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中正中學

CHUNG CHENG HIGH SCHOOL (MAIN)



PRELIMINARY EXAMINATION 2014
SECONDARY 4

BIOLOGY

Paper 1

5158/01

3rd September 2014

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

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

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, class and index number on the Answer Sheet in the spaces provided unless this has been done for you.

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 choice 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 booklet.

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

This document consists of 16 printed pages, including the cover page

[Turn over]

1 Which series progresses in complexity?

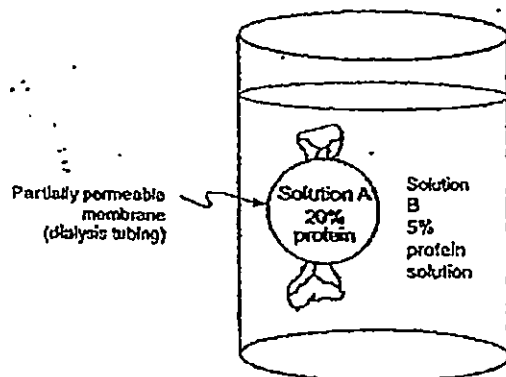
- A chromosome, DNA, mRNA, nucleus
- B DNA, chromosome, ribosome, mRNA
- C mRNA, DNA, chromosome, nucleus
- D nucleus, chromosome, DNA, mRNA

2 Which line in the table correctly identifies these body components?

- 1. Brain, spinal cord and nerves
- 2. Blood
- 3. Neurone
- 4. Stomach

	Cell	Tissue	Organ	System
A	2	3	1	4
B	2	4	3	1
C	3	2	1	4
D	3	2	4	1

3 In the situation shown in the diagram below,



- A Water will enter solution A and the concentration of solution A will increase.
- B Water will enter solution A and the concentration of solution A will decrease.
- C Water will enter solution B and the concentration of solution B will increase.
- D Water will enter solution B and the concentration of solution B will decrease.

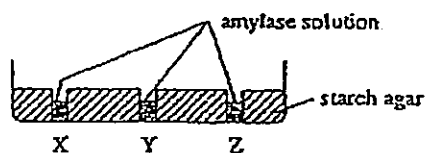
4 The table shows the concentration of a substance inside and outside four different cells. Which cell would need the most energy to absorb the substance by active transport?

cell	concentration (arbitrary units) inside cell	concentration (arbitrary units) outside cell
A	3	6
B	3	9
C	6	3
D	9	3

5 Three different intestinal amylase solutions are prepared as follows.

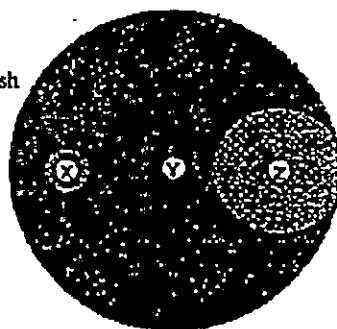
1. Amylase solution
2. Amylase solution of pH 8
3. Amylase solution of pH 2

A shallow dish which holds agar jelly containing starch was prepared. Three similar wells, X, Y and Z are cut in the jelly and each well has a different intestinal amylase solution added to it as shown in the diagram below.



24 hours later the jelly is covered with iodine solution.

top view of dish
after 24 hours



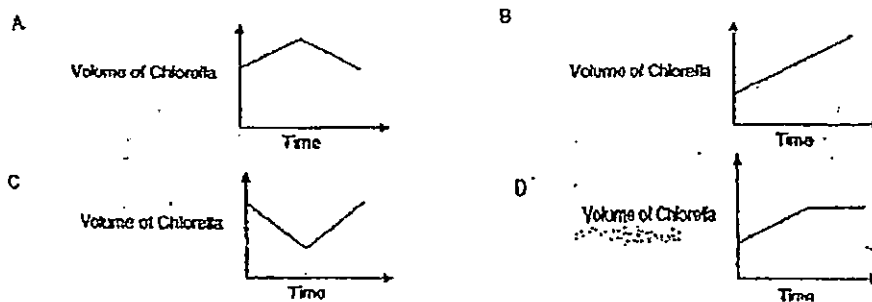
key

-  jelly stained light brown
-  jelly stained blue-black

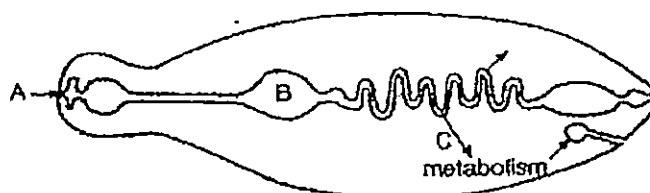
Which amylase solution was placed into each well?

	Well X	Well Y	Well Z
A	1	2	3
B	1	3	2
C	2	1	3
D	3	2	1

A *Chlorella* cell (a unicellular alga) is put in a beaker of distilled water. Which of the following graphs currently shows the change in volume of *Chlorella*?



The figure below shows the structures in an animal.



The processes which would occur in a living animal at A, B and C are

	A	B	C
A	Egestion	Absorption	Assimilation
B	Ingestion	Digestion	Absorption
C	Ingestion	Digestion	Excretion
D	Chewing	Excretion	Egestion

Which characteristic activities of living organisms are similar to the burning of petrol and the release of exhaust fumes by a car?

	Burning of petrol	Release of exhaust fumes
A	Excretion	Movement
B	Movement	Nutrition
C	Nutrition	Respiration
D	Respiration	Excretion

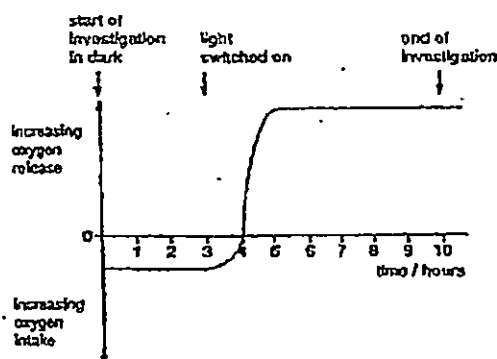
- 9 The table below shows an experiment carried out by a student.

Step	Food substance under test	Substance added	Results
1	X	Iodine solution	Blue-black
2	X	Benedict's solution	Blue
3	X	Y	Z formed
4	X	Y (boiled)	A mixture W is formed
5	Z	Benedict's solution	Orange-red precipitate
6	W	Benedict's solution	Blue

Which of the following correctly identifies W, X, Y and Z

	W	X	Y	Z
A	Reducing sugar	Starch	Saliva	Starch
B	Starch	Starch	Saliva	Reducing sugar
C	Starch	Saliva	Reducing sugar	Reducing sugar
D	Reducing sugar	Reducing sugar	Saliva	Starch

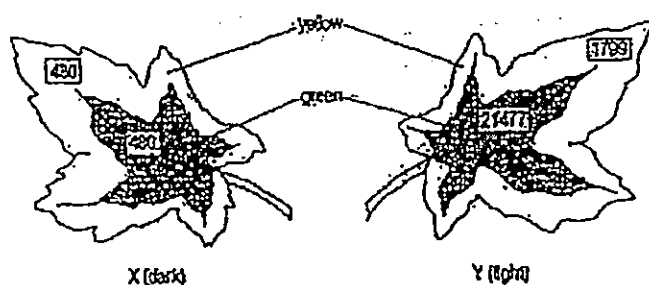
- 10 The graph shows the results of an investigation into oxygen release and oxygen intake by a green plant in different light conditions.



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

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

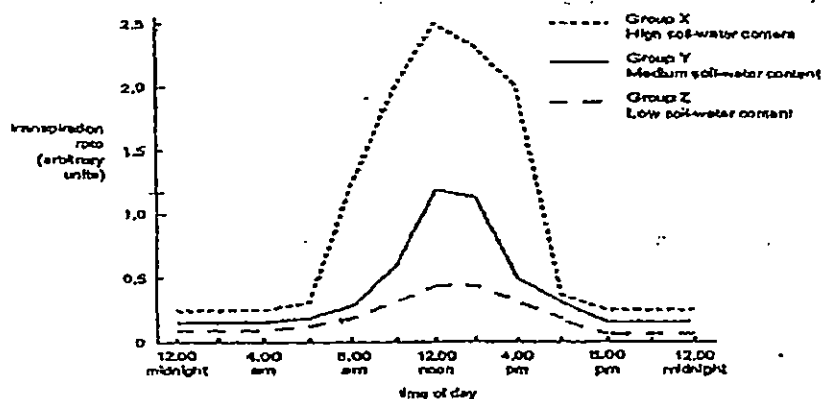
- 11 Variegated leaves of a plant were supplied with radioactive carbon dioxide ($^{14}\text{CO}_2$) during an experiment. Leaf X was kept in the dark and leaf Y was kept in the light. At the end of the experiment, the radioactivity in the leaves was measured. The results in arbitrary units are shown in the boxes in the diagrams.



What is the most likely explanation for the level of radioactivity found in the yellow zone of leaf Y?

- A Photosynthesis occurs but no storage of starch occurs in this zone.
 B Photosynthesis proceeds slowly in the absence of chlorophyll.
 C Products of photosynthesis are transported into the yellow zone.
 D Radioactive carbon dioxide diffuses into the leaf and accumulates there.
- 12 Transpiration rate was measured in the bean, *Phaseolus vulgaris*. Three identical groups were tested. In group X the soil moisture was high, in group Y it was medium and in group Z it was low.

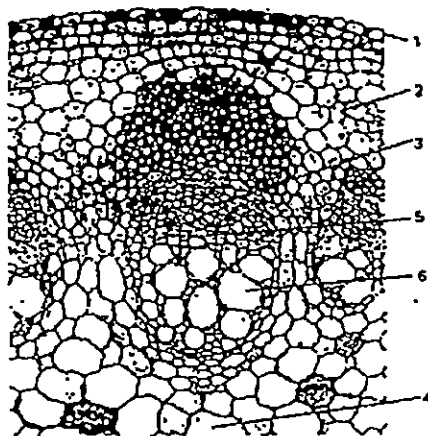
The graph below shows the results of the experiment.



From the graph, we can conclude that:

- A stomata were closed between 8:00 am and 4:00 pm in group Z.
 B no water was lost between 8:00 pm and midnight in group Z.
 C the rate of water loss through stomata was greatest in group X.
 D at 12:00 noon, water loss in group X was four times greater than water loss in group Y.

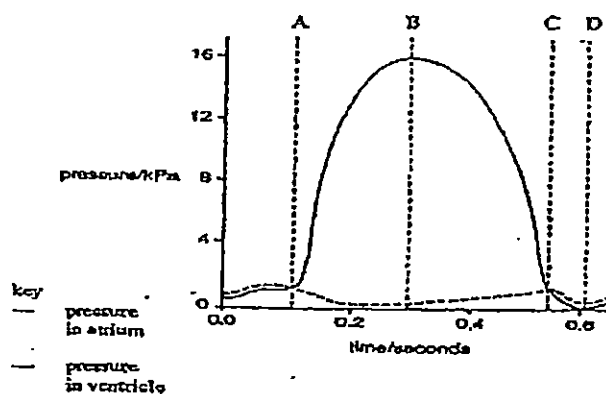
- 13 The photomicrograph below shows the transverse section of a dicotyledonous stem.



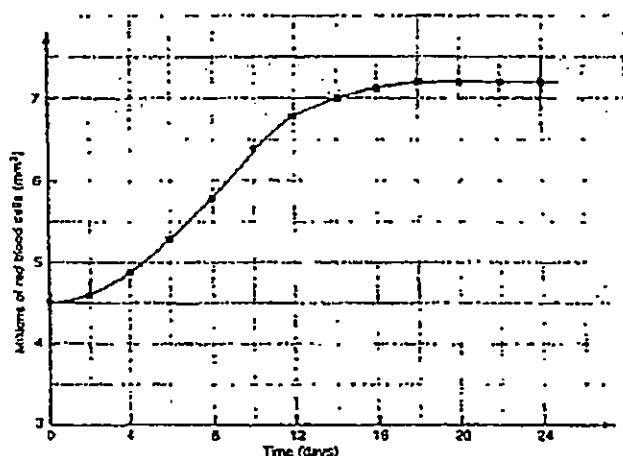
Which of the following combinations is correct?

	Reduction of water loss	Storage of food	Transport of water & mineral salts	Production of new cells	Transport of food
A	2	4	1	3	6
B	1	3	5	6	4
C	1	4	6	5	3
D	2	5	4	3	6

- 14 The graph shows pressure changes in the left side of the heart, during a single heartbeat. At which point does the bicuspid (mitral) valve open, allowing blood to flow from the atrium to the ventricle?

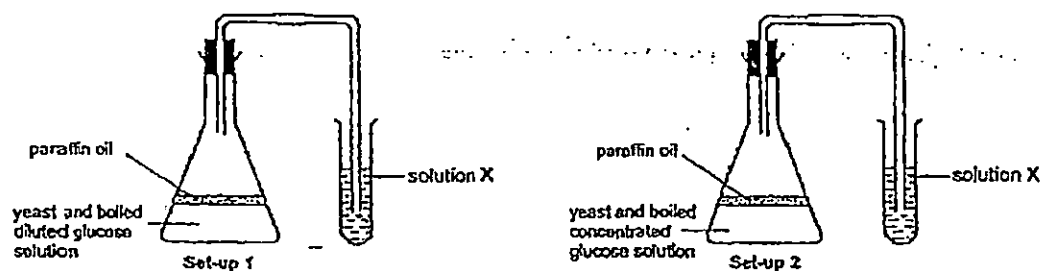


- 15 The graph below shows how moving from sea level to the mountains will affect red blood cells. Based on the graph, which of the following conclusion cannot be made?



- A A person who has just arrived at this altitude will feel breathless.
 B It takes at least 20 days to get used to the 'thinner' air.
 C The percentage increase in the number of red blood cells is 60 %.
 D Exercising at high altitude helps a person develop stronger lung muscles.

Questions 16 to 18 refer to the diagram below which shows two set-ups used to study anaerobic respiration in yeast:



The table below shows the results obtained:

Set - up	Result
1	Alcohol produced
2	No alcohol produced

- 16 What conclusion can be drawn from the results?
- A Yeast respire aerobically at high glucose concentration.
 B Yeast breaks down food completely at high glucose concentration.
 C Yeast is killed by dehydration at high glucose concentration.
 D Yeast cannot respire anaerobically at high glucose concentration.

17 Which of the following is not essential for creating an anaerobic condition in the set-ups?

1. stopper the flask
2. vaseline the joints
3. add paraffin oil
4. boil the glucose solution

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

18 Solution X is used to test the gas produced in the flask. Solution X can be

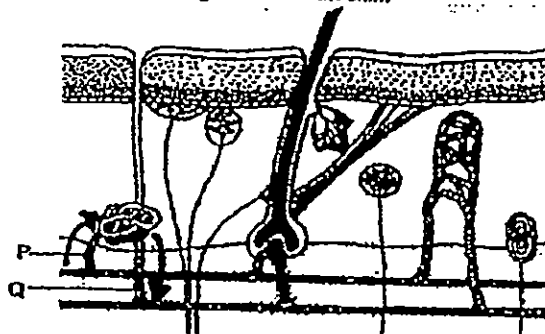
1. lime water.
2. sodium hydroxide solution.
3. sodium hydrogencarbonate solution.
4. hydrogencarbonate indicator solution

- A 1 and 2
B 2 and 3
C 3 and 4
D 1 and 4

19 In a dialysis machine, all the following would take place except

- A diffusion of solutes into the surrounding fluids.
B blood cells are prevented from leaving the tubing.
C selective reabsorption of salts.
D blood flows through a tube with partially permeable walls.

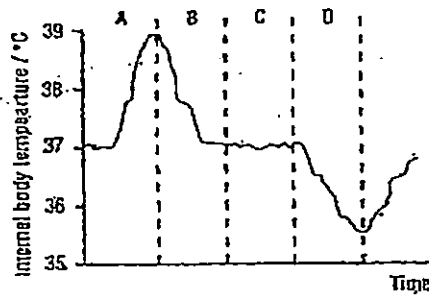
20 The diagram shows a section through mammalian skin.



Which of the following changes in concentrations of carbon dioxide, salt and urea take place as blood passes from P to Q?

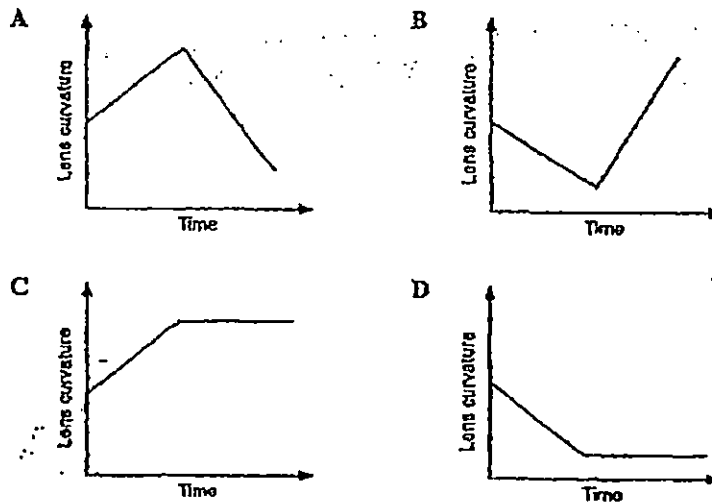
	Carbon dioxide	Salt	Urea
A	Decrease	Decrease	Increase
B	Decrease	Increase	Decrease
C	Increase	Decrease	Decrease
D	Increase	Decrease	Increase

- 21 The graph shows changes in a person's internal body temperature over a period of time. During which period would the arterioles supplying blood to surface capillaries first become constricted?

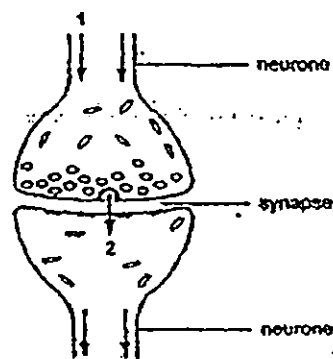


- 22 When a rabbit was shown to a classroom of kindergarten kids, it was very frightened, resulting in an increase in its blood sugar. Which substance is responsible for this increase?
- A Adrenaline
 - B Amylase
 - C Glycogen
 - D Insulin
- 23 Which of the following takes place when a person moves from bright to dim light?
- A The circular muscles contract and the pupil enlarges.
 - B The circular muscles contract and the pupil becomes smaller.
 - C The radial muscles contract and the pupil enlarges.
 - D The radial muscles contract and the pupil becomes smaller.
- 24 Which of the following involves both the nervous and endocrine systems?
- A A young boy developing a deeper voice at puberty.
 - B Feeling "pins and needles" in the legs after sitting cross-legged.
 - C Hearing a buzzing sound at the ear and trying to kill a mosquito.
 - D Running after a snatch thief.

- 25 A boy standing on a station platform watches a distant train approaching the platform until it comes to a standstill. Which of the following graphs correctly shows the change in the curvature of the lens of his eye?



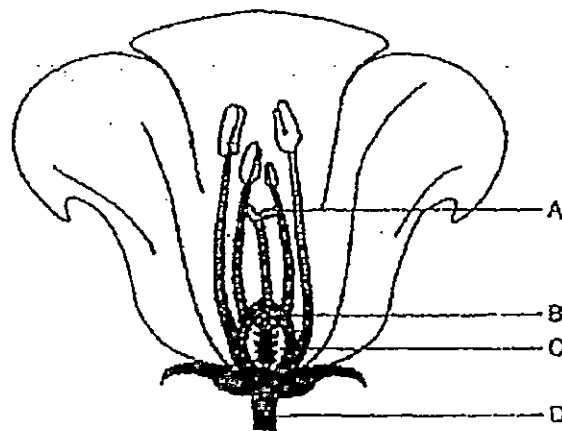
- 26 The diagram below shows the working of a synapse between two neurones.



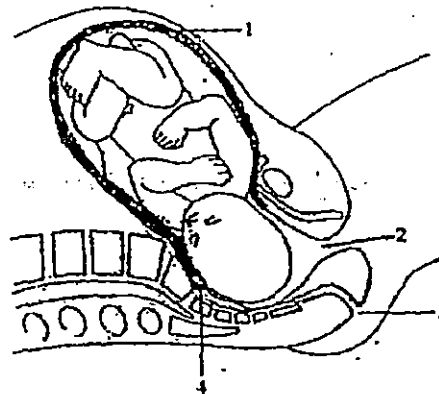
What do arrows 1 and 2 represent?

	1	2
A	Chemical transmitter	Slow acting hormone
B	Chemical transmitter	Chemical transmitter
C	Nerve impulse	Chemical transmitter
D	Nerve impulse	Slow acting hormone

- 27 The diagram shows the main parts of a flower. Which labelled part shows that this flower is insect-pollinated?



- 28 The diagram shows a stage during the birth of a baby.



Identify the numbered structures.

	1	2	3	4
A	Amniotic sac	Cervix	Vagina	Uterus
B	Uterus	Vagina	Anus	Cervix
C	Uterus	Vagina	Cervix	Amniotic sac
D	Amniotic sac	Cervix	Anus	uterus

29 Which of the following are genetically identical?

- A Kittens born in the same litter.
- B Fraternal (non-identical) twins in the same family.
- C Seeds produced from the same plant.
- D Plants produced by tissue culture from different parts of a leaf.

30 If X units of DNA are present in the nucleus of a cell during Interphase before DNA replication, what is the relative amount of DNA present in this cell during anaphase of the first meiosis?

- A $X/4$
- B $X/2$
- C X
- D $2X$

31 In order to produce large quantities of human insulin, genetic engineering can be carried out. The following shows the processes involved in the procedure.

1. Remove plasmid DNA from bacteria
2. Grow bacteria in fermenter tanks
3. Insert insulin gene into plasmid DNA
4. Use of detergents to break nuclear membrane
5. Cut plasmid DNA using enzymes
6. Isolate human insulin gene from chromosome using enzymes

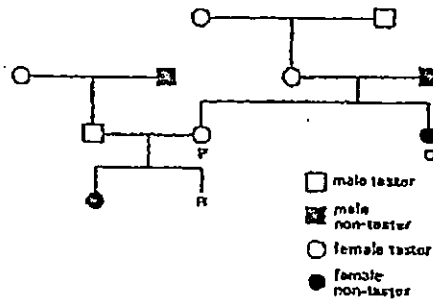
Which represents the most logical sequence in which these processes are carried out?

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

32 Pollen grains are usually produced in large numbers so that

- A the species can explore new environments.
- B competition among the new plants can be reduced.
- C they can help the dispersal of new plants.
- D they can have a greater chance of reaching other flowers.

- 33 Only people who have the dominant allele, T , have the ability to taste certain chemicals. The pedigree chart shows the transmission of this gene in a family.



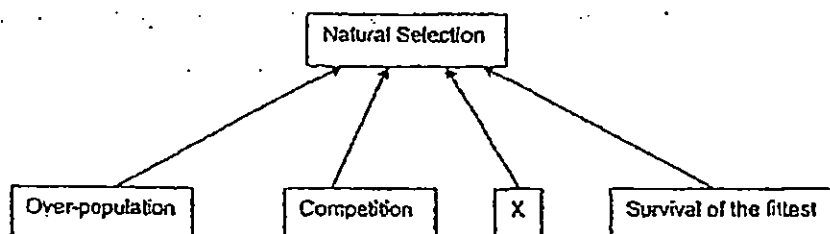
What is the chance that child R is a male taster?

- A 0.13
B 0.25
C 0.38
D 0.75
- 34 A farmer saves the seeds from his best maize crop plants to sow for next year's crop.

This is an example of

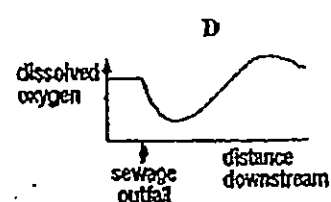
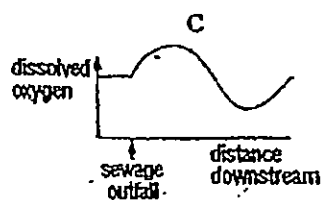
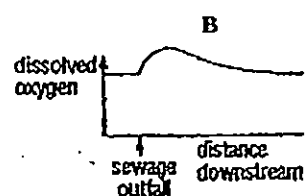
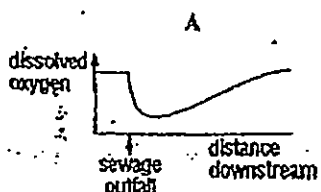
- A Artificial selection.
B Genetic engineering.
C Natural selection.
D Genetic variation.
- 35 Which two statements about continuous variation are correct?
1. The heights of adult humans will partly depend on the quality on their diets when young.
 2. During puberty there is a dramatic growth spurts.
 3. A group of adult males had heights ranging from 155 cm to 220 cm.
 4. During old age, people tend to shrink in height.
 5. Humans grow taller during infancy and childhood.
- A 1 and 2
B 1 and 3
C 2 and 4
D 3 and 5

- 36 Some of the concepts included in Darwin's Theory of Natural Selection are represented in the diagram below.

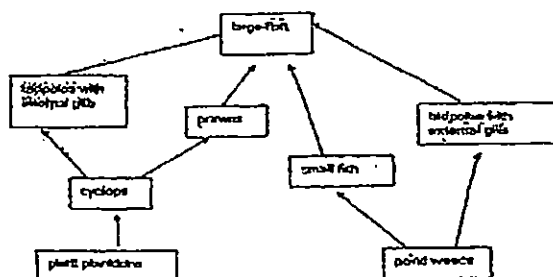


Which concept could be correctly represented by X?

- A Meiosis
 - B Mutation
 - C Genetic variation
 - D Transmission of acquired traits
- 37 Which graph shows the most likely effect of pollution by sewage on the amount of oxygen dissolved in a river?



For Questions 38 and 39, refer to the diagram below which shows the relationship between some organisms living in a freshwater lake.



38 Which of the following organisms is/are primary consumers?

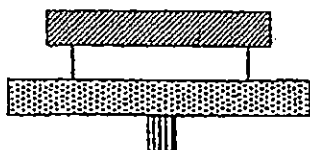
1. plant planktons
2. Cyclops
3. Prawns
4. Tadpoles with internal gills

- A 1 only
 B 2 only
 C 1 and 2 only
 D 2 and 4 only

39 Which of the following statements about this food web is true?

- A There are three herbivores in this food web.
 B Only two food chains are present in this food web.
 C All the tadpoles present on the food web are primary consumers.
 D The ultimate source of energy is the plant planktons and pond weeds.

40 Which are the two factors that contribute to the shape of the pyramid of numbers shown below?



1. a large number of small carnivores
2. a large number of small producers
3. a small number of large carnivores
4. a small number of large producers

- A 1 and 2
 B 1 and 4
 C 2 and 3
 D 3 and 4

END OF PAPER

Name: _____ () _____

SECTION A [50 marks]

Answer all questions in this section.

Write your answers in the spaces provided.

- 1 (a) Outline how smoking leads to
(i) Chronic bronchitis

.....
.....
.....[2]

- (ii) Emphysema

.....
.....
.....[2]

- (b) Briefly explain how these two diseases lead to difficulties in breathing.

.....
.....
.....
.....[2]

[Total: 6]

- 2 Fig. 2 are two graphs showing oxygen uptake (Graph A) and lactic acid concentration (Graph B) in the blood of a man before, during and after a short-period of physical exercise.

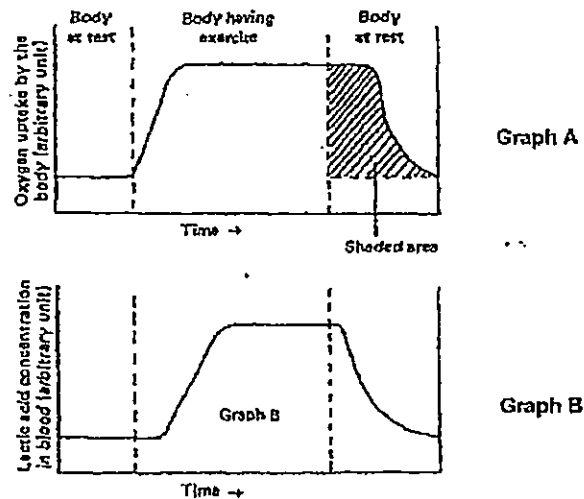


Fig. 2

- (a) Explain the increase in lactic concentration in the blood at the beginning of exercise.

.....

[3]

- (b) State the biological term used to represent the shaded area on Graph A. Explain how the volume of oxygen in the shaded region is related to the amount of lactic acid in the blood.

.....

[3]

(c) Describe the effect of lactic acid during exercise.

[1]

[Total: 7]

3 Fig. 3 shows animal cells in different stages of mitosis.

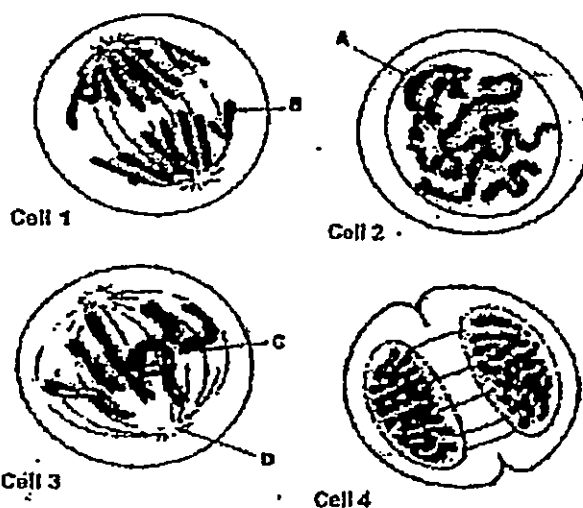


Fig. 3

(a) Using the number given to each cell above, arrange the stages in the correct mitotic sequence.

[1]

(b) What is the diploid number of chromosomes in Cell 3?

[1]

(c) Complete the table using letters A, B, C and D from the diagrams in Fig. 3.

[1]

1. Attaches a chromatid to a spindle fibre	
2. Breaks down at the beginning of mitosis	
3. Formed by longitudinal division of a chromosome	
4. Produces spindle fibres	

[Total: 3]

Fig. 4 shows the inheritance of sickle-cell anaemia in two families. A person who is a carrier of this disease usually shows no ill effects,

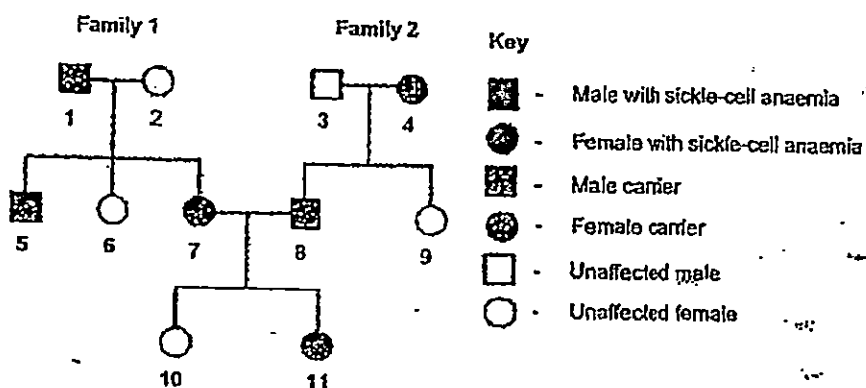


Fig. 4

- (a) Sickle-cell anaemia is a genetic disorder that results in the red blood cells having a 'sickle' shape and a reduced ability to carry oxygen. What is the cause of sickle-cell anaemia?

.....

..... [1]

- (b) Person 7 is pregnant with her third child. Use a genetic diagram to show how it is possible for this child to have sickle-cell anaemia.

[4]

[Total: 5]

Fig. 5.1 shows a vein passing between two muscles.

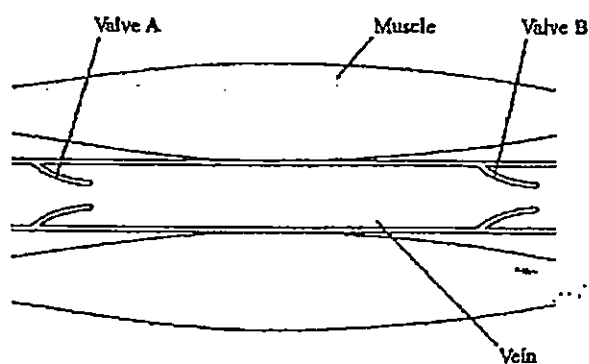


Fig. 5.1

- (a) When the muscles contract, the pressure of the blood in the part of the vein between valves A and B changes. Explain why this change in pressure, together with the action of the valves, helps the blood to flow to the heart.

.....

[2]

- (b) Describe how capillaries are adapted to enable the transfer of named substances between blood and tissue fluid.

.....

[4]

- (c) Fig. 5.2 shows the relationship between the pressure in the veins returning blood into the heart and stroke volume (the volume of blood pumped by the left ventricles of the heart in one contraction).

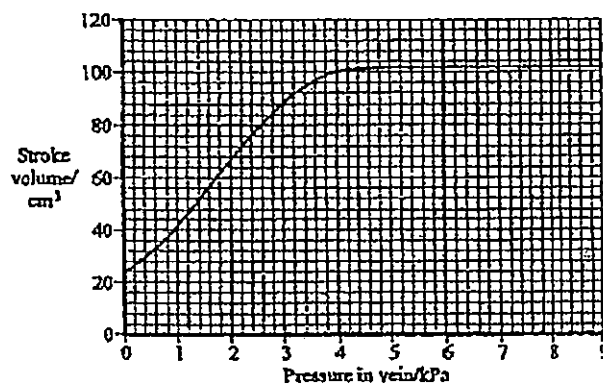


Fig. 5.2

- (i) From the graph, describe the relationship between stroke volume and pressure in the veins.

.....[1]

- (ii) What information would you need, other than that in the graph, to calculate this person's cardiac output (the volume of blood pumped out by the heart per minute)?

.....[1]

[Total: 8]

- 6 (a) Fig. 6 shows the energy flow through a food chain.

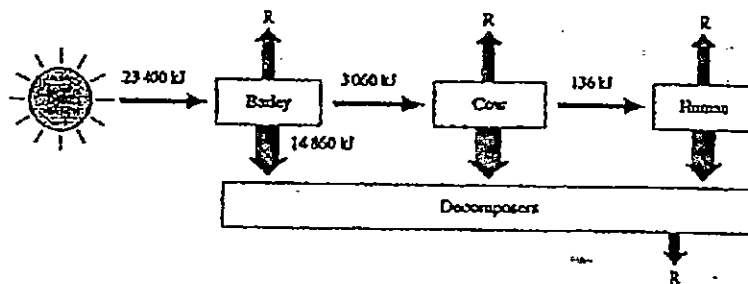


Fig. 6

- (i) Calculate the percentage of the energy received by the cow which is available to the human. Show your working.

Answer = _____ [2]

- (ii) Explain, in terms of energy, why it would be better for humans to eat barley directly.

.....

 [3]

- (iii) The herbivores are mammals. Suggest why they lose to the environment about 80% of the energy they receive, but the plants lose only about 50% of their energy.

.....

 [2]

- (b) (i) With reference to Fig. 6, draw a labelled pyramid of energy for the food chain.

[1]

- (ii) State two advantages of using pyramids of energy instead of pyramids of biomass to represent the feeding relationships in a food chain.

[2]

[Total: 10]

Fig. 7.1 shows the menstrual cycle of a human female, with changes in the thickness of the uterus wall and the levels of two female sex hormones:

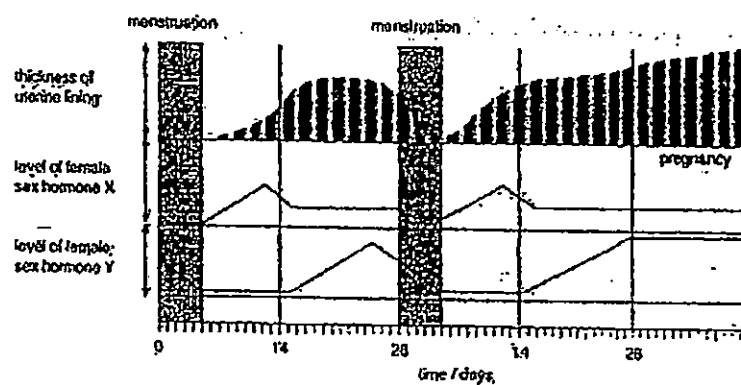


Fig. 7.1

- (a) How long is the duration of the menstrual cycle of this woman?

[1]

- (b) With reference to Fig. 7.1,
(i) When does ovulation occur?

[1]

- (ii) State the days which sexual intercourse is most likely to result in pregnancy. Explain your answer.

[2]

- (iii) With reference to Fig. 7.1, state the changes when this woman becomes pregnant.

[2]

- (c) Using the information from Fig. 7.1, complete Table 7.2 for hormones, X and Y.

[5]

Hormone	Name of Hormone	Functions	Explanation
X			
Y			

Table 7.2.

[Total: 11]

SECTION B [30 marks]

Answer all questions in this section.

Question 8 is an Either/Or Question.

There are two types of plants, C3 and C4 plants, which differ in the kind of photosynthetic mechanism they have, and this has a direct effect on how efficiently they photosynthesize.

Rice is an example of a C3 plant while maize is an example of a C4 plant.

C4 plants use a different enzyme, called PEP carboxylase, which allows CO₂ to be taken into the plant much more quickly compared to C3 plants.

- (a) Use the data in Table 8 below to plot a graph of rate of photosynthesis against water uptake.

Water uptake / mm ³ per min	Photosynthetic rate / mg carbohydrate produced per unit area per min	
	Rice (C3)	Maize (C4)
2	1	4
4	3	10
6	7	29
8	16	46
10	20	49
12	32	54
14	42	58
16	55	60
18	72	60
20	72	60

Table 8

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- 17

..[4

OCH PreExms 2014 5158/2

- 9 Fig. 9 shows changes in the rate of secretion of two pancreatic hormones, A and B at different blood glucose levels in humans

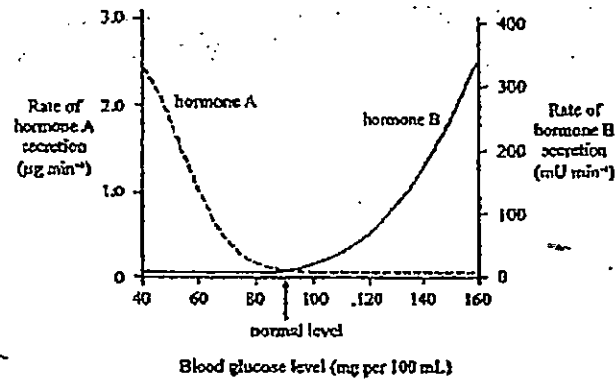


Fig. 9

- (a) Define a hormone.

.....
[2]

- (b) Which hormone will play an active role in the control of blood glucose level from the normal level to 40mg per 100mL? Give evidence from the graph to support your answer.

.....

[3]

- (c) Identify hormone A and state how this hormone contributes to the homeostatic control of blood glucose level.

.....

[2]

- (d) State one way in which a hormone is different from an enzyme.

.....[1]

[Total: 8]

10 Ether

- (a) Describe and explain in what ways does a plant use water?

149

- (b) With reference to the vascular tissues in roots, stems and leaves, describe the movement of essential materials within a plant.

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[Total: 10]

- (c) (i) Using the graph, state the temperature at which the rate of carbon dioxide uptake is equal to the rate of rate carbon dioxide release.

.....[1]

- (ii) Suggest the effect of growing crop plant seedlings for an extended period of time at this temperature.

.....[1]

- (d) Explain how the plant may avoid overheating on a hot sunny day given that the soil is well-watered.

.....[2]

[Total: 10]

End of Paper

2014 BIOLOGY PRELIMINARY EXAMINATION
MARK SCHEME
(updated 28 Aug 2014)

Paper 1

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

Paper 2

Question	Answers	Marks
1 (a) (i)	• <u>Tar paralyzes cilia</u> + accumulation of mucus / mucus not swept up the trachea / pharynx; • Inflammation of airways / air passages / epithelium; R: lungs are inflamed • Prolonged exposure to irritants + excessive / increase secretion of mucus R: ciliated cell / ciliary cells	any 2 points
(ii)	• Smoking causes <u>violent and persistent / constant coughing</u>; • <u>Partition walls of alveoli weaken / break down</u> (and sacs lose their elasticity);	1 1
(b)	• (accumulation of) mucus block / narrow airways + less air enters lungs; • Decrease / reduced surface area + lesser/slower gaseous exchange;	1 1
2 (a)	• Oxygen cannot be delivered to the muscles fast enough to keep pace with the need / insufficient oxygen supply to muscle cells; R: energy supplied for aerobic respiration is not sufficient • muscle cells respire anaerobically producing lactic acid; • which (accumulates) diffuse into the blood stream; (max 2 marks if no mention of muscle cells)	1 1 1
(b)	• <u>Oxygen debt</u>; • The shaded area refers to the amount of oxygen required to oxidise lactic acid; • The greater the shaded region/oxygen debt, the greater the amount of lactic acid produced/oxidised; R: As the volume of oxygen in the shaded region decreases, the amount of lactic acid in the blood decreases. (cause and effect is wrong)	1 1 1
(c)	• It causes <u>muscle fatigue</u> R: muscle ache / pain	1
3 (a)	• 2,3,1,4;	1

2014 BIOLOGY PRELIMINARY EXAMINATION
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Paper 1

1	C	11	C	21	D	31	D
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8	D	18	D	28	B	38	B
9	B	19	C	29	D	39	A
10	D	20	C	30	C	40	D

Paper 2

Question	Answers	Marks
(b)	• <u>6</u> ;	1
(c)	• <u>CABD</u> ;	1
4 (a)	• Mutation in the gene / change in structure of the gene / mutation of allele; R: genetic mutation	1
(b)	• Parental Genotype – Aa, Aa • Gametes should be circled • Offspring genotype – AA, Aa, Aa, aa • Offspring phenotype – 1 normal, 2 carrier, 1 Anaemia (ratio not required) (minus 1 mark – if the description is wrong) (minus 1 mark – if no key, R: if not mention of alleles in key)	4
5 (a)	• Increase pressure causes valve A to shut and valve B to open; • Blood squeezed in one direction / prevent backflow of blood + flows through valve B;	1 1
(b)	• Materials transferred are <u>glucose / amino acids / oxygen / other named suitable material</u> ; (A): fatty acids/inorganic minerals, ions/hormones/vitamins/CO ₂ /urea at least 2 R: nutrients / dissolved food substances / nitrogenous waste <u>Max 3 :</u> • walls are <u>one-cell thick to decrease distance of diffusion</u> ; • <u>lumen is small / capillaries are narrow to decrease the flow rate</u> ; • dense / large <u>network of capillaries to increase Surface Area</u> ; • walls of capillaries are partially permeable; • capillaries are microscopic/smaller than other blood vessels + close proximity to cells; • network/branching of capillaries + slow down blood flow + sufficient	4

2014 BIOLOGY PRELIMINARY EXAMINATION
MARK SCHEME
(updated 28 Aug 2014)

Paper 1

1	C	11	C	21	D	31	D
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8	D	18	D	28	B	38	B
9	B	19	C	29	D	39	A
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Paper 2

Question	Answers	Marks
1 (a) (i)	• <u>Tar paralyses cilia</u> + accumulation of mucus / mucus not swept up the trachea / pharynx; • Inflammation of airways / air passages / epithelium; R: lungs are inflamed • Prolonged exposure to irritants + excessive / increase secretion of mucus R: ciliated cell / ciliary cells	any 2 points
(ii)	• Smoking causes <u>violent and persistent / constant coughing</u>; • <u>Partition walls of alveoli weaken / break down</u> (and sacs lose their elasticity);	1 1
(b)	• (accumulation of) mucus block / narrow airways + less air enters lungs; • Decrease / reduced surface area + lesser/slower gaseous exchange;	1 1
2 (a)	• Oxygen cannot be delivered to the muscles fast enough to keep pace with the need / insufficient oxygen supply to muscle cells; R: energy supplied for aerobic respiration is not sufficient • muscle cells respire anaerobically producing lactic acid; • which (accumulates) diffuse into the blood stream; (max 2 marks if no mention of muscle cells)	1 1 1
(b)	• <u>Oxygen debt</u>; • The shaded area refers to the amount of oxygen required to oxidise lactic acid; • The greater the shaded region/oxygen debt, the greater the amount of lactic acid produced/oxidised; R: As the volume of oxygen in the shaded region decreases, the amount of lactic acid in the blood decreases.(cause and effect is wrong)	1 1 1
(c)	• It causes <u>muscle fatigue</u> R: muscle ache / pain	1
3 (a)	• 2,3,1,4;	1

2014 BIOLOGY PRELIMINARY EXAMINATION
MARK SCHEME
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8	D	18	D	28	B	38	B
9	B	19	C	29	D	39	A
10	D	20	C	30	C	40	D

Paper 2

Question	Answers	Marks
(b)	• <u>6</u> ;	1
(c)	• <u>CABD</u> ;	1
4 (a)	• Mutation in the gene / change in structure of the gene / mutation of allele; R: genetic mutation	1
(b)	• Parental Genotype – Aa, Aa • Gametes should be circled • Offspring genotype – AA, Aa, Aa, aa • Offspring phenotype – 1 normal, 2 carrier, 1 Anaemia (ratio not required) (minus 1 mark – if the description is wrong) (minus 1 mark – if no key, R: if not mention of alleles in key)	4
5 (a)	• Increase pressure causes valve A to shut and valve B to open; • Blood squeezed in one direction / prevent backflow of blood + flows through valve B;	1 1
(b)	• Materials transferred are <u>glucose / amino acids / oxygen / other</u> named suitable material; (A): fatty acids/inorganic minerals, ions/hormones/Vitamins/CO ₂ /urea at least 2 R: nutrients / dissolved food substances / nitrogenous waste <u>Max 3 :</u> • walls are <u>one-cell thick to decrease distance of diffusion</u> ; • <u>lumen is small / capillaries are narrow to decrease the flow rate</u> ; • dense / large <u>network of capillaries to increase Surface Area</u> ; • walls of capillaries are partially permeable; • capillaries are microscopic/relative smaller than other blood vessels + close proximity to cells; • network/branching of capillaries + slow down blood flow + sufficient	4

2014 BIOLOGY PRELIMINARY EXAMINATION
MARK SCHEME
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Paper 1

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4	D	14	C	24	D	34	A
5	B	15	D	25	C	35	B
6	D	16	C	26	C	36	C
7	B	17	A	27	A	37	A
8	D	18	D	28	B	38	B
9	B	19	C	29	D	39	A
10	D	20	C	30	C	40	D

Paper 2

Question	Answers	Marks
	time for diffusion;	
(c) (i)	- As pressure in vein increases, stroke volume increases until 4 to 5 kPa; - R: As stroke volume increases, pressure in vein increases. (cause & effect)	1
(ii)	Heart rate/pulse rate / pulse beat per min / heartbeat per min / no. of contractions by left/right ventricles per min;	1
6 (a) (i)	$136/3060 \times 100 = 4.44\%$ (must be at least 1 dp) (A) answer in fraction 1 mark for working, 1 mark for final answer	2
(ii)	- A lot of energy/90% of energy lost from one trophic level to the next; - Through respiration/excretion; (at least 1) - Fewer links in food chain if humans eat barley / barley is the producers / barley is the 1st trophic level + so more energy available/less energy lost;	1 1 1
(iii)	- animals are mobile + need energy to move around; - respiration is much <u>more</u> rapid; - have <u>higher</u> metabolic rate; <u>greater</u> heat loss to environment; - need more energy to keep constant body temperature ;	any 2
(b) (i)	Accept any possible answer, Base should be the largest;	1
(ii)	- Pyramids of energy take in account the energy level in each trophic level over a period of time, while pyramids of biomass only represent energy at a certain point in time. - Pyramid of energy take into account rate of reproduction while pyramid of biomass does not.	1 1

2014 BIOLOGY PRELIMINARY EXAMINATION
MARK SCHEME
(updated 28 Aug 2014)

Paper 1

1	C	11	C	21	D	31	D
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7	B	17	A	27	A	37	A
8	D	18	D	28	B	38	B
9	B	19	C	29	D	39	A
10	D	20	C	30	C	40	D

Paper 2

Question	Answers	Marks									
7 (a)	• 28 days;	1									
(b) (i)	• Day 12;	1									
(ii)	• Day 10 – 14;	1									
	• Sperm and egg can survive for at least 2-3 days + ovulation takes place on day 12;	1									
(iii)	• Sex hormone Y (increases and) remains at high levels; • uterine lining increases in thickness/remains thick;	1 1									
(c)	<table border="1"> <thead> <tr> <th>Hormones</th><th>Function</th><th>Explanation</th></tr> </thead> <tbody> <tr> <td>Oestrogen</td><td>• To repair/thicken uterine lining</td><td>• after menstruation, thickness of uterine lining increased with increasing hormone X/ oestrogen.</td></tr> <tr> <td>Progesterone</td><td>• To maintain thickness of the uterine lining</td><td></td></tr> </tbody> </table>	Hormones	Function	Explanation	Oestrogen	• To repair/thicken uterine lining	• after menstruation, thickness of uterine lining increased with increasing hormone X/ oestrogen.	Progesterone	• To maintain thickness of the uterine lining		5
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Paper 2

Question	Answers	Marks
Section B		
8 (a)	Rate of PS in C3 and C4 plant agst water uptake Rate of PS / mg CO₂ produced per unit area per min Water uptake / mm³ per min Series 1 Series 2 - Labels + graph; - Scale + Axes; - Axes; - Plot ;	4
(b)	- rate of photosynthesis increases rapidly/sharply from 2cm³ to 8cm³ - from 8cm³ to 16cm³ of water uptake rate of photosynthesis increases gradually	

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Paper 2

Question	Answers	Marks
	Beyond 16cm² of water uptake, photosynthesis rate remains the same/constant at (60mg carbohydrate produced per unit area per min).	
(c)	maize + has a faster rate of photosynthesis at lesser amounts of water absorbed/at lower water uptake	1
(d)	- Cut the gene for <u>PEP carboxylase (enzyme)</u> + a bacterial plasmid + using the same restriction enzyme; - R: plasmid from plant - Mix the plasmid with the gene of interest/cut out gene (OWTTE) + DNA ligase (to join the gene to the plasmid); - Mix the <u>recombinant</u> plasmid with bacteria + heat or electric shock + to introduce recombinant plasmid into bacteria; - infect plant cells with transgenic bacteria;	4
9 (a)	- chemical substance + produced in minute quantities/by endocrine gland; - carried by the blood/secreted into bloodstream; - which alters the activity of one or more specific target organs and is then destroyed by the liver;	any 2
(b)	<u>Hormone A/glucagon</u>; - as blood glucose decreases from normal concentration to 40mg/100ml, hormone A increases/from 40mg/100ml to normal concentration of blood glucose, hormone A decreases; - Hormone B remains at low levels;	3
(c)	<u>Glucagon</u> - facilitates the conversion of glycogen to glucose + to raise blood glucose level back to normal - R: converts glycogen to glucose - ecf if hormone A is identified wrongly	2

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Paper 2

Question	Answers	Marks										
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10. (a) E	- used in <u>photosynthesis</u> + provides the hydrogen necessary for the reduction of carbon dioxide to glucose; - turgidity in plant cells + provide support to seedlings/plants with soft stems; - turgidity in leaf cells + keep leaves spread out + absorb maximum sunlight for photosynthesis; - medium for chemical reactions in plant cells; - solvent + transport of materials/translocation; - evaporation from leaves + takes away latent heat/cool down plant;	any 4										
(b)	<u>With reference to xylem</u> - transports water and mineral salts; - from roots to leaves; - capillary action/transpiration pull/root pressure; (any 2) <u>With reference to phloem</u> - transports sucrose/amino acids; - from leaves to all parts of plants; - translocation/active transport; NB : if no mention of xylem or phloem, max 4	6										
10 (a) O	- as temperature increases from -10°C to 35°C rate of carbon dioxide uptake increase from 0 to 11 arbitrary units; - the highest rate of carbon dioxide uptake at 11 arbitrary units takes place at 35°C; - from 35°C to 47°C rate of carbon dioxide uptake decreases from 11 to 0 arbitrary units;	3										

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Paper 2

Question	Answers	Marks
(b)	• biomass decreases + carbon dioxide uptake is (two times) lower than carbon dioxide release at 45°C; • Rate of respiration exceeds rate of photosynthesis or vice versa; • Depletes food reserves/using up food store;	3
(c) (i)	• 43°C (+/-1°C);	1
(ii)	• just enough energy released for sustenance /no cell growth/no increase in biomass/seedling does not grow;	1
(d)	• guard cell turgid + stomata opened • excess heat is removed by increased transpiration	2