

PEPERIKSAAN PERCUBAAN
SIJIL TINGGI PERSEKOLAHAN MALAYSIA
NEGERI PAHANG DARUL MAKMUR
2012

BIOLOGY
PAPER 1

One hour and forty five minutes

Instructions to candidates:

DO NOT OPEN THE BOOKLET UNTIL YOU ARE TOLD TO DO SO

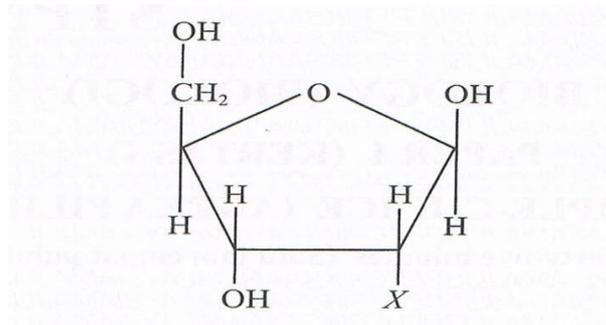
There are **fifty** questions in this paper. For each question, four suggested answers are given. Choose **one** correct answer and indicate it on the multiple-choice answer sheet provided.

Read the instructions on the multiple-choice answer sheet carefully.

Answer **all** questions. Marks will not be deducted for wrong answers.

This question paper consists of 22 printed pages.

1. The diagram below shows a pentose sugar molecule which can be found in DNA.



Which of the following is true about the pentose sugar?

- A The sugar is ribose.
- B X represents a hydroxyl group.
- C X represents a hydrogen atom.
- D The sugar is fructose.

2. Which of the following are characteristics of lipid?

- I Insoluble in water
- II Soluble in non polar solvents
- III Combine with fatty acids to form esters

- A I and II only
- B I and III only
- C II and III only
- D I, II and III

3. Which of the following is the **most** important function of epithelium tissue?

- A Secretion
- B Protection
- C Absorption
- D Transportation

4. Which statements about a non competitive inhibitor are **true**?

- I Its molecular shape is the same as that of a substrate.
- II It binds to sites other than active sites.
- III Its effect is not influenced by increases in substrate concentration
- IV V_{\max} is constant
- V K_m varies

- A II and III only
- B I, IV and V only
- C II, III and IV only
- D II, III, IV and V only

5. Which statement best explains why enzymes are specific in their action?

- A Enzymes have polypeptide chains.
- B Enzymes have large fibrous protein.
- C Enzymes are not changed or consumed during reaction.
- D Enzymes have specific surface configuration.

6. Which of the following statements is **not** true the genetic code?

- A Genetic code is a triplet.
- B Genetic code is specific.
- C Genetic code AUG is the termination codon
- D Genetic code AUG is the code for amino acid methionine

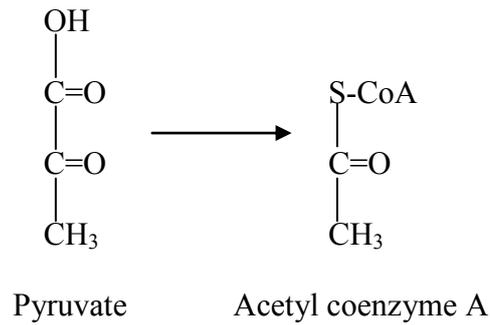
7. Which of the following about cyclic photophosphorylation and non-cyclic phototophosphorylation is correct?

	<i>Cyclic</i>	<i>Non-cyclic</i>	<i>Cyclic and non cyclic</i>
	<i>photophosphorylation</i>	<i>photophosphorylation</i>	<i>photophosphorylation</i>
A	Oxygen is produced	ATP is produced	NADPH is not formed
B	NADPH is not formed	Oxygen is produced	ATP is produced
C	ATP is produced	Oxygen is produced	NADPH is not formed
D	NADPH is not formed	ATP is produced	Oxygen is produced

8. Which of these are the pathways involved in the photosynthesis of C_4 plants ?

- I Krebs cycle
 - II Calvin cycle
 - III Glycolysis pathway
 - IV Hatch-Slack pathway
- A I and III
 - B II and IV
 - C I, II and III
 - D I, III and IV

9. The following reaction happens in all aerobic cells.



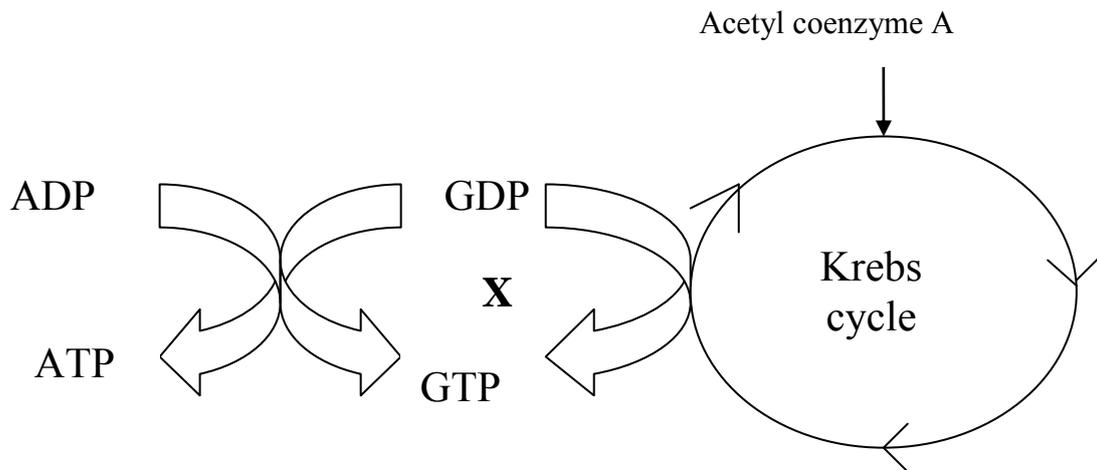
Which of the following statements are true about the above reaction?

- I The reaction happens in cell cytoplasm
 - II Oxygen is needed for the above reaction.
 - III 2H^+ are released and received by NAD.
 - IV ATP energy is used in the above reaction.
 - V Carbon dioxide is released during the reaction.
- A I and III
 - B II and V
 - C III and V
 - D I, II and IV

10. Which of the following reaction in glycolysis is catalysed by phosphofruktokinase?

- A Fructose 1,6-diphosphate to fructose
- B Glucose 6-phosphate to fructose 6-phosphate
- C Fructose 6-phosphate to fructose 1,6-diphosphate
- D Fructose 1,6-diphosphate to two triose phosphate

11. The diagram below shows the Krebs cycle. What is process X?

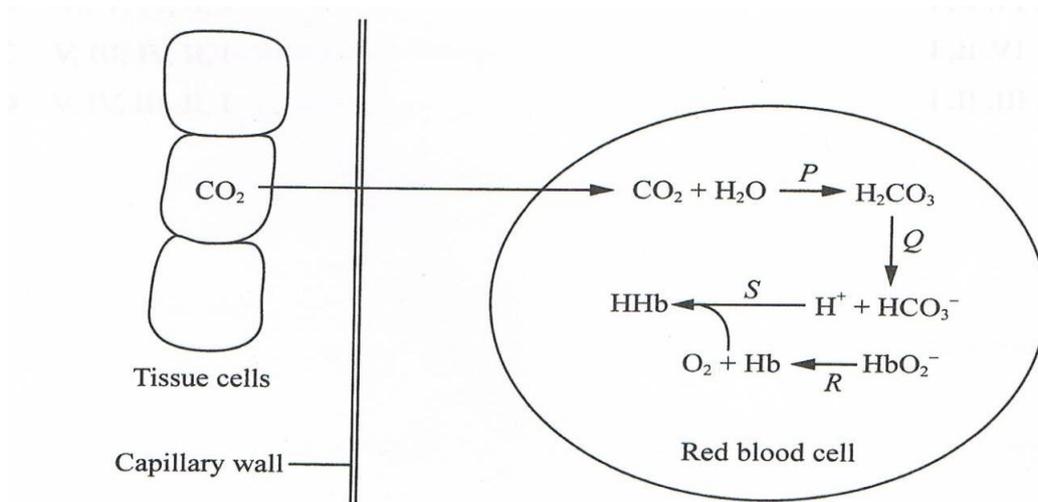


- A Phosphorylation
- B Oxidation of GTP
- C Oxidative phosphorylation
- D Substrate level phosphorylation

12. Which of the following are saprophytic organisms?

- I Yeast
 - II Mushroom
 - III *Rhizobium* bacteria inside root nodules
- A I and II
 - B I and III
 - C II and III
 - D I, II and III

13. The diagram below shows the diffusion of carbon dioxide from respiring cells into the blood involving steps P, Q, R and S.



Which step shows the formation of haemoglobinic acid?

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

14. Which process does **not** occur during the opening of stomata?

- A Sugar is converted into starch.
- B Starch is converted into malic acid.
- C Water enters osmotically into the guard cells.
- D Potassium ions diffuse into the guard cells from the adjacent cells.

15. What is the volume of air that can be forced out following the deepest possible inspiration?

- A tidal volume
- B vital capacity
- C residue volume
- D expiratory reserve volume

16. The following structures are found in the heart:

- I Bundle of His
- II Purkinje tissue
- III Atrioventricular node
- IV Sinoatrial node

Which of the following shows the correct sequence for impulse conduction in the heart?

- A III, IV, I, II
- B IV, III, I, II
- C III, IV, II, I
- D IV, III, II, I

17. In a study of the movement of substances in plants, aphids were used. The study showed that

- A translocation occurred in two ways.
- B translocation occurred electro-osmotically.
- C the phloem was responsible for the transportation of organic substances.
- D the xylem was responsible for the transportation of water and minerals.

18. When diabetics inject themselves with insulin, which event will occur in the liver?

- A an increase in the synthesis of lipid and polysaccharide molecules
- B a decrease in the permeability of the cells to glucose
- C a decrease in the rate of uptake of amino acids and protein synthesis
- D an increase in the breakdown of glycogen

19. The table below shows the substances that diffuse out via passive or active transportation from the nephron and the part of the nephron where it occurs.

<i>Nephron part</i>	<i>Substance(s) that diffuse out</i>
I Proximal convoluted tubule	(a) Sodium chloride
II Descending loop of Henle	(b) Glucose, sodium chloride, water
III Ascending loop of Henle	(c) Sodium ion, hydrogen carbonate ion, water
IV Distal convoluted tubule	(d) Water

Which of the following are correctly paired?

- | | I | II | III | IV |
|---|----------|-----------|------------|-----------|
| A | (b) | (d) | (a) | (c) |
| B | (b) | (d) | (c) | (a) |
| C | (c) | (a) | (d) | (b) |
| D | (c) | (d) | (a) | (b) |

20. The drug curare acts by

- A blocking the action of acetylcholine
- B increasing the secretion of acetylcholine
- C activating the action of acetylcholinesterase
- D inhibiting the action of acetylcholinesterase

21. The table below shows some parts of the neuron and their functions.

<i>Part of neuron</i>	<i>Function</i>
I Synaptic knob	(a) To receive information from the receptor
II Cell body	(b) To transmit the information received
III Schwann cells	(c) To transmit the information to a target organ
IV Axon	(d) To coordinate all metabolic activities of cells
V Dendrites	(e) To wrap the axon and dendron

Which of the following is correct for the parts of the neuron and their functions?

	I	II	III	IV	V
A	(c)	(a)	(d)	(e)	(b)
B	(c)	(d)	(e)	(b)	(a)
C	(e)	(a)	(d)	(b)	(c)
D	(d)	(b)	(e)	(c)	(a)

22. Where are the receptor sites for neurotransmitters situated?

- A nodes of Ranvier
- B postsynaptic membrane
- C presynaptic membrane
- D membranes of the synaptic vesicles

23. Which of the following distinguish between the two mechanisms of hormonal actions?

<i>Gene activation</i>	<i>Activation of cyclic AMP system</i>
A The effects last longer	The effects last shorter
B For non-steroid hormones	For steroid hormones
C Involves a second messenger	Does not involve a second messenger
D Hormones do not enter the cells	Hormones enter the cells

24. The table shows four hormones and their physiological effects.

<i>Hormone</i>	<i>Physiological effect</i>
I Aldosterone	(a) To control the metabolic rate
II Insulin	(b) To maintain the balance of Na ⁺ and K ⁺ ions
III Thyroxine	(c) To decrease the glucose level in the blood
IV Glucagon	(d) To increase the glucose level in the blood

Which of the following is correct for the hormones and their physiological effects?

	I	II	III	IV
A	(a)	(d)	(c)	(b)
B	(b)	(c)	(a)	(d)
C	(c)	(d)	(b)	(a)
D	(d)	(c)	(a)	(b)

25. Which of the following hormones is **incorrectly** paired with its action?

- A progesterone – stimulates follicles to develop
- B GnRH – control the release of FSH and LH
- C oestrogen – responsible for primary and secondary female sex characteristics
- D human chorion gonadotrophin – maintains secretions from the corpus luteum

26. Which of the following enables HIV to act dormant in the human body?
- A The virus rests in the cytoplasm of T₄ cell.
 - B The viral DNA integrates into the DNA of T₄ cell.
 - C The viral RNA takes some time to replicate.
 - D The viral reverse transcriptase is engulfed by T₄ cell.
27. Which of these statements is true about the reproduction difference between Cnidaria and Coniferophyta?
- A Cnidaria is bisexual.
 - B Coniferophyta needs water for bisexual reproduction.
 - C Coniferophyta produces spores in dry environment.
 - D The movement of the male gametes in Cnidaria happens as a chemotaxis.
28. Which of the following is true of an oviparous animal?
- A An individual hatches from the egg outside the female parent's body
 - B An individual hatches from the egg in the uterus of the female parent
 - C An individual is born before maturity and continues to develop in the sac of the female parent
 - D An individual develop in the uterus of the female parent and the embryo obtains the nutrient from the placenta.

29. The table below shows three organs and the germinal layers that form them.

Organs	Germinal layer
I Spinal cord	(a) Endoderm
II Kidney	(b) Mesoderm
III Liver	(c) Ectoderm

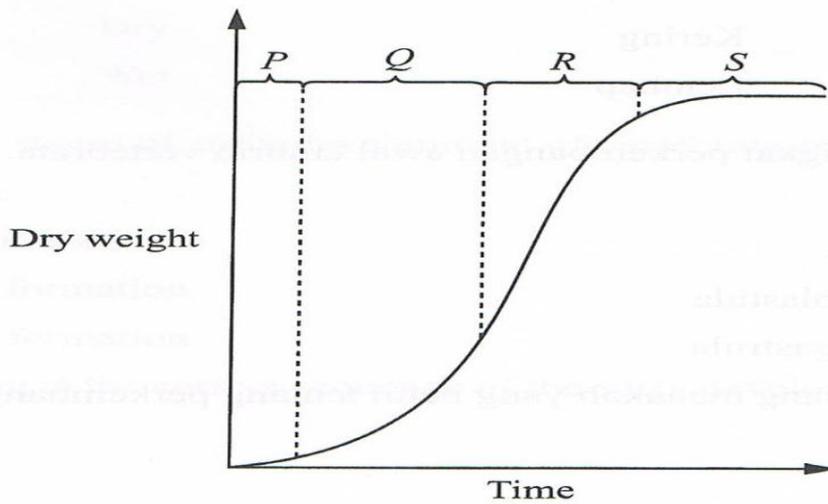
Which of the following is the correct match for the above three organs and germinal layers that form them?

	I	II	III
A	(a)	(c)	(b)
B	(b)	(a)	(c)
C	(b)	(c)	(a)
D	(c)	(b)	(a)

30. Which of the following parameters is plotted to obtain a relative growth rate curve of a plant?

- A The height against time
- B Absolute rate of growth against time
- C The growth rate against time
- D The height against the growth rate

31. A typical sigmoid growth curve is shown below.



Which of the following are represented by **P**, **Q**, **R** and **S**?

	P	Q	R	S
A	Lag phase	Log phase	Linear phase	Plateau phase
B	Lag phase	Linear phase	Log phase	Plateau phase
C	Plateau phase	Log phase	Linear phase	Lag phase
D	Plateau phase	Linear phase	Log phase	Lag phase

32. In a species of flowering plant, $C^R C^R$ genotypes produces red flowers, $C^W C^W$ genotype produce white flowers and $C^R C^W$ genotype produces pink flowers. What is the percentage of the progeny that have pink flowers if a cross is made between $C^R C^W$ and $C^R C^W$?

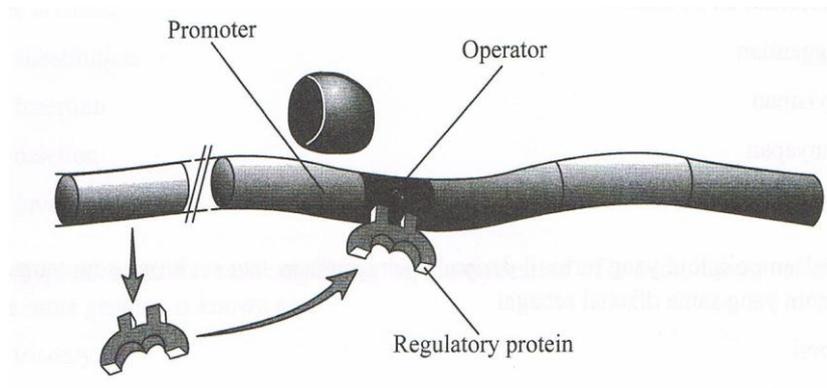
- A 0 %
- B 25 %
- C 50 %
- D 75 %

33. White eye colour in fruit fly is inherited as sex-linked recessive. What are the results obtained if a white-eyed female fruit fly is crossed with a red eye male fruit fly?
- A All males and female have red eye.
 - B 50% males have white eyes, 50% male have red eyes and all female have have red eyes.
 - C 50% males have white eyes, 50% male have red eyes, 50% female have have white eyes and 50% female have have red eyes.
 - D All males have white eyes and all females have red eyes.
34. Which of the following mutations is human is / are trisomic?
- I Down syndrome
 - II Turner syndrome
 - III Thallasemia major
 - IV Klinefelter syndrome
- A I only
 - B I, II and III only
 - C I and IV only
 - D II and III only
35. Cystic fibrosis is a recessive condition that affects about 1 in 2 500 babies in the Caucasian population in the United States. Calculate the percentage of individuals who are carriers in the population.
- A 4 %
 - B 98 %
 - C 2 %
 - D 40 %

36. In a population that is in Hardy-Weinberg equilibrium, 16 % of the individuals show the recessive trait. What is the frequency of the dominant allele in the population?

- A 0.84
- B 0.36
- C 0.6
- D 0.4

37. A condition of the *lac* operon is shown in the diagram below.



Which statement is true of the *lac* operon?

- A The operon is “switched on”
- B Glucose is present
- C β -galactosidase is produced
- D Transcription of the structural genes occurs.

38. Which of the following are the characteristics of cloning vectors?

- I They are able to accept foreign DNA.
- II They can replicate freely in their host cells.
- III They harm their host cells.
- IV They are able to express the cloned gene.

- A I and III
- B II and IV
- C I, II and III
- D I, II and IV

39. The transgenic plant is different from the wild type of plant because

- A It is tetraploid
- B It is formed by interbreeding of two different plants.
- C It contains a foreign gene in their genomes.
- D It contains cDNA.

40. Which of the following statements is/are **true** of an artificial classification system?

- I The system is based on phylogenetic relationship
- II The system can be used to construct dichotomous keys
- III Organisms are placed into groups for specific purposes
- IV Organisms are placed into groups according to their different characteristics which are arbitrarily chosen

- A I only
- B I and II only
- C II, III and IV only
- D III and IV only

41. Which of the following is likely to be radially symmetrical?

- A An annelid
- B An arthropod
- C A chordate
- D A platyhelminth

42. The table below shows four phyla and their examples.

<i>Phylum</i>	<i>Example</i>
I Fungi	(a) <i>Helianthus</i>
II Bryophyta	(b) <i>Dryopteris</i>
III Filicinophyta	(c) <i>Marchantia</i>
IV Angiospermophyta	(d) <i>Mucor</i>

Which of the following is correct for the phyla and their respective example?

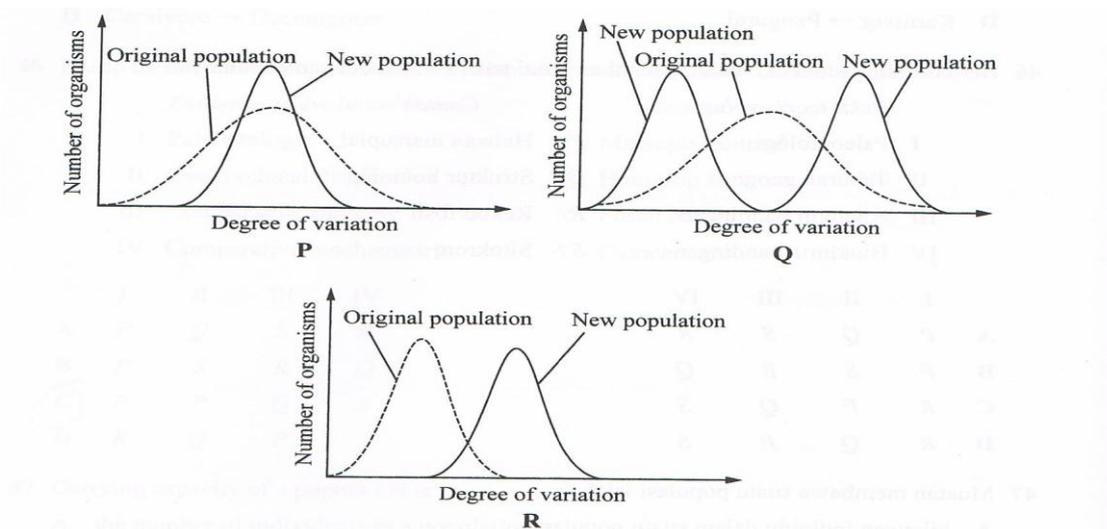
	I	II	III	IV
A	(a)	(b)	(c)	(d)
B	(c)	(d)	(a)	(b)
C	(d)	(a)	(b)	(c)
D	(d)	(c)	(b)	(a)

43. Which of the following would cause phenotypic variation among organisms of the same genotype?

- A Mutation
- B Exposure to different environments
- C Continuous variation within the species
- D Different varieties of the same species

44. Which processes result in the greatest amount of genetic variation in a population?
- A Natural selection and meiosis
 - B Meiosis and mutation
 - C Mutation and mitosis
 - D Mitosis and natural selection
45. According to Darwin's theory of evolution, what causes the struggle for survival in populations?
- A Overproduction of offspring
 - B Favourable heritable variations
 - C Natural selection
 - D Competition between the fittest individuals in the population

46. The graph below shows the effects of three types of ecological selection.



Which of the following is correct regarding *Biston betularia* in industrial areas, human birth weight in developed countries and rabbit population in the Andes mountain?

	<i>Biston betularia</i> in industrial areas	Human birth weight in developed countries	Rabbit population in Andes mountain
A	R	P	Q
B	Q	R	P
C	Q	P	R
D	R	Q	P

47. Which of the following energy flows in an ecosystem involves the transfer of the greatest amount of energy?

- A Plant to herbivore
- B Plant to decomposer
- C Herbivore to carnivore
- D Carnivore to decomposer

48. Which of the following are **true** of an ecosystem?

- I Phytoplankton are producers.
 - II The last consumer obtains the highest energy
 - III Ecosystem is an open system with input and output of energies.
 - IV Heterotroph include herbivores, carnivores, decomposers and detritivores
- A I and II
 - B III and IV
 - C I, III and IV
 - D II, III and IV

49. Carrying capacity of a population is

- A the number of individuals in a population
- B the population size when the mortality rate is more than the natality rate
- C population size when the natality rate is more than the mortality rate
- D the population size of species which can be supported by resources available in a habitat

50. In an experiment, a 25cm x 25cm quadrat was used to determine the density of the plant *Mimosa pudica* in the area R and S. The results of the experiment were as below.

Quadrat	1	2	3	4	5	6	7	8	9	10
Number of plants in R	5	10	9	0	7	6	5	9	0	9
Number of plants in S	3	4	3	2	1	0	4	1	2	0

What is the density of the plant *Mimosa pudica* per square meter in R and S?

	R	S
A	40	16
B	60	20
C	96	32
D	120	40

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BIOLOGY

PAPER 2

Two and a half hours

Instructions to candidates

**DO NOT OPEN THIS QUESTION PAPER
UNTIL YOU ARE TOLD TO DO SO**

*Answer all questions in section A. Write your answer
in the spaces provided.*

*Answer any four questions in section B. Begin each
answer on a fresh sheet of paper and arrange your
answers in numerical order.*

Tie your answer sheets to this question paper.

*Answers should be illustrated by large and clearly
labelled diagrams wherever suitable.*

For examiner's use	
Section A	
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2	
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4	
Section B	
Total	

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[Turn over

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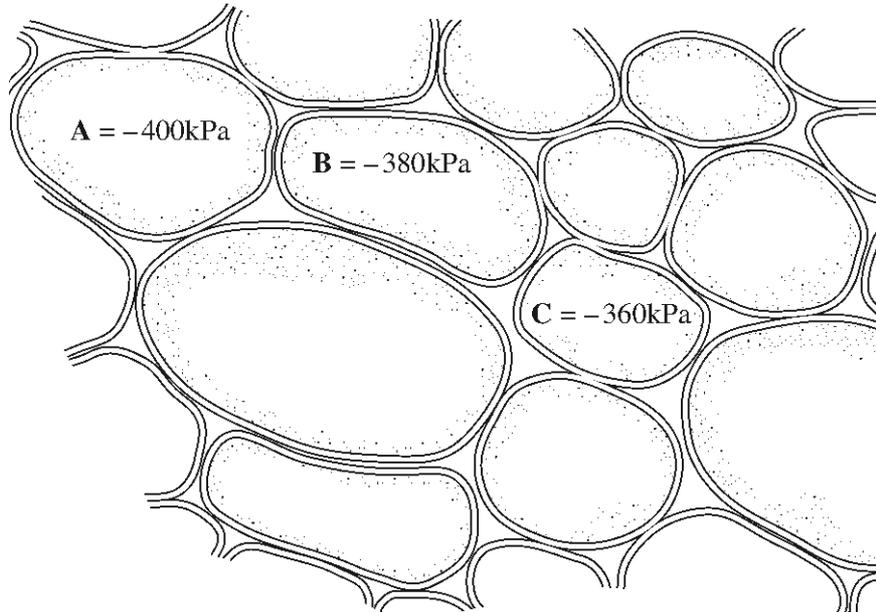
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Section A [40 marks]

Answer **all** questions in this section.

1 The diagram shows cells taken from the stem of a plant. Cells A , B and C are adjacent cells and the figures indicate the water potential Ψ of each cell.



(a) (i) Draw arrows on the diagram to show the overall direction of water movement between these three cells. [1 mark]

(ii) Explain your answer in terms of water potential. [2 marks]

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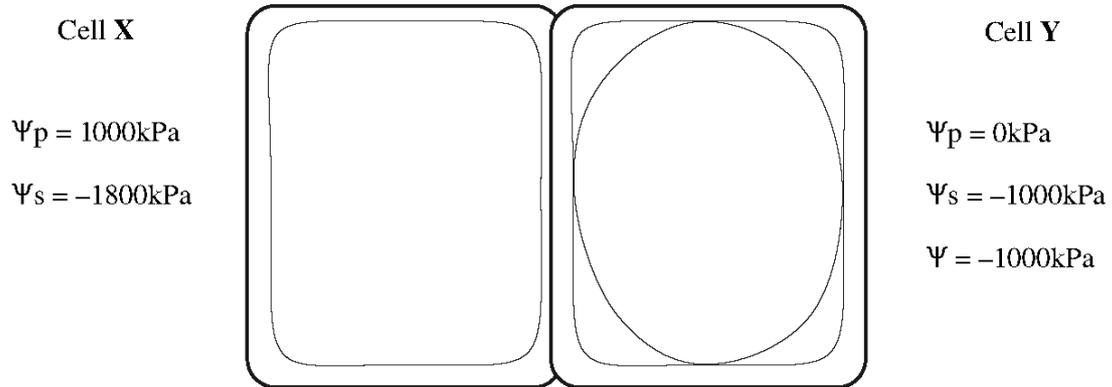
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(b) The diagram below shows two plant cells, X and Y as seen through a microscope. The figures show the solute potential Ψ_s and the pressure potential Ψ_p for both cells and the water potential Ψ for cell Y



Water relations in the cells are given by the following equation:

$$\Psi_{\text{cell}} = \Psi_s + \Psi_p$$

(i) Calculate the water potential, Ψ , of cell X. Show your working. [1 mark]

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(ii) State the name of the condition shown by cell Y and explain how this condition could have arisen. [3 marks]

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(c) Cell X has the higher pressure potential Ψ_p . Explain how this pressure potential is built up in cell X. [3 marks]

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2 Figure 2.1 outlines anaerobic respiration in yeast cells.

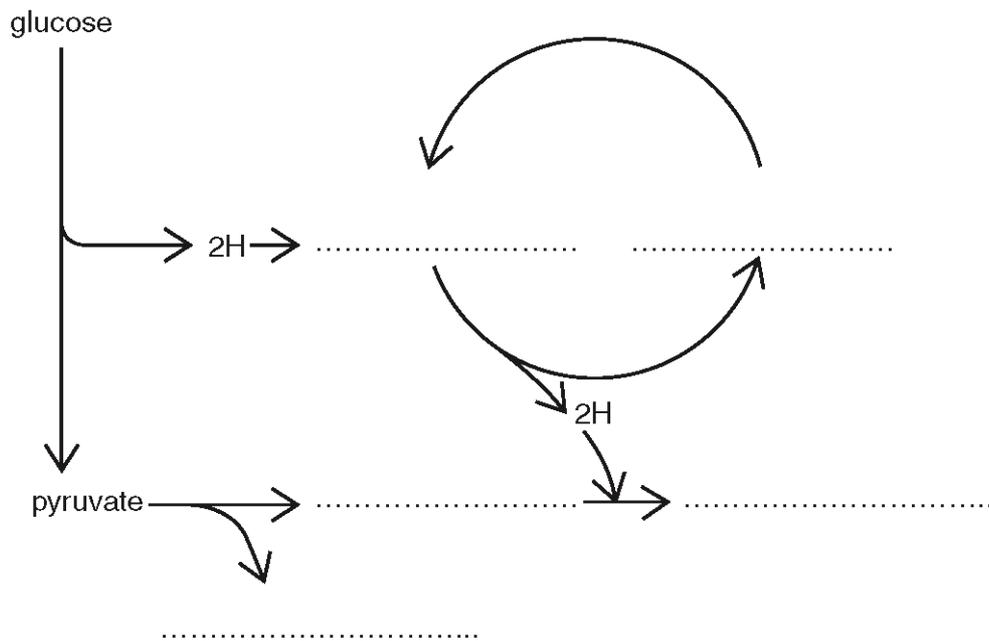


Fig. 2.1

(a) Complete Fig. 2.1 by writing in the missing compounds. [4 marks]

(b) Describe how anaerobic respiration in mammalian cells differs from anaerobic respiration in yeast cells [3 marks]

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(c) Explain why anaerobic respiration results in a small yield of ATP compared with aerobic respiration . [3 marks]

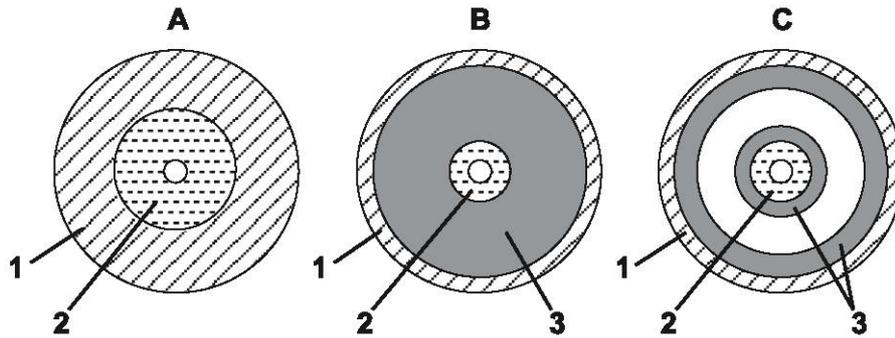
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3 The diagram below represents transverse sections through three different animal phyla, A ,B and C



(a) Identify the body layers 1,2 and 3. [3 marks]

1 :

2 :

3 :

(b) identify which of the transverse sections (A , B or C) represents a member of the phylum Platyhelminthes. Give one reason for your decision.

[2 marks]

Section :

Reason:.....

.....

(c) Which section (A ,B or C) represents a phylum that shows radial symmetry? [1 mark]

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(d) Which section (A, B or C) represents a phylum in which chaetae would be present ? [1 mark]

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(e) Describe *three* features found in members of the phylum Annelida which are not found in *Hydra*. [3 marks]

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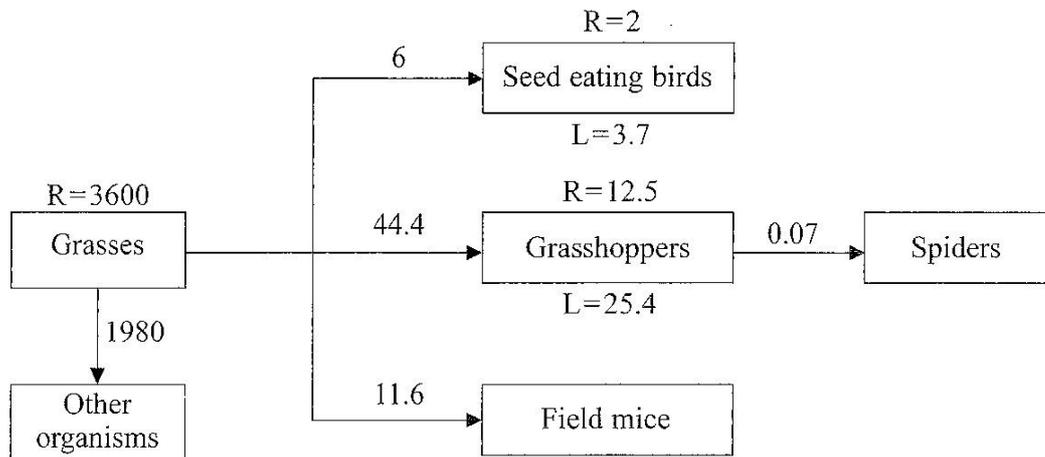
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4 The diagram below shows energy flow measured during a study of a grassland ecosystem. The values shown are $\text{kJm}^{-2} \text{year}^{-1} \times 10^4$. Values of energy lost through respiration (R) and other means (L) are shown for some organisms. The biomass of the organisms in the ecosystem remained unchanged during the study.



(a) Calculate the gross primary productivity (GPP) for the grasses in this system . Show your working. [2 marks]

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(b) Describe how this figure could be used to calculate the net primary productivity (NPP) of the grasses. [1 mark]

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(c) Calculate the percentage of the energy taken in by the grasshoppers that is converted into new grasshopper biomass. Show your working.

[3 marks]

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(d) Give two ways in which energy is lost by the grasshoppers other than in respiration.

[2 marks]

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(e) Use your calculated figures from parts (a) and (c) to explain why food chains are of limited length.

[2 marks]

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Section B [60 marks]

Answer any four questions in this section.

- 5 (a) Draw and label a simplified diagram to show how DNA is constructed from sugars ,phosphates and bases. [6 marks]
- (b) Explain why DNA must be replicated before mitosis and the role of helicase in DNA replication. [4 marks]
- (c) Explain how the base sequences of DNA is conserved during replication. [5 marks]
- 6 (a) The leaves of plants are adapted to absorb light for photosynthesis.
Draw a labelled diagram to show the arrangement of tissues in a leaf. [6 marks]
- (b) Explain the reaction involving the use of light energy that occurs in the thylakoids of the chloroplast. [9 marks]
- 7 (a) Outline one example of inheritance involving multiple alleles. [6 marks]
- (b) Using an example you have studied, explain a cross between two linked genes , including the way in which recombinants are produced. [9 marks]
- 8 (a) Draw and label a diagram showing the structure of a glomerulus and an associated nephron. [6 marks]
- (b) Explain how water balance is maintained in the blood. [9 marks]
- 9 (a) Compare the roles of the endocrine and nervous systems in control and coordination in animals. [8 marks]
- (b) Describe the part played by auxins in apical dominance in a plant shoot. [7 marks]

- 10(a) Explain the role of isolating mechanisms in the evolution of new species. [8 marks]
- (b) Describe and explain, using an example , the process of artificial selection. [7 marks]