

Class	Index Number	Name
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**PRELIMINARY EXAMINATION TWO
SECONDARY FOUR**

BIOLOGY

Paper 1

Additional Materials:

OTAS

5158/01

29 Aug 2016

1 hour

INSTRUCTIONS TO CANDIDATES

Write in soft pencil.

Write your name, class and index number on the Answer Sheet.

There are forty questions on 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 answer in soft pencil on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this question paper.

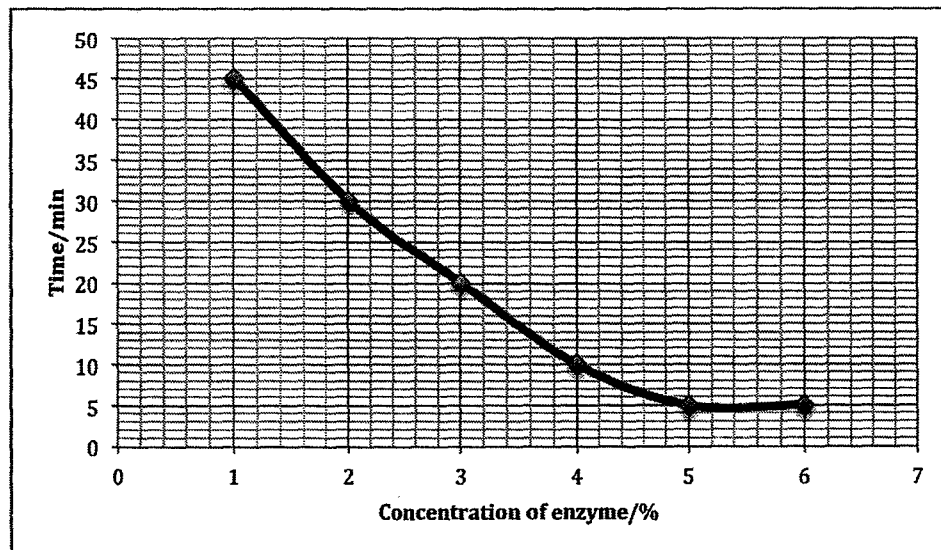
The number of marks is given in brackets [] at the end of each question or part question. The total number of marks for this paper is 40.

At the end of the examination, hand in the following separately:

(1) Optical Test Answer Sheet (OTAS)

(2) Question Paper

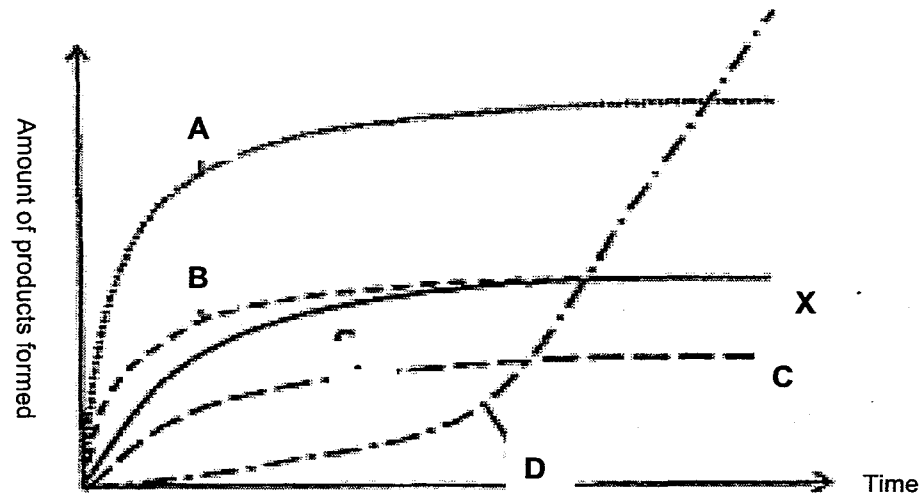
- 1 Which of the following organelles is not involved in the synthesis of lipases in an intestinal cell?
- A golgi apparatus
 B smooth endoplasmic reticulum
 C nucleus
 D ribosomes
- 2 Which feature of xylem vessels allows them to have reduced resistance to water flow?
- A xylem vessels are thickened with lignin
 B xylem vessels are narrow
 C xylem vessels carry extra water as the plant grows
 D xylem vessels are empty without cross walls or protoplasm
- 3 Which of the following has glucose as a basic unit?
- A glucagon B glycogen
 C glycerol D glycine
- 4 The graph below shows the relationship between the concentration of enzyme and the time taken for the reaction to complete.



What is the limiting factor that results in graph XY?

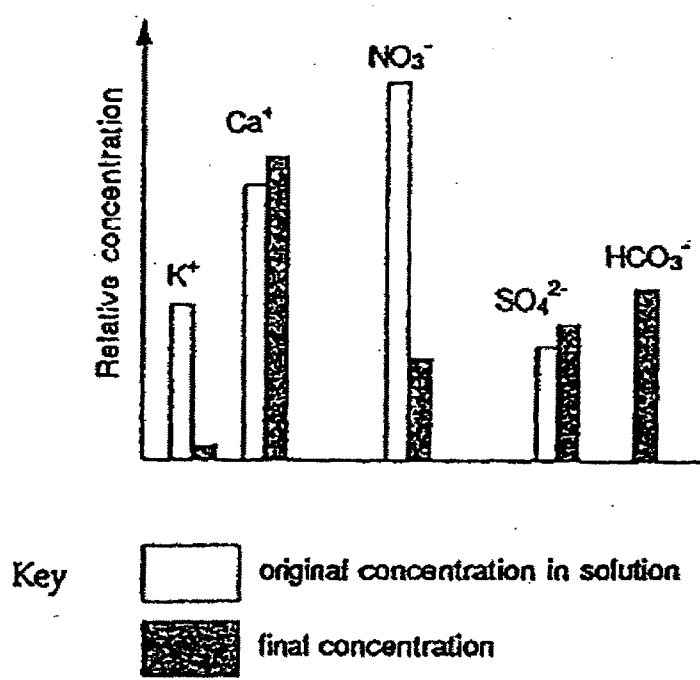
- A enzyme concentration
 B pH of the environment
 C substrate concentration
 D temperature of the environment

- 5 The graph below shows curve X which represents the activity of an enzyme X at 20°C.



- Which curve represents the activity when the temperature is raised to 35°C and enzyme concentration is increased?
- 6 The following blocks of agar were prepared and immersed in beakers filled with 100cm³ of methylene blue (a blue dye). Which of the blocks will take the longest time to turn completely blue?
- A 1 cm by 1 cm by 1 cm block
 B 1 cm by 1 cm by 2 cm block
 C 1 cm by 2 cm by 2 cm block
 D 1 cm by 2 cm by 3 cm block
- 7 The elderly are advised to get flu vaccinations every year. A different flu vaccine is produced every year. This is because
- A antibodies to the flu vaccine do not survive long in the blood
 B the body produces new antibodies to the flu virus
 C flu viruses mutate so quickly that vaccines against them become obsolete quickly
 D vaccines are unstable and cannot be stored for more than a year
- 8 Which process is an example of assimilation?
- A formation of carbon dioxide from glucose
 B formation of cell membrane from lipids
 C formation of sweat from blood plasma
 D formation of urea from excess amino acids

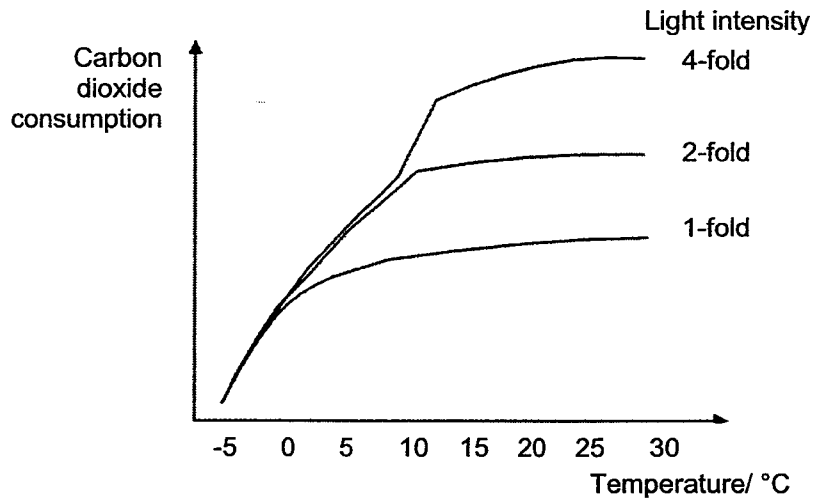
- 9 The chart below shows the changes in ionic concentrations of culture solutions in which barley seedlings have been growing for 24 hours.



Which of the following ions appear to have been taken in by plants through active transport?

- A potassium and nitrate ions
 - B potassium and hydrogen carbonate ions
 - C calcium and hydrogen carbonate ions
 - D calcium and sulfate ions
- 10 What causes the symptoms of emphysema?
- A inflammation of trachea walls
 - B narrowing of pulmonary arteries
 - C breakdown of alveolar walls
 - D uncontrolled division of alveolar cells
- 11 What is the main cause of transpiration?
- A cohesion and adhesion of water molecules
 - B evaporation of water from the leaves
 - C water entering the xylem by osmosis
 - D capillary action of water up plant stems

- 12 Photosynthesis in plants is dependent on temperature (T) and light intensity (L). The following graphs show the results of measurements of CO₂ consumption for three plants of the same species under different light intensities.

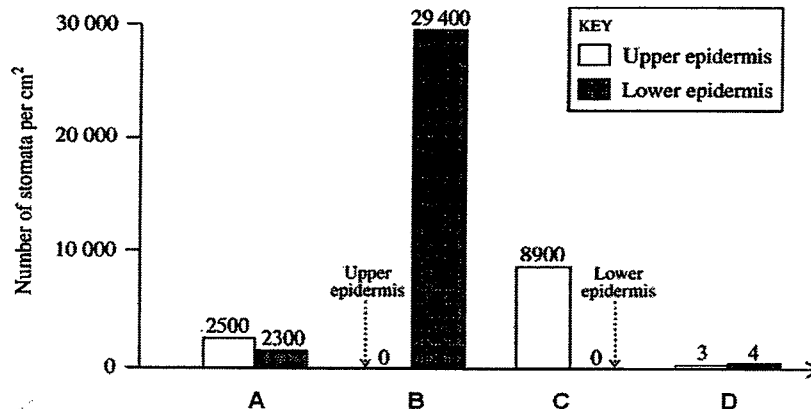


Which combination of statements concerning limiting factors in the temperature ranges (I) -5°C to 0°C and (II) 20°C to 30°C is correct under the light intensity used?

		-5°C to 0°C	20°C to 30°C
A	T	X	X
	L	X	X
B	T	✓	X
	L	X	✓
C	T	✓	✓
	L	X	X
D	T	X	✓
	L	✓	X

Key: ✓ - limiting factor
X - non limiting factor

- 13 The chart below shows the distribution of stomata on the upper and lower epidermis of the leaves of four plants.

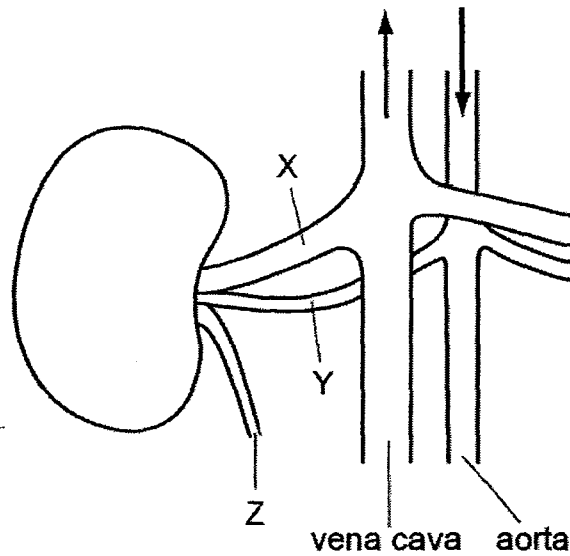


Which of these plants would be found floating on the surface of a pond?

14 Which of the following is not an example of excretion?

- A water removal through the kidneys
- B undigested food leaves the body through the anus
- C urea is leaves the body in sweat
- D carbon dioxide is breathed out from the lungs

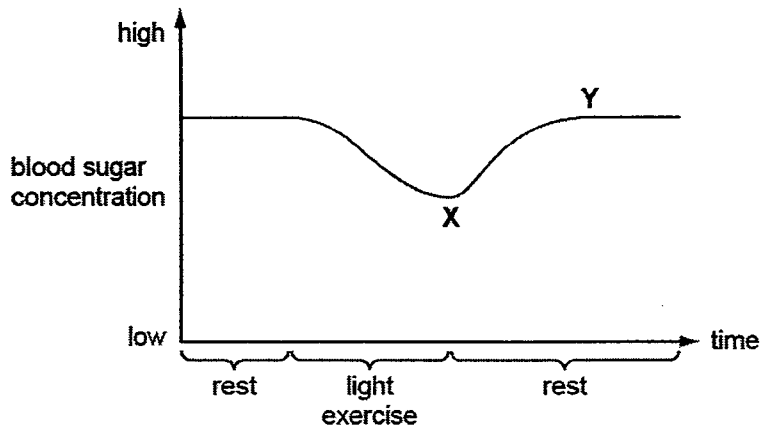
15 The diagram shows the structures associated with a human kidney.



What are the relative concentrations of urea in X, Y and Z?

- A X is sometimes higher than Y
- B Y is always lower than Z
- C Y is always higher than X
- D Z is sometimes lower than X

- 16 The graph shows the changes in blood glucose concentration during periods of rest and exercise.



What causes the change in blood glucose level between X and Y?

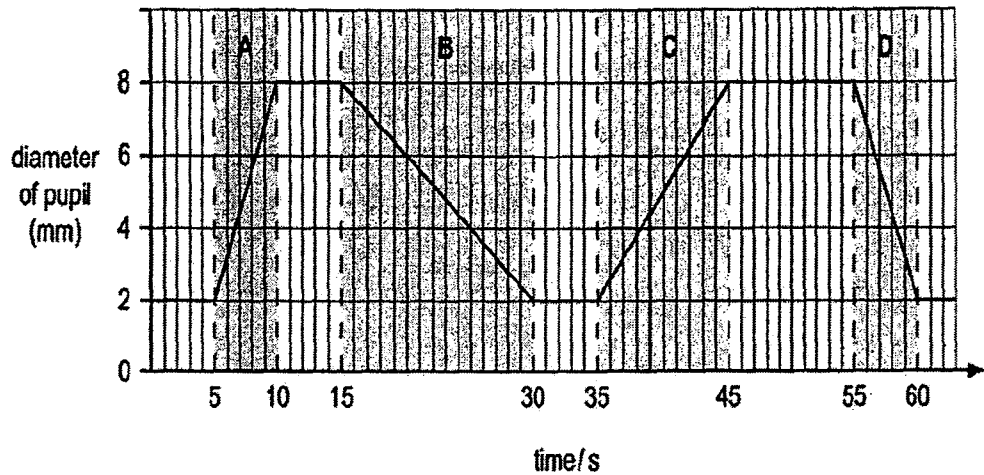
	glucagon secretion	insulin secretion	glycogen stored in liver
A	decreases	increases	increases
B	decreases	increases	decreases
C	increases	decreases	decreases
D	increases	decreases	increases

- 17 A man injures his hand in an accident. Shortly after, he can feel the objects touching his hand, but he cannot move his hand away from them.

What could have caused this?

- A** Receptors in his hand are damaged.
- B** Relay neurones in his hand no longer function.
- C** The nerve connection is cut only between the receptors in his hand and his central nervous system.
- D** The nerve connection is cut only between his central nervous system and the effectors in his arm.

- 18 The diameter of a person's pupil is measured as the light intensity is varied. During which time period does the light intensity decrease the fastest?



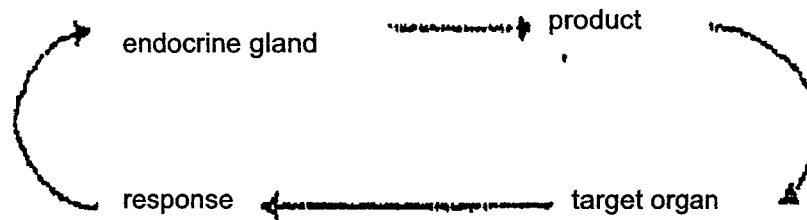
- 19 When a person is looking at an object far away, his ciliary muscles
- A contract to pull on the suspensory ligaments
 - B contract to release the tension on the suspensory ligaments
 - C relax to pull on the suspensory ligaments
 - D relax to release the tension on the suspensory ligaments
- 20 Tom was waiting at a taxi stand in the middle of the night when a robber came up to him and demanded money from him at knife point.

Which of the following are likely to take place in Tom's body at that moment?

- (i) relaxation of radial muscle in the iris
- (ii) dilation of arterioles supplying blood to the gastro-intestinal tract
- (iii) dilation of arterioles supplying blood to skeletal muscle
- (iv) increased heart rate

- A (i), (iii) and (iv)
- B (i), (ii) and (iv)
- C (ii) and (iii)
- D (iii) only

- 21 The diagram shows the relationship between two organs and the changes they bring about in the body.

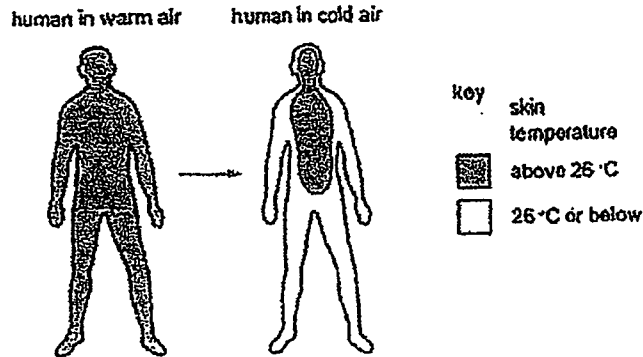


If the response of the target organ is controlled by negative feedback, then the product of the endocrine gland

- A inhibits the response of the target organ
 - B stimulates a greater response of the target organ
 - C stimulates a greater response of the target organ while the response inhibits the secretion of the product
 - D inhibits the response of the target organ while the response of the target organ stimulates greater secretion of the product
- 22 In the desert, the environmental temperature is higher than the core body temperature. Which processes help to cool the body?

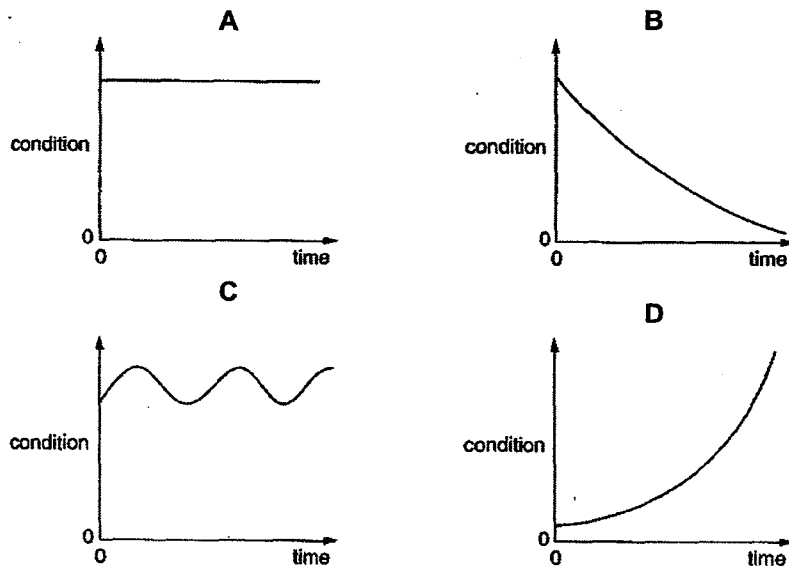
	shivering	sweating	vasodilation of skin arterioles
A	yes	no	yes
B	yes	no	no
C	no	yes	yes
D	no	yes	no

23 The figure below shows the skin temperature of a person when he is exposed to warm air then cold air.

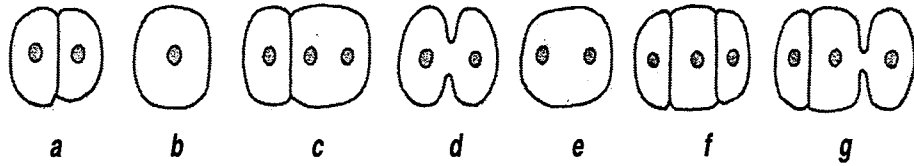


What causes the change in skin temperature when exposed to cold air?

- A more blood flowing just below the skin
 B more blood going to the heart and lungs
 C less blood flowing to the extremities
 D less blood going to the heart and lungs
- 24 Which of the following responses does not involve control from the body when a person regulates his body temperature?
- A evaporation of water from sweat on the skin
 B erection of hair on the skin
 C release of sweat from sweat gland
 D change of diameter of blood vessels
- 25 The graphs show how four different conditions in the body change with time. Which graph shows a condition controlled by negative feedback?



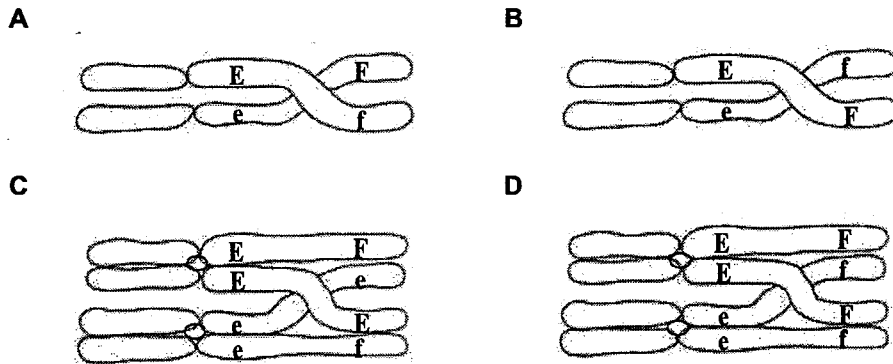
26 The drawings show stages in cell division but in the wrong order.



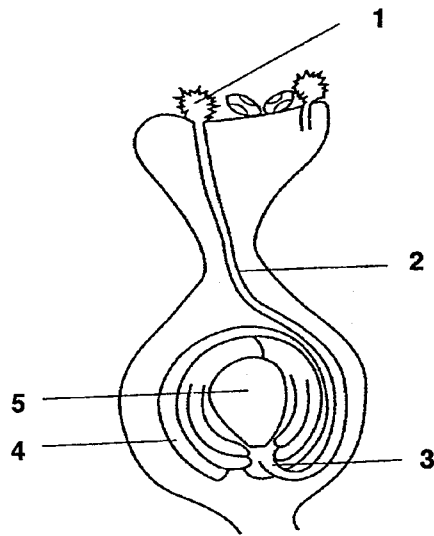
What is most likely sequence of events?

- A ebdafgc
- B ebdagcf
- C bedacgf
- D bedafcg

27 A cell replicated its DNA and then undergoes meiosis. What is the expected arrangement of chromosomes if crossing over is taking place between the two genes shown?

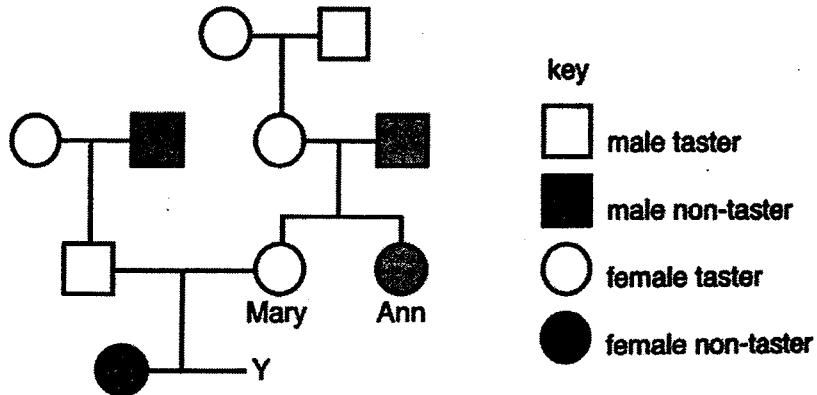


- 31 The diagram shows a cross section through the carpel of a flower after successful pollination.



Which parts will develop further after fertilisation?

- A 1 and 5 B 4 and 5
 C 1 and 4 D 3 and 4
- 32 The chart below shows how a gene encoding for the ability to taste certain chemical is inherited in a family. The trait is due to a dominant allele.

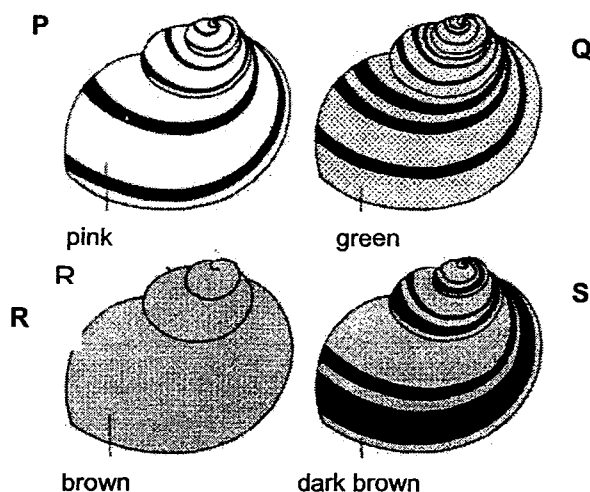


What is the probability that child Y will be a boy who can taste the chemical?

- A 0.25 B 0.75
 C 0.5 D 0.38

- 33** Thrushes are birds with good colour vision. They feed on the soft flesh of land snails by smashing their shells against rocks.

The following diagram shows four snail types (**P**, **Q**, **R** and **S**) and their shell colours.



If all the snails began with equal populations, which snail would decrease in numbers the fastest?

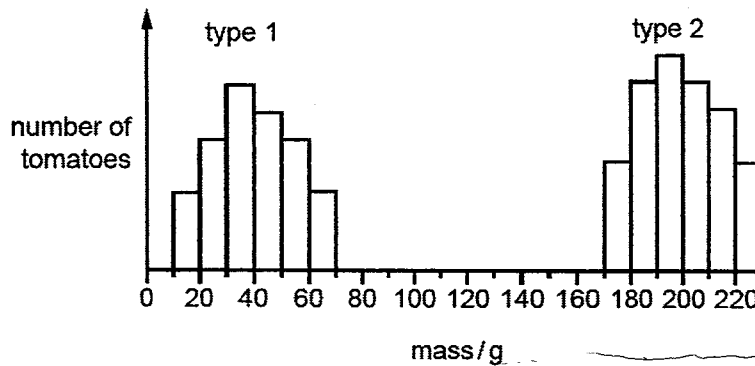
- | | | | |
|----------|----------|----------|----------|
| A | P | B | Q |
| C | R | D | S |

- 34** A woman with blood type A marries a man with blood type B. They have children with each of the four blood groups.

Which of the following statements correctly describes the children in this family?

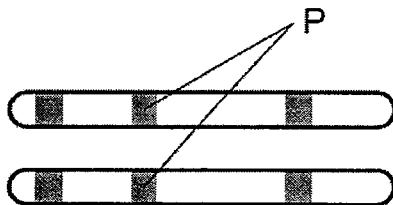
- A** Some of the children would have the same genotypes as the parents
- B** None of the children would be homozygous for any of the blood type alleles
- C** All the children would have at least one copy of the I^O
- D** Each of them would have either one I^A or one I^B allele

- 35 The diagram shows the masses of two types of tomato.



What can be concluded from the graph?

- A Type 1 tomatoes show continuous variation
 - B Type 2 tomatoes show discontinuous variation
 - C Type 2 tomatoes are sometimes smaller than type 1 tomatoes
 - D Genes do not affect the mass of tomatoes
- 36 A particular polypeptide is made up of 900 amino acids. How many nucleotides are there in the DNA strand that codes for this polypeptide?
- A 300
 - B 900
 - C 1200
 - D 270
- 37 The diagram shows a pair of chromosomes from the same cell.



What do the lines labelled P point to?

- A The site of an allele made up two or more genes which are always the same.
- B The site of an allele made up of two or more gene which might be different.
- C The site of a gene made up of two or more alleles which are always the same.
- D The site of a gene made up of two or more alleles which might be different.

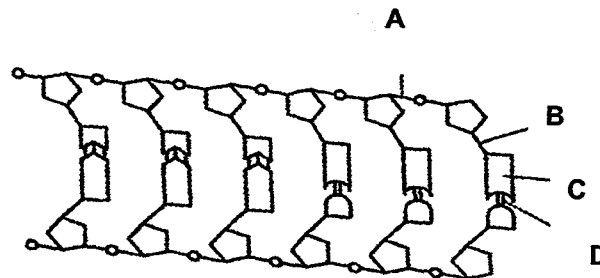
- 38 A student obtained a sample of DNA. mRNA was transcribed from this DNA and the two samples were purified. He then separated the two strands of the DNA sample. The base compositions of each strand and that of the mRNA were analysed.

The results are shown in the table below.

	A	G	C	T	U
DNA strand 1	19.1	26.0	31.0	23.9	0.0
DNA strand 2	24.2	30.8	25.7	19.3	0.0
mRNA	19.0	25.9	30.8	0.0	24.3

Which of the following shows the relationship between DNA strand 1, DNA strand 2 and mRNA?

- A Strand 1 is the coding strand for mRNA synthesis.
 B Strand 2 is the coding strand for mRNA synthesis.
 C mRNA is complementary to DNA strand 2.
 D mRNA is the template for DNA synthesis.
- 39 Which of the following is a possible outcome of genetic engineering?
- A Darker colouring of peppered moths in industrial areas.
 B Increased production of antibiotics by the fungus *Penicillium*
 C Increased resistance of houseflies to insecticides due to increased usage of insecticides.
 D Development of tolerance of algae to heavy metals on the bark of trees found around mines.
- 40 The diagram shows part of a DNA molecule. Where are the hydrogen bonds?



Class	Index Number	Name
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**PRELIMINARY EXAMINATION TWO
SECONDARY FOUR**

BIOLOGY	5158/02
Paper 2	22 Aug 2016
<i>Additional Materials:</i>	1 hour 45 minutes
Nil	

INSTRUCTIONS TO CANDIDATES

Write your class, index number and name on all the work you hand in.
Write in dark blue or black pen.
Do not use paper clips, highlighters, glue or correction fluid.
You may use a pencil for any diagrams or graphs.

This is Section A of the paper.

Section A
Answer **all** questions in the spaces provided.

The number of marks is given in brackets [] at the end of each question or part question.
The total number of marks for this paper is 80.

At the end of the examination, hand in the following separately:
(1) Section A
(2) Section B

For Examiner's Use	
Section A	50
Section B	30
Total	80

Section A [50 marks]

Answer all questions in the spaces provided.

- 1 A patient has a disease which damages his pancreas. He was advised by his doctor to take one capsule of medicine. Fig.1.1 shows the structure of a medicine capsule.

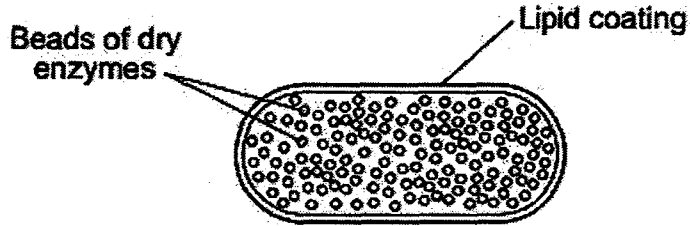


Fig. 1.1

- (a) Name two enzymes that are made in the pancreas of a healthy person.

_____ [2]

- (b) Explain how the lipid coating ensures the enzymes are only released in the small intestines.

_____ [2]

- (c) Suggest why the lipid coating is not digested by the enzyme beads in the capsule.

_____ [1]

- (d)(i) State another medical condition that this patient may have.

_____ [1]

- (ii) Suggest two ways in which the medical condition stated in (i) can be treated.

_____ [2]

[Total: 8m]

- 2 A catheter is a narrow tube which can be threaded through the heart via a vein. A tiny balloon at the tip of the catheter is used to measure the pressure changes in the pulmonary artery.

Fig. 2.1 shows a section of the heart with a catheter. Fig. 2.2 shows the pressure changes measured in the pulmonary artery.

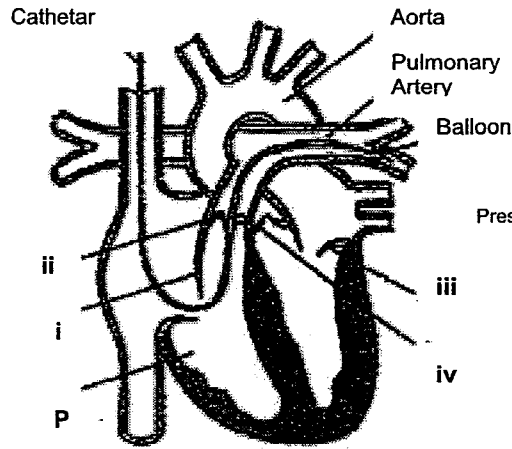


Fig. 2.1

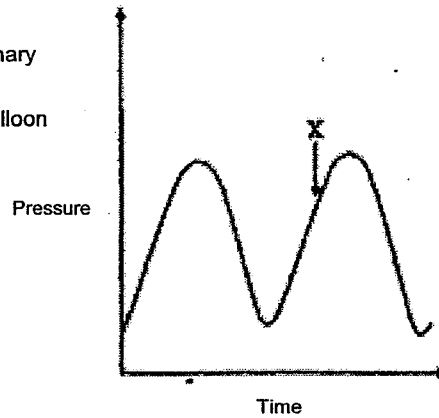


Fig. 2.2

- (a) Name the heart chamber labelled P.

_____ [1]

- (b) Identify the structures labelled i to iv. [2]

i: _____ ii: _____

iii: _____ iv: _____

- (c) Complete the table below by placing ticks (✓) in the correct boxes to show which structures (i – iv) will be open or closed at time X (as shown in Fig. 2.2). [2]

Structure	Open	Closed
i		
ii		
iii		
iv		

- (d) On Fig. 2.2, sketch and label a graph to show the pressure changes that would be expected if the pressure in the aorta is measured at the same time. [1]

- (e) Atherosclerosis is a condition in which walls of arteries are blocked by fatty deposits. A procedure called balloon angioplasty can correct this. The procedure is shown in Fig. 2.3.

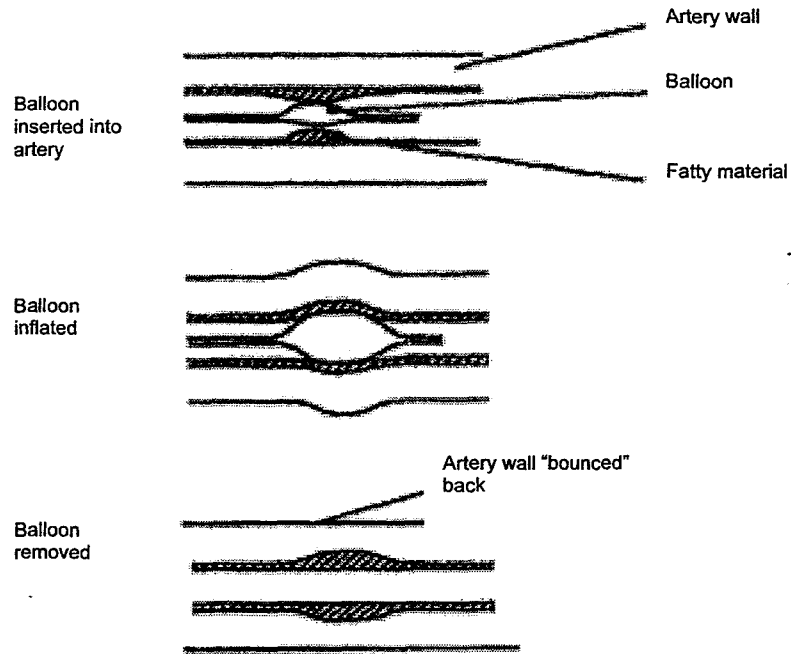


Fig. 2.3

- (i) Suggest why the artery wall "bounced back" when the balloon is removed.

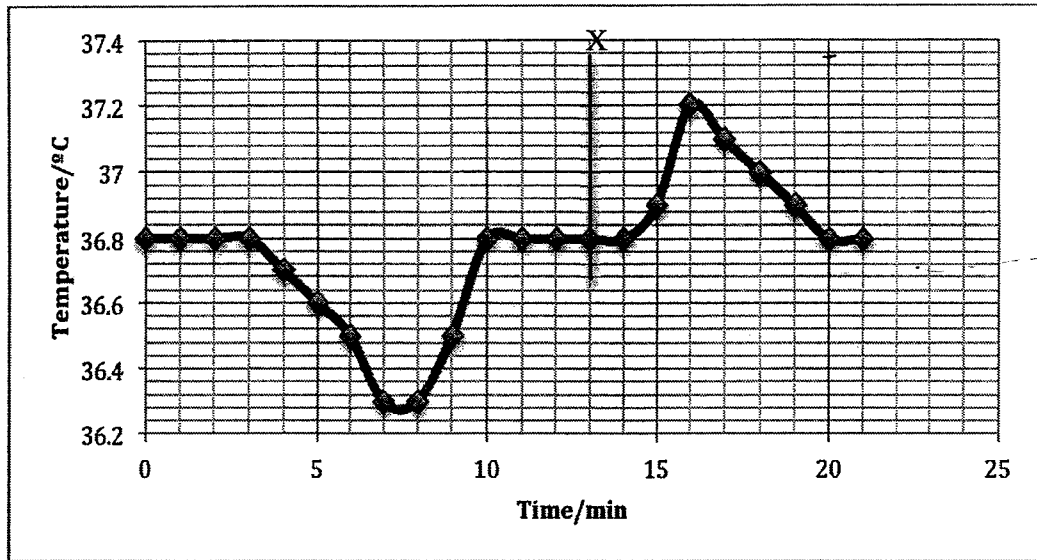
_____ [1]

- (ii) Explain why the ability of the artery wall to "bounce back" is important in maintaining blood circulation.

_____ [2]

[Total: 9m]

- 3 The graph below shows how the temperature of a person changes as he drives.



- (a) At the first minute, he switched on the air conditioning in the car. Describe how the change in temperature between minutes 8 and 10 took place.

[2]

- (b) At point X, the car in front stopped suddenly, nearly causing an accident. Using your knowledge of the nervous and endocrine systems, explain the rise and fall in temperatures at minutes 14 and 16.

[3]

[Total: 5m]

4 Fig. 4.1 shows two processes taking place in a cell.

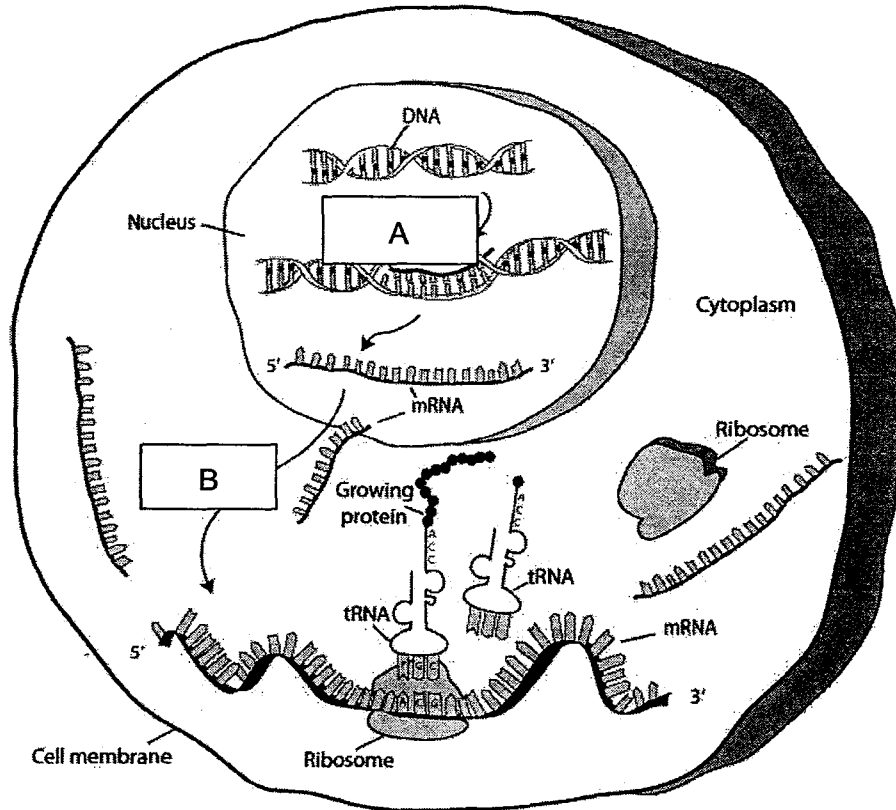


Fig. 4.1

(a) Name the processes A and B. [2]

A _____

B _____

(b) Suggest why process A does not take place in the cytoplasm.

 _____ [1]

(c) Fig.4.2 shows a nucleotide sequence in part of the unwound DNA:

TGAGGACTCCTC

Fig.4.2

(i) Write the resulting sequence of the messenger RNA produced by process A.

_____ [1]

(ii) Describe how meiosis increases variation in organisms.

[2]

(iii) A mutation has occurred in the DNA in Fig.4.2. The mutated DNA sequence is shown in Fig.4.3.

TGAGGACACCTC

Fig.4.3

State the type of mutation shown in Fig. 4.3.

[1]

(iv) Explain how a change in the bases leads to a different protein being formed.

[2]

[Total: 9m]

- 5 A student completed his 2.4km NAPFA test in 10 minutes and rested for 10 minutes. Fig. 5.1 shows the lactic acid and muscle glycogen concentration in blood samples taken from the student at different time intervals.

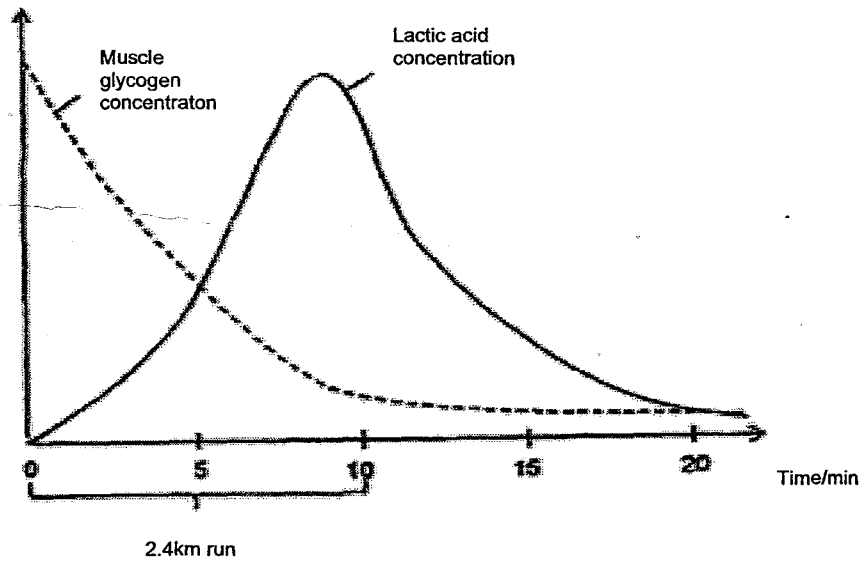


Fig. 5.1

- (a) On Fig. 5.1, draw a line representing the oxygen intake of the student. [1]
 (b) Explain the decrease in muscle glycogen concentration during the run.

[2]

- (c) Describe and explain the changes in lactic acid concentration during rest.

[3]

[Total: 6m]

- 6 Fig. 6.1 shows an experiment to investigate the effect of sunlight on photosynthesis.

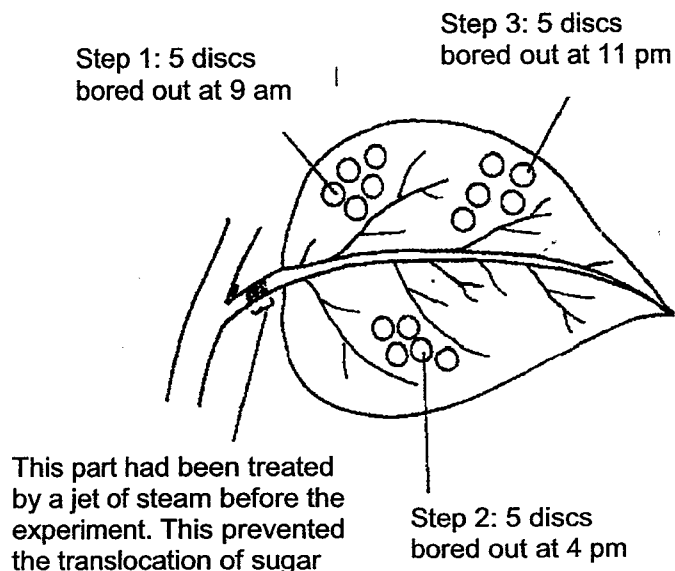


Fig. 6.1

Details of the experiment are shown below:

Step 1: At 9am, five discs were cut out of leaf and their dry mass measured.

Step 2: The plant was put in sunlight from 9am to 4pm. Another five discs were cut from the same leaf and dry mass measured.

Step 3: The plant was kept in the dark till 11pm. Five discs were cut from the same leaf and dry mass measured.

Dry mass was obtained by heating the leaf discs in an oven until dehydrated.

The results obtained are shown in Fig. 6.2.

Time	Dry mass of discs/g
9am	0.151
4pm	0.170
11pm	0.160

Fig. 6.2

- (a) Suggest how the jet of steam can prevent the translocation of sugar.

[1]

(b) Explain the change in dry mass between 9 am and 4 pm.

[3]

(c) Explain the change in dry mass between 4 pm and 11 pm.

[2]

(d) Suggest the advantage of using dry mass.

[1]

(e) Why will the results be less reliable if the discs were cut from the mid rib?

[1]

[Total: 8m]

7 Fig. 7.1 shows a marine food chain.

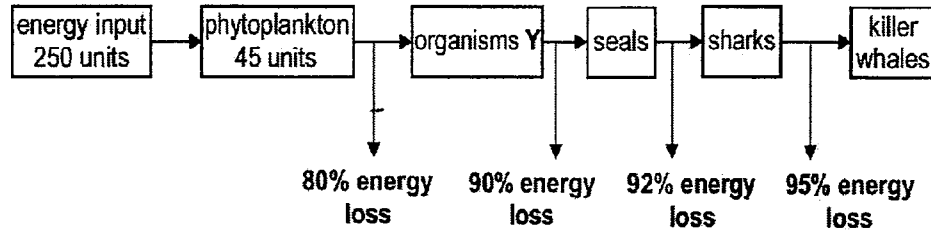


Fig. 7.1

(a) Suggest the type of organism labelled Y.

_____ [1]

(b) Calculate the amount of energy the seal obtains from its prey. Show your working clearly. [1]

Amount of energy = _____ units

(c) State two ways in which energy is lost from this food chain.

 _____ [1]

(d) Describe the role of phytoplankton in this food chain.

 _____ [2]

[Total: 5m]

Class	Index Number	Name
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**PRELIMINARY EXAMINATION TWO
SECONDARY FOUR**

BIOLOGY	5158/02
Paper 2	22 Aug 2016
<i>Additional Materials:</i>	1 hour 45 minutes
Nil	

INSTRUCTIONS TO CANDIDATES

Write your class, index number and name on all the work you hand in.
Write in dark blue or black pen.
Do not use paper clips, highlighters, glue or correction fluid.
You may use a pencil for any diagrams or graphs.

This is Section B of the paper.

Section B
Answer all **three** questions, the last question is in the form either/or. Write your answers on the lines provided and, if necessary, continue on separate writing paper.

The number of marks is given in brackets [] at the end of each question or part question.
The total number of marks for this paper is 80.

For Examiner's Use	
Question 1	10
Question 2	10
Question 3 (either/or)	10
Total	30

Section B [30 marks]

Answer all **three** questions, the last question is in the form either/or. Write your answers on the spaces provided.

- 8 A severe head injury had caused a person to suffer from central diabetes insipidus. This is a condition caused by insufficient anti-diuretic hormone in a person.

(a)(i) Which regions could be affected as a result of this head injury?

[1]

(ii) Describe and explain two possible symptoms of this condition.

[3]

(b) Fig. 1.1 shows a set up used to show the functioning of a nephron.

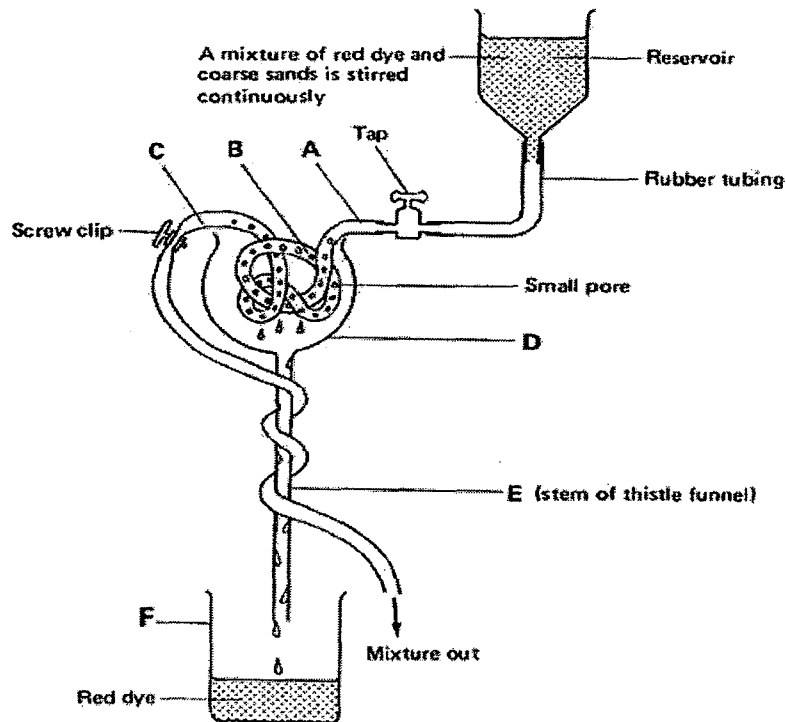


Fig. 1.1

- (i) State the letters representing the following parts in a real nephron. [2]

Afferent arteriole : _____ Glomerulus: _____

Efferent arteriole: _____ Bowman's capsule: _____

- (ii) The experiment begins by turning on the tap and tightening the screw clip on the left. What is the importance of these actions on glomerulus function? [1]

_____ [1]

- (iii) Why is only red dye collected in D?

_____ [1]

- (iv) Name one substance in humans that is represented by the coarse sand mixture.

_____ [1]

- (v) State one reason why this model is not an accurate representation of the function of a nephron.

_____ [1]

[Total: 10m]

9 The familiar orange-pink colour of salmon (a type of fish) is due to a gene that allows the fish to metabolise carotene found in its plankton and crustacean (shellfish) diet. In the wild, about 1 in 20 salmon are white fleshed. White flesh in salmon is a recessive trait.

(a) An orange-pink fleshed salmon was crossed with a white fleshed salmon. Of the 2500 hatched eggs, about half were orange-pink fleshed while the rest were white fleshed.

What is the genotype of the parent that is orange-pink fleshed? Explain your answer with the help of a clearly labeled genetic diagram. Use **B** to represent orange pink flesh and **b** to represent white flesh.

[4]

(c) Describe two differences between the transfer of the male gametes in humans and flowering plants.

[2]

[Total: 10m]

----- End of Paper -----



Suggested Answers for 2016 Prelim 2

Paper 1

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

Paper 2

Section A

1a) Lipase / trypsin/ amylase [any 2. Max 2m]

@protease / trypsinogen

R: pepsin/rennin/ maltase/sucrase/lactase/bile/insulin/glucagon

Examiner comments:

Bile, insulin and glucagon are not enzymes.

Many students cannot answer this question. They cannot differentiate between (i) hormones and enzymes (ii) enzymes produced in small intestine and pancreas. Shows a lack of preparation. A sad loss of marks.

1b) –enzymes have specific substrates / enzyme lipase needed to digest/hydrolyse/chemically digest lipids/fats [1];

-no lipase produced/found in stomach [1] (@no fat/lipid digestion in stomach or fat digestion can only take place in the small intestine);

-lipase found only in the small intestines [1]... so lipid coat is only digested in the small intestines to release the enzyme beads [Any 2- max 2m]

Examiner comments:

Reject: Lipase catalyse lipids into fatty acids and glycerol

Will accept "lipase break down lipids into fatty acids and glycerol". However, better to use "digest"

1c) –enzymes work only in solution / when dissolved/ in presence of water/ inactive or do not work when dry [1]

If just state enzyme is dry / inactive / no water present - [0.5]

Examiner comments:

Reject: enzyme and lipid substrate do not match/ any concept on specificity of enzymes / enzyme beads are dry....thus they are not moving around rapidly and cannot collide with lipid coating.....enzyme-substrate concept (wrong concept) / lipase cannot break down lipids (??)/beads are dry and need to be in acidic conditions to work (diagram already states "beads of dry enzymes" and "pancreas / small intestine" are hints that an alkaline medium is involved/ dry and not at optimum pH / any mention of "alkaline" or pH

1di) Diabetes / diabetes mellitus [1]

Examiner comments:

Accepted: high blood glucose level

Rejected: kidney failure / /coronary heart disease

1dii) –Insulin injections; make sure diet is low in carbohydrates/sugars; exercise regularly [any 2. Max 2m]

Rejected: diet low in fats

Examiner comments:

Accept: Take diabetic medication / inhale insulin / takes diabetic medication to increase insulin production / gene therapy to cure the pancreas disease or diabetes/ pancreas transplant

Reject: dialysis / kidney transplant/ eat foods rich in sugar / eat pills rich in insulin / control or change diet (should elaborate) / take amylase pills / drinking more water/ingest insulin through the mouth / inject with a shot of insulin / take medicine to stimulate the pancreas/ eat more enzymes

Just state “the hormone” - max 0.5m

2a) Right ventricle [1]

2b) i- flap of tricuspid valve [0.5] ii- pulmonary / semi lunar valves [0.5]

iii- mitral / bicuspid valves [0.5] iv- aortic / semi lunar valves [0.5]

Examiner comments:

Reject: atrio-ventricular valve (must specify which one) / aortic arch

2c) [2m]

Structure	Open	Closed
i		✓
ii	✓	
iii		✓
iv	✓	

2d) Graph is same shape + above current one [1]

Examiner comments:

Many did not get this correct. Drawn curve should not touch any part of the printed graph.

2ei)-artery muscle walls contains elastic tissues / fibres [0.5];

-wall stretches when balloon pushes against the walls [0.5]

-wall recoil when balloon is removed [0.5]

[any 2 points – max 1m]

5a) Graph increases but should not start from zero¹; [0.5]
and plateaus well before 10 min is up²; [0.5]

Examiner comments:

1. Even when not running, there should be oxygen intake. Therefore, graph should not start from zero.
2. During the run in 10 min, lactic acid increases. This shows aerobic respiration is not supplying enough oxygen. The student must have reached maximum oxygen intake. Therefore, graph reaches plateaus (max oxygen intake) within the 10 min run.

5b) Glycogen broken down to glucose /increasing glucose concentration; [1];
-to increase¹ rate of respiration to meet increased¹ energy demand; [1]

Examiner comments:

1. The concept that there is an **increased** demand must be emphasised.
2. Glycogen in the muscle tissue **does not need** to be sent to the liver to be converted to glucose. Many wrote that. This is a misconception.

5c) From 10-20min (during rest), oxygen supply exceeds oxygen demands /
excess oxygen intake is used to pay back oxygen debt; [1];
-lactic acid is removed from cells and transported to liver; [1];
-part of the lactic acid is broken down. The energy released is used to convert
the rest of lactic acid into glucose¹; [1]

6a) Steam kills the phloem tissue; [1]

***Dead phloem tissue cannot transport sucrose/ amino acids by active transport.**

6b) Between the period from 9am to 4pm, in the presence of sunlight, rate of
photosynthesis is higher than respiration; [1]

-more glucose is produced than what is required for respiration; [1]

-excess glucose is converted into starch¹ [1] resulting in higher dry mass.

Examiner comments:

Many were comparing what happened at 9am and at 4pm.

1. It is the presence of more starch in the leaf that resulted in higher dry mass.

6c) Between the period from 4pm to 11pm, there is lower (accept no)
photosynthesis in the dark; [1]

-some starch¹ is converted into glucose [0.5 ext], used for respiration [1],
resulting in loss in dry mass.

Examiner comments:

Many were comparing what happened at 4pm and at 11pm.

1. Starch is converted to glucose. Presence of less starch in the leaf resulted loss in dry mass.

6d) Mass of water changes according to the environmental conditions and can
affect reliability of the mass measurements / presence of water and dissolved
gases affect the readings; [1]

6e) Mid rib has fewer mesophyll cells for photosynthesis / consists of mainly vascular bundles / xylem and phloem; [1]
Accepted mid rib has less chloroplasts, does not contribute to producing glucose / starch to make a change in dry mass.

7a) Primary consumer/ zooplankton [1] *Accepted fish, herbivores.*

7b) Amount of energy = (45) (0.2) (0.1) [0.5]
= 0.9 units [0.5]

7c) Incomplete consumption of prey;
heat loss in metabolic reactions, respiration, movement, excretion
[any 2 points/ 0.5m each. Max 1m]

7d) Converts light energy into chemical energy [0.5];
via photosynthesis [0.5]; *Accepted if chlorophyll was mentioned.*
provides food directly or indirectly to other organisms in the food chain [1]

Section B

8ai) Hypothalamus; [0.5] pituitary gland / posterior pituitary gland; [0.5]

8aii)

Symptoms: Excessive amount of urine / increased frequency in urination / dilute urine formed; [0.5]

Dehydration / feels thirsty; [0.5]

Accepted Nausea / lethargy / headaches / dizziness / low blood pressure.

Reason: Less water reabsorbed; [0.5] into blood capillaries at the second convoluted tubules and collecting duct; [0.5 for where] due to lesser ADH released.

8bi) A- afferent arteriole B- glomerulus
C- efferent arteriole D- Bowman's capsule [0.5 each/ Max 2m]

8bii) Tightening the clip to increases hydrostatic pressure in B; [0.5]
- for ultrafiltration; [0.5]

8biii) Sand particles are too big to pass through small pores of B / red dye particles are small enough to filter through; [1]

8biv) Red blood cells / proteins; [1]

8bv) Model/set up does not show selective reabsorption process of any useful substances from the urine; [1]
at first convoluted tubules; [1 ext]

Examiner comments:

Accept: artery wall is elastic / stretchable / flexible

Reject: elastic in nature / revert back to original shape / artery wall is made up of thick muscle...and hence will constrict after it dilates / fatty material embedded in artery wall

- 2eii)** -elastic muscular walls / fibres help the artery / prevent it from bursting [1];
-elastic recoil maintains high energy / speed / velocity / momentum of the blood, allowing the blood to move quickly to other parts of the body [1]
- push blood forward / prevent air bubble [1]
[any 2 points- max 2m]

Examiner comments:

Accept: withstand high blood pressure OR artery does not get damaged (link to prevent artery from bursting) / artery wall need to expand or dilate / oxygenated blood can be transported to all parts of the body

Reject: links to fat deposits blocking the artery, CHD etc / proper blood circulation (need to elaborate and link to recoil in artery due to high blood pressure)

- 3a)**-Signal sent to arterioles to constrict [0.5];
-reducing blood flow to blood capillaries at skin surface [0.5];
-sweat glands produce lesser sweat [0.5];
-hair erector muscles contract [0.5].....lower rate of heat loss
-increase in metabolic rate / shivering [0.5 max if either is mentioned]

Examiner comments:

Accept: decrease rate of sweat production

- 3b)** -Impulses are sent via neurones / optic nerve [0.5];
- to the brain [0.5]
-impulses sent to the hypothalamus[0.5];
-hypothalamus sends signals to the adrenal gland [0.5];
-adrenaline secreted [0.5];
-adrenaline causes an increase in metabolic rate and more heat released [0.5];
-when stress is over, adrenaline is broken down in the liver [0.5];
-metabolic rate decreases [0.5] [Max 3m]

Examiner comments:

Many did not write "hypothalamus".

Important to note that adrenaline should be broken down in the liver to reduce its effects

Some students still write "energy is produced". This is incorrect.

There is no "adrenaline gland"

Reject: adrenaline secreted from pituitary gland / rate of respiration increases to provide more glucose to muscle cells / endocrine gland

4a) A-Transcription ; B- Translation [1m each. Max 2m]
Reject: translocation

4b) DNA-stays in the nucleus/ does not exit nucleus / too large to exit the nucleus. @protect the DNA from damage [1]
Accept: only nucleus contains DNA

4ci) ACUCCUGAGGAG [1]

Examiner comments: *Many students forget that RNA does not contain thymine.*

4cii) –Crossing over occurs [0.5] where sections of homologous chromosomes are exchanged during prophase [0.5];
-Random assortment [0.5] of homologous pairs of chromosomes during metaphase [0.5]

Examiner comments:

Some mixed up meiosis with fertilization and defined what fertilization is. Some students defined meiosis as fusion of gametes followed by crossing over (points as mark scheme). Note that you will have either marks deducted in the O Levels OR 0marks awarded. Hence, if you are not sure, please do not write it down in your answer. It shows much about your lack of preparation.

4ciii) Substitution (@gene mutation) [1]

Examiner comments:

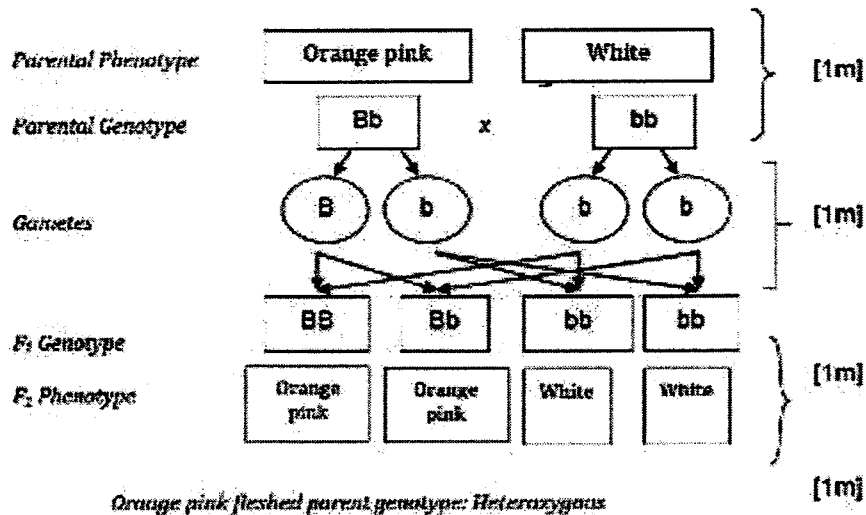
Reject: genetic mutation (must specify gene mutation) / sickle cell anaemia/ down syndrome

4civ) –sequence of bases determines amino acid sequence in protein [1];
-wrong amino acid in the sequence will lead to a different protein being formed [1];
-results in different 3D/physical structure/ protein folds differently [1] [Any 2]

Examiner comments:

Reject: base combinations (sequence means there is a specific position for each base. The word “combination” does not adequately show this specificity”). tRNA is not required to answer this question.

9a)



Parent genotype – 1m; Gametes – 1m;
 F1 genotype – 1m; and phenotype – 1m;
 No line or line wrongl drawn – last 2m deducted.

9bi) Cut the ocean pout gene using a suitable restriction enzyme; [1]

- cut the plasmid using the same restriction enzyme; [1]
 - to produce complementary sticky ends; [0.5] on the ocean pout DNA fragment and plasmid;
 - stitch the ocean pout gene to the plasmid using DNA ligase; [1]
 - weaken the bacterial cell wall with heat or electricity; [0.5m]
- [total: 4m]

9bii) Loss of wild varieties / less diveristy of salmon; [1]

- GM salmon grow faster / larger and compete for food /mates . Hence more likely to survive and reproduce. Wild varieties will decrease in numbers;

or

- animals lose their source of food and reduce in numbers or overpopulate due to loss of predator;

or

-disturbances to food chain and wild salmon cannot compete...; [Anyone, 1m]

10) Either

10a) -Ref to photosynthesis, conversion of light energy to chemical energy, energy stored as carbohydrate in tissues of producers; [1]

-Primary consumers feed on producers to obtain energy / concept of energy is passed to next trophic level; [1]

-Examples of how some energy is lost: as heat in respiration, undigested material and also in uneaten parts; [1]

-Less energy is used for growth/increase in biomass; [1]

-Energy is unlocked by decomposers...; [1]

-The concept that energy flow is non-cyclic in an ecosystem; [1] . Max 5m

-The concept of next trophic level has only 10% energy for growth. If not mentioned, minus 1 mark.

10bi) Pollution – either inorganic water pollution or sewage pollution:

-Release of detergent and fertiliser or untreated sewage/raw sewage into river/ponds results in eutrophication / growth of algae; [1]

-Sunlight blocked, submerged plants cannot carry out photosynthesis; [1]

-Decreased oxygen level kills aquatic organisms; [1]

Result: growth of only a few variety of floating plants / loss of biodiversity;

[Max for pollution: 3m]

10bii) Fishing

-Controlling fishing eg. Net size /frequency of fishing /fishing zones /tonnage of fish caught, etc (any two); [1]

-to allows time for marine organisms to reproduce and replace; [1]

-Prohibition of dredging to allow species on sea bed to thrive / not destroyed; [1]

-Concept of food chain not affected, ecological balance...; [1]

[Max for fishing mangement: 3m]

[Max for 10bi) and bii): 5m]

10) Or

10a) -Ref. to finger-like projections (villi) embedded into uterine wall to form placenta (made up of maternal and embryonic tissues), umbilical cord attaches fetus to the placenta; [1]

-In the placenta, fetal blood capillaries are close-by to maternal blood, separated by a thin layer of tissue; [1]

-to allow **diffusion** [process] of nutrients and metabolic wastes; [1]

-**Umbilical arteries** transport deoxygenated blood / carbon dioxide and metabolic wastes/ urea from the fetus to the maternal blood through the placenta [NOT umbilical cord]; [1]

-**Umbilical vein** that transports oxygenated blood/ oxygen and glucose and amino acids from maternal blood to the fetus via the placenta to fetus; [1]

Examiner comments:

Many wrote fetus gets nutrients via umbilical cord. MUST make it clear that the process is diffusion and is taking place at placenta.

10b) Mentrual flow marks the start of the menstrual cycle.

-After menstruation, estrogen (secreted by Graafian follicle cells) to bring about the repair of the uterine lining (endometrium); [1]

-About the ovulation period, corpus luteum starts to secrete progesterone; [1]

-It causes the uterine lining to grow thicker and spongier / richly supplied with blood capillaries. This is to prepare for implantation of the embryo; [1]

-The combined high level of estrogen and progesterone prevents the maturing and development of more follicles in the ovaries; [1] [Max 3m]

10c)

	Human	Flowering plants
Involve external agents in transfer	No external agents required	External agent such as wind or insects are required for transfer of pollen grains
Internal or external transfer	Within human body	During transfer of pollen grains, often released into the environment
Transfer mechanism	Sperm reach ovum in oviduct by beating action of the tail of the sperm (swimming)	Male gametes in pollen grains reach ovum in ovary by growing of pollen tube
	Movement of sperm helped by muscular contraction of walls of uterus and oviduct	Pollen tube grows down the style and reaches ovule containing ovum

Examiner comments:

Must be in constrating statements. 1 mark for each constrating statement. Self pollination involves fusion of nuclei of dissimilar gametes. Therefore, it is also sexual reproduction.

