SMJK PEREMPUAN CHINA PULAU PINANG
END OF YEAR EXAMINATION 2011
LOWER SIX BIOLOGY PAPER 2
TIME: 2 HOURS

Name: …….. L6S….

Instructions

Answer **all** questions.

At the end of the examination, fasten all your work for Section B answer separately from Section A.

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

Section A: Section A contains four structure questions. Answer all.

(a) Fig. 1 shows a transverse section through an earthworm, *Lumbricus terrestris*, which is an annelid.

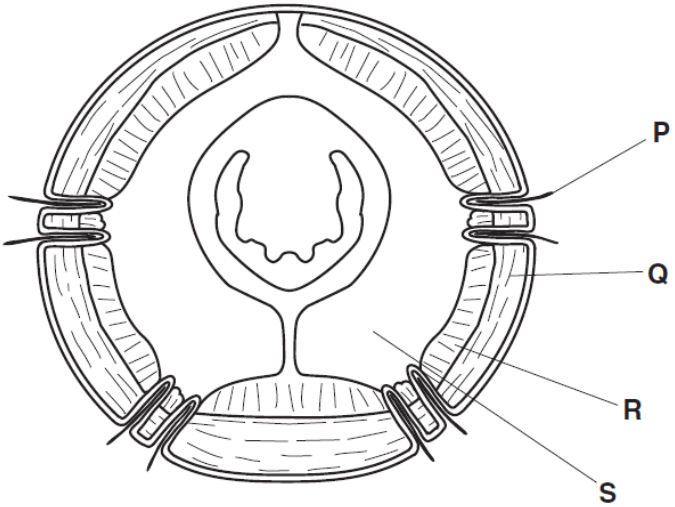

Fig. 1

(i) Explain how the body plan of an annelid differs from that of a cnidarian. [2]

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(ii) Describe how structures **P**, **Q**, **R** and **S** are involved in the locomotion of an earthworm. [4]

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(b) Some earthworms deposit their egested material on the surface of the soil as worm faeces.

Table 1 shows the calcium, magnesium and carbon content of worm faeces and the similar content of the top 15 cm of the soil.

Element	**Worm faeces**	**Top 15 cm of soil**
Calcium / ppm	2790	1900
Magnesium / ppm	492	162
Carbon / ppm	5.17	3.35

Table 1

(i) Describe how earthworms feed. [2]

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(ii) With reference to Table 1, suggest explanations for the differences in composition between the worm faeces and the soil. [2]

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2. (a) Explain what is meant by the term *community*. [2]

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Fig. 2 shows the flow of energy through a woodland.
All figures are in kJ m^{-2} per week.

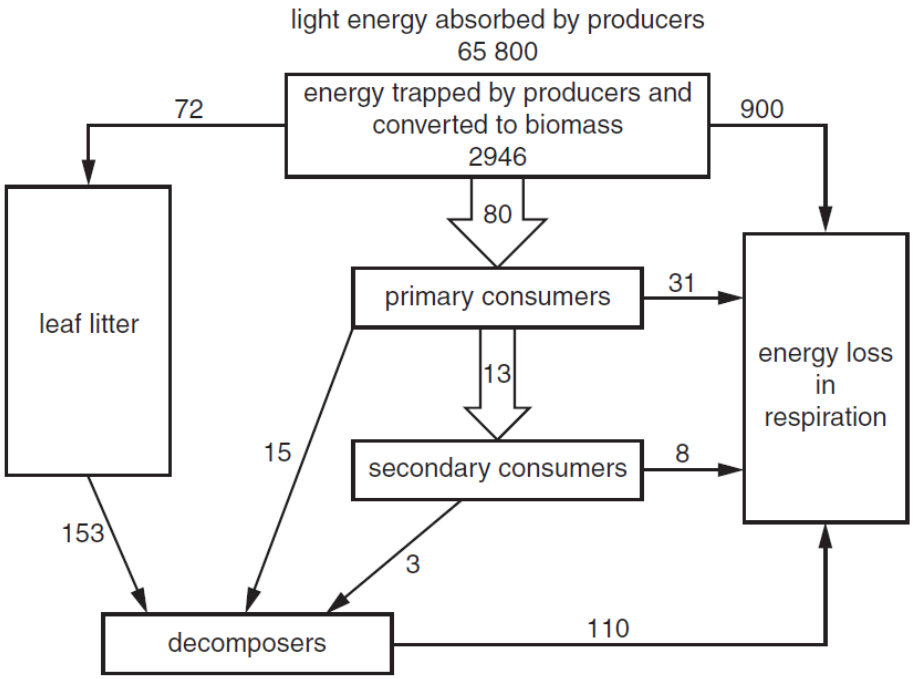

Fig. 2

(b) (i) Calculate the energy trapped by the producers and converted to biomass as a percentage of the light energy absorbed. Express your answer to the nearest 0.1%. Show your working. [2]

Answer .....%

(ii) Suggest, in terms of energy flow, why there are no tertiary consumers in the woodland. [2]

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(iii) Leaf litter is composed of dead leaves and twigs. The total energy in the leaf litter was 15 899 kJ m^{-2} but only 153 kJ m^{-2} per week is transferred to decomposers. When animal wastes rich in nitrogen were mixed with the leaf litter the energy flow to decomposers increased significantly.

Suggest why the addition of animal wastes rich in nitrogen increased the energy flow to decomposers. [3]

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3. Lysozyme is an enzyme found in many places within the human body. It consists of a single polypeptide folded into a complex shape. Fig. 3.1 shows a model of lysozyme.

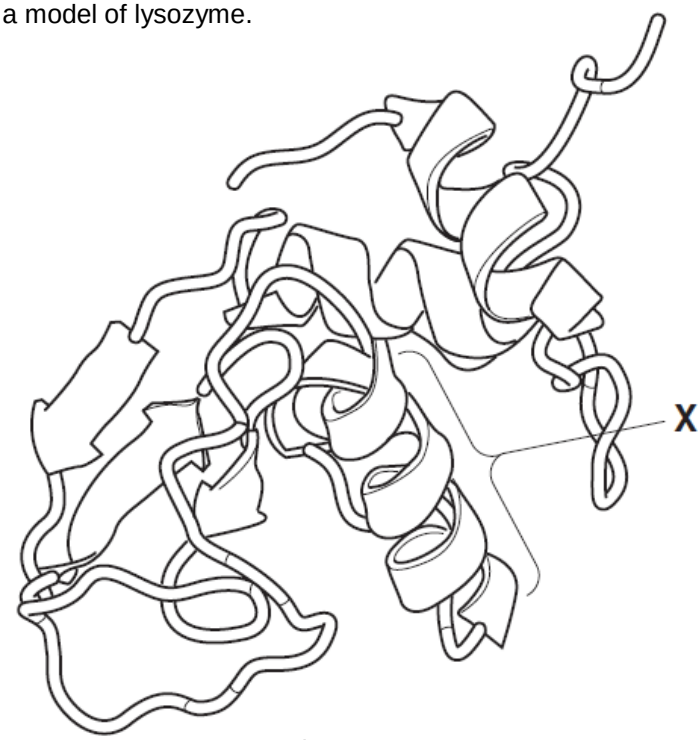

Fig. 3.1

(a) With reference to Fig. 3.1, state the name given to the level of organisation shown,

(i) by the whole polypeptide [1]

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(ii) at region **X**. [1]

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(b) Name the part of the enzyme where the reaction occurs. [1]

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(c) Table 3 shows some mRNA codons and the amino acids for which they code.

Amino Acid	**Abbreviation**	**mRNA Codons**					
Glutamic acid	Glu	GAA	GAG	–	–	–	–
Phenylalanine	Phe	UUU	UUC	–	–	–	–
Lysine	Lys	AAA	AAG	–	–	–	–
Proline	Pro	CCA	CCC	CCG	CCU	–	–
Threonine	Thr	ACA	ACC	ACG	ACU	–	–
Valine	Val	GUA	GUC	GUG	GUU	–	–
Cysteine	Cys	UGC	UGU	–	–	–	–
Arginine	Arg	CGC	CGA	CGU	CGG	AGA	AGG

Table 3

Fig. 3.1 shows, the sequence of three amino acids in the lysozyme polypeptide.

Amino acids	Arg	Cys	Glu
mRNA	.....	.....	GAA
DNA	GCA	.....	.....

(i) Use the information in Table 3 to complete the nucleotide sequences for the mRNA and the DNA. [2]

(ii) Explain why the human gene for lysozyme may have a different nucleotide sequence from the answer you have given in (c)(i). [2]

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(d) Fig. 3.2 represents a polyribosome with several translation sites.

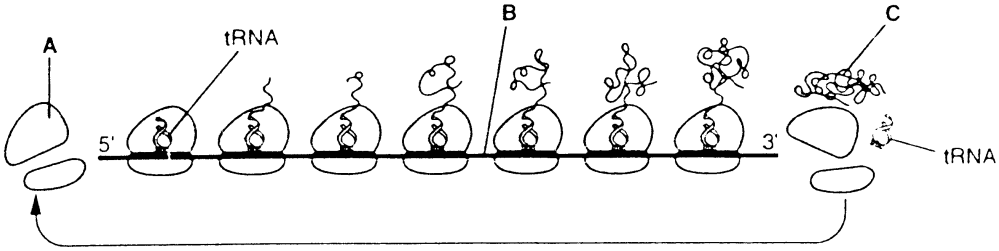

Fig. 3.2

Name the structures labeled A to C. [3]

A ……..

B ……..

C ……..

4. The uptake of water and ions through the cell membrane maintains the osmotic concentration of an organism which is important in homeostatic control.

(a) Describe how water passes through the cell membrane. [2]

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(b) Describe the process involved when ions are taken up to maintain an internal concentration of an organism that is higher than its surrounding fluid. [2]

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(c) Why are mitochondria essential for the maintenance of water balance in some organisms like *Paramecium*? [2]

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(d) Fig. 4 below shows three cells, A, B and C, placed side by side, each with its own water potential. [3]

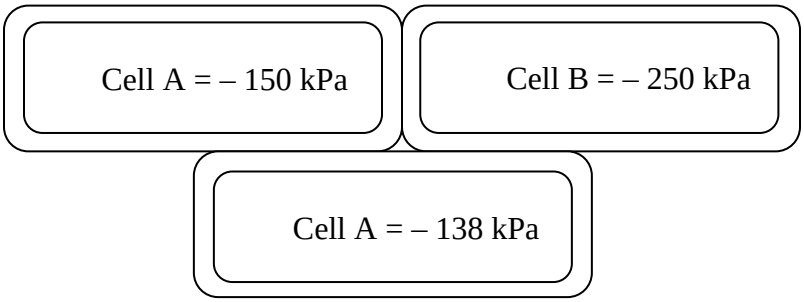

Fig. 4

Use arrows to show the net water movement between cell A, B and C. [3]

(e) What would be the effect of adding some solute to a cell on its water potential? [1]

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<u>Section B</u>: Essay questions

Select any **three** out of the five questions below to answer in this section.

5. (a) List down any three classes of enzymes. How do they react? [6]
   (b) What are the advantages and disadvantages of immobilized enzymes? [5]
   (c) Cofactors play a role in enzyme reaction. Use **one** suitable **example** to explain cofactors. [4]

6. (a) Polysaccharides play an important role as structural and storage compound in plants.

   By giving one example for each of these compounds, explain how their molecular structures are related to their functions. [8]

(b) (i) With relevant example, compare fibrous protein and globular protein. [4]

(ii) Describe the structure of lechitin and its importance in the cell membrane structure. [3]

7.(a) Describe the experiment conducted by Meselson and Stahl to prove DNA replication model. [7]

(b) Describe the key characteristics of the following phyla: [8]

Chordata Cnidaria

8. (a) Based on growth characteristics, populations can be categorized into either r-strategists or K-strategists. Compare the characteristics of r-strategists and K-strategists. [10]

(b) Factors that limit population size and distribution are either dependent or independent on the population density. Explain the limiting factors which are density-dependent. [5]

9. (a) Explain what is meant by biogeochemical cycle. [5]

(b) Explain the components in the phosphorus cycle. [10]

~ End of Paper ~

Prepared by Yeap Chee Beng

Checked by Approved by