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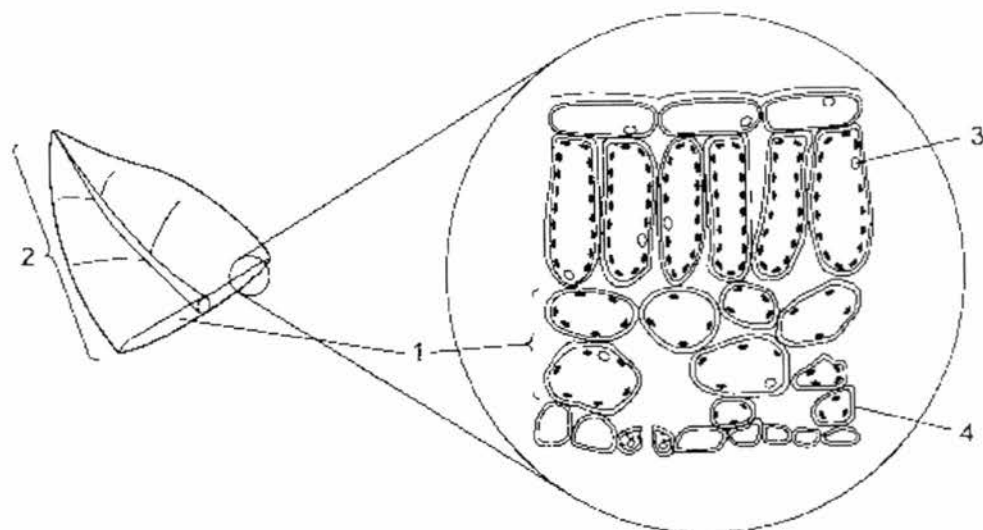
E

This document consists of **20** printed pages and 0 blank page.

Multiple Choice Questions [40 marks]

Choose the most appropriate option and shade your choice in the OAS provided.

- 1 The diagram shows the structure of a leaf.



Which labelled part identifies a cell, a tissue and an organ?

	cell	tissue	organ
A	3	2	4
B	1	4	3
C	4	1	2
D	2	3	1

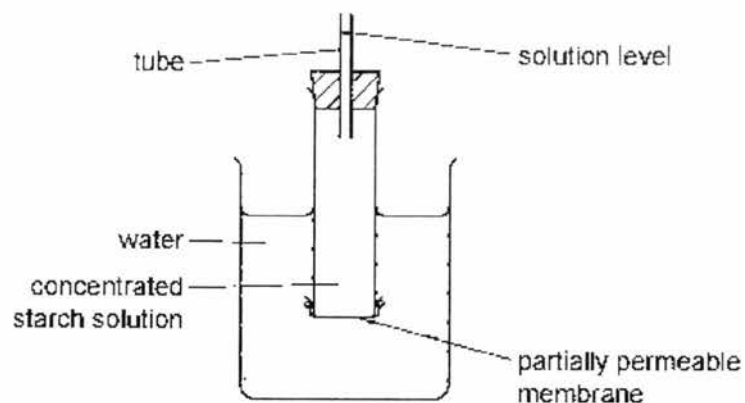
- 2 When mucus is secreted from a goblet cell in the trachea, these events take place.

- 1 addition of carbohydrate to protein
- 2 fusion of the vesicle with the plasma membrane
- 3 secretion of a glycoprotein
- 4 separation of a vesicle from the Golgi apparatus

What is the sequence in which these events take place?

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

- 3 The diagram shows an experimental set-up used to investigate osmosis.



Which molecules will move across the partially permeable membrane and which change will occur in the solution level?

	molecules	solution level
A	starch	fall
B	starch	rise
C	water	fall
D	water	rise

- 4 Some processes which occur in flowering plants are listed.

- 1 ion uptake by roots hairs
- 2 water uptake by root hairs
- 3 ion movement up the xylem in the stem
- 4 water vapour loss by the mesophyll cells of the leaves

Which processes are controlled by cell surface membranes?

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

- 5 Single-celled animals that live in fresh water have a vacuole that contracts regularly to remove excess water. Single-celled plants that live in fresh water do not have a similar vacuole.

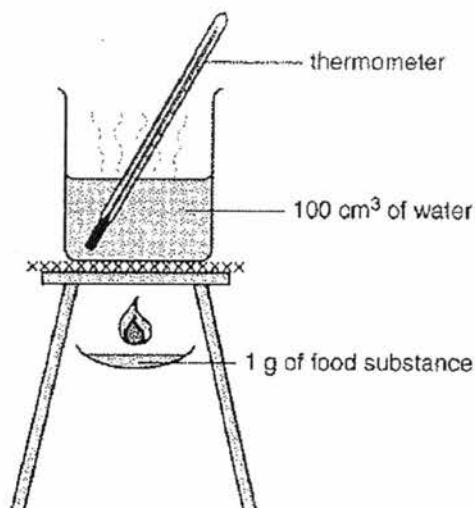
Which statement best explains why these animals need this vacuole but plants do not?

- A Plant cell cytoplasm and animal cell cytoplasm both have a lower water potential than fresh water.
- B Plant cell sap has the same water potential as fresh water, animal cytoplasm has a lower water potential than fresh water.
- C Plant cell walls are impermeable to water, animal cell surface membranes are permeable to water.
- D Plant cell walls restrict the entry of water, animal cell membranes allow the entry of water.
- 6 Two solutions, 1 and 2, one containing starch and sucrose, and the other containing glucose and protein, were tested with a variety of reagents to confirm their identity.

The table shows the conclusions from the results recorded for the various tests. Which row identifies the two solutions?

	add iodine solution		boil with Benedict's solution		boil with Benedict's solution after acid hydrolysis		add biuret solution		key
	1	2	1	2	1	2	1	2	
A	+	-	+	-	-	+	-	+	+ = biological molecule present - = biological molecule absent
B	-	+	+	-	+	-	+	+	
C	+	-	-	+	+	-	-	+	
D	-	+	+	-	+	+	+	-	

- 7 The apparatus shown can be used to compare the energy values of various food substances.

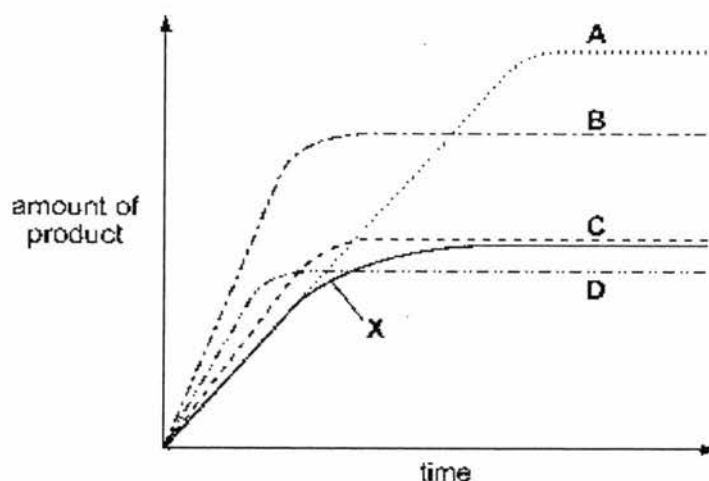


Which food substance would give the greatest rise in the temperature of water if 1 g of it were burnt?

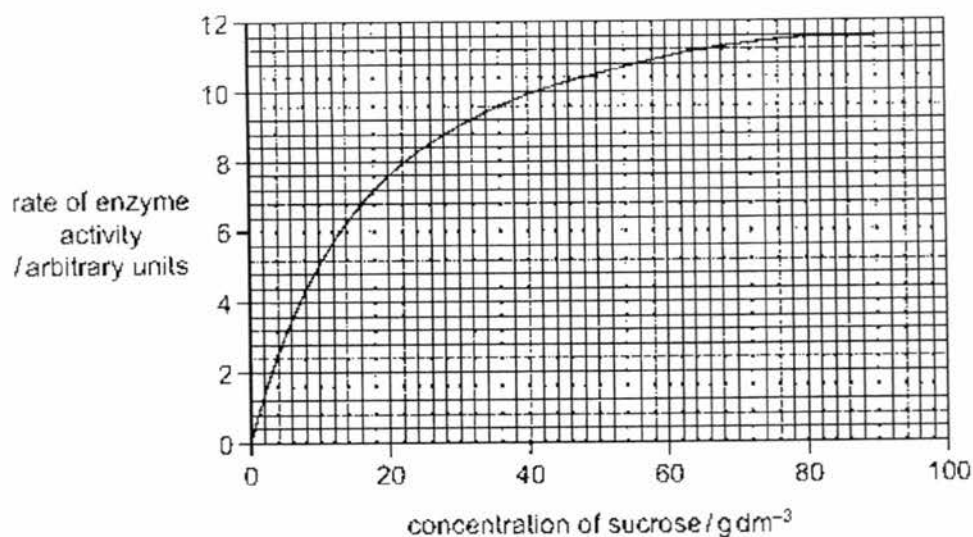
- | | | | |
|----------|-------------|----------|--------|
| A | beef | B | butter |
| C | cooked rice | D | potato |

- 8 The curve X shows the activity of an enzyme at 20 °C. Curves A, B, C and D show the effect of different conditions on the activity of the enzyme.

Which curve shows the effect of increasing the temperature by 10°C and adding extra substrate?



- 9 The graph shows the rate of activity of the enzyme sucrase plotted against the concentration of sucrose.



Why does the rate of enzyme activity remain constant from 80–90 g dm⁻³?

- A All the enzyme has been inhibited.
 - B All the substrate has been used up.
 - C The concentration of the enzyme is limiting the rate.
 - D The concentration of the substrate is limiting the rate.
- 10 Which processes take place in the mouth (buccal) cavity?

	chemical digestion	mechanical digestion	dissolving of nutrients
A	✓	✓	✓
B	✓	✓	x
C	✓	x	✓
D	x	✓	✓

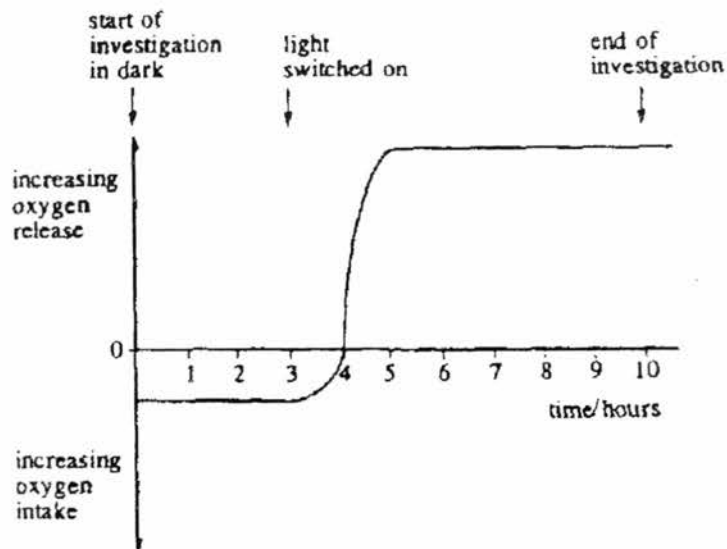
- 11 Which features make a villus well adapted for absorbing amino acids from the ileum?
- A large surface area, thin walls, lacteal
 - B large surface area : volume ratio, good blood supply, thin walls
 - C small surface area, good blood supply, lacteal
 - D small surface area : volume ratio, good blood supply, thin walls
- 12 The table shows the results of an investigation of the absorption of products of digestion in the presence and absence of oxygen.

product of digestion	absorption in the presence of oxygen / arbitrary units	absorption in the absence of oxygen / arbitrary units
amino acids	5.3	1.7
fatty acids	1.9	2.0
glucose	6.4	2.3
glycerol	4.8	4.7

Which conclusion can be drawn from these results?

- A All products of digestion are absorbed by both active transport and diffusion.
- B All products of digestion are absorbed by diffusion only.
- C Amino acids and glucose are absorbed by active transport only.
- D Fatty acids and glycerol are absorbed mainly by diffusion.

- 13 The graph shows the result of an investigation into oxygen release and oxygen intake by a green plant in different light conditions.



For how many hours did respiration and photosynthesis take place during the investigation?

	Respiration hours	Photosynthesis hours
A	3	5
B	3	6
C	4	7
D	10	7

- 14 For which processes do plants need either nitrate ions or magnesium ions?

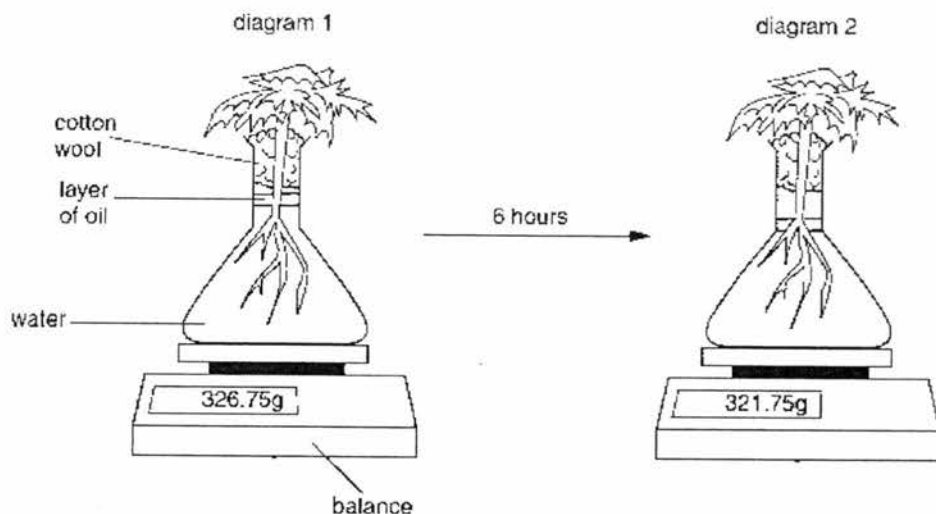
	synthesis of cellulose	synthesis of chlorophyll	synthesis of proteins
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✗
D	✗	✓	✓

key

✓ needed

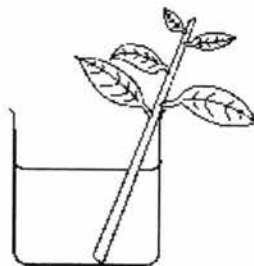
✗ not needed

- 15 The diagrams show a plant in a flask of water. It is left for six hours on a warm and windy day in bright sunshine.

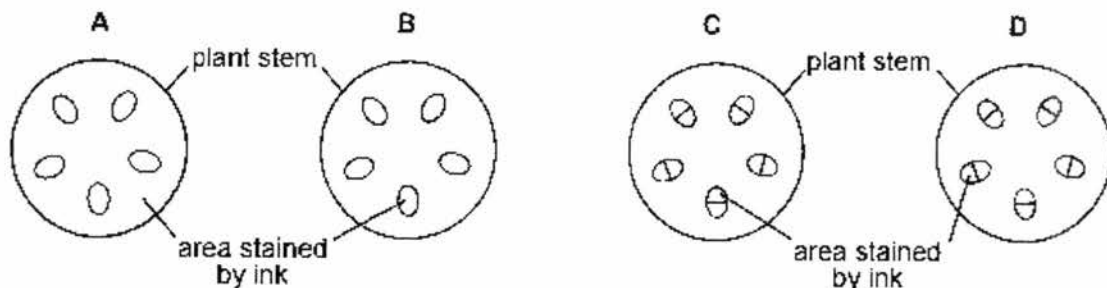


Which process explains the result shown in diagram 2?

- A active transport of water into the root hairs
 - B evaporation of water from the flask
 - C photosynthesis in the leaves of the plant
 - D transpiration from the leaves of the plant
- 16 A plant shoot is left in ink solution for several hours.



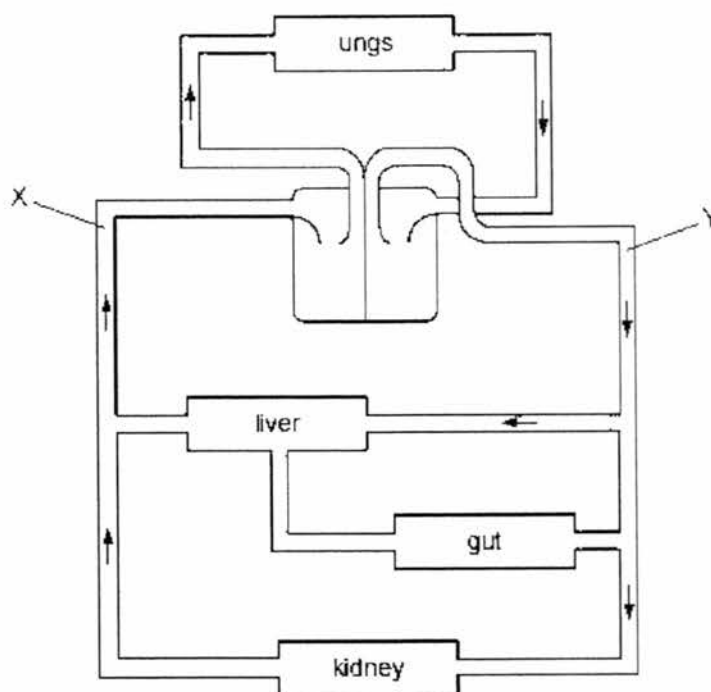
A section is cut through the stem. What would you see?



- 17 A young plant may wilt when dug up and re-planted in another place.

What causes this?

- A The leaves lose less water.
 - B The roots cannot take up mineral salts.
 - C The stem cannot transport water.
 - D The surface area of the root is reduced.
- 18 The diagram shows a plan of part of the circulatory system.



Which vessel must the blood pass through in flowing from X to Y?

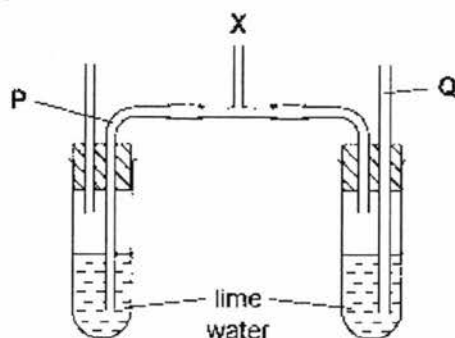
- A hepatic artery
- B hepatic portal vein
- C pulmonary artery
- D renal vein

- 19 The table shows the blood groups of four people and the type of blood each received in a transfusion

	Blood group under ABO system	Blood type received in transfusion
K	A	A
L	B	AB
M	AB	O
N	O	B

Which two people are at risk of agglutination?

- A K and L
 B K and M
 C L and N
 D M and N
- 20 The diagram shows apparatus used to investigate inspired and expired air. A person breathes in and out through tube X.



What are the carbon dioxide concentrations at P and Q?

	CO ₂ at P (%)	CO ₂ at Q (%)
A	16	20
B	0.04	4.00
C	4.00	0.04
D	20	16

21 Which word equation shows anaerobic respiration in yeast?

- A glucose $\rightarrow$ ethanol
- B glucose $\rightarrow$ ethanol + carbon dioxide
- C glucose $\rightarrow$ lactic acid
- D glucose $\rightarrow$ lactic acid + carbon dioxide

22 Some of the structures in the excretory system are listed.

- 1 bladder
- 2 ureter
- 3 urethra

In which order does a molecule of urea pass through these structures?

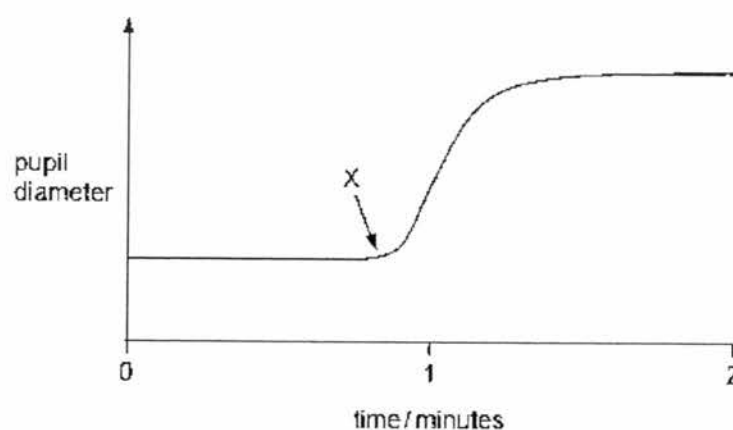
First $\longrightarrow$ Last

- A 1 2 3
- B 1 3 2
- C 2 1 3
- D 3 1 2

23 What are characteristics of all neurones?

	carry information within the brain	stimulate muscles or glands	transmit electrical impulses
A	✓	✓	x
B	✓	x	✓
C	x	✓	x
D	x	x	✓

- 24 The graph shows how the diameter of the pupil of a person's eye changed during the course of two minutes.



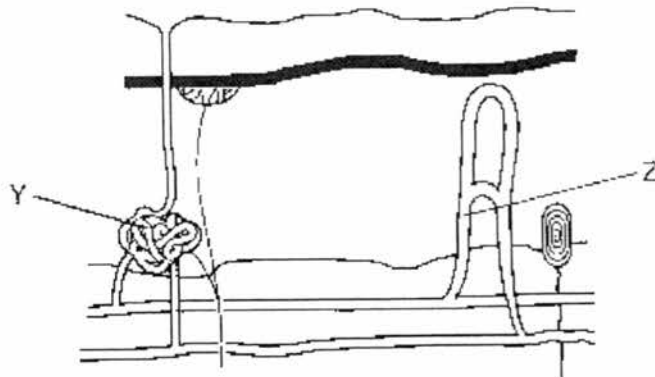
What happens to the light intensity at X and which muscles begin to contract?

	light intensity	iris muscles contracting
A	decreases	circular
B	decreases	radial
C	increases	circular
D	increases	radial

- 25 What are the cause, signs and symptoms and treatment for diabetes mellitus?

	cause	signs and symptoms	treatment
A	damaged pancreas cells	excess sugar in blood	adrenaline injections
B	damaged pancreas cells	sugar in urine	insulin injections
C	sugar in urine	damaged pancreas cells	insulin injections
D	sugar in urine	damaged pancreas cells	adrenaline injections

- 26 The diagram shows some of the structures in human skin.



Which labels describe the structures Y and Z in hot conditions?

	Y	Z
A	active	constricted
B	active	dilated
C	inactive	constricted
D	inactive	dilated

- 27 The main function of a flower is to _____.

- A** attract insects for pollination
- B** ensure genetic variation
- C** produce fruits and seeds
- D** protect the fruit

- 28 A male gamete leaves the pollen tube immediately after the pollen tube has entered which structure?

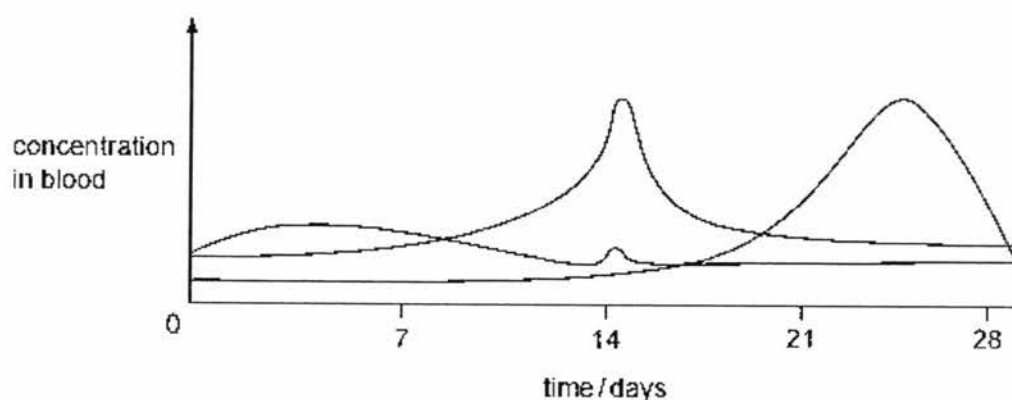
- A** ovary
- B** ovule
- C** stigma
- D** style

- 29 An insect carries pollen from one flower to another flower on the same plant.

What is the type of reproduction and what is the type of pollination in this plant?

	reproduction	type of pollination
A	asexual	cross-pollination
B	asexual	self-pollination
C	sexual	cross-pollination
D	sexual	self-pollination

- 30 The graph shows the concentration in the blood of three of the four hormones FSH, LH, oestrogen and progesterone.

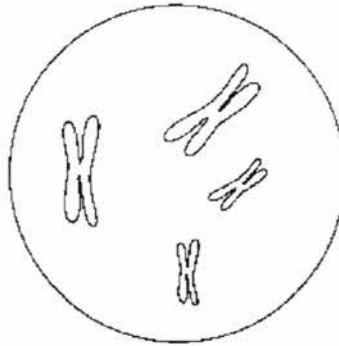


Which hormone is not shown?

- | | | | |
|----------|-----------|----------|--------------|
| A | FSH | B | LH |
| C | oestrogen | D | progesterone |
- 31 What are the conditions in a human cell just before the cell enters prophase?

	number of chromatids	number of molecules of DNA in nucleus	spindle present	nuclear envelope present
A	46	46	yes	no
B	92	46	no	yes
C	46	92	yes	yes
D	92	92	no	yes

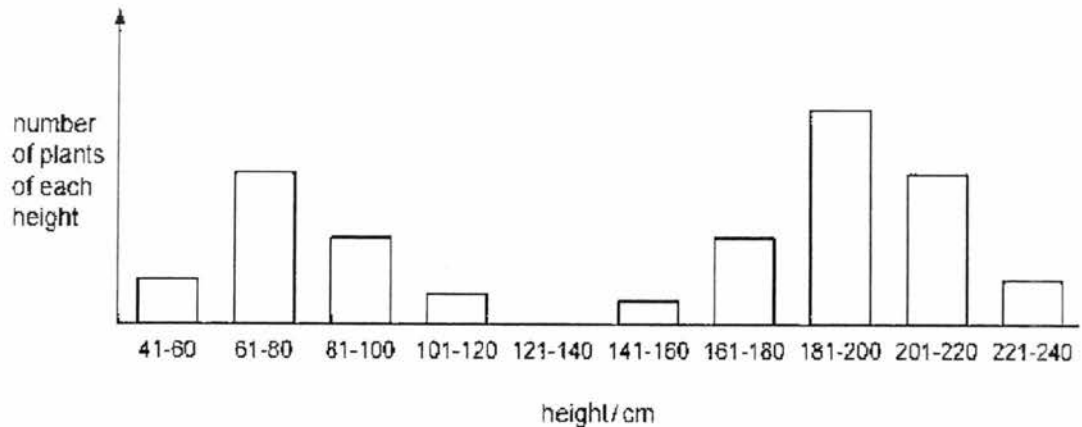
- 32 The diagram shows a cell nucleus in prophase of mitosis.



Which statement describes the chromosomes found in each daughter nucleus immediately following division of this cell by mitosis?

- A 2 chromosomes, each consisting of 2 chromatids
 - B 4 chromosomes, each consisting of 2 chromatids
 - C 8 chromosomes, each containing 1 molecule of DNA
 - D 4 chromosomes, each containing 1 molecule of DNA
- 33 The genotype for the height of an organism is written as Tt.
- What conclusion may be drawn?
- A The allele for height has at least two different genes.
 - B There are at least two different alleles of the gene for height.
 - C There are two different genes for height, each having a single allele.
 - D There is one allele for height with two different forms.

- 34 The heights of 500 pea plants of the same age were measured to the nearest 20 cm. The results are shown in the chart below.



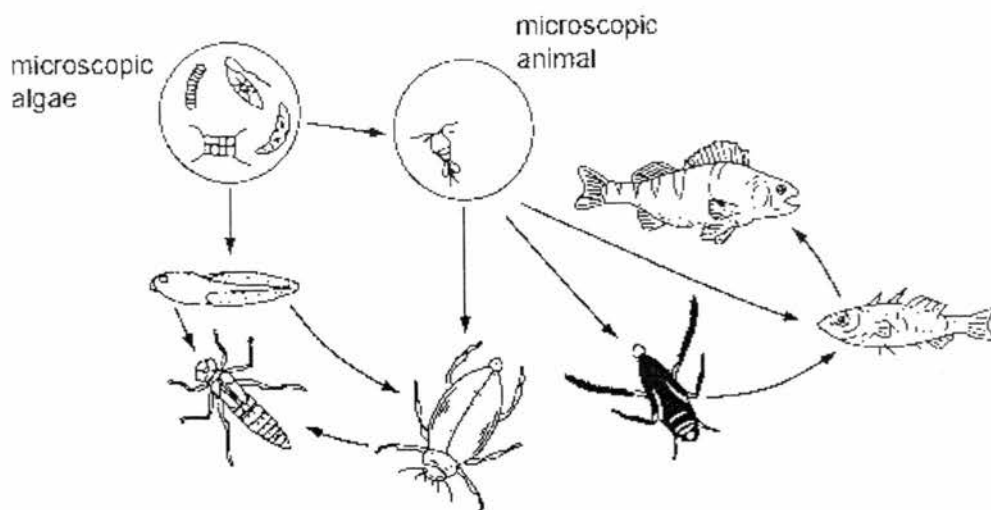
Variation in height of these pea plants shows

- A continuous variation only.
 - B discontinuous variation only.
 - C both continuous and discontinuous variation.
 - D neither continuous nor discontinuous variation.
- 35 In a genetic engineering experiment a piece of double-stranded DNA containing 6000 nucleotides is transcribed and translated.

What is the total number of amino acids used?

- | | |
|--------|--------|
| A 500 | B 1000 |
| C 2000 | D 3000 |
- 36 One gene provides the code for the production of which molecule?
- A amino acid
 - B DNA
 - C nucleotide
 - D polypeptide

- 37 The diagram below shows part of a pond food web.

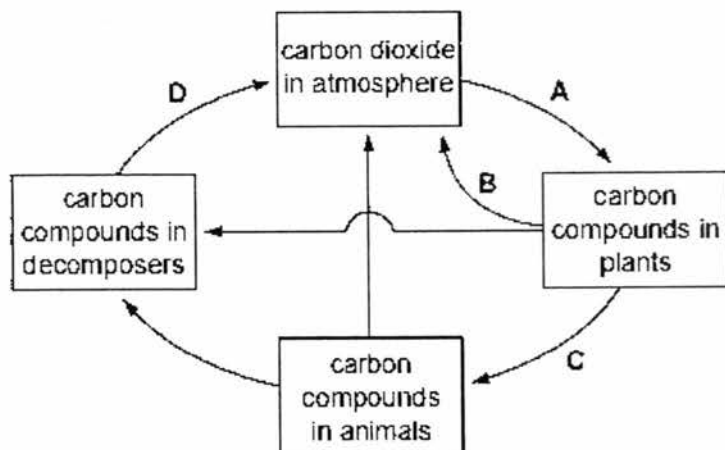


How many primary consumers are there?

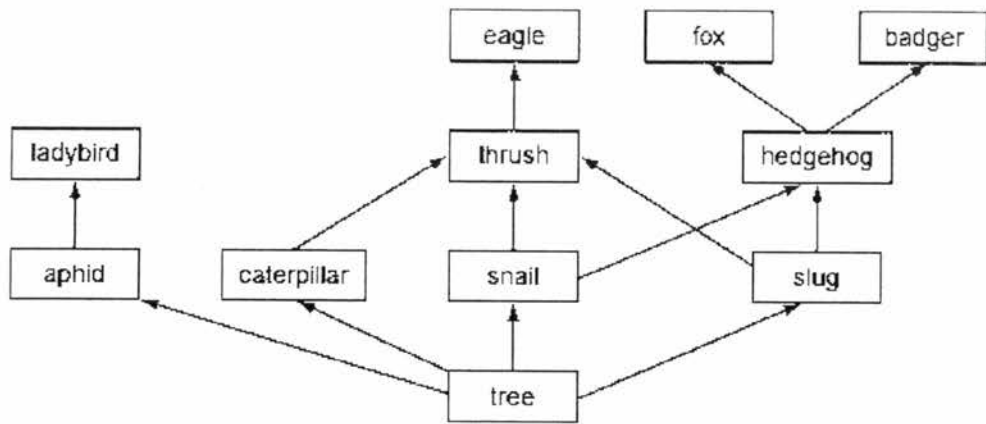
- A 1
C 3

- B 2
D 4

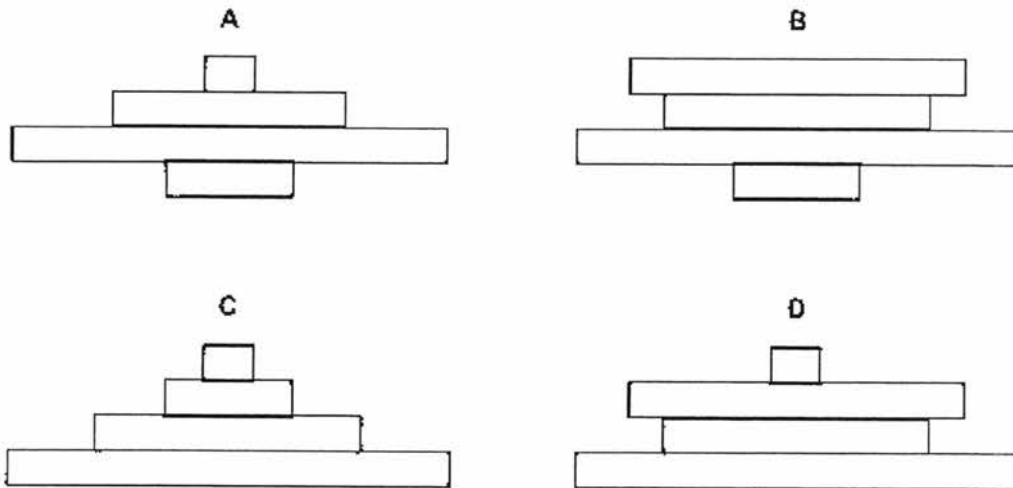
- 38 The diagram shows part of the carbon cycle. Which process causes the largest amount of carbon to be converted from one form to another?



39 The diagram shows part of a food web.



Which is a pyramid of numbers based on this food web?



- 40 A farmer sprays some fields with nitrogen fertilizers. Soon afterwards, the fertilizer is washed off by heavy rain into a nearby lake. Then, a few weeks later, most of the organisms in the water die.

The list includes the main stages that led to the death of the organisms.

- P Light is blocked from deeper water plants.
- Q Plants cannot photosynthesise and die.
- R Algae multiply rapidly on the lake surface.
- S Oxygen levels fall and aerobic organisms die.
- T Aerobic bacteria feed on dead plants.

In what order do these stages occur?

- A $P \rightarrow R \rightarrow T \rightarrow Q \rightarrow S$
- B $Q \rightarrow S \rightarrow P \rightarrow R \rightarrow T$
- C $R \rightarrow P \rightarrow Q \rightarrow T \rightarrow S$
- D $S \rightarrow T \rightarrow P \rightarrow Q \rightarrow R$

---- END OF PAPER ----

Name: Register no: Class:



NGEE ANN SECONDARY SCHOOL

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PRELIMINARY EXAMINATION

BIOLOGY

5158/02

Paper 2

2 August 2017

1 h 45 min

Additional Materials: **NIL**

Instructions to Candidates

Write your name, index number and class at the top of this page.

Write in dark blue or black ink.

You may use a pencil for any diagrams, graphs, tables or rough working.

The use of an approved scientific calculator is expected, where appropriate.

You may lose marks if you do not show your working or if you do not use appropriate units.

Section A:

Answer ALL questions.

Write your answers in the spaces provided on the question paper.

Section B:

Answer ALL the questions.

For question 11, choose 11 **EITHER** or 11 **OR**.

Write your answers in the spaces provided on the question paper.

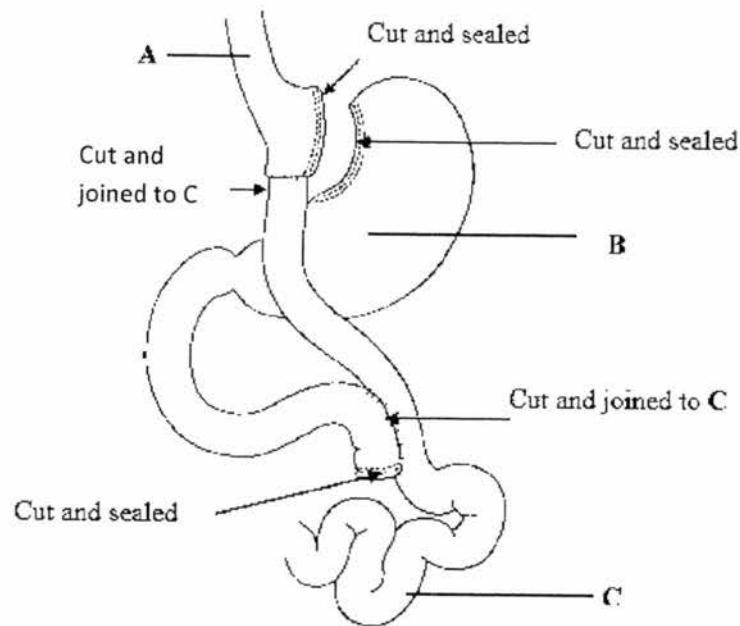
The number of marks is given in brackets [] at the end of each question or part question.

For Examiner's Use

Section	Marks
A	50
B	30
Total	80

Section A: Structured Questions (50 marks)
Write your answers in the spaces provided only.

- 1 Gastric bypass procedure is used to treat morbid obesity where there is severe accumulation of weight due to fatty tissue. The surgeon reduces the size of the stomach significantly and the duodenum is bypassed. The smaller, upper stomach is re-attached to C. The Roux-en-Y gastric bypass procedure is shown in Fig. 1.



Source: JACC@2008 American College of Cardiology Foundation

Fig. 1

- (a) Label the structures A and C.

A:

C:

[2]

- (b) On Fig. 1 above, mark with the letter Z, the location of the pancreas.

[1]

- (c) Explain the advantage (to a person who underwent the gastric bypass) of attaching the smaller, upper stomach to the lower end of C.

[2]

[Total: 5]

2. Fig. 2 shows a section of the lung.

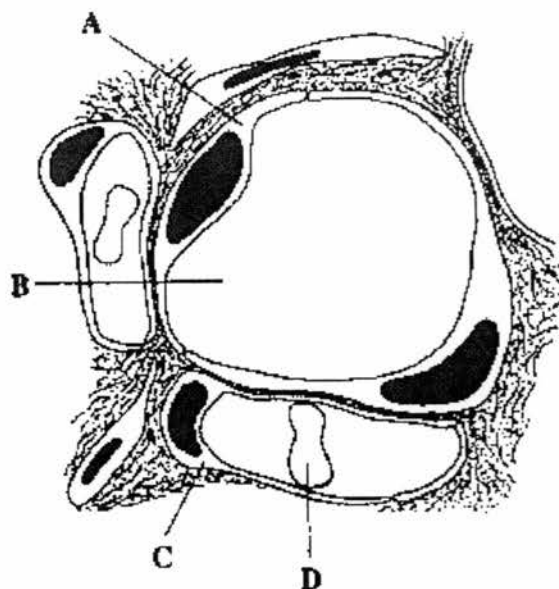


Fig. 2

- (a) Name and state the function of structure D.

[1]

- (b) Describe how **one** feature of structure B enables it to perform its function efficiently.

[2]

- (c) On Fig. 2, shade the structure that is broken down as observed in a person suffering from emphysema.

[1]

- (d) (i) Describe how emphysema affects the effectiveness of lung function.

[1]

- (ii) State one characteristic of a person suffering from emphysema.

[1]

[Total: 6]

3. Table 3 shows the concentration of certain substances found in the plasma of a patient suffering from kidney failure. Patients with kidney failure can be treated by dialysis.

Table 3

Fluid	Concentration		
	Sodium ions (mEq/L)	Glucose (mg/100 ml)	Urea (mg/100 ml)
Plasma	142	100	200
Dialysis fluid			

- (a) Complete Table 3 to show the approximate concentrations for the substances present in the dialysis fluid. [3]

An alternative method of treatment is by peritoneal dialysis. Fig. 3 shows the procedure for peritoneal dialysis.

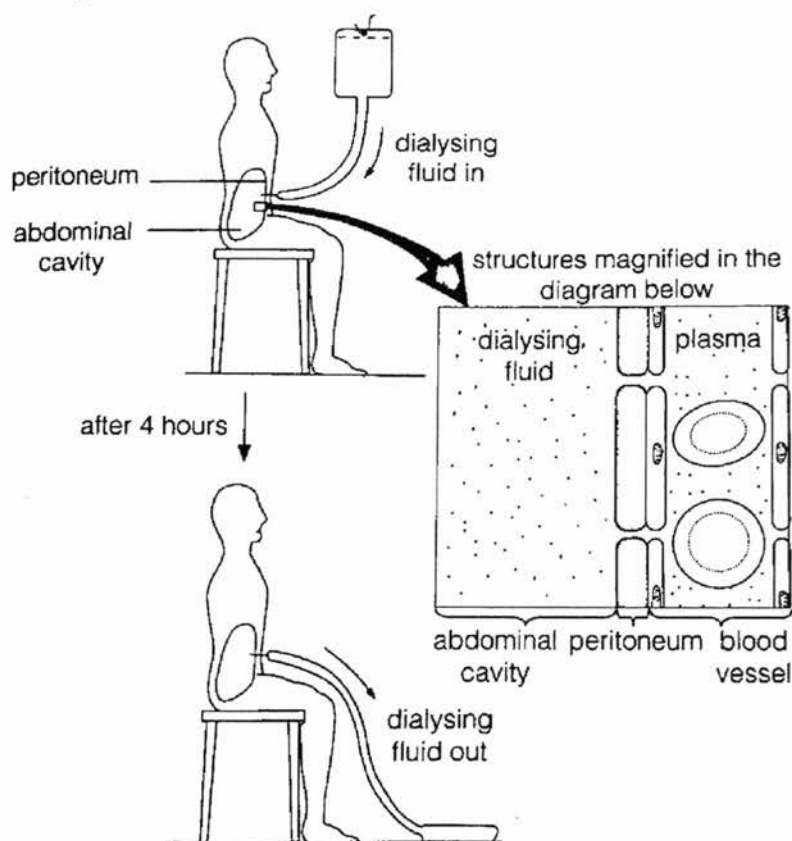


Fig. 3

- (b) Suggest why the dialysis fluid has to remain in the abdominal cavity for about 4 hours before it is removed from the body.

[1]

- (c) Explain why it is important for the patient to avoid excessive intake of proteins.

[2]

[Total: 6]

4. Fig.4 illustrates the principles of homeostasis.

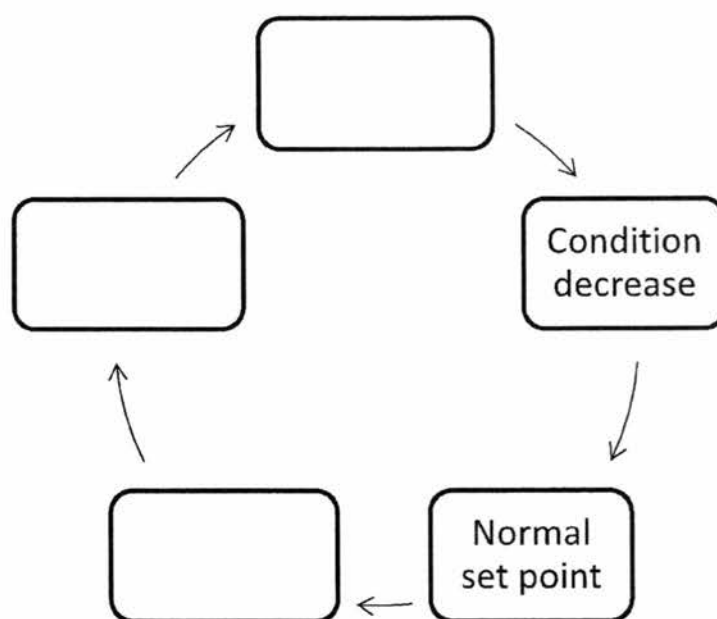


Fig. 4

- (a) Fill in the boxes in Fig. 4 with the appropriate terms. [1]
- (b) Use a dotted, labelled arrow (-->) to show where negative feedback takes place in Fig. 4. [1]
- (c) State one example, other than body temperature, that is under homeostatic control in a mammal.

[1]

- (d) Explain why the homeostatic control of the example given in (c) is essential for survival of the mammal.

[2]

[Total: 5]

5. Fig. 5 shows the leg of a person sitting with the foot clear off the ground. If a sharp tap is applied at X, the lower leg swings forward involuntarily.

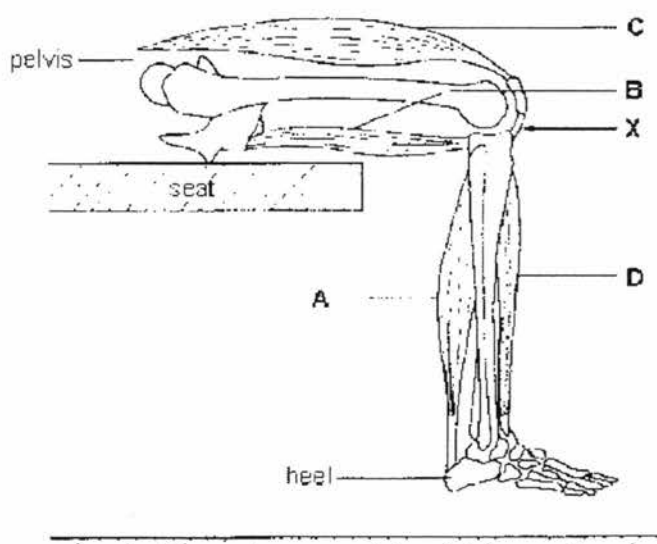


Fig. 5

- (a) (i) With reference to Fig. 5, describe the pathway of nerve impulses from the sharp tap to the movement of the leg.

[4]

- (ii) If the spinal cord is cut through near the chest, this reflex action will still take place. Suggest where the reflex centre is.

_____ [1]

- (b) Another involuntary response occurs when a person is in the state of 'fight or flight'.

- (i) Name the hormone that the body releases, when in such a state.

_____ [1]

- (ii) Describe and explain the changes in the eye when the above hormone is released.

_____ [2]

[Total: 8]

6. Fig. 6.1 shows graphs of two hormones involved in the control of the human menstrual cycle. The concentration of each plasma hormone was plotted over an interval of 30 days.

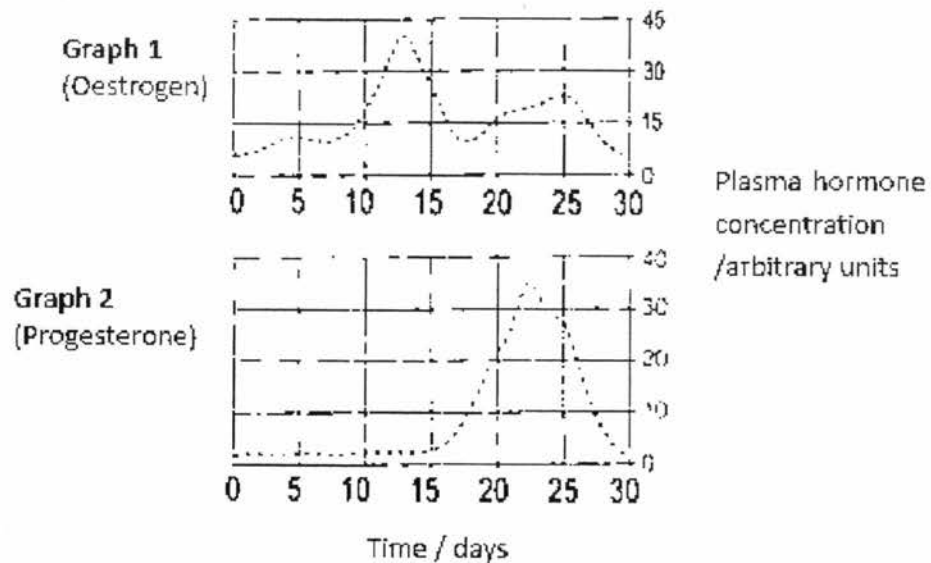


Fig. 6.1

- (a) Predict a day in the next cycle when implantation might occur, if a woman were to become pregnant. Explain your answer with reference to Fig. 6.1, graph 2.

[2]

Fig. 6.2 shows the sequence of events in the development of a follicle into a corpus luteum.

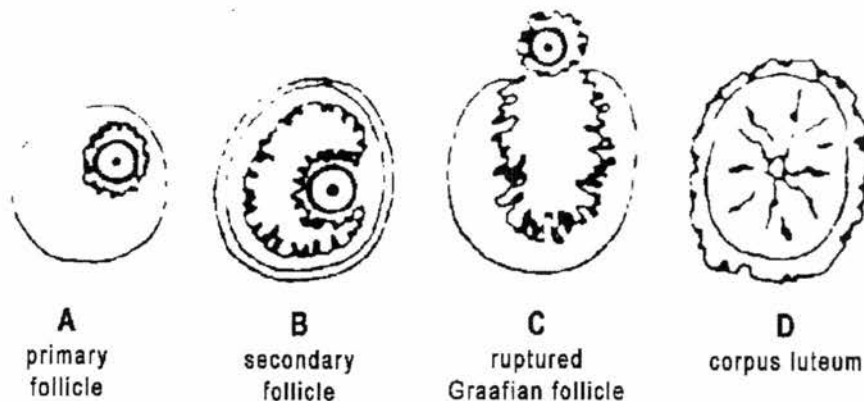


Fig. 6.2

- (b) (i) Which two stages in Fig. 6.2, from **A** to **D**, would you expect to find in the ovary of a woman during the early stages of pregnancy? Explain your answer in terms of hormonal changes.

[3]

- (ii) Name the structure in plants that is equivalent to the structure shown in Fig. 6.2, stage **B**.

[1]

[Total: 6]

7. Fig. 7.1 represents four genes on a part of the X chromosomes from a body cell of a woman.

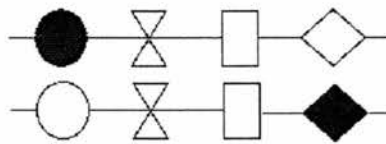


Fig. 7.1

- (a) (i) In the space below, draw these genes as they might appear in one of her ova.

[1]

- (ii) Name the process by which the ova is produced.

[1]

- (b) Fig. 7.2 shows the same section of an X chromosome in another cell of the same person in which the structure of one of the genes has been changed.

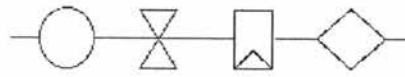


Fig. 7.2

- (i) State the name given to such a change in the gene.

[1]

- (ii) Suggest a possible cause of such changes in genes.

[1]

- (c) Fig. 7.3 shows the alleles of a person with blood group A

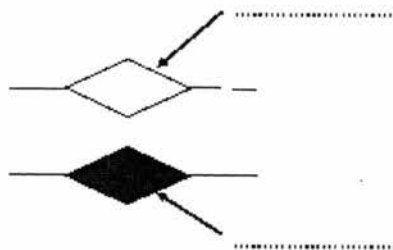


Fig. 7.3

- (i) Label the alleles in Fig 7.3 with the appropriate genetic symbols. [2]

- (ii) Describe the relationship between the alleles and blood group A.

[2]

[Total: 8]

8. Fig. 8 shows a food web which exists in the very cold waters of the Antarctic Ocean.

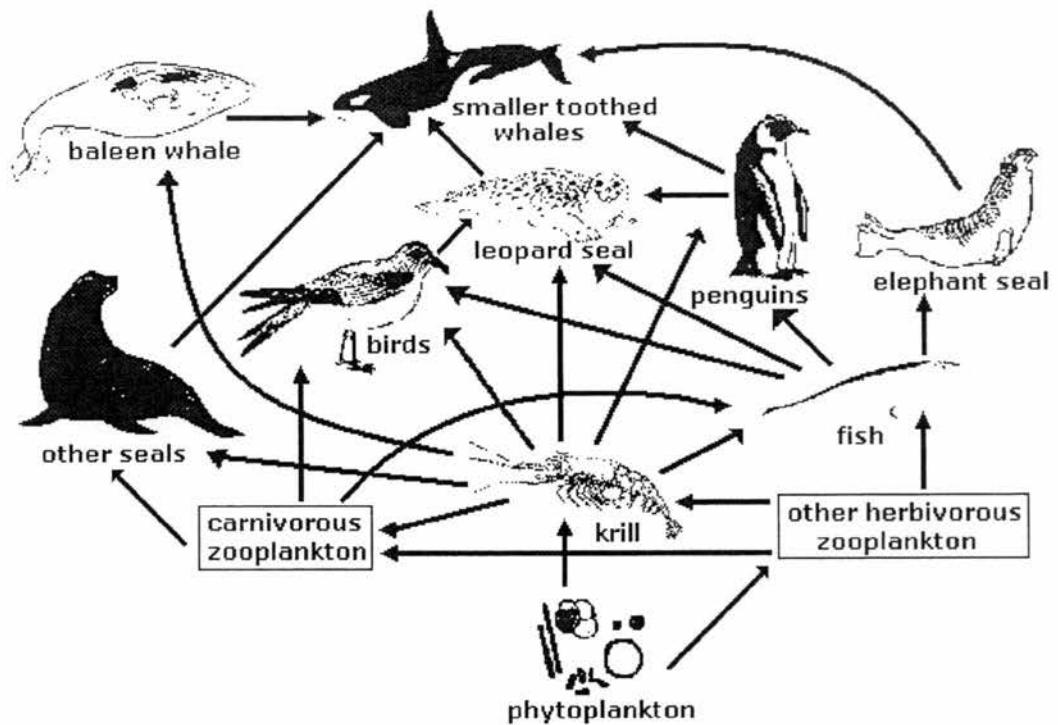


Fig. 8

- (a) In the food web, which one of the animals would you expect to find in the largest numbers? Give a reason for your answer.

[1]

- (b) Over the last few years there has been a gradual build-up of non-biodegradable pollutants in the waters of the Antarctic Ocean. Which one of the animals shown in Fig. 8 is likely to have the most pollutant in its body? Explain your answer.

[3]

- (c) Identify a food chain from Fig. 8, whereby the smaller toothed whales obtain the least amount of energy. Explain why this is so.

[2]

[Total: 6]

Section B: Open-Ended Questions (30 marks)Answer **three** questions in this section.Question 11 is in the form of an **Either/Or** question. Only one part should be answered.

9. The table shows the time taken for mammalian cells to divide by mitosis at different temperatures.

Table 9

Temperature (°C)	3	10	15	20	25
Time taken for cell division in hours	14	6	4	3	2

- (a) Plot the data on the grid provided.

[3]

- (b) Describe the effect of temperature on cell division.

[1]

- (c) Starting with one cell at 25°C, how many cells would there be after

2 hours: _____

8 hours: _____ [2]

- (d) Suggest some factors (other than cell organelles) that the mammalian cell requires for cell division to occur and provide an explanation for your choices.

_____ [4]

[Total: 10]

10. (a) Outline how enzymes are made and secreted out of the cell.

_____ [3]

- (b) Briefly describe the practical test for the biological molecule, enzyme.

_____ [2]

(c) Compare between enzymes and hormones.

[5]

[Total: 10]

11. Either

- (a) With reference to photosynthesis, explain the term limiting factor.

[5]

- (b)** Describe how dissolved mineral salts from the soil reach a mesophyll cell.

[5]

[Total: 10]

11. OR

- (a)** Outline how bacteria is used to produce human insulin.

[5]

- (b)** Describe, with examples, the transfer of dissolved materials from the blood to the cells of the body.

[5]

[Total: 10]

--- END OF PAPER ---

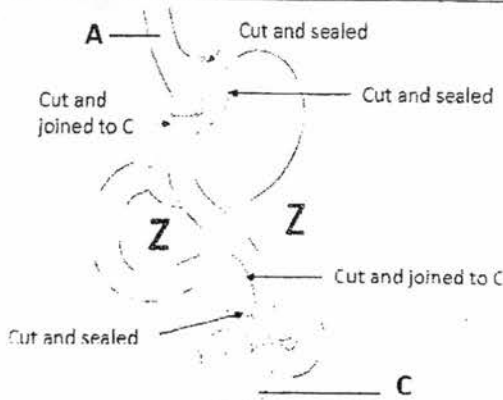
2017 SEC4 PRELIM PURE BIO ANS

Section A

1	C	2	A	3	D	4	C	5	B
6	C	7	B	8	B	9	C	10	A
11	B	12	D	13	D	14	D	15	D
16	C	17	D	18	C	19	C	20	C
21	B	22	C	23	D	24	B	25	B
26	B	27	C	28	B	29	D	30	C
31	D	32	D	33	B	34	C	35	B
31	D	32	B	33	C	34	B	35	D
36	D	37	B	38	A	39	A	40	C

ANSWERS

Section A

1	(a)	A: Oesophagus [1] C: Small intestine/jejunum/ileum [1]															
	(b)																
	(c)	• Smaller stomach → Less digestion of proteins → less absorption of amino acids → Less weight gain → feel full faster → eat less food → less chance of putting on weight • Shorter upper small intestine → less digestion of protein/fats/carbohydrates → less absorption → less weight gain (Any 2)															
2	(a)	Red blood cell transports oxygen around the body [1]															
	(b)	• B has one cell thick/thin walls [1] which reduced the distance for diffusion to occur. [1] OR • B is near/surrounded by blood capillaries [1] this maintains the diffusion gradient for the efficient exchange of gases. [1] OR • Thin film of moisture lining the inside of B [1] allows oxygen to dissolve [1] and diffuse into the blood stream.															
	(c)	Shade on alveolar wall [1] (walls of structure B)															
	(d)	<u>Decrease in surface area</u> available → Less oxygen is taken up by blood / less carbon dioxide removed [1]															
	(i)	Accepted: Reduced efficiency of gaseous exchange															
	(ii)	Breathlessness/ wheezing/ gasping for air [1]															
3	(a)	<table border="1"> <thead> <tr> <th rowspan="2">Fluid</th> <th colspan="3">Concentration</th> </tr> <tr> <th>Sodium ions (mEq/L)</th> <th>Glucose (mg/100 ml)</th> <th>Urea (mg/100 ml)</th> </tr> </thead> <tbody> <tr> <td>Plasma</td> <td>142</td> <td>100</td> <td>200</td> </tr> <tr> <td>Dialysis fluid</td> <td>142 +/- 12</td> <td>100 +/- 5</td> <td>0</td> </tr> </tbody> </table>	Fluid	Concentration			Sodium ions (mEq/L)	Glucose (mg/100 ml)	Urea (mg/100 ml)	Plasma	142	100	200	Dialysis fluid	142 +/- 12	100 +/- 5	0
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	(b)	To allow sufficient time for <u>urea</u> and excess mineral salts (<u>or waste materials</u>) to <u>diffuse</u> out of blood plasma into dialysis fluid. [1] Removal of substances / exchange of substances – not accepted Must state that diffusion occurred during the dialysis, and which substances diffused.															

	(c)	<u>Excess proteins</u> de-aminated / converted to <u>urea</u>, thereby increasing the concentration of urea in the blood. [1] Dialysis fluid needs to be changed more frequently / less efficient as concentration gradient reduced / more rounds of treatment needed / more time required for dialysis to remove urea [1]							
4	(a) (b)	<pre> graph LR Stimulus --> Receptor Receptor --> NF[Negative Feedback] NF --> CondDec[Condition decrease] CondDec --> CM[Corrective mechanism] CM --> Receptor subgraph Bottom Stimulus2[Stimulus] NSP[Normal set point] end </pre>							
	(c)	Blood glucose level / concentration; Water potential of blood; Carbon dioxide / pH							
	(d)	<table border="1"> <tr> <td>Blood glucose level / concentration;</td><td> Glucose required for respiration to provide cells with energy [1] Low levels of glucose might cause lack of energy / loss of consciousness / dizziness; High levels of glucose might affect blood pressure / damage to organs / glucose in urine [1] <i>Many students incorrectly wrote that high levels of glucose would cause diabetes.</i> </td></tr> <tr> <td>Water potential of blood</td><td> Water potential of blood will affect composition of tissue fluid / osmotic concentration of cells / affect vital cell activities [1] Low water potential of tissue fluid would result in cells to crenate / high water potential would result in cells bursting [1] <i>Water potential affecting blood pressure was not accepted, which was a common answer</i> </td></tr> <tr> <td>Carbon dioxide / pH</td><td> The pH of blood plasma and tissue fluid is affected [1] Enzyme reactions will be affected, as enzymes have an optimum pH [1] </td></tr> </table>	Blood glucose level / concentration;	Glucose required for respiration to provide cells with energy [1] Low levels of glucose might cause lack of energy / loss of consciousness / dizziness; High levels of glucose might affect blood pressure / damage to organs / glucose in urine [1] <i>Many students incorrectly wrote that high levels of glucose would cause diabetes.</i>	Water potential of blood	Water potential of blood will affect composition of tissue fluid / osmotic concentration of cells / affect vital cell activities [1] Low water potential of tissue fluid would result in cells to crenate / high water potential would result in cells bursting [1] <i>Water potential affecting blood pressure was not accepted, which was a common answer</i>	Carbon dioxide / pH	The pH of blood plasma and tissue fluid is affected [1] Enzyme reactions will be affected, as enzymes have an optimum pH [1]	
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5	(a)	• <u>Receptor</u> at X detects the stimulus • Nerve impulse generated and <u>transmitted</u> by the <u>sensory neurone</u> • Across a <u>synapse</u> to a relay neuron • Across a synapse to a <u>motor neuron</u> • Which transmits the signal to the <u>effector muscle / muscle C</u> which contracts to swing the leg forward.							
	(ii)	lower part or base of spinal cord / spinal cord [1]							
	(b)	(i) Adrenaline [1]							
	(ii)	Radial muscles of the iris contract and the circular muscles of the iris relax [1]							

		Causing the pupil to dilate / enlarged / increase in size [1] to allow more light to enter and more information collected
6	(a)	ONE day, within the range of Day 19 – 23 [1] Graph 2 shows increase in level progesterone from Day 17 and peak at Day 23 (high levels of progesterone) to prepare the uterine lining for implantation [1]
	(b)	A and D; [1]
	(i)	If the woman is pregnant, the corpus luteum (D) will persist and continue to produce progesterone to maintain the thickness of the lining [1] High level of progesterone will inhibit FSH and LH which will prevent the development/growth of primary follicle (A) [1]
	(ii)	ovule
7	(a)	Either one strand
	(i)	(allow combinations that show crossing over)
	(ii)	meiosis
	(b)	(i) mutation
	(ii)	Exposure to ultraviolet rays/ radiation / (chemical) mutagens (mustard gas, ethidium bromide etc) / x-rays / errors in DNA replication
	(c)	(i) I^A and I^O
	(ii)	The alleles are alternative/different forms of the gene; [1] That codes for synthesis/formation of the polypeptide that form the antigen A on the red blood cell. [1]
8	(a)	Krill and It is a source of food for many animals in the trophic level above itself OR krill supports all other animals above its trophic level.
	(b)	Smaller toothed whales. [1] • Bioaccumulation occurs in the bodies of the consumer/organism as the non-biodegradable pollutants are <u>not excreted out</u>. [1] • Bioamplification/ biomagnification takes place when the pollutants are passed along the food chains, <u>increasing its concentration</u> in the bodies of the organisms along each trophic levels [1]
	(c)	Phytoplankton $\rightarrow$ 1^O consumer $\rightarrow$ 2^O consumer $\rightarrow$ 3^O consumer $\rightarrow$ smaller toothed whales [1] • In this food chain, the smaller toothed whales is at the highest trophic level, since there is only 10% of energy passed down / 90% energy lost from one trophic level to the next, at the 5th trophic level, there will be a very small amount of energy received by the smaller toothed whale through this food chain. [1]

Section B

ANSWERS	
9	(a)

Time taken for cell division to occur (hrs)

Temperature (°C)	Time taken for cell division (hrs)
4	13
10	6
15	4
20	3
25	2.5

		Correct axis & units [1] Correct plotting & scale [1] Best fit line [1]																								
	(b)	As temperature increases, the rate of cell division increases.[1] OWTTE																								
	(c)	2 hours: 2 cells [1] 8 hours: 16 cells [1]																								
	(d)	Glucose [1] – substrate for respiration to occur and produce energy [1] for chromosomes to move and arrange themselves Oxygen [1] - Required for aerobic respiration for the production of energy [1] Appropriate temperature [1] - Allow enzymes to function properly as enzymes will be inactive at low temperatures and denatured at high temperatures[1] (max 4)																								
10	(a)	Synthesis at ribosome attached on the rough endoplasmic reticulum (rER); [1] transported from the rER in vesicles to the golgi apparatus for modification; [1] Packaged into secretory vesicles, fuse to cell membrane and released outside of the cell. [1]																								
	(b)	Add 2cm ³ of sodium hydroxide solution to 2cm ³ of sample in a test tube and shake thoroughly and then copper (II) sulfate solution drop by drop [1] OR 2cm ³ of biuret solution to 2cm ³ of sample; [1] Solution with change from blue to violet [1]																								
	(c)	<table border="1"> <thead> <tr> <th>Enzymes</th><th>Hormones</th></tr> </thead> <tbody> <tr> <td colspan="2">Both are effective in small amounts</td></tr> <tr> <td colspan="2">Both maintain homeostasis</td></tr> <tr> <td>Enzymes are always proteins</td><td>Hormones may be proteins, short peptides or steroids.</td></tr> <tr> <td>Enzymes are generally highly specific.</td><td>Hormones have a range of effects, acts on different tissues and/or organs.</td></tr> <tr> <td>Enzymes are secreted out through a duct from one location to another From exocrine gland</td><td>Hormones are released directly into the bloodstream From endocrine gland</td></tr> <tr> <td>Enzymes catalyse a reaction.</td><td>Hormones initiates a biochemical reaction.</td></tr> <tr> <td>Enzymes act quickly Short-term effect</td><td>Some hormones are quick acting, while some are slow acting with a lag period. Long term effect.</td></tr> <tr> <td>Enzymes work at a specific location.</td><td>Hormones are distributed throughout the body, where they may exert their effects upon a number of different target tissues.</td></tr> <tr> <td>Enzyme speeds up a reaction</td><td>Hormones regulate a metabolic process.</td></tr> <tr> <td>Enzymes are unchanged at the end of a reaction.(They are not used up in metabolic functions)</td><td>Hormones are changed in structure after the reaction. (They are destroyed after metabolic functions.)</td></tr> <tr> <td>Enzymes catalyse reversible reactions.</td><td>Hormones controlled reactions are not reversible.</td></tr> </tbody> </table> Must have mixture of similarities and differences	Enzymes	Hormones	Both are effective in small amounts		Both maintain homeostasis		Enzymes are always proteins	Hormones may be proteins, short peptides or steroids.	Enzymes are generally highly specific.	Hormones have a range of effects, acts on different tissues and/or organs.	Enzymes are secreted out through a duct from one location to another From exocrine gland	Hormones are released directly into the bloodstream From endocrine gland	Enzymes catalyse a reaction.	Hormones initiates a biochemical reaction.	Enzymes act quickly Short-term effect	Some hormones are quick acting, while some are slow acting with a lag period. Long term effect.	Enzymes work at a specific location.	Hormones are distributed throughout the body, where they may exert their effects upon a number of different target tissues.	Enzyme speeds up a reaction	Hormones regulate a metabolic process.	Enzymes are unchanged at the end of a reaction.(They are not used up in metabolic functions)	Hormones are changed in structure after the reaction. (They are destroyed after metabolic functions.)	Enzymes catalyse reversible reactions.	Hormones controlled reactions are not reversible.
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11		EITHER
	(a)	Factors that affect photosynthesis - Light intensity, temperature and carbon dioxide [1] Factor in shortest supply is the limiting factor [1] (Limiting factor is the factor that <u>directly affects</u> the rate of photosynthesis when its quantity is changed /the one in shortest supply) Factor + Explanation: Light intensity – As light intensity increases, the rate of photosynthesis increases; When the rate of photosynthesis remains constant even when light intensity is increased, light is no longer the limiting factor; <i>Some other factor becomes limiting e.g. carbon dioxide and temperature</i> Carbon dioxide concentration – increased concentrations will greatly increase the rate of photosynthesis (at same light intensity) Temperature – at high concentrations of CO₂, increasing temperature will cause a large increase in the rate of photosynthesis (max 3marks for explanation)
	(b)	• Dissolved mineral salts enters the root hair cell by active transport when concentration is lower in the soil; • By diffusion when concentration in the soil solution is high; • water carrying the mineral salts move from the root hair cell to inner cells of the root by osmosis; • Move up to the leaf by root pressure, capillary action and transpiration stream/pull; • evaporation of water from the mesophyll cell causes the cell to have a lower water potential, • Thus <u>drawing the water from the xylem</u> as it moves by osmosis from a region of higher water potential to the mesophyll cells which have a lower water potential. (max 5)
		OR
11	(a)	• cut out gene for insulin from the human genome/chromosome using restriction enzyme; • cut a bacterial plasmid using the same restriction enzyme to produce complementary sticky ends; • mix plasmid with insulin gene to allow complementary base-pairing to occur; • Add DNA ligase to ligate/join/seal the insulin gene to the plasmid; • Apply heat/electric shock to allow the recombinant plasmid to enter the bacteria; • Transgenic bacteria will make human insulin (max 5)
	(b)	• Occurs in the capillaries; • High blood pressure at the arterial end of the capillary forces; • the blood plasma out through the one-cell thick capillary walls; • Forms tissue/interstitial fluid containing dissolved substances around the body cells. • Dissolved substances such as glucose, amino acids and oxygen will be present in the tissue fluid; • Glucose, amino acids and oxygen will diffuse from the tissue fluid into the surrounding cells. (max 5)