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Anglo-Chinese School  
(Barker Road)

PRELIMINARY EXAMINATION 2014

SECONDARY FOUR EXPRESS

BIOLOGY PAPER 1

5158/1

TIME: 1 HOUR

INSTRUCTIONS TO CANDIDATES:

Write in soft pencil.

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

Write your name and index number on the answer sheet in the spaces provided.

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.

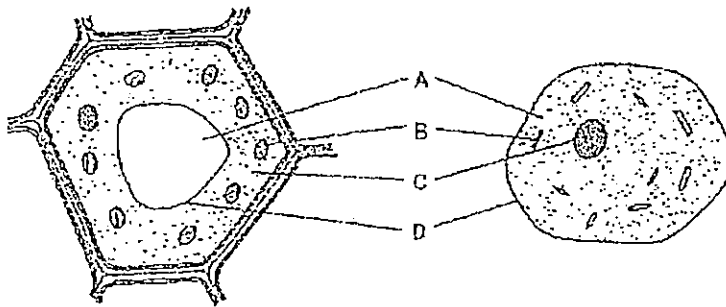
Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this booklet.

Additional Materials provided by the School:

Answer Sheet

*This question paper consists of 16 printed pages.*

1. The diagrams below show two cells as seen under a light microscope.



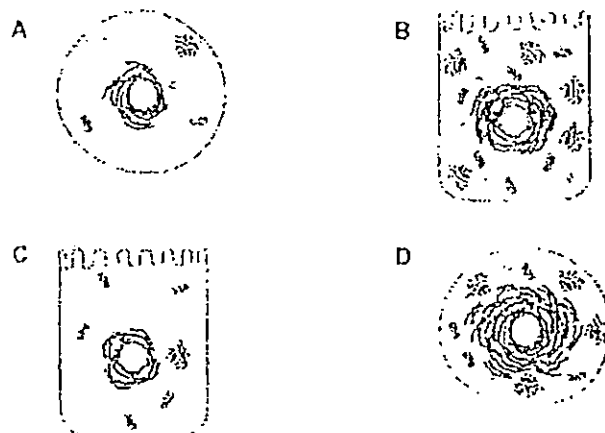
Which label is correct for both cells?

- A cell sap  
B cytoplasm  
C golgi apparatus  
D membrane
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. Which of the following cells of equal volume would be most efficient at absorbing nutrients as well as synthesizing and secreting a product?



4. A student observes that a human liver cell placed in fresh water for 30 minutes eventually lyses but a leaf epidermal cell remains intact when subjected to the same treatment.

Which of the following explains his observations?

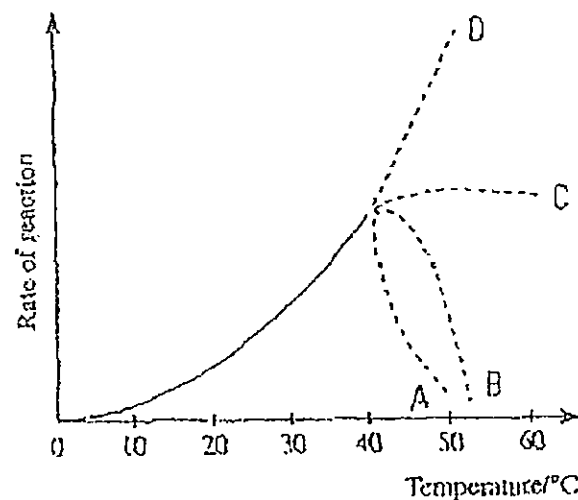
- A The liver cell has a more concentrated cytoplasm than the leaf epidermal cell.
- B The liver cell is smaller and can therefore take in less water.
- C The liver cell lacks a cell wall that would resist excessive intake of water.
- D The liver cell lacks a large central vacuole that can accommodate large amounts of water.

5. Which is an example of active transport?

- A movement of glucose molecules into the cells of the villi
- B movement of ions in blood plasma
- C movement of mineral salts into root hair cells
- D movement of water in the transpiration stream

6. A student is investigating the activity of enzyme Q which is typically found in organisms that live in the vent of hot springs (about 120 °C). The graph shows how activity of the enzyme changes with temperature.

Which line correctly shows the activity of the enzyme above 40 °C?



7. A sample of food mixed with water was tested to find out its contents. The results are shown in the table below.

| test                  | results                        |
|-----------------------|--------------------------------|
| Benedict's test       | brick red precipitate formed   |
| Iodine test           | Iodine solution remained brown |
| Ethanol emulsion test | white emulsion formed          |
| Biuret test           | violet solution formed         |

What were present in the food sample?

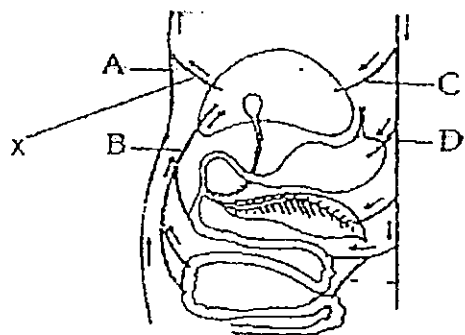
- A amino acids, fats and reducing sugars  
 B amino acids, fats and starch  
 C reducing sugars, fats and proteins  
 D starch, fats and proteins
8. Lipase solution was added to milk. After 30 minutes, the milk when tested with a pH meter, shows a low pH value.

What were the substrate and product in this reaction?

|   | substrate | products    |
|---|-----------|-------------|
| A | fats      | amino acids |
| B | fats      | fatty acids |
| C | proteins  | amino acids |
| D | proteins  | fatty acids |

For questions 9 and 10, refer to the diagram below.

The diagram shows part of the digestive system and associated blood vessels.

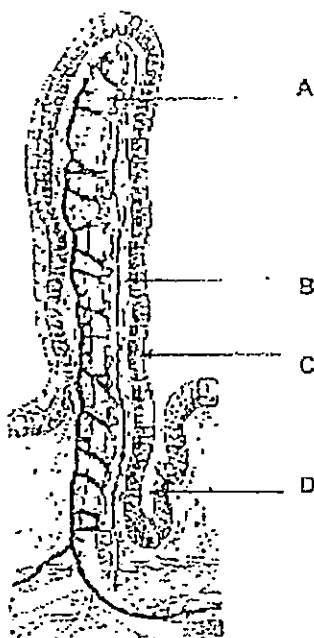


9. Which blood vessel would contain the highest concentration of amino acids after a meal?

10. Which of the following correctly compares the concentration of dissolved substances in blood vessel X with blood vessel B?

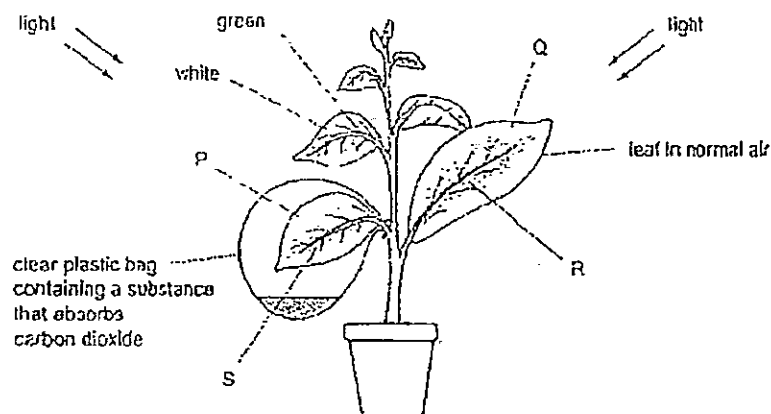
|   | glucose<br>concentration | amino acids<br>concentration | fats<br>concentration |
|---|--------------------------|------------------------------|-----------------------|
| A | higher                   | higher                       | equal                 |
| B | higher                   | lower                        | higher                |
| C | lower                    | lower                        | equal                 |
| D | lower                    | lower                        | lower                 |

11. Which letter indicates the area from which the products of lipids digestion are transported throughout the body?



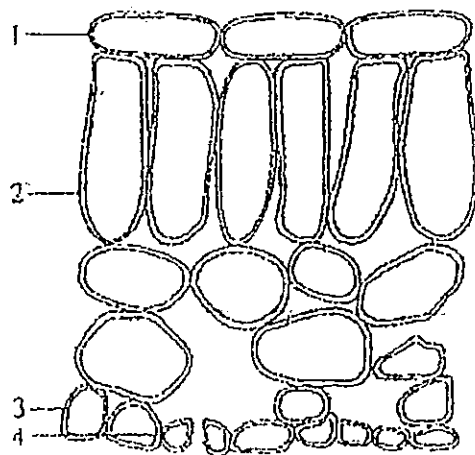
12. The diagram below shows an experiment on photosynthesis. The plant has leaves that are green in the middle and white round the edges.

Which two leaf areas each lack only one factor needed for photosynthesis?



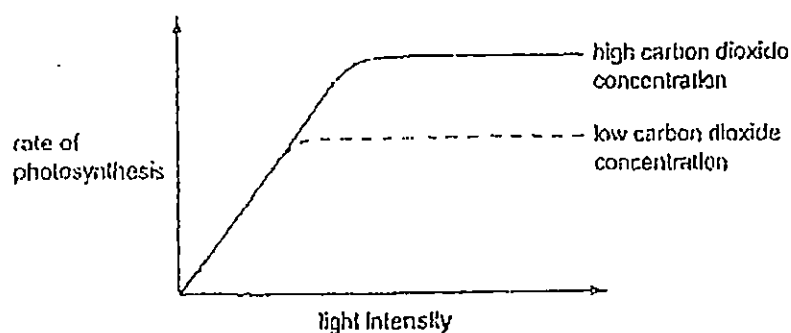
- A P and Q  
 B P and R  
 C Q and S  
 D R and S
13. The diagram shows the arrangement of cells inside the leaf of a green plant, without any cell content.

Which two cells contain chloroplasts?



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

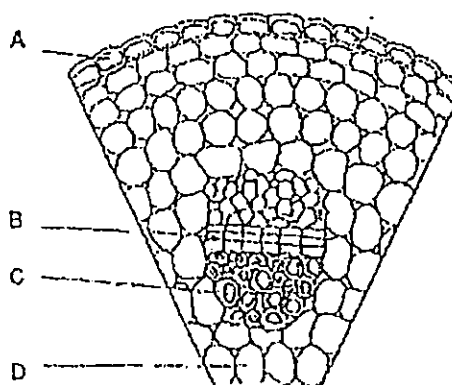
14. The graph shows the effect of changing light intensity on the rate of photosynthesis in a plant at two different carbon dioxide concentrations.



Which conclusion can be drawn from the graph?

- A At high light intensity, carbon dioxide limits the rate of photosynthesis.
  - B At low light intensity, light intensity has no effect on photosynthesis.
  - C Light intensity limits the rate of photosynthesis.
  - D When carbon dioxide concentration is low, plants cannot photosynthesize.
15. How does most carbon dioxide reach the photosynthesising cells of leaf?
- A diffusion through the epidermis of the leaf
  - B diffusion through the stomata of the leaf
  - C movement through the phloem vessels
  - D movement through the xylem vessels
16. A leafy shoot is placed in a beaker containing a solution of coloured dye. The diagram shows part of the section of the stem after two days.

Which part is now most coloured by the dye?

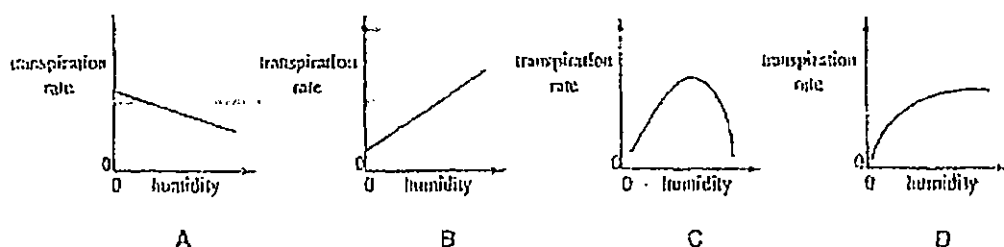




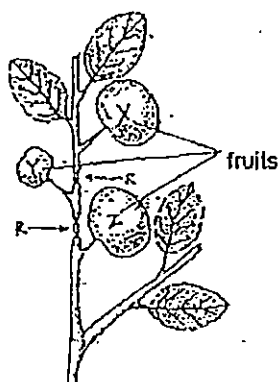
17. What causes root pressure, capillary action and transpiration pull to occur?

|   | root pressure                            | capillary action                         | transpiration pull                       |
|---|------------------------------------------|------------------------------------------|------------------------------------------|
| A | cohesion and adhesion of water molecules | evaporation of water                     | water entering xylem by osmosis          |
| B | evaporation of water                     | water entering xylem by osmosis          | cohesion and adhesion of water molecules |
| C | water entering xylem by osmosis          | cohesion and adhesion of water molecules | evaporation of water                     |
| D | water entering xylem by osmosis          | evaporation of water                     | cohesion and adhesion of water molecules |

18. Which graph shows the effect of increased humidity on the rate of transpiration of a plant?



19. The diagram below shows part of the shoot system of a fruit tree.



At the two places marked R, all the tissues external to the xylem were removed at the flowering stage.

What is the most likely explanation of the difference in size of fruits?

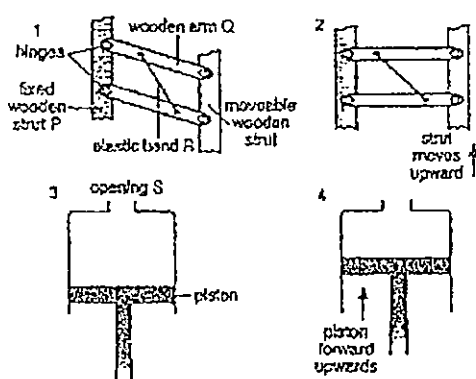
- A Food is transported downwards in the phloem, and water upwards in the xylem.
- B Food is transported both upwards and downwards in phloem.
- C Fruit Y is not getting enough water.
- D Fruits X and Z received more light than Y.

20. The table below shows the blood groups of four people and the type of blood received in a transfusion.

Which person is at risk from agglutination?

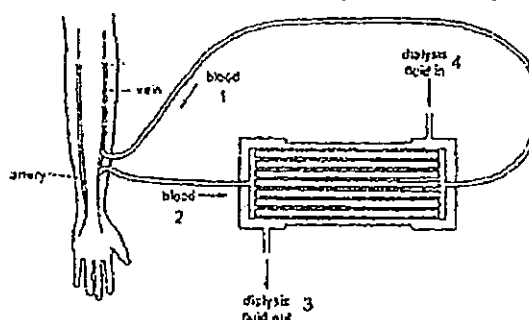
|   | recipient blood group | donor blood group |
|---|-----------------------|-------------------|
| A | A                     | B                 |
| B | A                     | O                 |
| C | AB                    | A                 |
| D | O                     | O                 |

21. The figure below shows models which demonstrate the action of two different sets of muscles used during breathing.



Which two diagrams represent the thorax after breathing in?

- A 1 and 3  
B 1 and 4  
C 2 and 3  
D 2 and 4
22. The diagram shows the flow of blood and dialysis fluid through a dialysis machine.



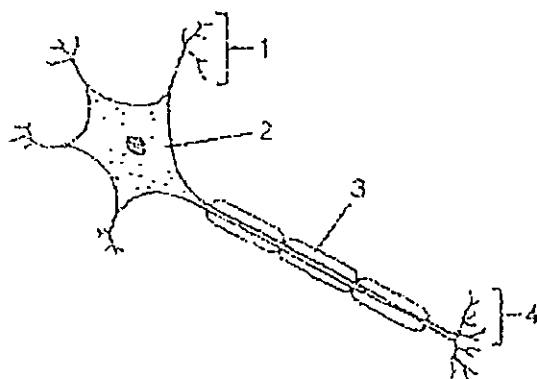
Where would the concentration of urea be the lowest or absent?

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

9

For questions 23 and 24, refer to the diagram below.

The diagram below shows a neurone.



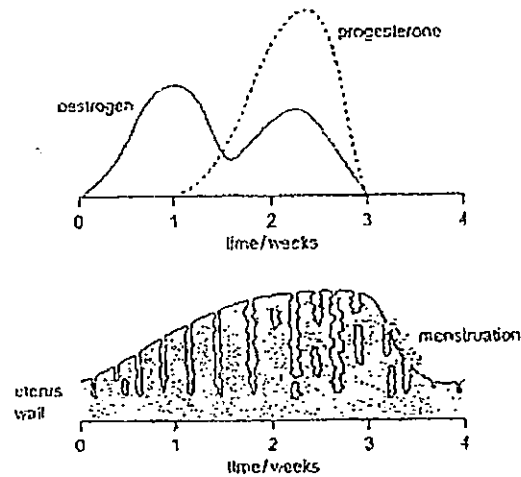
23. Which correctly identifies part 2 and the functions of parts 1 and 3?

|   | 2         | function of 1      | function of 3          |
|---|-----------|--------------------|------------------------|
| A | axon      | transmits impulses | speeds up transmission |
| B | cell body | insulation         | receives impulses      |
| C | cell body | receives impulses  | insulation             |
| D | dendron   | receives impulses  | speeds up transmission |

24. Which statement about part 4 is false?

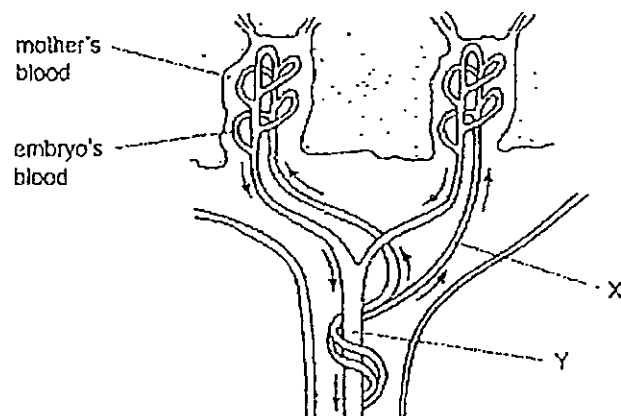
- A It transmits impulses.
- B It contains a nucleus which is not shown in the diagram.
- C It is not connected to another neurone.
- D There is a higher surface area to volume ratio in part 4 compared to parts 2 and 3.

25. The diagram shows the changes that take place during a woman's menstrual cycle.



What is occurring during the woman's fertile phase?

- A a fall in the level of progesterone only
  - B a fall in the levels of oestrogen and progesterone
  - C a rise in the level of oestrogen only
  - D a rise in the levels of oestrogen and progesterone
26. The diagram shows how the blood of a human embryo flows close to the mother's blood in the placenta.

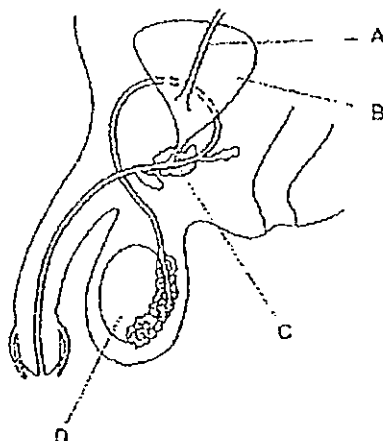


Which substances are present at X in higher concentrations than at Y?

- A carbon dioxide and glucose
- B carbon dioxide and urea
- C glucose and oxygen
- D glucose and urea

27. The diagram shows the male reproductive system.

Which structure produces testosterone?

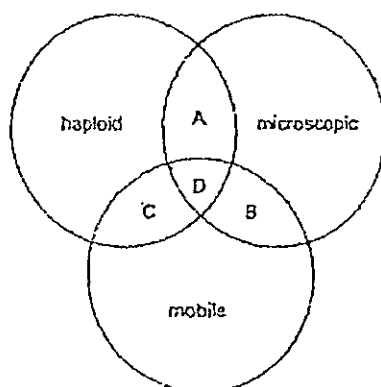


28. The table lists some processes that take place during reproduction in flowering plants and humans. Which row is correct?

|   | fertilisation needed        | implantation needed         | pollination needed          |
|---|-----------------------------|-----------------------------|-----------------------------|
| A | flowering plants and humans | flowering plants and humans | humans only                 |
| B | flowering plants and humans | humans only                 | flowering plants only       |
| C | flowering plants and humans | humans only                 | flowering plants and humans |
| D | humans only                 | humans only                 | flowering plants only       |

29. The diagram represents three properties of gametes.

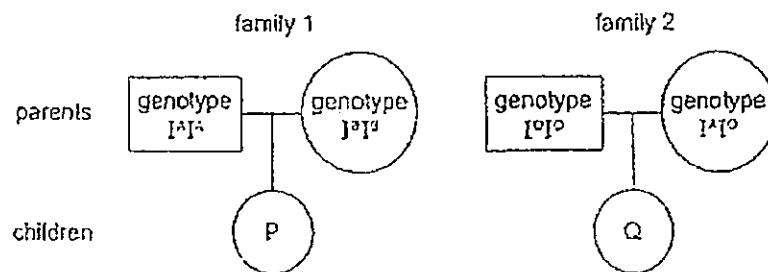
Which area describes the male gametes of humans and flowering plants?



30. Albinism in humans is caused by a recessive allele. Parents who do not suffer from the condition produce an albino child. If they already have 2 other children who are normal, what is the probability that their fourth child will be born albino?

A 0%  
B 25%  
C 50%  
D 75%

31. The diagram shows inheritance of blood groups in two different families.



For each of P and Q, what is the probability that they have a co-dominant genotype?

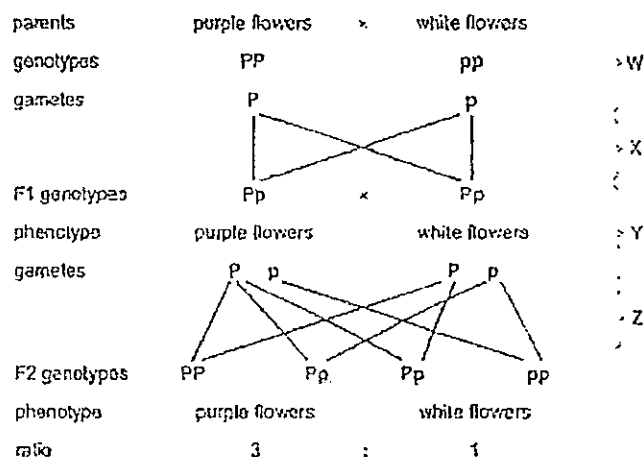
|   | P   | Q   |
|---|-----|-----|
| A | 0   | 1   |
| B | 0.5 | 1   |
| C | 1   | 0   |
| D | 1   | 0.5 |

32. A person with Down's syndrome is born with 47 chromosomes in each of his / her cells, instead of 46.

What could cause this?

A A mutation happened during the production of the egg cell.  
B More than one sperm fused with the egg at fertilisation.  
C Radiation caused a change in structure of a gene in the father's sperm.  
D The mother was exposed to harmful chemicals while she was pregnant.

33. The diagram shows the inheritance of flower colour in pea plants.



At which stages in the diagram does meiosis occur?

- A W and Y  
B W and Z  
C X and Y  
D X and Z
34. Rice is a type of grass that has been grown by humans for about 5000 years. Over hundreds of years, farmers have improved the yield of rice crops. They kept grains from the highest yielding stalks to grow the next crop.

What is this farming practice?

- A genetic engineering  
B natural selection  
C outbreeding  
D selective breeding
35. Which of the following combinations correctly matches the words to the blanks?

Chromosomes are long threads made up of many (I) \_\_\_\_\_.

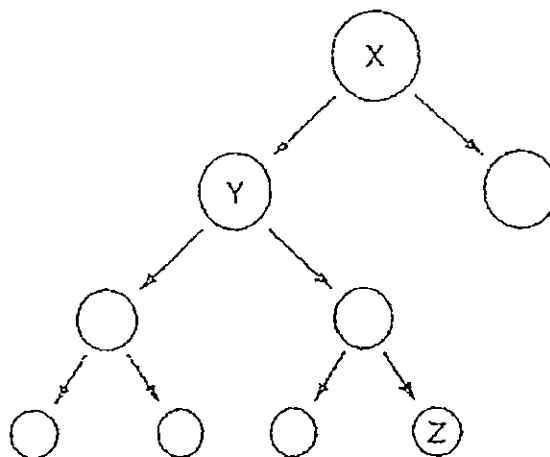
Two or more alternative forms of a gene are called (II) \_\_\_\_\_.

A nucleus contains a single set of unpaired (III) \_\_\_\_\_.

These nuclei are found in (IV) \_\_\_\_\_.

|   | I           | II         | III         | IV      |
|---|-------------|------------|-------------|---------|
| A | DNA         | chromatids | genes       | haploid |
| B | genes       | alleles    | chromosomes | gametes |
| C | nucleotides | alleles    | genes       | diploid |
| D | nucleotides | genotypes  | chromosomes | gametes |

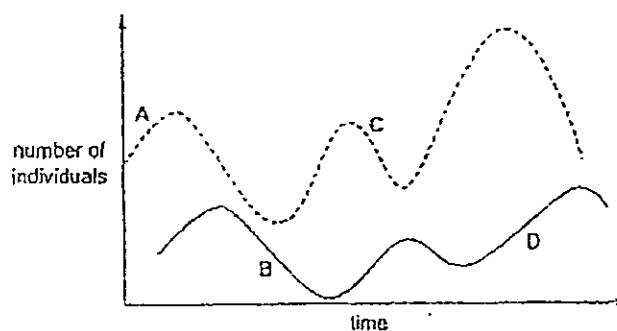
36. Cell X first divides by mitosis and then cell Y divides by meiosis.



How does cell Z compare to cell X?

|   | same number of chromosomes as cell X | genetically identical to cell X |                              |
|---|--------------------------------------|---------------------------------|------------------------------|
| A | ✓                                    | ✓                               | key<br>✓ = true<br>x = false |
| B | ✓                                    | x                               |                              |
| C | x                                    | ✓                               |                              |
| D | x                                    | x                               |                              |

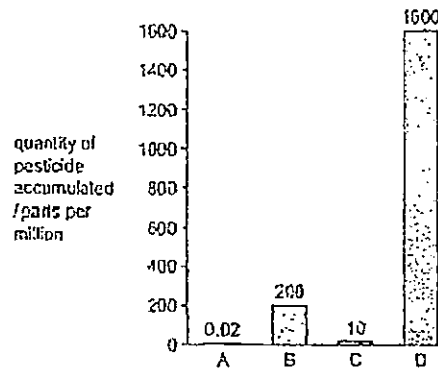
37. The graphs show the changes in the populations of predator and prey over a period of time.



Which point on the graph shows a decrease in predator population?

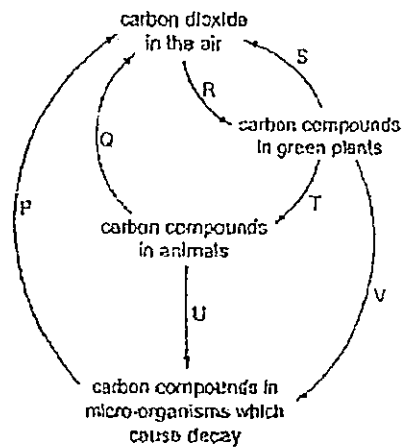


38. The graph shows the quantities of pesticides that accumulate in four populations, each at different trophic levels in a food chain.



Which population is most likely to be herbivores?

39. The diagram shows the carbon cycle.



Which letters represent respiration?

- A. P and Q  
 B. P, Q and S  
 C. T, S and V  
 D. T, U and V
40. The presence of high concentrations of nitrogen-containing fertilisers in a pond can lead to the death of fish. What is the sequence of events leading to the death of the fish?
- A. increase in algae → algae die → increase in bacteria → drop in oxygen  
 B. increase in algae → drop in oxygen → increase in bacteria → algae die  
 C. increase in bacteria → drop in oxygen → increase in algae → algae die  
 D. increase in bacteria → increase in algae → algae die → drop in oxygen

End of Paper

|           |  |
|-----------|--|
| INDEX NO. |  |
|-----------|--|



Anglo-Chinese School  
(Parker Road)

PRELIMINARY EXAMINATION 2014

SECONDARY FOUR EXPRESS

BIOLOGY PAPER 2

5158/2

TIME: 1 Hour 45 Minutes

READ THESE INSTRUCTIONS FIRST

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

Section A

Answer all questions.

Write your answers in the spaces provided on the Question Paper.

Section B

Answer all the questions.

Write your answers in the spaces provided on the Question Paper.

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

You are advised to spend no longer than one hour on Section A and no longer than 45 minutes on Section B.

At the end of examination fasten all your work securely together.

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

|           |  | Marks |
|-----------|--|-------|
| Section A |  |       |
| Section B |  |       |
| 8         |  |       |
| 9         |  |       |
| 10        |  |       |
| TOTAL     |  |       |

*This question paper consists of 19 printed pages.*

## SECTION A (50 marks)

Answer all questions in the spaces provided.

1. Fig 1.1 shows an experiment where two potato cylinders A and B, of identical mass are balanced on each end of a pivoted wooden ruler.

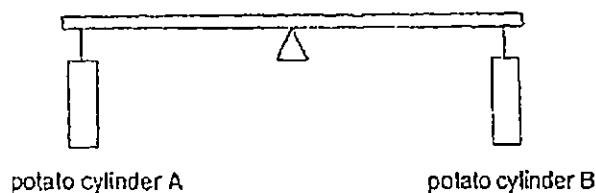


Fig 1.1

Fig 1.2 shows the two potato cylinders being placed in different solutions for half an hour and then removed.

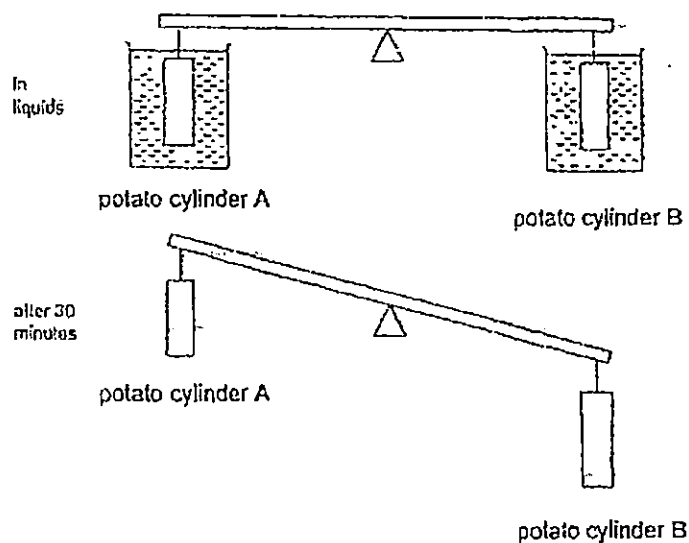


Fig 1.2

- (a) Concentrated sucrose solution and distilled water were used in this experiment. In the table below, state the potato cylinder that has been immersed in each of these solutions.

|      | Type of solution              | Potato cylinder immersed in solution |
|------|-------------------------------|--------------------------------------|
| (i)  | Concentrated sucrose solution |                                      |
| (ii) | Distilled water               |                                      |

[1]

- (b) State and give the definition of the process involved in this experiment that caused the results shown in Fig 1.2.

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.....

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[2]

- (c) Explain the results obtained in Fig 1.2.

.....

.....

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.....

.....

[4]  
[Total: 7]

2. Fig 2 shows the results of an experiment. Four starch agar plates were prepared and treated. The experimental set-ups were left for 30 minutes at 40 °C before iodine solution was added to each agar plate at the end of 30 minutes.

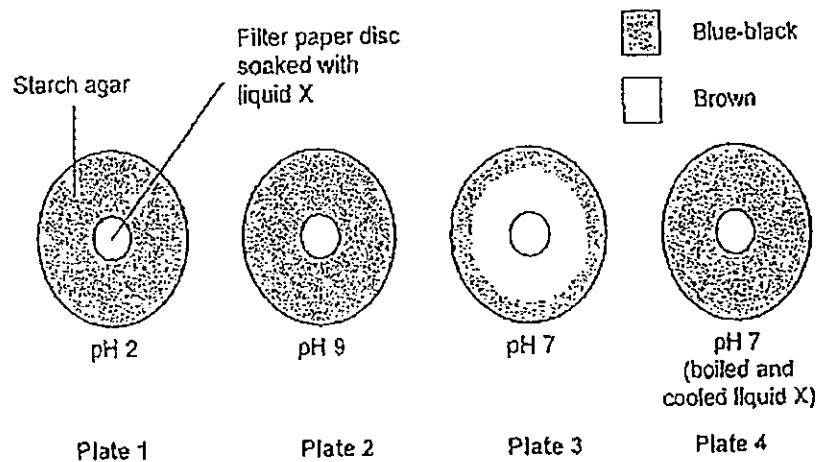


Fig 2

- (a) Using the results of this experiment to support, list two conclusions that can be drawn.

Conclusion 1.....

Evidence from results .....

.....

.....

.....

Conclusion 2.....

Evidence from results .....

.....

.....

.....

[4]

- (b) State the part of the human body that naturally produces the substance in liquid X.

.....

[1]

- (c) Briefly explain what is meant by the 'lock and key' hypothesis.

.....

.....

.....

[3]

[Total: 8]..

3. A small tube called a catheter can be inserted into the blood system through a vein. It can be threaded through the vein and into and through the heart until its tip is in the pulmonary artery. A tiny balloon at the tip can then be used to measure the pressure changes in the pulmonary artery.

Fig 3.1 shows a section through the heart with the catheter in place. Fig 3.2 shows the pressure changes recorded in the pulmonary artery.

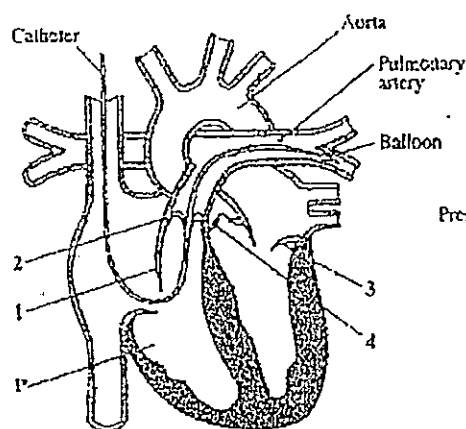


Fig 3.1

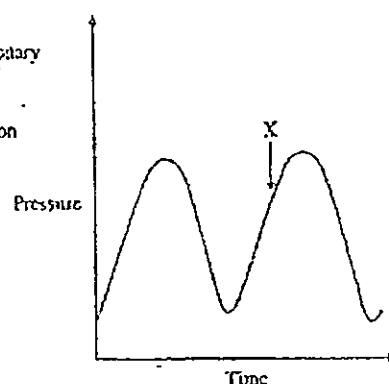


Fig 3.2

- (a) Name the chamber of the heart labelled P.

[1]

- (b) Complete the table below by placing ticks (✓) in the appropriate boxes to show which of the structures 1 – 4 will be open and which will be closed at time X as shown in Fig 3.2.

| Structure | Open | Closed |
|-----------|------|--------|
| 1         |      |        |
| 2         |      |        |
| 3         |      |        |
| 4         |      |        |

[2]

- (c) On Fig 3.2, 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]

- (d) Arteries may become blocked by the formation of fatty materials on the walls. An operation called balloon angioplasty may be used to correct this. The procedure is shown in Fig 3.3.

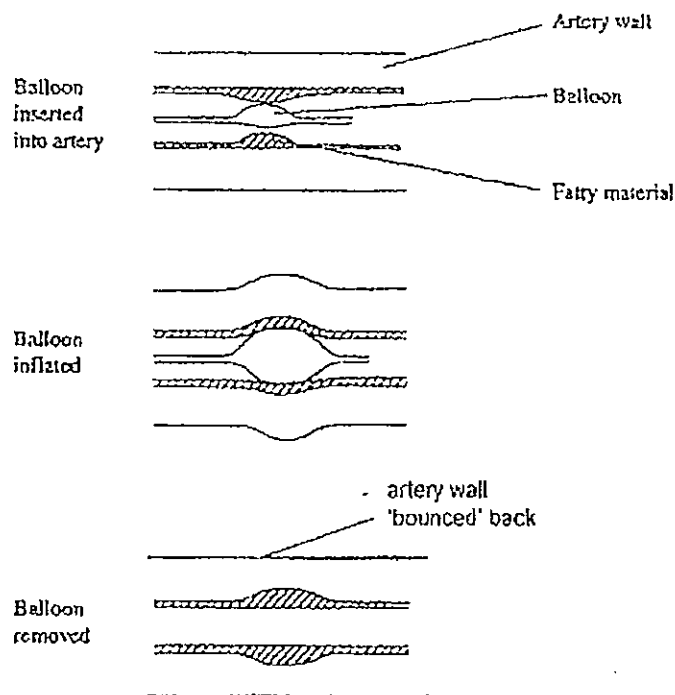


Fig 3.3

- (i) Explain why the artery wall 'bounces back' when the balloon is removed.

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[2]

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

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[3]

[Total: 9]

4. Fig 4 shows a transverse section of a nephron in the region of the medulla of a person.

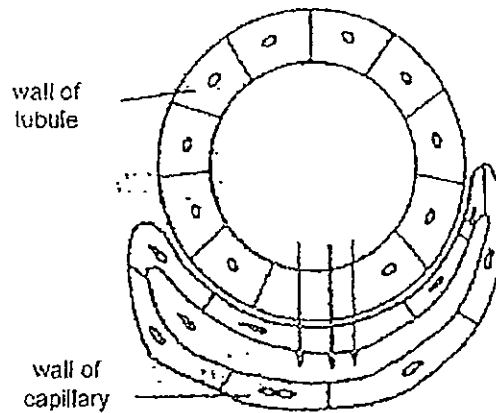


Fig 4

- (a) (i) Name the liquid present in the lumen of this tubule.  
 ..... [1]
- (ii) Name the process that caused the liquid in part (a)(i) to be present.  
 ..... [1]
- (iii) Plasma proteins and amino acids are both detected in the lumen. Deduce, with explanation, whether the nephron is functioning properly in this person.  
 .....  
 ..... [2]
- (b) Name the parts of the nephron that are found in the medulla.  
 ..... [2]

[Total: 6]



5. Species D of a rodent lives in the highlands of a mountain range. Fig 5 shows what can happen over the same period of time, if some members of species D migrate from the highlands to the lowlands.

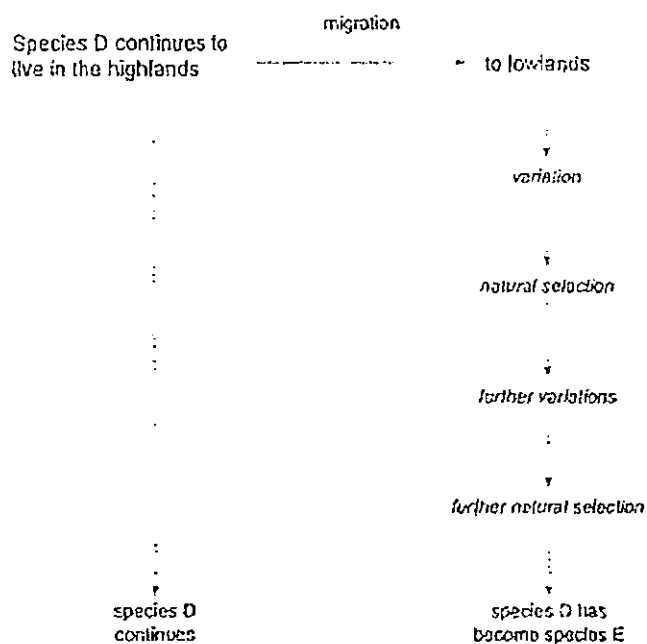


Fig 5

- (a) Name the two factors that may act as selective forces on the rodent.
1. ....
2. .... [2]
- (b) Name the process involving variation and natural selection that has led to the development of species E.
- ..... [1]

- (c) Suggest how the processes of variation and natural selection may have acted to produce the new species E in the lowlands.

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[4]

- (d) Explain the roles of meiosis and sexual reproduction in producing variation in a species.

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[4]

[Total: 11]

6. Haemophilia A is caused by a mutation to the gene responsible for the formation of factor VIII, a protein involved in blood clotting.
- (a) In the past, people with haemophilia depended upon blood or plasma donations as a source of factor VIII. Nowadays, biotechnology provides a better source of the protein.

Suggest why factor VIII produced by biotechnology is a better source of the protein than blood or plasma donations.

.....

.....

[1]

- (b) Fig 6 is a diagram showing the sequence of events in the production of defective factor VIII in a cell of a patient with Haemophilia A.

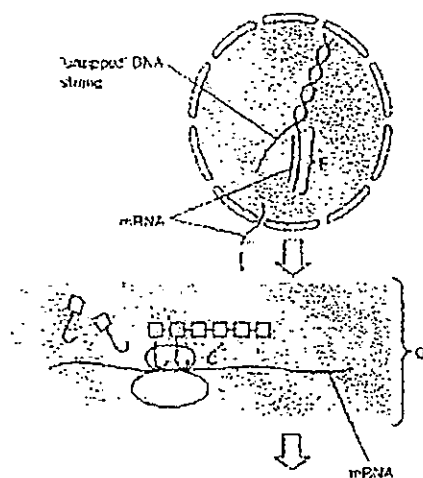


Fig 6

- (i) State the process represented by G.
- .....
- [1]
- (ii) Describe the relationship between the DNA strand marked F and factor VIII.
- .....
- .....
- .....
- [1]

- (c) Part of the DNA sequence on the coding strand is shown below.



State the corresponding sequence on the non-coding strand.

|                   | triplet 1 | triplet 2 | triplet 3 |
|-------------------|-----------|-----------|-----------|
| non-coding strand |           |           |           |

[1]

- (d) Factor VIII is made up of 191 amino acids. The DNA sequence of a patient with Haemophilia A is 500 base pairs long. Showing your working clearly, deduce the effect of the mutation on the gene for factor VIII in this patient.

Conclusion .....

.....

[2]

[Total: 6]

27

7. Fig 7.1 and Fig 7.2 are light micrographs of onion cells in various stages of mitosis.



Fig 7.1

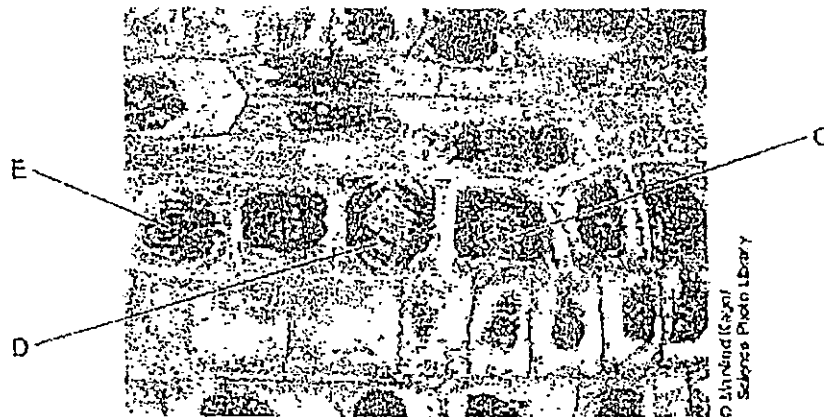


Fig 7.2

Using the letters A, B, C, D or E, identify one cell that is in:

anaphase .....

metaphase .....

telophase .....

[3]  
[Total: 3]

## SECTION B (30 marks)

Answer three questions.

Question 10 is in the form of Either/Or question.

Only one part should be answered.

8. (a) A group of scientists observed the animals in a forest ecosystem. Table 8.1 shows the average number of each type of animal in one mahogany tree.

| animal       | trophic level | number of animals |
|--------------|---------------|-------------------|
| hawk owl     | 4             | 2                 |
| tanager      | 3             | 4                 |
| warbler      | 3             | 5                 |
| aphid        | 2             | 36                |
| caterpillar  | 2             | 42                |
| weevil       | 2             | 13                |
| wasp         | 2             | 7                 |
| forest mouse | 2             | 2                 |

Table 8.1

- (i) Use information from Table 8.1 to calculate the total number of animals at each trophic level. Write your answers in Table 8.2.

| trophic level | number of animals |
|---------------|-------------------|
| 2             |                   |
| 3             |                   |
| 4             |                   |

Table 8.2

[2]

- (ii) Use information from Tables 8.1 and 8.2 to draw an overall pyramid of numbers for this food web.

- (iii) Many scientists believe that a pyramid of biomass is more useful than a pyramid of numbers. State what extra information would be needed to draw a pyramid of biomass.

[1]

- (b) Fig 8.3 shows the same information in part (a) being presented in another form.

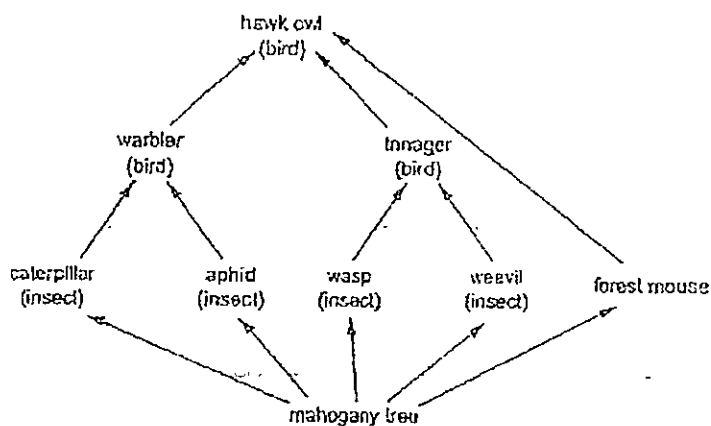


Fig 8.3

- (i) What do the arrows in Fig 8.3 represent?

[1]

- (ii) Identify the energy source and the tertiary consumer.

energy source .....

tertiary consumer .....

[2]

- (c) Describe how the information presented in Table 8.1 and Fig 8.3 differ.

[1]

- (d) Some local people were paid to catch warblers for the pet trade.

Predict the effect on tanagers and forest mice if all of the warblers were removed from the forest. Explain briefly.

.....

.....

.....

[2]

- (e) Forests form a major carbon sink for the biosphere.

Explain how the mahogany tree plays the role of a carbon sink.

.....

.....

.....

[2]

[Total: 12]

9. (a) Explain how the structure of each of the following is related to its function:

- (i) the exchange surface of the alveolus.

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[3]



(ii) the lining of the trachea.

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[3]

(b) Describe two effects of nicotine, which is found in cigarette smoke, on the human body.

.....

.....

.....

[2]

[Total: 8]

[3]

[7]

[Total: 10]

10. Or

- (a) A person is sitting in the shade reading a book when he looks at the bright sky to see an aeroplane flying past. Describe and explain the changes in

(i) the lens, and

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(b) State the two functions of the choroid.

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.....

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[2]  
[Total: 10]

*End of Paper*

ACS (Barker Road)  
Sec 4 Biology (5158)  
Preliminary Examination Paper 1  
Answer Scheme

| Qn No. | Ans | Qn No. | Ans | Qn No. | Ans | Qn No. | Ans |
|--------|-----|--------|-----|--------|-----|--------|-----|
| 1      | D   | 11     | A   | 21     | C   | 31     | C   |
| 2      | D   | 12     | C   | 22     | B   | 32     | A   |
| 3      | B   | 13     | D   | 23     | C   | 33     | A   |
| 4      | C   | 14     | A   | 24     | B   | 34     | D   |
| 5      | C   | 15     | B   | 25     | D   | 35     | B   |
| 6      | D   | 16     | C   | 26     | B   | 36     | D   |
| 7      | C   | 17     | C   | 27     | D   | 37     | B   |
| 8      | B   | 18     | A   | 28     | B   | 38     | C   |
| 9      | B   | 19     | B   | 29     | D   | 39     | B   |
| 10     | C   | 20     | A   | 30     | B   | 40     | A   |

1ai) A ii) B

\*Must have both answers correct = [1]

b) - Osmosis [1]

- Net / overall movement of water molecules from a region of higher water potential (higher water concentration) to a region of lower water potential (lower water concentration), through a partially permeable membrane. [1] \*Reject semi-permeable membrane

c) - For A, higher water potential in the potato cells compared to the concentrated sucrose solution. [1]

- Movement of water molecules out of the potato cells to make the potato cylinder lighter / lower in mass. [1]

- For B, lower water potential in the potato cells as compared to the distilled water. [1]

- Movement of water into the potato cells to make the potato cylinder heavier / increased in mass. [1]

2a) Conclusion 1: X works best / better at pH 7 or Optimum pH is pH 7. [1]

Evidence from results: Starch has disappeared in Plate 3 while starch remains in all other plates. [1]

Conclusion 2: X contains enzymes / amylase. [1]

Evidence from results: X no longer acts on starch when it is boiled and cooled. [1]

b) Salivary glands (reject mouth) / Pancreas [1]

c) A proposed model that explains the specificity of enzyme action through the binding of substrate with enzyme [1] via active sites [1] as substrate and enzyme have complementary surfaces that fit with each other. [1]

3a) Right ventricle [1]

b) 1: closed 2: open 3: closed 4: open

c) \*Graph is of same shape and above the current curve. [1]

di) - Artery wall contains elastic tissues / muscles / fibres. [1]

- Wall stretches as the balloon pushes against the wall. [1]

- Wall recoils when the balloon is removed. [1]

\*Any 2 correct answers = [2]

ii) - Heartbeat causes a surge of blood into the artery. [1]

- Elastic tissues allow artery to withstand the rise in pressure and prevents the artery from rupturing. [1]

- Elastic recoil maintains a high energy / velocity / momentum of blood flowing through. [1]

4ai) Glomerular filtrate [1]

ii) Ultrafiltration [1]

iii) - Plasma proteins are normally retained in the glomerulus. [1]

- Its presence indicates the Bowman's capsule may be damaged / ruptured / leaking. [1]

b) Loop of Henle [1] and Collecting duct [1]

5a) Answers: Change in: Temperature / Food supply / Water supply / pH of environment / Condition of soil minerals / Light intensity etc

\*Any 2 of the above biotic and/or abiotic factors of the ecosystem = [2]

b) Evolution [1]

c) - Genetic variation / Phenotypic variation [1]

- Organisms with traits that make them more adapted, survive better and reproduce more. [1]

- Over time, the proportion of individuals with genes for the adaptations in the population increases. [1]

- The differences accumulated eventually lead to the formation of a new species. [1]

d) Meiosis creates genetic variation by (Max [2] for any 2 correct answers)

- creation of haploid gametes [1]

- selection of one out of each homologous pair to be passed to the next generation. [1]

- different combination of chromosomes amongst the gametes. [1]

- crossing over of alleles between homologous chromosomes during prophase I. [1]

- random assortment / arrangement of chromosomes. [1]

Sexual reproduction creates genetic variation by (need both answers)

- random fusion of gametes. [1]

- creates new homologous pairs / new allele combinations / new genetic combinations. [1]

6a) - No risk of blood-borne infections. [1]

- Easier to ensure steady supply of factor VIII. [1]

- Injections are more convenient than blood transfusions. [1]

- No risk of incompatible blood type / rejection as wrong blood type. [1]

\*Any 1 of the answers = [1]

bi) Translation [1]

ii) - Sequence of bases / Nucleotides determines / Corresponds to / Codes for the sequence of amino acids of the protein formed. [1]

c) Triplet 1: CTC

Triplet 2: GAG

Triplet 3: GCT

d)  $191 \times 3 = 573$  coding bases [1]

Part of the gene is removed / deleted / truncated. [1]

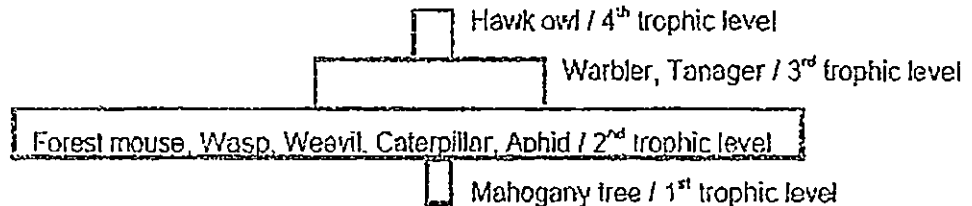
7. anaphase: B / D [1]

metaphase: A [1]

telophase: C [1]

8ai) 100; 9; 2

ii)



iii) Dry mass of organisms in each trophic level at any one time. [1]

bi) Energy flow / Transfer of energy [1]

ii) Sun [1]. Hawk owl [1].

c) Table 8.1 shows the quantitative abundance of each organism while Fig 8.3 shows the feeding relationships of organisms / directions of energy flow. [1]

d) - Population size will decrease. [1]

- Less prey / food for hawk owl causes increased predation of tanagers and forest mice. OR

- When warbler population decreases, the populations of caterpillar and aphid will increase and therefore there is not sufficient food (mahogany tree for wasp and weevil and therefore not sufficient food for tanager, which will decrease in population. There is insufficient food (mahogany tree) for forest mouse so population of forest mouse will decrease. [1]

e) - Photosynthesis removes carbon dioxide from the air. [1]

- Storage of carbon in cell walls / Formation and storage of carbon compounds in cells OR Reference to longevity of mahogany trees. [1]

9ai) - Wall is one-cell thick, minimizes distances of travel of gases which enhances diffusion. [1]

- A thin film of moisture covers the surface of the air-facing surface of the alveolus which dissolves oxygen and enhance its movement into the capillaries. [1]

- The wall / surface of the alveolus is richly surrounded with blood capillaries which facilitates absorption, release and transportation of gases. [1]

ii) - The gland cells secrete mucus to trap dust and bacteria. [1]

- The cilia sweeps these trapped particles upwards towards the pharynx. [1]

- Combined action of cilia and gland cells help filter the air passing through the trachea towards the alveolus. [1]

b) - Increases heartbeat and blood pressure. [1]

- Increases risk of blood clots in blood vessels. [1]



10 Either

a) A hormone is a chemical substance / complex protein [1] secreted in minute amounts by endocrine gland / ductless gland [1] into bloodstream, carried to target organ(s) to exert its effects. [1]

b) - Increases blood glucose levels by speeding up the breakdown of glycogen to glucose in the liver and muscles. [1]

- Increases metabolic rate, more energy is released via respiration. [1]

- Increases rate of heartbeat and causes a rise in blood pressure so oxygen and glucose are carried faster to the muscles. [1]

- Increases the rate and depth of ventilation. [1]

- Constricts arterioles in skin / vasoconstriction of arterioles in skin to cause paleness, channelling more blood to the muscles. [1]

- Increases rate of blood coagulation. [1]

- Causes pupils to dilate to enhance vision. [1]

- Contracts hair erector muscles, producing 'goose pimples'. [1]

\*Any 7 correct answers = [7]

10 Or

ai) - Contracted ciliary muscles will now relax. [1]

- Relaxed / slackened suspensory ligaments now contract. [1]

- Lens will change from thick and more convex to become thin and less convex. [1]

- This is to increase the focal length of the eye to allow the distant plane to be focused sharply on the retina. [1]

ii) - Contracted radial muscles of the iris will now relax. [1]

- Relaxed circular muscles of the iris will now contract. [1]

- Dilated / enlarged pupil will now constrict / become smaller. [1]

- This is to decrease the amount of light entering the eyes. [1]

b) - Prevents internal reflection of light. [1]

- Brings oxygen and nutrients to the eyeball and remove metabolic waste products. [1]