Name	Class	Register Number

14/S4P2/5158/1

5158/01

BIOLOGY (SPA)

Thursday 14 Aug 2014 1 hour

VICTORIA SCHOOL

SECOND PRELIMINARY EXAMINATION
(SECONDARY FOUR)

Additional Material:

Optical marksheet

READ THESE INSTRUCTIONS FIRST
Do not open this booklet until you are told to do so.

Write your name, class and register number in the spaces provided at the top of this page and on the optical answer sheet.

There are forty questions in this paper.
Answer all questions.

For each question, there are four possible answers A, B, C and D. Choose the one you consider correct and shade your choice on the optical marksheet provided.

Each correct answer will score one mark. Marks will not be deducted for incorrect answers.

This Question Paper consists of 16 printed pages (including this cover page).

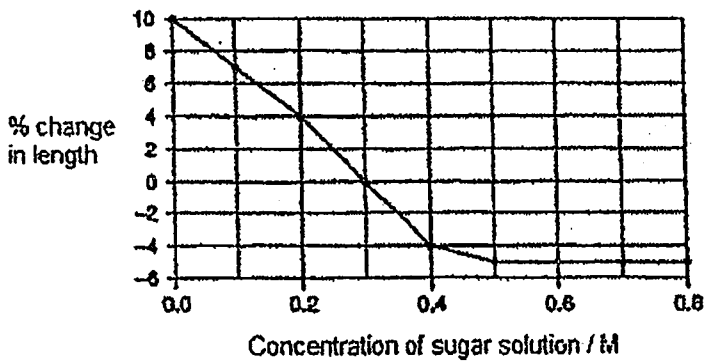
1 Which of the following options below correctly identifies a cell, a tissue and an organ?

	Cell	Tissue	Organ
A	stoma	xylem	leaf
B	sperm	testis	penis
C	ovum	muscle	uterus
D	ovule	epidermis	ovary

2 Which of the following organelles is not involved in the synthesis of lipases in an intestinal cell?

A ribosomes
B nucleus
C golgi apparatus
D smooth endoplasmic reticulum

3 Cylinders of potato tissue were placed in different concentrations of a sugar solution. The graph shows the percentage change in length of the tissues over a fixed period of time?



Assuming that the water potential of a red blood cell is similar to that of potato cells, which of the following statements is correct?

A Red blood cells placed in 0.1M sugar solution will be crenated.
B Red blood cells placed in 0.6M sugar solution will be crenated.
C Red blood cells placed in 0.3M sugar solution will burst.
D Red blood cells placed in 0.6M sugar solution will burst.

4 A sample of food mixed with water tested to determine its contents. The results of the test are shown in the table below.

Test	Results
Iodine solution added.	Solution remained brown.
Benedict's solution added and mixture heated.	Brick-red precipitate appeared.
Mixture shaken with ethanol and poured into water.	White emulsion formed
Dilute sodium hydroxide solution added, followed by a few drops of dilute copper sulfate solution.	Solution remained blue.

What is the most likely identity of the food sample?

A baked potato chips
B cream topped muffin
C fried fish fillet
D strawberry flavoured sweets

5 The enzyme lysozyme secreted from tear glands forms deposits on contact with the lens surface.

Which of the following ingredients would be effective in a lens cleaner for the removal these deposits?

A proteases
B antibodies
C pH buffers
D Bicarbonate solution

6 Enzyme action can be explained by the lock and key hypothesis. Which of the following options correctly shows the location of the active site and what the lock and key represent?

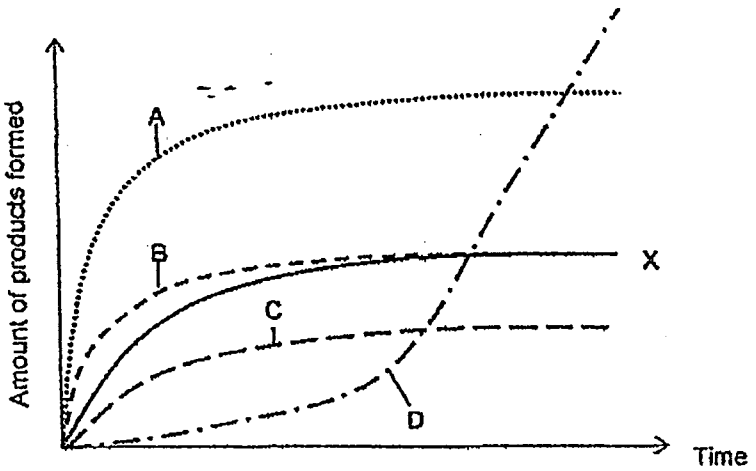
	Active site	Lock	Key
A	On the enzyme	Substrate	Enzyme
B	On the enzyme	Enzyme	Substrate
C	On the substrate	Substrate	Enzyme
D	On the substrate	Enzyme	Substrate

7 The anti-diuretic hormone (ADH) is produced by the _____ and its function is to _____.

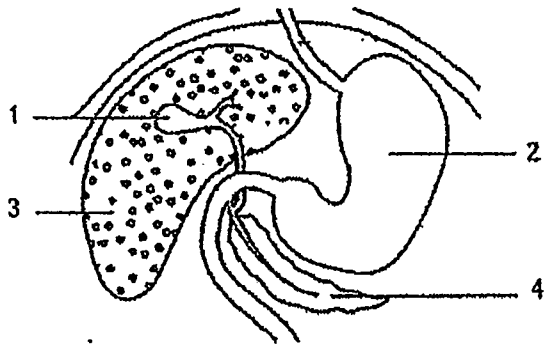
A pituitary gland; control the rate of sweat secretion.
B kidney; control the rate of sweat secretion.
C pituitary gland; maintain a balance in blood plasma water potential.
D kidney; maintain a balance in blood plasma water potential.

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

Which curve represents the activity when the temperature is raised to 30°C and with more enzymes added?



9 The diagram shows a part of the human alimentary canal.



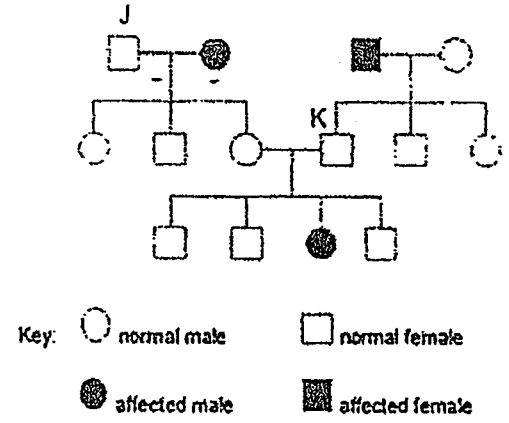
Which two structures produce substances involved in fats digestion?

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

10 Which of the following statements describes an example of artificial selection?

A It has been found that some strains of bacteria produce antibiotics.
B It is common practice to mate bulls with cows that produce the most milk.
C It is possible to control caterpillars on food crops by releasing small wasps which lay their eggs inside caterpillars and kill them.
D Mosquitoes have developed strains that are resistant to insecticides.

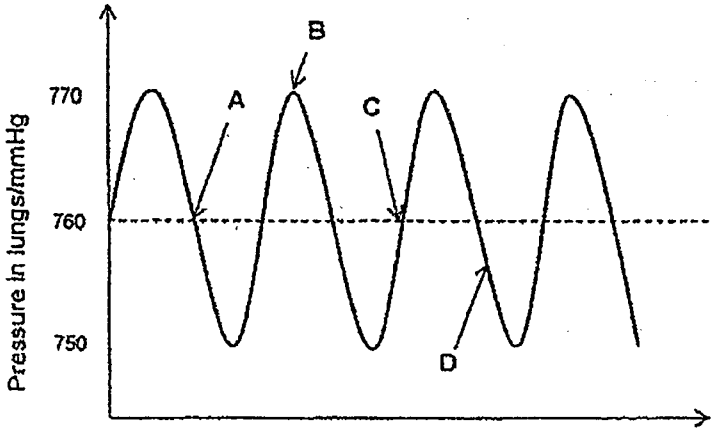
11 The pedigree chart below shows the inheritance of a recessive characteristic that is controlled by a single pair of alleles, G and g. G represents the dominant allele and g represents the recessive allele.



Which of the following options shows the most likely genotypes of individuals J and K?

	J	K
A	GG	GG
B	GG	gg
C	Gg	GG
D	Gg	Gg

12 The diagram below illustrates changes in air pressure taking place inside the lungs during complete cycles of breathing at atmospheric pressure of 760mmHg. At which point are the external intercostal muscles certainly contracted?



13 A plant is heterozygous for a single pair of alleles that are codominant. This plant is self-pollinated and the resulting seeds are germinated and allowed to grow.

Which of the following ratios are expected in the progeny?

	Ratio of phenotypes	Ratio of genotypes
A	1:2:1	1:2:1
B	1:2:1	3:1
C	3:1	1:2:1
D	3:1	3:1

14 A woman with blood group AB marries a man who is heterozygous for blood group B. What is the probability of the couple having a son with blood group A?

A 6.25%
B 12.5%
C 25.0%
D 50.0%

15 Which of the following options shows the correct stages of a cell cycle corresponding to the events shown?

	DNA replication	Breakdown of nuclear membrane	Division of centromere
A	interphase	prophase	metaphase
B	interphase	prophase	anaphase
C	prophase	interphase	anaphase
D	prophase	interphase	metaphase

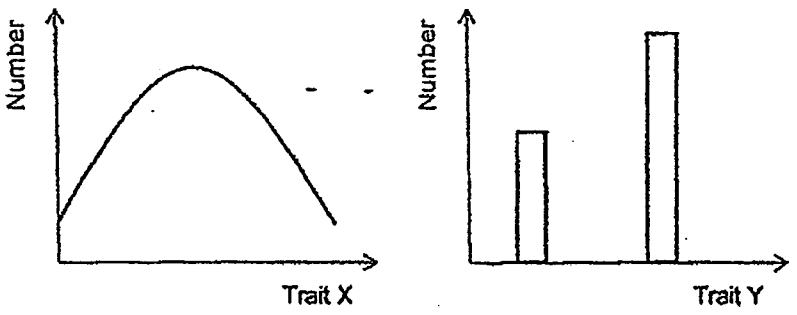
16 Which of the following statements correctly suggests a possible hazard of the practice of genetic engineering?

A Genes for antibiotic resistance might be unknowingly incorporated into bacteria and cause human diseases.
B GMOs might be able to produce human proteins on a large scale.
C Transgenic crops might develop resistance to pests.
D The nutritional content of certain crops might be enhanced.

17 Which of the following is an incorrect characteristic of adrenaline?

A It increases breakdown of glycogen to glucose
B It increases heart rate and blood pressure.
C It is produced when a person is frightened.
D It decreases the rate of breathing.

18 The diagrams below show the distribution of two inheritable traits in a human population.



Which traits might best be represented by X and Y?

	X	Y
A	IQ	Height
B	Ability to roll tongue	Weight
C	Skin colour	Gender
D	Blood type	Shoe size

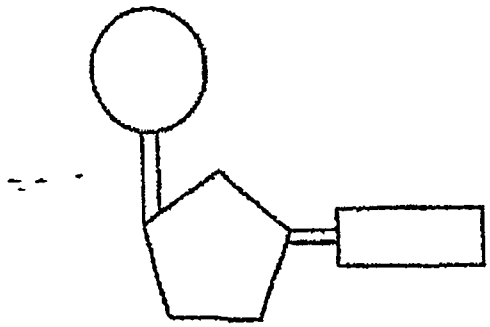
19 Independent assortment of chromosomes is one of the most important events in meiosis because it _____.

A produces new combinations of the genetic information in gametes
B limits variation in genetic information in the next generation.
C halves the number of chromosomes in each cell during segregation
D enables exchange of genetic information between random chromosomes

20 Which of the following options below correctly identifies the affinity between haemoglobin and the three gases?

	highest affinity ⟶		lowest affinity
A	carbon monoxide	carbon dioxide	oxygen
B	carbon monoxide	oxygen	carbon dioxide
C	oxygen	carbon dioxide	carbon monoxide
D	oxygen	carbon monoxide	carbon dioxide

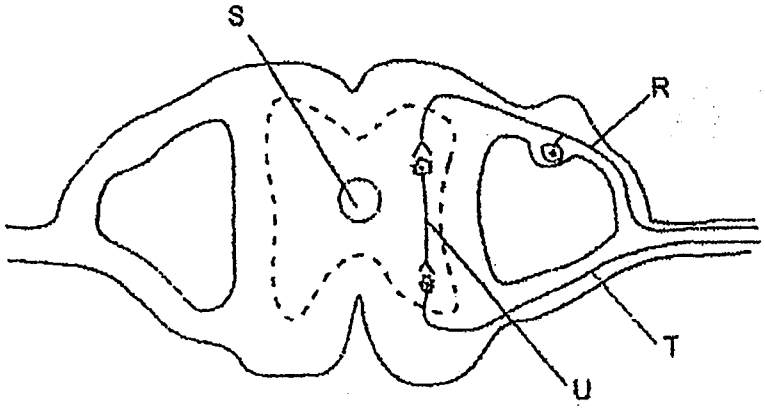
21 The figure below shows the diagrammatic representation of a biological molecule.



What of the following is the correct identity of the molecule represented?

A DNA molecule
B nucleotide
C tRNA
D sugar-phosphate backbone

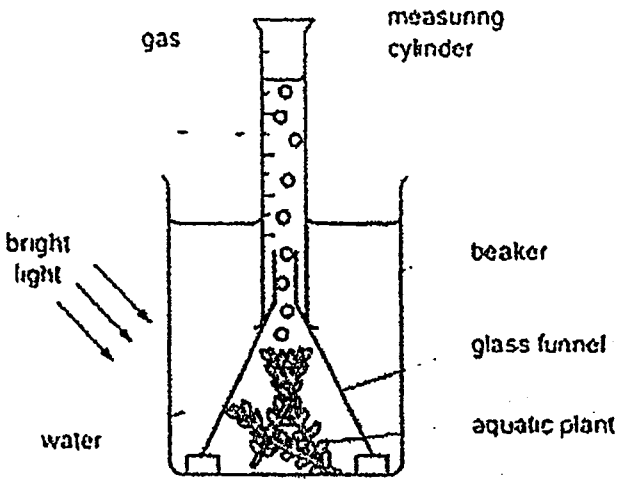
22 The diagram shows a transverse cross-section of the spinal cord with spinal nerves.



Which of the following represents the correct pathway of a reflex action?

A Effector → R → U → T → receptor
B Effector → T → U → R → receptor
C Receptor → T → U → R → effector
D Receptor → R → U → T → effector

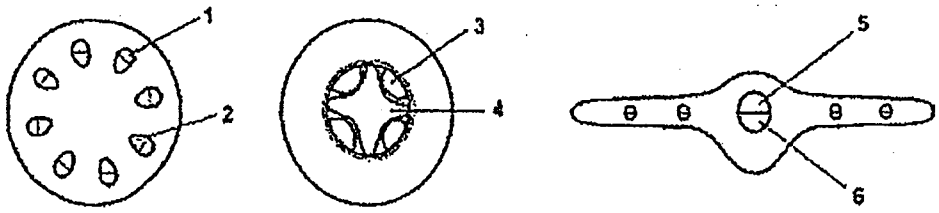
23 The figure shows an experiment carried out to investigate the effect of light intensity on the rate of oxygen production in aquatic plants.



Which two important factors must be kept constant during this investigation?

A The amount of water in the beaker and the height of the measuring cylinder.
B The size of aquatic plant and the amount of gas in the measuring cylinder.
C Size of aquatic plant and the duration of exposure to light.
D The size of the beaker and the funnel.

24 The diagram below represent the cross section of the stem, root and leaf (respectively from the left) of a non-woody dicotyledonous plant. In each section the distribution of the structures is shown.



Which labelled numbers correctly identify the xylem and phloem in the stem, root and leaf?

	xylem	phloem
A	1 3 5	2 4 6
B	1 3 6	2 4 5
C	2 4 5	1 3 6
D	2 4 6	1 3 5

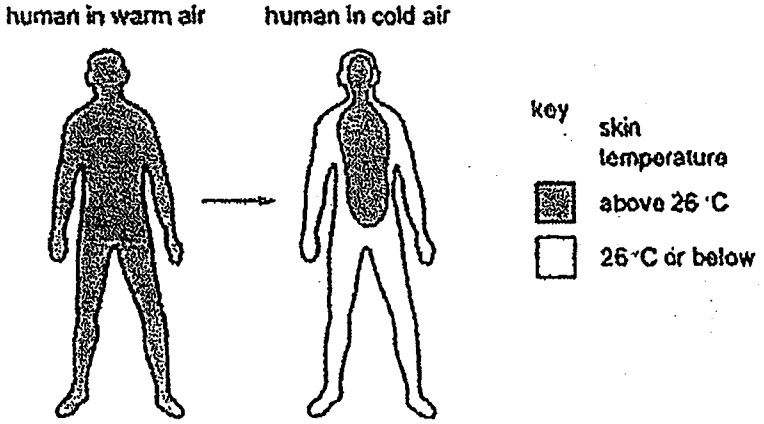
25 The table below shows the characteristics of the blood in a blood vessel in the body.

Oxygen concentration	carbon dioxide concentration	pressure
high	low	high

Which of the following is the likely identity of this blood vessel?

A aorta
B pulmonary artery
C pulmonary vein
D vena cava

26 The figure below shows skin temperature of a human when exposed to warm air and then exposed to cold air.



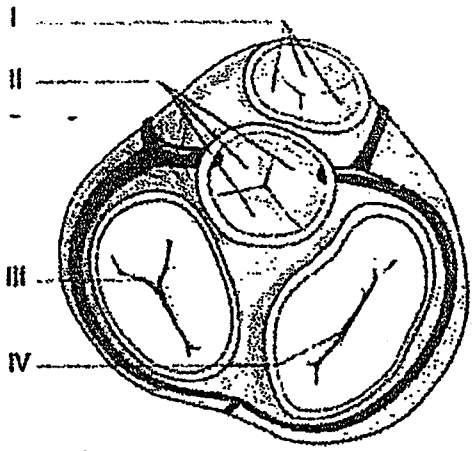
What causes the observed change in skin temperature on exposure to cold air?

A Less blood flowing to the extremities.
B Less blood going to the heart and lungs
C More blood flowing just below the skin
D More blood going to the heart and lungs

27 The hypothalamus detects a rise in blood temperature above normal. Which of the following options shows the appropriate response?

	arterioles in the skin	sweat glands	hair erector muscles
A	constrict	active	relax
B	constrict	inactive	contract
C	dilate	active	relax
D	dilate	inactive	contract

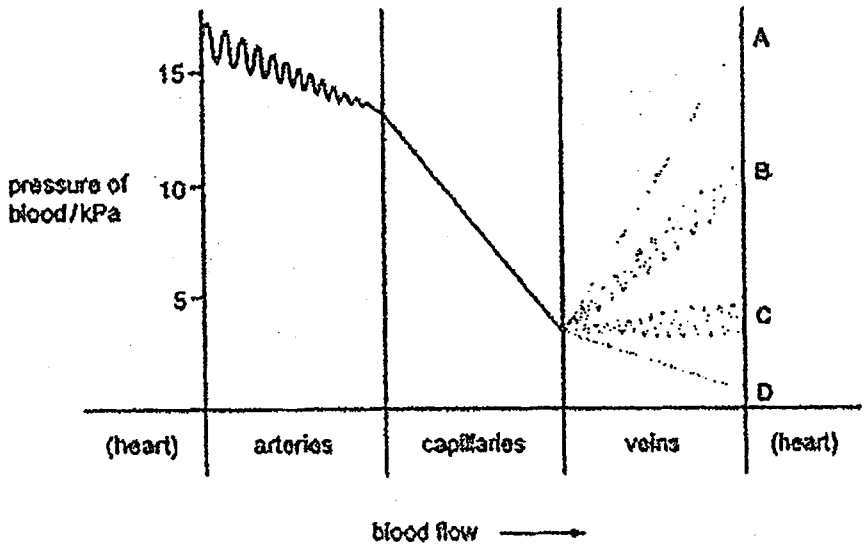
28 The figure below shows the valves in the human heart.



Which of the labelled valves close immediately after ventricular systole?

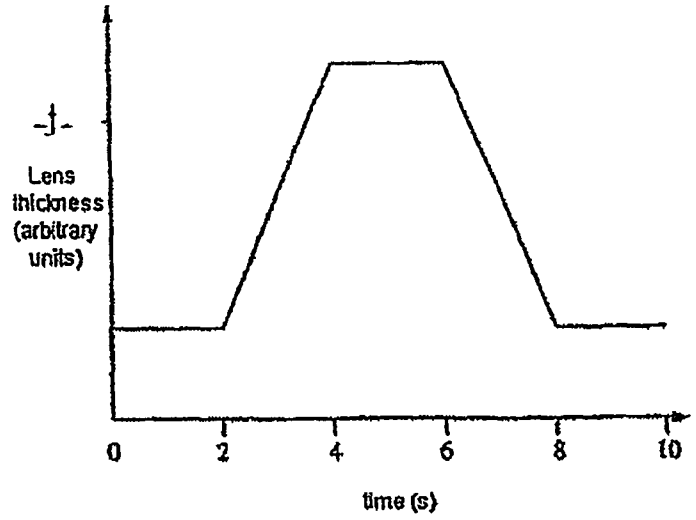
A I and II.
B II and III.
C III and IV.
D IV only.

29 The figure below shows the blood pressure of a person at rest as the blood leaves the heart and passes through arteries and then the capillaries.



Which of the labelled lines shows the pressure of blood as it flows through veins before returning to the heart?

For questions 30 and 31, refer to the graph below which shows the changes in the lens thickness in a boy's eye within a period of time.



30 What is happening to the boy's eye between the 2nd and 4th second?

A The tension on the suspensory ligaments is decreasing
B The tension on the suspensory ligaments is increasing
C The ciliary muscles are relaxing
D The radial muscles are contracting.

31 What is the boy looking at between the 4th to 6th second?

A A distant object.
B An object moving away from him.
C A nearby object.
D An object moving towards him.

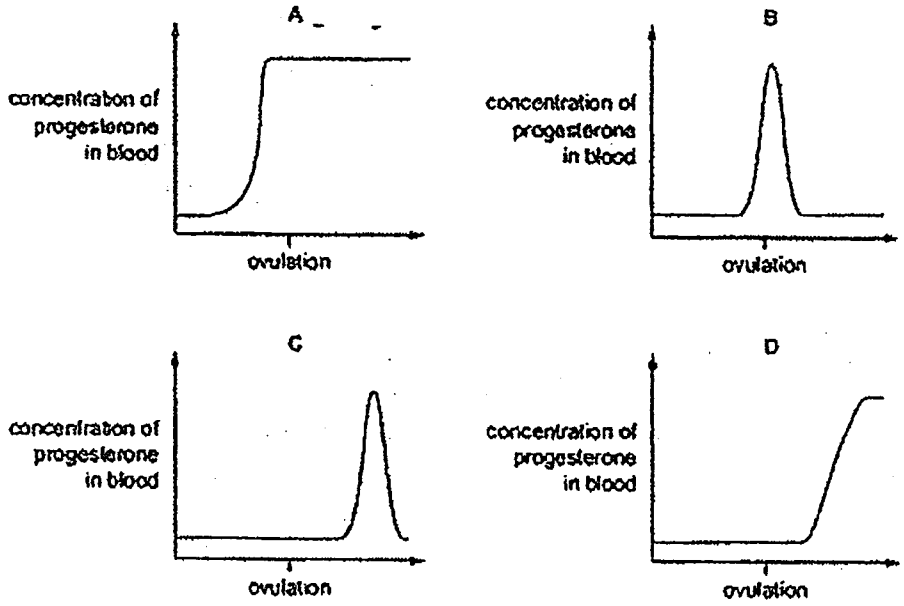
32 A pomegranate tree of variety X had its flowers pollinated by a distinctly different pomegranate tree of variety Y. However, the fruits produced strongly resembled those produced when variety X was self-pollinated.

Which of the following statements is the most reasonable explanation for this phenomenon?

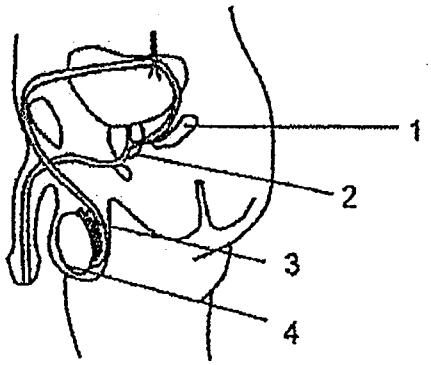
A The fruit's flesh develop from tissues of the female parent plant.
B Pollen contains very little genetic material.
C Varieties X and Y are genetically identical.
D Variety X is genetically more robust than variety Y.

33 The graphs below show the concentration of progesterone in the blood of a female during a 28 day cycle.

Which graph shows the changes in concentration of progesterone if pregnancy occurs after ovulation?



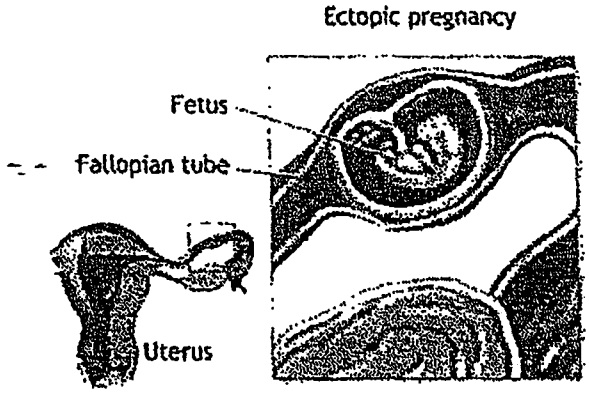
34 The figure below shows a section through the male reproductive system.



Which structure(s) produce(s) the fluid part of the semen that contains nutrients and enzymes?

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

35 An ectopic pregnancy refers to one in which the embryo implants in an area other than the womb, as illustrated in the figure below.



Which of the following statements would account for why the pregnancy could be dangerous for the mother?

1 Ectopic pregnancy would cause the uterine lining to shed.
2 Fetal and maternal blood systems are continuous.
3 The fallopian tube might rupture as the fetus enlarges.

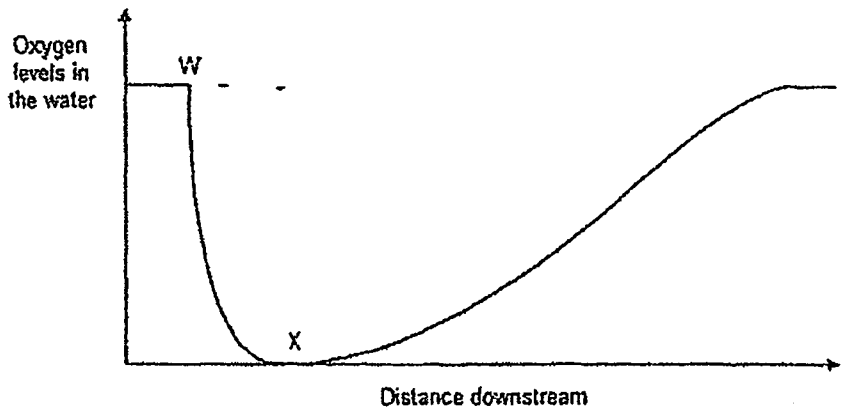
A 2 only.
B 3 only.
C 1 and 3.
D 1, 2 and 3.

36 Which of the following statements about eutrophication is true?

1 It increases the amount of sunlight reaching the bottom of the water body.
2 It occurs due to excessive amount of nitrates and phosphates in water.
3 It results in a decrease in water clarity, dissolved oxygen and aquatic life.

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

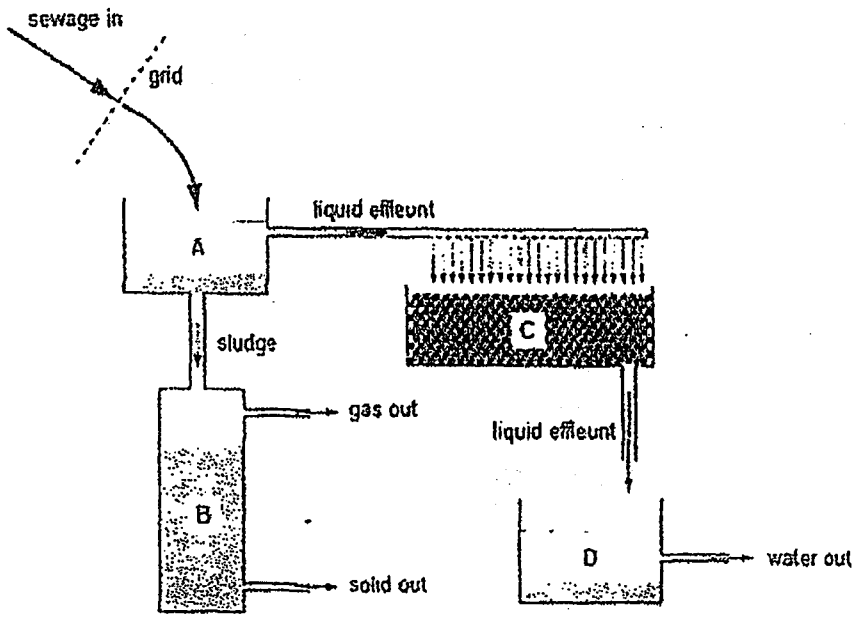
37 The graph below shows the oxygen levels in a slow-moving fresh water stream that has been contaminated by sewage.



The reason why the oxygen levels dropped rapidly between points W and X is because _____.

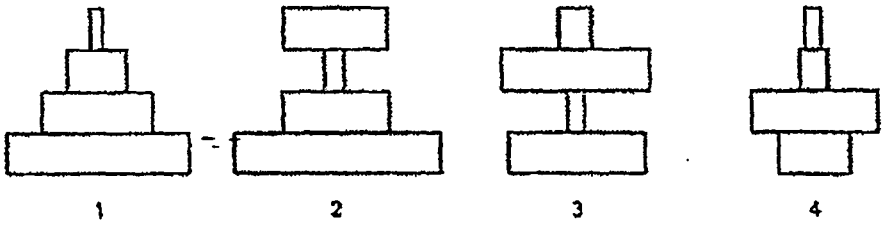
A the fish took in all of the oxygen
B there was an increase in the number of decomposers
C there was a rapid increase in the numbers of green plants
D there was a decrease in the dissolved nitrate concentration

38 The diagram shows a sewage treatment process.



Which of the labelled stages is likely to involve anaerobic bacteria?

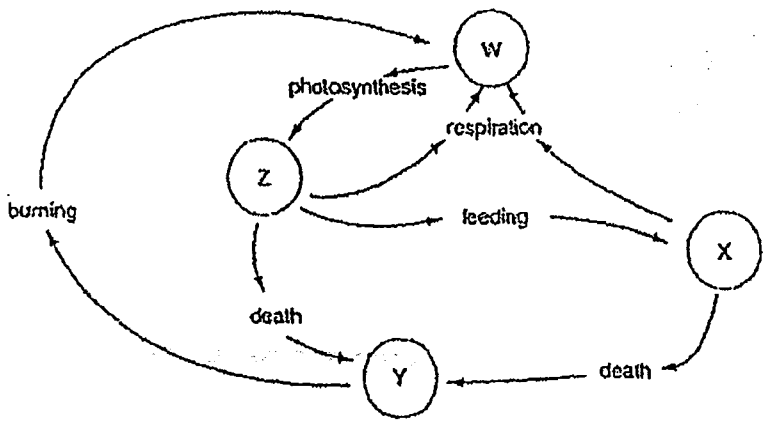
39 In a food chain, grass is eaten by cows. The cows have insects living on their hides. These insects are fed on by birds.



The diagram above shows four ecological pyramids. Which is the pyramid of biomass and which is the pyramid of numbers for this food chain?

	Pyramid of biomass	Pyramid of numbers
A	1	1
B	3	1
C	1	3
D	3	4

40 The diagram below shows some stages in the carbon cycle. W, X, Y and Z are carbon compounds.



Which of the following identifies Y?

A Coal and natural gas.
B Carbon dioxide in the air
C Carbon compounds found in plants
D Carbon compounds found in animals

- End of Paper -

Setters: Mr K. Tan
Mdm N. Kabir

Name	Class	Register Number

5158/02 **BIOLOGY (SPA)**

Tuesday 5 Aug 2014 1 hour 45 minutes

VICTORIA SCHOOL

SECOND PRELIMINARY EXAMINATION
(SECONDARY FOUR)

READ THESE INSTRUCTIONS FIRST

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

Write your name, class and register number in the spaces provided at the top of this page.

Write in dark blue or black pen in the spaces provided on the question paper.

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

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

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

Answer all questions. Question 10 is in the form of an Either/ Or question.

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

This Question Paper consists of 16 printed pages (including this cover page).

[Turn Over]

Section A (50 marks)
Answer all questions.
Write your answers in the spaces provided.

1 Fig. 1.1 shows a large jar in which plants are growing.

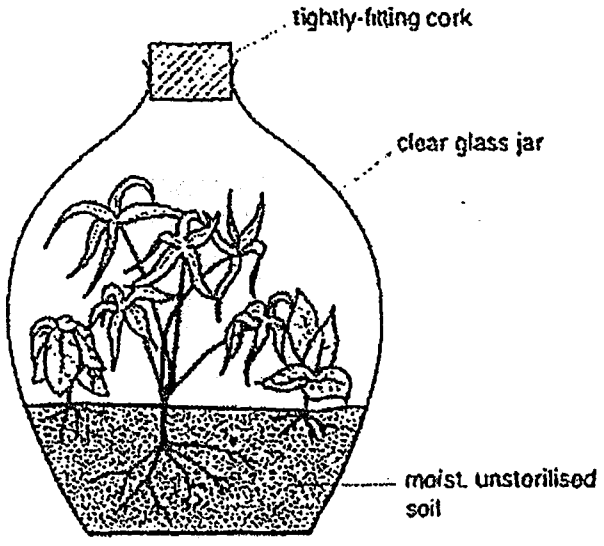


Fig 1.1

The jar provides an environment in which plants can survive for many months without the addition of water or air.

(a) State the chemical equation of the process that occurs in the green plants in the presence of light.

..... [1]

(b) Name two likely limiting factors for the growth of the plants.

1) ..... 2) ..... [2]

(c) Explain how the plants are able to survive without a continuous supply of fresh air.

.....

.....[2]

(d) Explain why water does not need to be added to the plants.

.....

.....[2]

[Total:7]

2 Fig. 2.1 shows a section through a small surface wound to the skin.

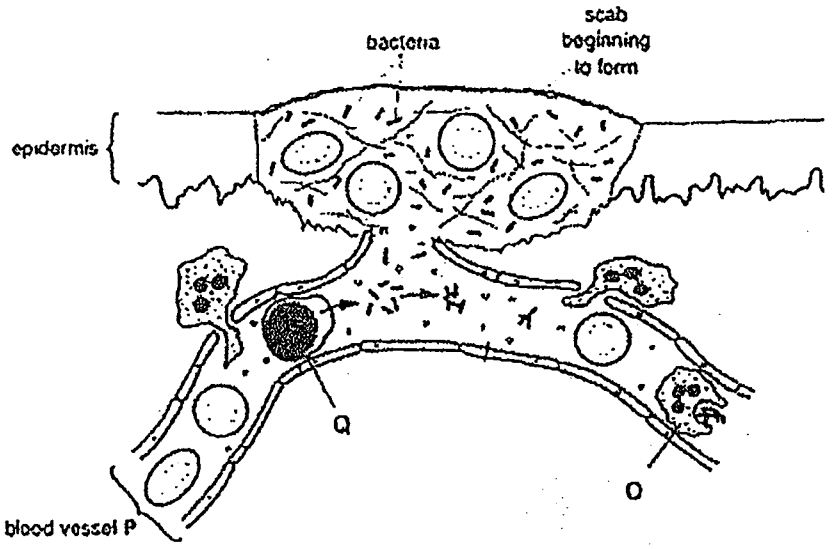


Fig 2.1

(a) Name the cell O and blood vessel P.

O : ..... P: ..... [2]

(b) Briefly describe the involvement of cells O and Q in defence.

.....

.....

.....

.....[3]

(c) Explain how further entry of bacteria is prevented during wound healing.

.....

.....

.....[2]

[Total:7]

3 A student completed his 2.4km run for his NAPFA test in 10 minutes and then rested for another 10 minutes. Fig 3.1 shows the lactic acid and muscle glycogen concentration in blood samples of the student taken at different time intervals.

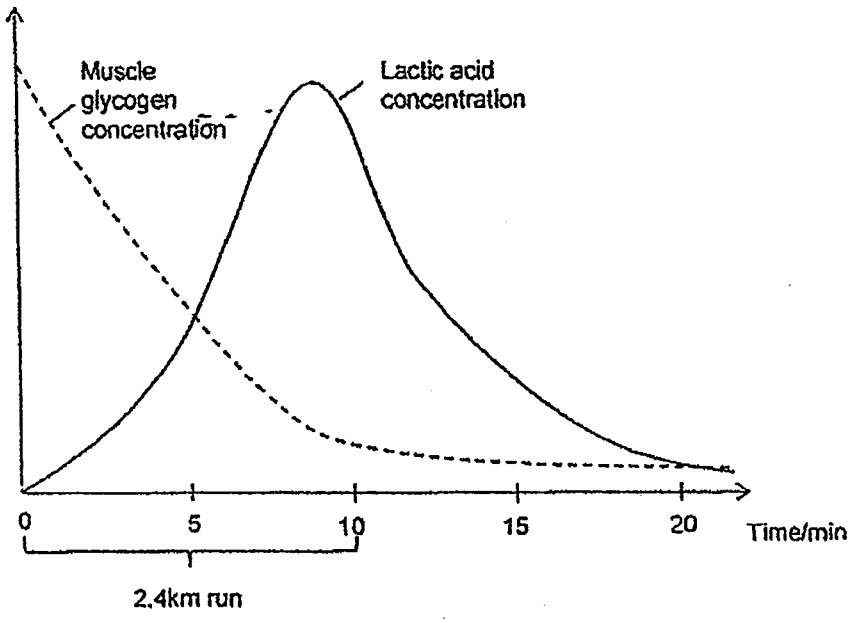


Fig 3.1

(a) In Fig 3.1 above, draw a line representing the oxygen intake of the student. [1]

(b) Define *anaerobic respiration*.

.....

.....[1]

(c) Explain the decrease in muscle glycogen concentration during the 2.4km run.

.....

.....

.....

.....[2]

(d) Explain the change observed in lactic acid concentration during rest.

.....

.....

.....

.....

.....

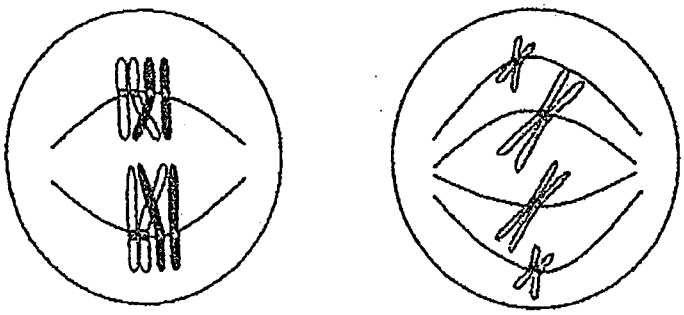
.....

.....

.....[3]

[Total:7]

4 Fig 4.1 shows two cells obtained from a flowering plant undergoing cell division. Cell A is obtained from the ovule while Cell B, from the style. The diploid number of chromosomes in this plant is 4.



Cell A Cell B

Fig 4.1

(a) In the table below, state the type and stage of cell division that each of the cells are undergoing.

	Type of cell division	Stage of cell division
Cell A		
Cell B		

[2]

(b) In the space provided below, illustrate the next stage of cell division that Cell A will undergo.

[2]

(c) Explain why a gene mutation in Cell A is more likely to lead to the emergence of a new species compared to a gene mutation in Cell B.

.....

.....

.....

..... [2]

[Total:6]

5 Fig 5.1 shows the initial stages involved in the insertion of the human insulin gene into a bacterium.

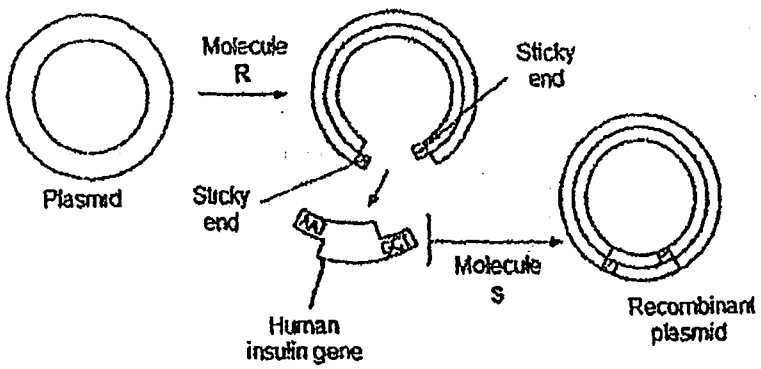


Fig 5.1

(a) (i) Identify molecules R and S.

R: ..... S: ..... [2]

(ii) Explain why the same molecule R has to be used to obtain the gene that codes for human insulin.

.....

..... [1]

(iii) State the term used to describe the role of the plasmid in this procedure.

..... [1]

(b) A section of the base sequence of the human insulin gene is given below.

ATG GCC CTG TGG ATG

(i) State the base sequence of the mRNA that is produced from this sequence by the recombinant bacteria.

..... [1]

(ii) Explain how fermenters can achieve large scale production of insulin to meet the demands of pharmaceutical companies.

.....

.....

.....

.....

.....

..... [3]

(c) Explain the significance of insulin in humans.

.....

.....

.....

.....

.....

..... [3]

[Total:11]

6 Fig. 6.1 shows the energy flow through a food chain.

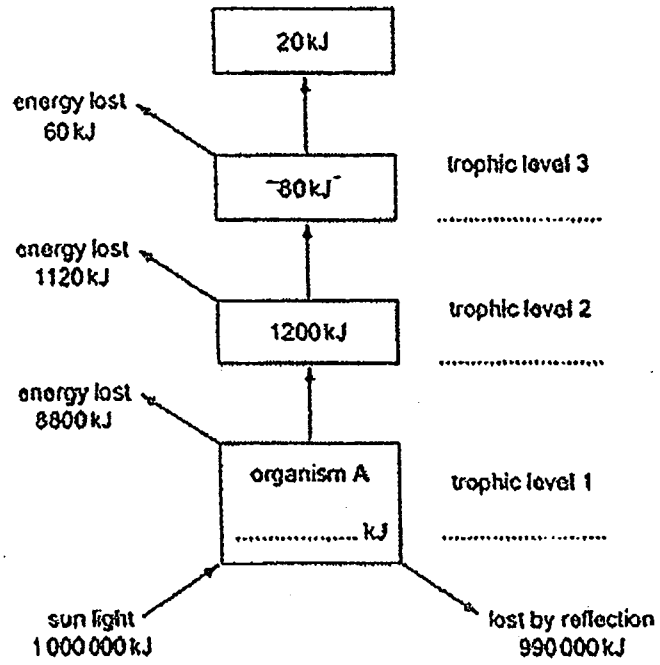


Fig 6.1

(a) On Fig. 6.1, write carnivore, herbivore or producer at the correct trophic level. [1]

(b) On Fig. 6.1, complete the energy value of organism A. [1]

(c) Name the process by which organism A traps energy.

..... [1]

(d) With reference to Fig 6.1, explain why the food chain exhibits the non-cyclical nature of energy flow.

.....

.....

..... [2]

[Total:5]

7 A 10-year study on a certain ecosystem was carried out to investigate the relationship between voles and owls.

Voles are small mouse-like mammals and owls are carnivorous birds.

The results are shown in Fig. 7.1 and Fig. 7.2.

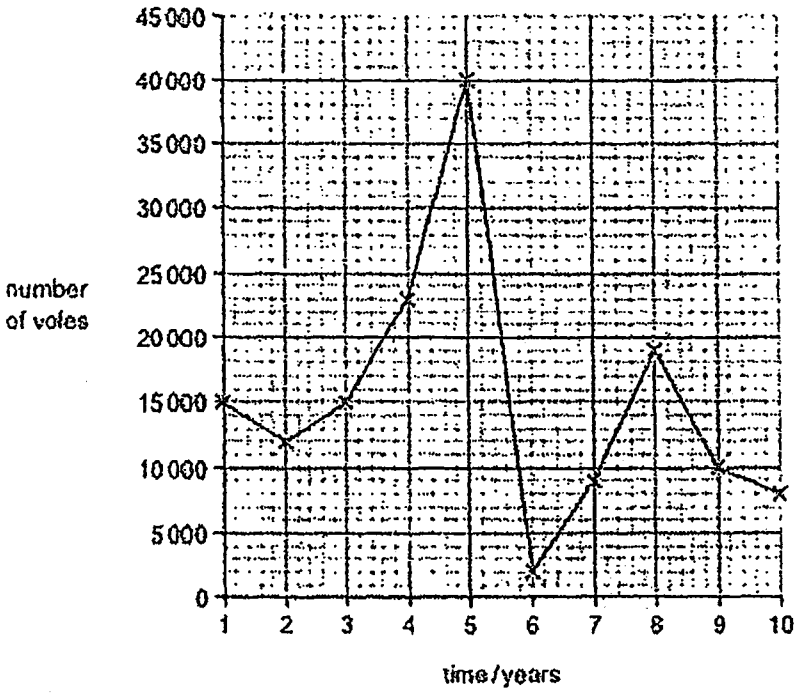


Fig 7.1

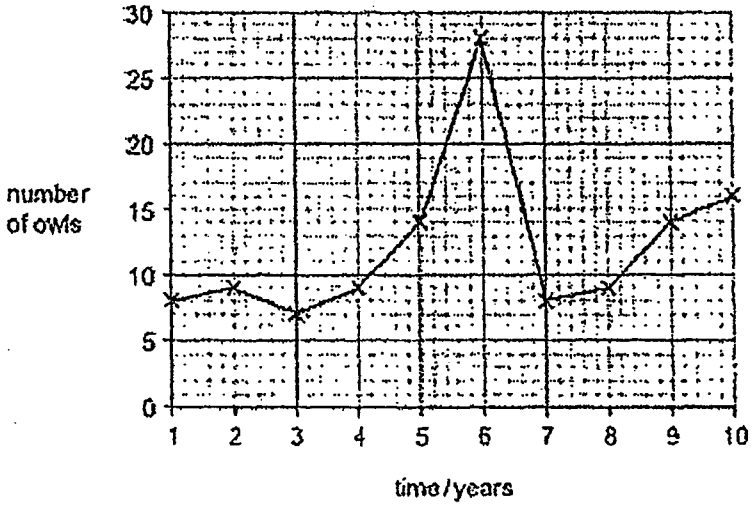


Fig 7.2

(a) Explain the significance of the much larger population of voles compared to the owls.

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.....

.....[2]

(b) Suggest three reasons for the decrease in the voles population between years 5 and 6.

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.....

.....[3]

(c) State the evidence from Fig. 7.1 and Fig. 7.2 that supports the idea that voles form a large part of the owl's diet.

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.....[2]

[Total:7]

Section B (30 marks)
Answer three questions.
Question 10 is in the form of an Either/ Or question.
Only one part should be answered.

8 Clement carried out an experiment to investigate the effect of pepsin on egg whites.

6 test tubes were set up containing 10 cm^3 of egg white and 1 cm^3 of pepsin at a pH of 2. The 6 test tubes were then incubated in water baths of temperatures ranging from 10°C to 60°C. The time taken for the egg whites to turn clear was then recorded.

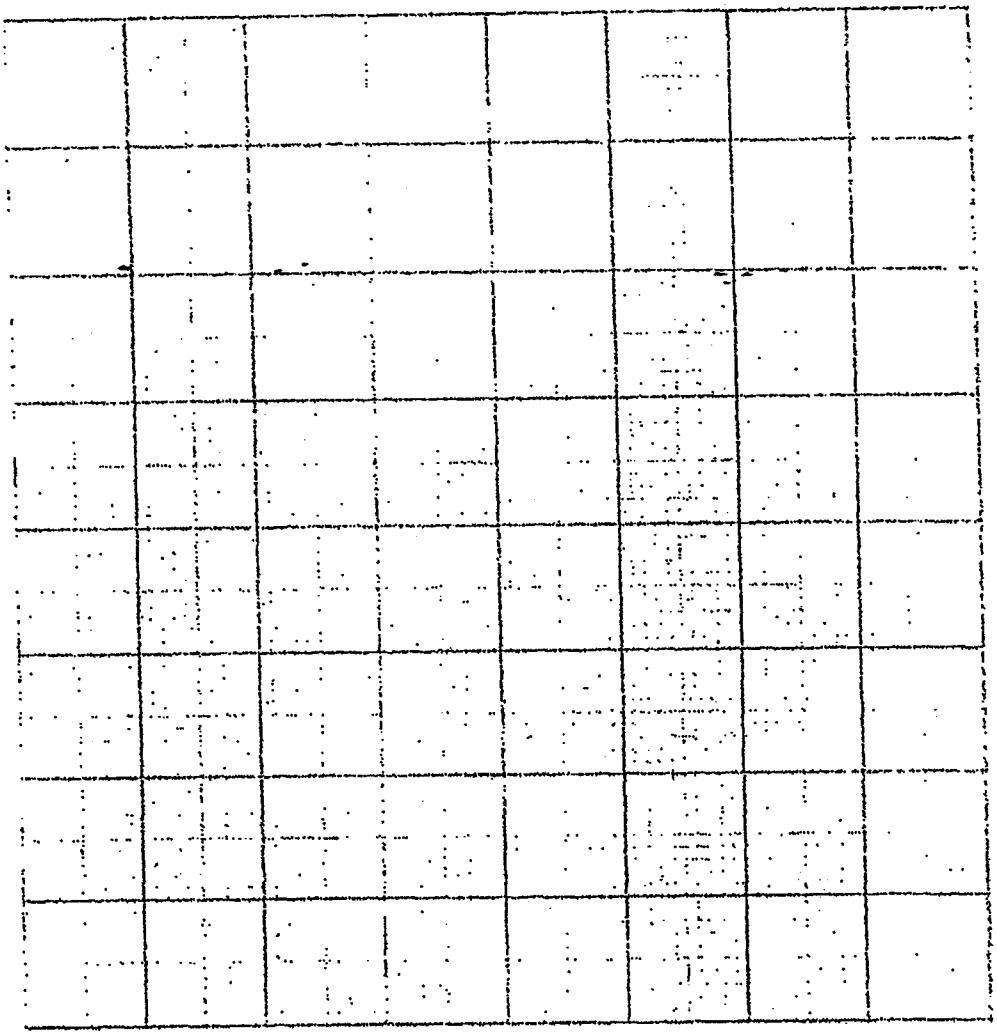
The experiment was repeated at a pH of 10.

The results are shown in Table 8.1 below.

Temperature / °C	Time taken for egg whites to clear / min	
	pH 2	pH 10
10	36	65
20	20	62
30	10	63
40	9	61
50	42	64
60	60	63

Table 8.1

(a) Plot a graph of time taken for egg whites to clear against temperature at pH 2 and pH 10 on the grid provided. [4]



(b) With reference to your graph, deduce the optimum temperature for pepsin.

..... [1]

(c) Explain the trends shown by the graphs at pH 2 and pH 10 between 10°C and 40°C.

.....

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..... [4]

(d) Suggest how the results will differ if the experiment was repeated using intestinal protease instead of pepsin.

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..... [1]

[Total:10]

9 Farmers have widely adopted the use of genetically modified (GM) crops in agriculture in recent years. Between 1996 and 2011, the total surface area of land cultivated with GM crops had increased hundredfold. GM crops offer many advantages over regular crops but there have been many concerns about the use of genetic engineering in food production.

(a) Explain the term *Genetically Modified Organism*.

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.....[2]

(b) Describe two ethical and two social issues associated with genetic engineering with reference to a named example.

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.....[4]

(c) Describe how a farmer could use artificial selection, instead of genetic engineering, to improve his crops.

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.....[4]

[Total:10]

10 Either

(a) Fig.10.1 shows a fetus developing inside the uterus.

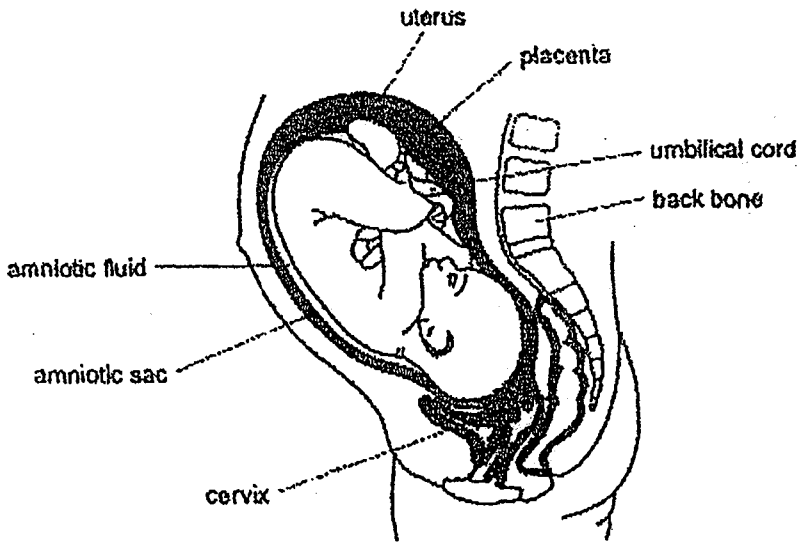

Fig 10.1

Describe how the structures named in Fig. 10.1 provide the following needs of the fetus.

Protection: .....

.....

.....

.....[2]

Excretion of metabolic waste: .....

.....

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.....

.....

.....[3]

(b) With reference to key structures and processes, describe what happens in the human body from the time of ovulation leading up to fertilisation.

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.....[5]

[Total:10]

10 OR

(a) Describe two disadvantages of deforestation to the environment.

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.....[4]

(b) State an example of pollution, caused by human activity and discuss the effects of the named example.

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.....[3]

(c) Discuss reasons for the conservation of species in the management of fisheries.

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.....[3]

[Total: 10]

- End of paper -

Setters: Mr K Tan
Mdm N Kabir

Mark Scheme – Sec 4 Express Biology Prelim 2 2014

Paper 1: MCQs [40 marks]

Answer Key:

1	2	3	4	5
C	D	B	B	A

6	7	8	9	10
B	C	B	D	B

11	12	13	14	15
D	D	A	B	B

16	17	18	19	20
A	D	C	A	B

21	22	23	24	25
B	D	C	C	A

26	27	28	29	30
A	C	C	D	A

31	32	33	34	35
C	A	D	B	B

36	37	38	39	40
C	B	B	C	A

Answers to Paper 2

Section A [50 marks]

Q No.		
1(a)	$6CO_2 + 6H_2O$ (in the presence of light) → $C_6H_{12}O_6 + 6O_2$	[1]
(b)	Limited water; area; space; carbon dioxide	[2]
(c)	Both respiration + photosynthesis (occurring in jar); respiration releases CO_2; CO_2 released used for photosynthesis; photosynthesis , releases O_2; O_2 + used for respiration; ref. microorganisms / bacteria / fungi / decomposers + in soil	[2]
(d)	water from leaves/transpiration / water from soil evaporates; respiration + produces/releases water; returned to soil / condenses; absorbed / used by plants;	[2]
2(a)	O – phagocyte, P - capillary	[2]
(b)	Q releases antibodies in response to the bacteria; clumping Causes the bacteria to be harmless, O, has the ability to move to site of infection and engulf bacteria; phagocytosis	[3]
(c)	action of platelets and damaged cells release thrombin activates fibrin formation; traps red blood cell → stops bleeding scab formation, prevents further entry of bacteria	[2]
3(b)	Breakdown of food substances to release less energy in the absence of oxygen	[1]
(c)	Glycogen is broken down, increasing glucose concentration; To increase rate of respiration to meet increased energy demand	[2]
(d)	From 10 to 20 min, oxygen supply exceeds oxygen demand/surplus of oxygen/ oxygen debt is repaid; lactic acid is increasingly removed from cells and transported to the liver;	[3]

	and converted into glucose, decreasing lactic acid concentration	
4(a)	<table><tr><th>Cell</th><th>Type of cell division</th><th>Stage</th></tr><tr><td>Cell A</td><td>Meiosis</td><td>Metaphase I</td></tr><tr><td>Cell B</td><td>Mitosis</td><td>Metaphase</td></tr></table>	[2]
(b)	Separation of chromatids; Chromatids showed crossing over	[2]
(c)	Mutation in cell A results in variation in gametes and subsequently offspring; While mutations in cell B only affects that organism and do not affect future offspring	[2]
5(a)(i)	R: Restriction enzyme S: DNA ligase	[2]
(a)(ii)	Using the same restriction enzyme will produce sticky ends that are complementary to the sticky ends on the plasmid	[1]
(a)(iii)	It acts as a vector to carry the human insulin gene into the bacterium	[1]
(b)(i)	UAC CGG GAC ACC UAC	[1]
(b)(ii)	Bacterial strain used must be able to readily grow in a fermenter; Provide nutrients necessary for rapid cell growth : carbon & energy sources; Maintain optimum temperature and oxygen content	[3]
(b)(iii)	Insulin stimulates liver; to convert excess glucose to glycogen; Decreasing blood glucose levels back to normal levels	[3]
6(a)	Level 1 – producer, Level 2 - herbivore, Level 3 - carnivore	[1]
(b)	10 000kJ	[1]
(c)	photosynthesis	[1]
(d)	90 % of energy is lost up a food chain as heat; Only 10% of energy is transferred to the next consumer in the food chain/ made available; diminishing energy (AW) 1 000 000kJ available energy from the Sun, results in only 20kJ at the 4th trophic level – eventually all energy is lost to the abiotic environment , hence cannot be re-enter the biotic environment	[2]

7(a)	Organisms lower in the food chain are larger in numbers to supply food for larger organism up the trohpic level; Greater survival value	[2]
7(b)	greater predation by owls / more predators / more owls; lack of food / starvation / more competition for food ; adverse (named) weather condition (s) ; disease / sickness / illness; emigration	[3]
7(b)	1. owl population increases, after vole population increases ; 2. owl population decrease sharply (in year 7) ; 3.immediately after sleep decrease in vole population ; 4.vole population decreases sharply (in year 6) ; 5.when there are most owls ; 6.if owls ate (much) other prey there would not be a close relationship / AW ; 7 ref to numbers of owls from the graph ;	[2]

Section B [30 marks]

Q No.	Answers	
8(c)	Pepsin works best in an acidic environment and is denatured at pH 10, temperature does not affect enzyme activity; At pH 2, as temperature increases below optimum, kinetic energy of molecules increase; substrate and enzyme molecules collide with each other more often; This increases the rate of formation of enzyme-substrate complex and an increased rate of reaction	[4]
8(d)	The results for pH 2 will show the results currently obtained for pH 10 while results for pH 10 will show the results currently obtained for pH 2	[1]
9(a)	Organism that had genes transferred from another organism; And which can express the transferred gene combinations of genes cannot occur in nature or in traditional crossbreeding	[2]
(b)	New proteins in GM food; might cause allergies in humans that consume them GM food may prove to be toxic or cancer-causing to people; Modifying a single gene in plants could result in the alteration of some metabolic processes within the plant. The resulting deaths of useful insects, like the honey bee, that feed on the nectar of GM crop plants;	

	may result in a loss of biodiversity Some biotechnology companies have engineered crop plants that produce seeds that cannot germinate; farmers have to buy special seeds from these companies every year There are objections to consuming animal genes in plants or vice versa; Vegetarians may object to the transfer to animal genes into crop plants Genes that code for antibiotic resistance may be used in genetic engineering; such genes might accidentally be incorporated into bacteria that cause diseases to humans	[4]
(c)	Analyse different plants and select plants that show the desirable traits; Let these plants self-fertilise or cross them with plants showing the same desired traits; select those with desirable traits and use them again as parents for the next few generations or cross different varieties of plants with different desirable qualities; Screen for plants with the desirable combination of genes from the two parental varieties; Propagate desired plant by vegetative means / repeat hybridisation process	[4]
Either		
10		
(a)	(amnion / uterus / amniotic fluid) 1. provides protection against, mechanical damage ; 2. provides sterile environment / no entry of pathogens ; 3. placenta provides a barrier to (named) pathogen(s) placenta prevents mixing of blood between fetus and mother excretion of metabolic waste across placenta / through placenta ; diffusion of, urea / carbon dioxide ; from fetal blood to mother's blood / into mother's blood ; nutrients / excretion umbilical cord transports, nutrients / excretory products ;	[5]
(b)	Position of ovum (fallopian tube); Time frame; Sperm swimming up through cervix to womb to fallopian tube Fusion of nuclei of ovum and sperm; Diploid zygote	[5]

OR		
10(a)	soil erosion / washed / blown ; loss of humus in soil ; desertification / ref. less rainfall / less transpiration ; leaching / flooding / loss of soil fertility ; loss of species / habitats / qualified effect on food chains ; loss of livelihood / resources / agricultural effects ; global warming / CO2 increase / climate change	[4]
(b)	insecticides + specific undesirable effect ; fertilisers / sewage / domestic or nitrogenous waste + specific undesirable effect ; heavy metal / inorganic, chemical or radioactive waste + specific undesirable effect ; gases from factories, car exhaust or fossil fuel / SO2 / + specific undesirable effect ; CFCs / CO2 / methane / CO + specific effect ; oil (spillage) + effect on wildlife ; litter / rubbish / noise / light + effect ;	[3]
(c)	Ensure livelihood of farmers (commercial value); Medical (research for drugs; Maintaining a stable and balance ecosystem; Maintenance of a large gene pool to increase variety	[3]