, from the highest to the lowest?

	highest	middle	lowest
A	P	Q	R
B	P	R	Q
C	Q	P	R
D	R	P	Q

5 The diagram represents how an enzyme molecule changes in shape.



What explains this change?

A It has been placed in a concentrated salt solution.

B It has been placed in a dilute salt solution.

C It has been heated to 70°C.

D It has been cooled to 5°C.

6 A student had samples of four types of biological molecules – water, carbohydrates, proteins and fats. 100g of each sample was added to a calorimeter and the temperature change of the water as a result of the combustion of the sample was recorded in the table below.

Which of the samples contained fat?

sample	temperature change /°C
A	0
B	25
C	37
D	70

7 What is the enzyme that controls a reaction in which both the enzyme and the substrate can denature at high temperatures?

A amylase

B insulin

C lipase

D protease

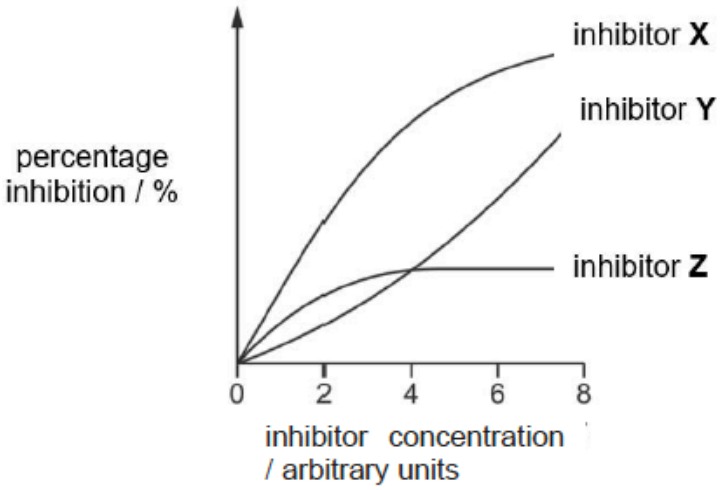
8 Lipase catalyses the conversion of fats into fatty acids and glycerol.

$$\text{fats} \xrightarrow{\text{lipase}} \text{fatty acids} + \text{glycerol}$$

Three different enzyme inhibitors of lipase **X**, **Y** and **Z**, which prevent the above reaction from occurring, were investigated.

The percentage inhibition of lipase was measured at different concentrations of inhibitor.

The graph shows the results of the investigation.

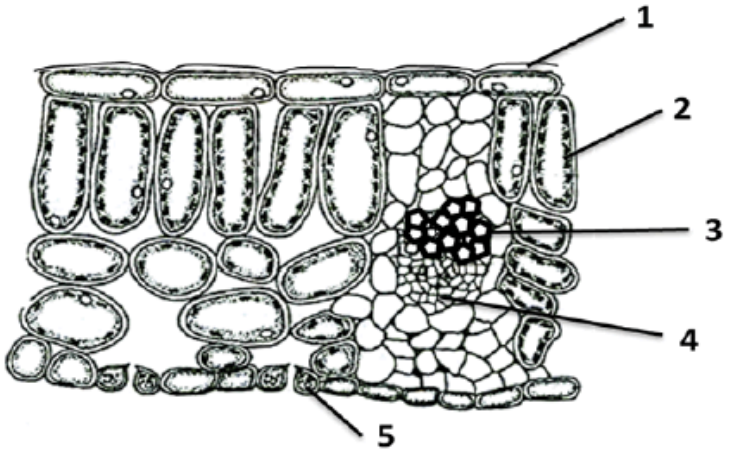


Which is/are valid conclusion(s) from these results?

1 The higher the concentration of inhibitor **X**, the lesser the amount of fats is broken down.
2 The production of fatty acids and glycerol using inhibitor **Y** is higher than when inhibitor **Z** is used.
3 The production of fatty acids and glycerol at an inhibitor concentration of 2 arbitrary units is lower than at an inhibitor concentration of 4 arbitrary units, for all inhibitors.

A 1 only **B** 3 only **C** 1 and 2 **D** 2 and 3

Refer to the diagram of a dicotyledonous leaf to answer questions **9** and **10**.



9 A drop of concentrated salt solution was placed on the surface of the leaf at 1.

Which statement describes the movement of water molecules between the salt solution and the plant cells in the leaf?

A There is no movement of water molecules between the salt solution and the plant cells.

B There is no net movement of water molecules between the salt solution and the plant cells.

C Water molecules move from the plant cells into the salt solution by osmosis.

D Water molecules move from the salt solution into the plant cells by osmosis.

10 The plant was placed in a glass jar containing radioactive carbon dioxide and then exposed to sunlight.

In which order would radioactivity be detected in the leaf?

A 1, 5, 2

B 1, 5, 4

C 5, 2, 4

D 5, 4, 3

11 Which of the following would not be an expected consequence of the removal of the pancreas?

A diabetes

B increased pH of the duodenum

C reduced protein digestion

D reduced glycogen production in liver and muscle cells

12 In patients with cystic fibrosis, thick mucus blocks the pancreatic duct.

Which are possible effects of this blockage?

1 egesting oily stool
2 weight loss
3 malnourishment
4 hyperglycemia (high blood glucose)

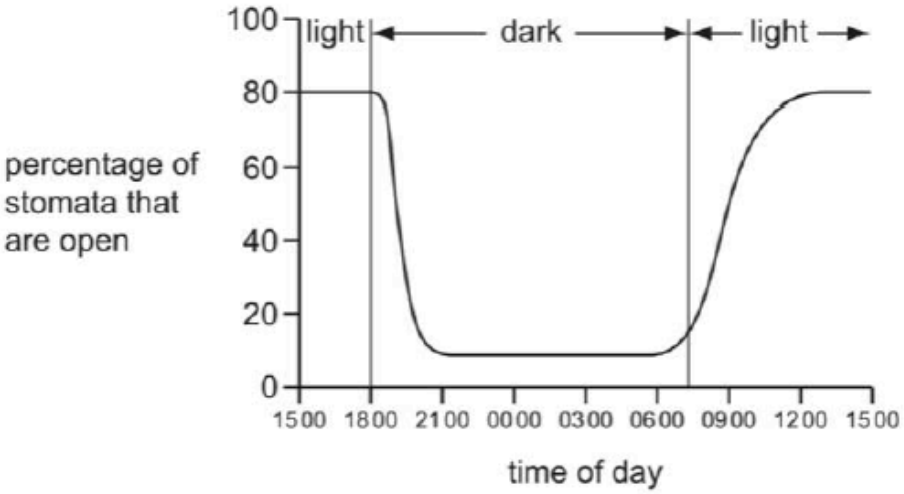
A 1 and 3

B 1, 2 and 3

C 1, 3 and 4

D 2 and 3

13 The graph shows stomatal opening and closing in leaves during a 24-hour period.



What can be concluded from the graph?

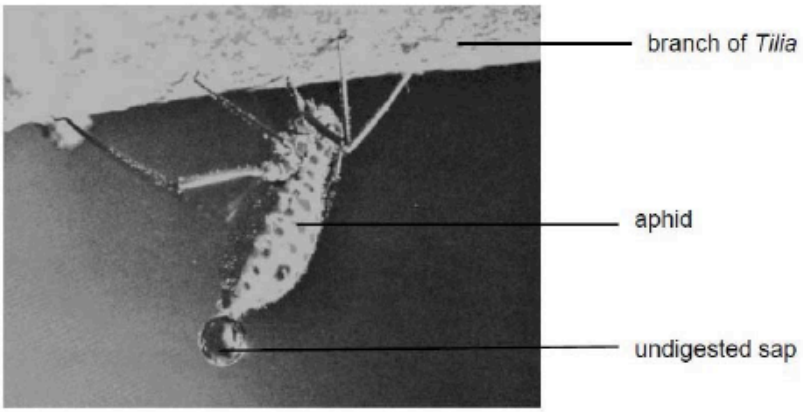
A Gaseous exchange occurs when stomata are open.

B Stomata open as light intensity increases.

C Gaseous exchange does not occur in the dark.

D Transpiration does not occur in the dark.

14 The photomicrograph shows an aphid feeding on a branch of a woody tree, *Tilia*. The fluid extracted by the aphid consists of sieve element sap. The high turgor pressure in the sieve element forces the cell contents through the food canal of the aphid. Once every 30 minutes, a droplet of undigested sap exits from the aphid. Plants exhibiting extensive aphid damage can display a variety of symptoms, such as decreased growth rates, stunted growth, low yields and death.



Which pair of observation and explanation is correct?

	observation	explanation
A	sieve element sap	rich in solutes, especially sucrose and amino acids
B	high turgor pressure in sieve element	numerous mitochondria in sieve tubes to carry out active transport
C	undigested sap	product of defecation and not excretion
D	variety of symptoms	due to low levels of manufactured food substances left for *Tilia* plant

15 There is a ring of muscle at the origin of a blood capillary network found near the skin.

Which of the following statements related to this ring of muscles is true?

A When constricted, it will increase blood flow in the capillary network.

B When constricted, it will not affect the blood pressure in the capillary network.

C When dilated, it can cause the skin to turn redder.

D When dilated, it will increase the blood pressure in the preceding arteriole.

16 Which of the following would be consequence(s) of a leaky bicuspid valve?

1 A heart attack would occur.
2 There would be reduced blood pressure in the aorta.
3 The heart would stop beating.
4 The blood leaving the aorta would be less oxygenated.

A 2 only **B** 2 and 4

C 1, 2 and 3 **D** 1, 2, 3 and 4

17 The table shows the results of a blood test of three volunteers, P, Q and R for blood transfusion.

		donor		
		P	Q	R
recipient	P		agglutination	no agglutination
	Q	no agglutination		no agglutination
	R	agglutination	agglutination	

Which of the following may be the blood types of volunteers P and Q?

	P	Q
A	A	AB
B	A	O
C	B	B
D	O	AB

18 The following reactions **X** and **Y** are catalyzed by the same enzyme, carbonic anhydrase found in red blood cells.

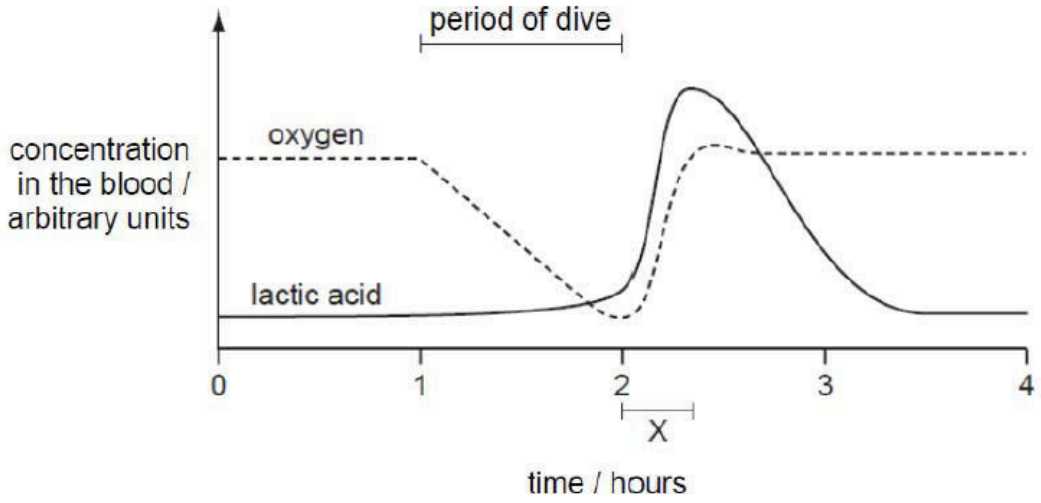
$$CO_2 + H_2O \underset{\text{reaction } \mathbf{Y}}{\overset{\text{reaction } \mathbf{X}}{\rightleftharpoons}} H_2CO_3 \rightleftharpoons H^+ + HCO_3^-$$

What is the homeostatic function of these reversible reactions and where do reactions **X** and **Y** occur in the human body?

	homeostatic function	**X**	**Y**
A	acid-base balance	respiring tissues	lungs
B	acid-base balance	lungs	respiring tissues
C	CO_2-O_2 balance	respiring tissues	lungs
D	CO_2-O_2 balance	lungs	respiring tissues

19 Seals are marine mammals. When they dive under water, they are capable of respiring anaerobically for long periods. During this time, blood flow to the muscles is greatly reduced but the muscles are able to tolerate high concentrations of lactic acid.

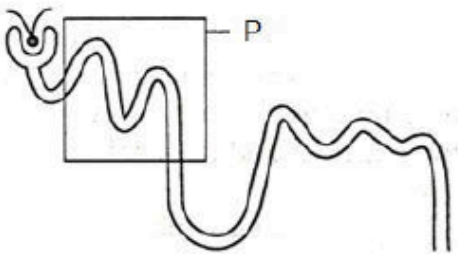
The graph shows the concentrations of lactic acid and oxygen in the blood of a seal before, during and after a dive.



What explains the change in lactic acid concentration during time **X**?

A increased lactic acid production
B increased blood flow to the muscles
C increased rate of aerobic respiration
D reduced rate of anaerobic respiration

20 The diagram below shows a nephron. Reabsorption of glucose and amino acids takes place in the section labeled P.



How is section P adapted to carry out its function?

A A high hydrostatic pressure is created at section P as the renal tubule becomes narrower.

B The cells lining the walls of the tubule at P have numerous mitochondria to release energy for active transport.

C The cells lining the walls of the tubule at P have numerous pores to help in passive transport only.

D The walls of the tubule at P is a few layers thick to ensure effective reabsorption.

21 Which of the following does not help to promote survival of an organism living in a dry environment?

A larger glomerulus

B longer large intestine

C longer loop of Henle

D more sebaceous glands in skin

22 How does the sweat glands and hair respond to an increasing body temperature?

	sweat glands	hair
A	Decreased production of sweat leads to greater heat loss by evaporation.	Hair lays down and allows heat to be lost easily via the skin surface.
B	Decreased production of sweat prevents greater heat gain from the environment.	Hair stands and creates a layer of air that prevents heat gain from environment.
C	Increased production of sweat leads to greater heat loss by evaporation.	Hair lays down and allows heat to be lost easily via the skin surface.
D	Increased production of sweat prevents greater heat gain from the environment.	Hair stands and creates a layer of air that prevents heat gain from environment.

23 Which of the following statements is not an example of homeostasis?

A Increase in the rate of expiration to remove excess carbon dioxide from the body.

B Sweating during strenuous physical activity.

C The conversion of excess blood glucose into glycogen for storage.

D The removal of undigested waste materials from the body.

24 A student touched a live electrical wire (with electricity running through it) with his hand and his fist immediately closed. Which of the following best explains this?

A Electricity removed the myelin sheath around his neurones and caused his hand muscles to contract.

B His pain receptors were stimulated and his fist closing was the result of a reflex action.

C Motor neurones were stimulated by the electricity and caused the contraction of his hand muscles.

D The electricity stimulated his heat receptors and the dilation of skin arterioles, causing his fist to close.

25 Which of the following does not describe the peripheral nervous system?

A It consists of cranial and spinal nerves.

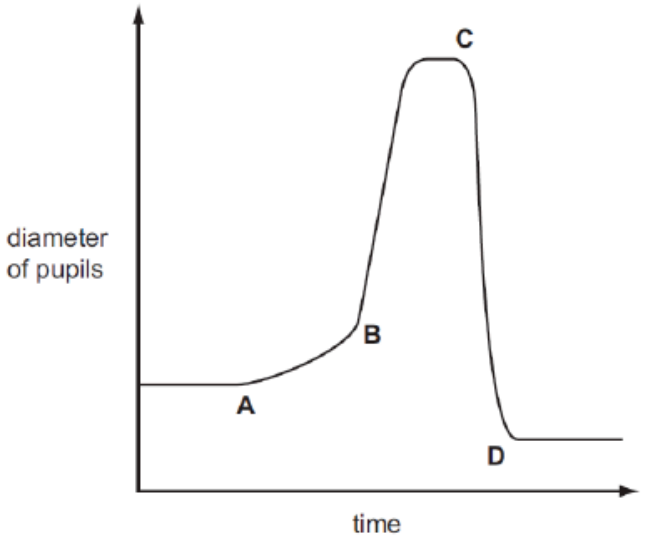
B It helps in the maintenance of body temperature.

C It sends nerve impulses to and from the central nervous system.

D It is capable of processing stimuli to bring about a reflex action.

26 The graph shows changes in the diameter of a person's pupils while outdoors on a sunny day.

At which time did the person take off a pair of sunglasses?



27 Adrenaline not only functions as a hormone in our body but can also be administered as a drug in life-saving situations. Under which condition(s) would the administration of adrenaline be useful?

1 low blood glucose concentration
2 low heart rate
3 low water potential of blood

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

28 Insulin is injected into a diabetic patient rather than taken orally. This is because insulin

1 can be broken down by the digestive enzymes.
2 will be destroyed by the body immune system.
3 cannot be absorbed in the small intestine.
4 can travel faster through the blood stream than through the lymphatic network.

Which statement(s) are correct?

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

29 The table shows information about flowers of three different plants.

flower characteristics	plant X	plant Y	plant Z
petal colour	white	purple	bright yellow
aroma	none	pungent smell	sweet smell
petal size	0.4 cm	10.2 cm	3.9 cm
nectar volume	none	medium amount	large amount

Which inference is valid about the method of pollination for plants X, Y and Z?

A All three plants are wind pollinated.

B All three plants are insect pollinated.

C Plant X is wind pollinated but plants Y and Z are insect pollinated.

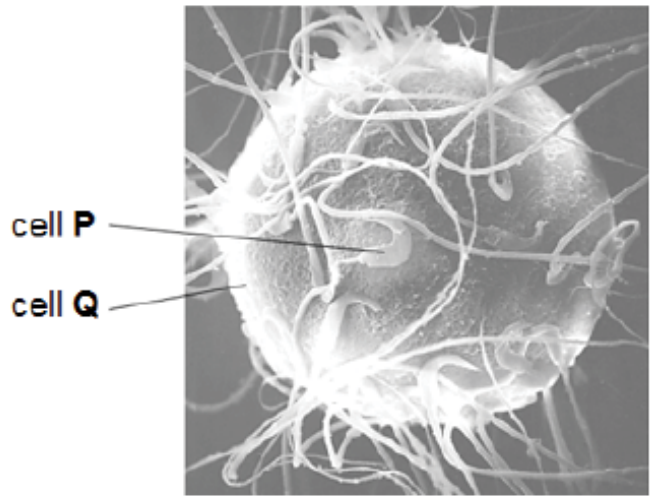
D Plants X and Y are insect pollinated but plant Z is wind pollinated.

30 An experiment was set up using four groups of insect-pollinated flowers in a field. In each group different parts of the flower were removed as shown below and insects were allowed to visit all the flowers.

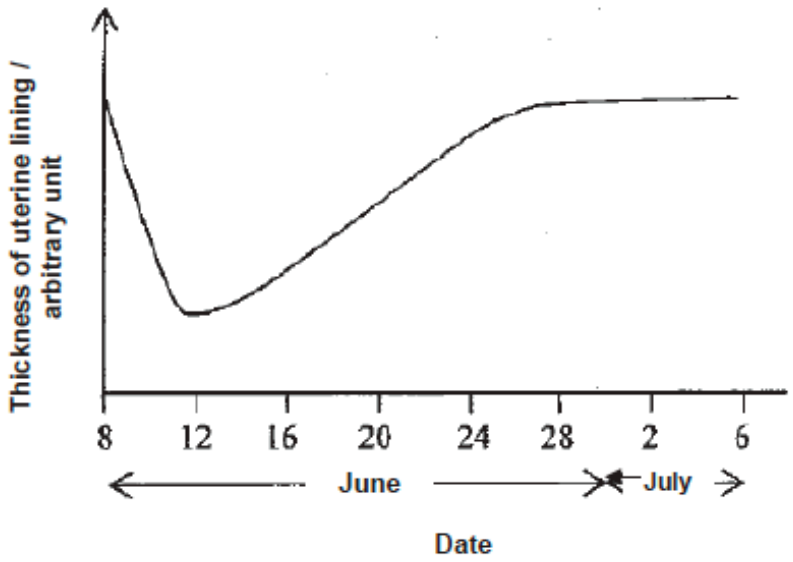
Which group would produce most seeds?

group of flowers	petals	stigmas	anthers
A	left	left	removed
B	removed	left	left
C	left	removed	removed
D	removed	removed	left

Questions **31** and **32** refer to the photomicrograph showing an event taking place in the oviduct.



31 The graph shows changes in the uterine lining of a woman from 8th June to 9th July.



Which date will the event in the above photomicrograph most likely take place?

A 10th June **B** 14th June

C 22nd June **D** 30th June

32 Which comparison between cells **P** and **Q** is correct?

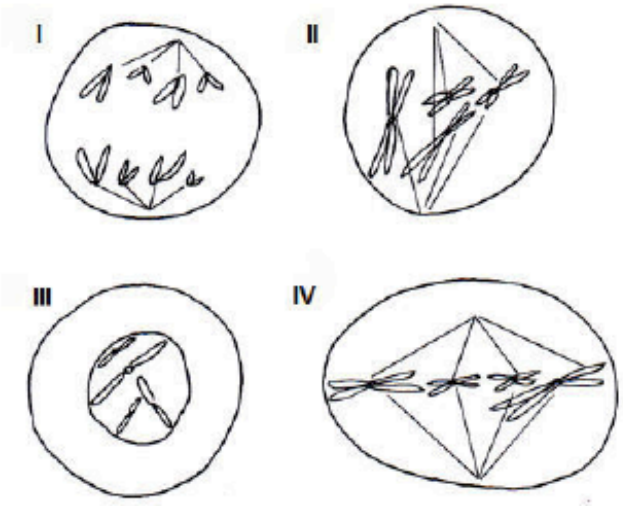
A Cells **P** and **Q** can undergo meiotic cell division.

B Cell **P** has a higher concentration of mitochondria than cell **Q**.

C Cell **P** has a smaller number of chromosomes than cell **Q**.

D Cells **P** and **Q** may contain either X or Y chromosomes.

33 The diagrams show four different stages of a type of cell division.



In which structure will the cell division shown above, will occur the slowest?

A in the anther sac

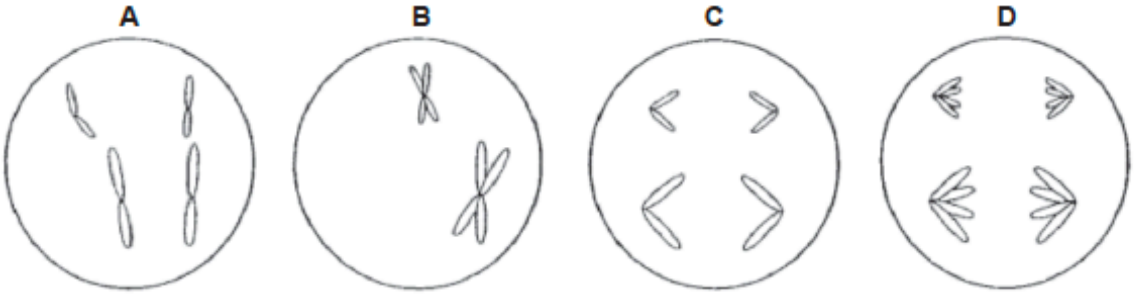
B in the bone marrow

C in mature cells of a petal

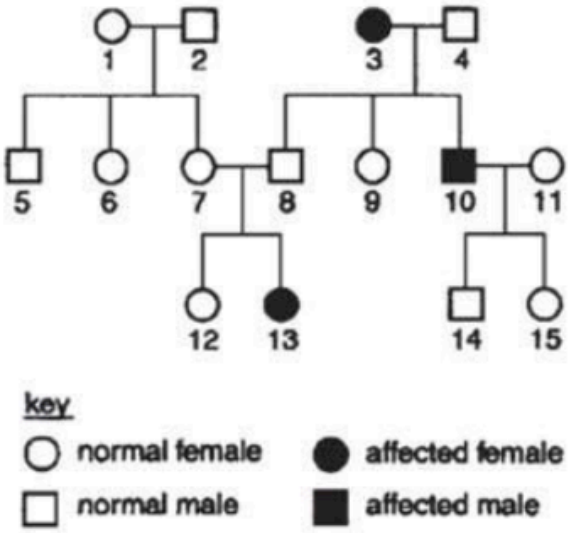
D in the root cap

34 The diagram represents the nucleus of a cell (where 2n = 4) in late prophase of meiosis.

Which diagram represents a cell of the same species in anaphase II of meiosis?



35 The pedigree chart below shows the inheritance of a recessive condition known as human albinism. Only homozygous recessive individuals are albinos.



What is the probability of individual 9 being a heterozygous carrier?

A 0.00
B 0.25
C 0.50
D 1.00

36 What describes two alleles of the same gene?

	relative position occupied on chromosome	characteristic controlled
A	different	different
B	different	same
C	same	different
D	same	same

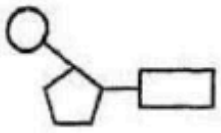
37 Which statements about homologous chromosomes are correct?

1 They form pairs during mitosis.
2 They are not present in all cells.
3 They contain identical genes and alleles.
4 X and Y sex chromosomes are not homologous chromosomes.
5 They are inherited from the different parents.
6 They are two chromatids that are joined together to form one chromosome.

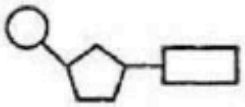
A 2 and 5
B 2, 3 and 5
C 1, 2 and 4
D 1, 3 and 6

38 What is the **correct** arrangement for the components in a nucleotide?

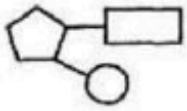
A



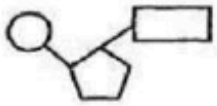
B



C



D



key


phosphate


sugar


base

39 Which statements about natural selection are **correct**?

	natural selection can lead to better adapted species surviving	natural selection can lead to extinction of a species	natural selection can lead to gene mutations occurring
A	true	true	true
B	true	true	false
C	true	false	true
D	false	true	true

40 In what order do the following processes occur to produce a population of bacteria that are resistant to a new antibiotic?

1 change in reproductive success of bacteria
2 increase in frequency of the resistance allele in the population
3 increase in genetic variation within the population
4 random mutation occurs in bacterial DNA

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