

Comparison between NEW and OLD syllabuses

In the New Biology syllabus, some topics are newly added and some are removed. Moreover, the syllabus is divided into two parts: **core** and **extension**. Some difficult topics are grouped under the extension part and they will only be asked in Section B of both Papers 1 and 2.

(a) Topics added to the syllabus

Sections	Topics added
The Cell	<ul style="list-style-type: none"> • Discovery of cells • Functions of mitochondrion
Organisms and Their Environment	<ul style="list-style-type: none"> • Classification of organisms into five kingdoms • Virus as a non-cellular entity • Concept of sustainable development
Energetics	—
Obtaining Essentials for Life	<ul style="list-style-type: none"> • Using data logger to study: (P) <ul style="list-style-type: none"> – the effect of light on gas exchange; and – the change in breathing rate during exercise. • Test for glucose using Clinistix paper (P) • Test for protein using Albustix paper (P) • Health problems resulting from improper diet • Periodontal disease and its prevention
Coordination and Response	<ul style="list-style-type: none"> • General effects of glucagon • Similarities and differences between hormonal and nervous coordination • Feedback mechanism in homeostasis
Regulation and Defence	<ul style="list-style-type: none"> • Regulatory role of glucagon in blood glucose level
Reproduction and Growth	<ul style="list-style-type: none"> • Structure of ovum • Formation of identical twins and fraternal twins • Advantages of breast-feeding
Genetics and Evolution	<ul style="list-style-type: none"> • Down syndrome, colour blindness and G6PD deficiency • Human Genome Project • Genetic engineering • Evolution

Key: (P) Practical work

5 Coordination and Response



Coordination and Response

In humans

In plants

Sensory organs
 – They contain receptors which convert environmental changes into nerve impulses.
 – The five senses are sight, hearing, taste, touch and smell.

send impulses to

Nervous system

initiates

Locomotion

Hormonal system Extension

Tropism Extension

Related structures

Skeletal muscles

– are the principal effectors of locomotion
 – work in pairs as opposing muscles i.e. flexor and extensor

Limb bones

– move at the joints

Movable joints

– allow bones to move

Tendons

– attach muscles to bones

Ligament

– hold the bones together

Structure

– It consists of various endocrine glands, e.g. pancreas, testis and ovary.

Function

– Secretion of hormones to regulate body activities

Feedback mechanism of hormonal control

Example

– Regulation of blood glucose level by insulin and glucagon

Types

– phototropism
 – geotropism
 – hydrotropism

Roles of auxin

– Higher concentrations promote shoot growth, but inhibit root growth.
 – Uneven distribution of auxin causes bending of plant.

Significance

Adaptation for:
 – photosynthesis
 – absorption of water and minerals
 – anchorage

Structures

- Basic units
 - Sensory neurones
 - Interneurones
 - Motor neurones
- Central Nervous System, CNS
 - Brain (includes cerebellum, cerebrum and medulla)
 - Spinal cord
- Peripheral nervous system, PNS
 - Cranial nerves
 - Spinal nerves

Functions

- Transmits nerve impulses
- Maintains balance and posture
- Produces sensation
- Initiates voluntary actions
- Acts as centre for reflex actions
- Controls breathing and heartbeat

Eye

Structures

- The iris and pupil control the amount of light entering the eye.
- The lens, suspensory ligament and ciliary body focus objects onto the retina.
- Rods and cones on retina generate visual impulses.

Eye defects Extension

- Long sight
- Short sight
- Colour blindness

5.1 Detecting environmental conditions

Learning Focus

- Understand the five senses are sight, hearing, taste, touch and smell.
- Study the roles of sense organs and receptors in the nervous system.
- State the structures and functions of different parts of the human eye.
- Distinguish between rods and cones in terms of their functions and distribution on the retina.
- Explain how the eye controls the amount of light entering it, and the accommodation of the eye.
- State the causes of long sight and short sight, and their corrections. **Extension**
- Understand the causes of colour blindness. **Extension**

A. Basic plan of a coordinating system

- For survival, an organism must have the *ability* to detect and respond appropriately to changes in its environment.
- Although the type of response may vary, the order of events involved follows a common pathway as shown below:

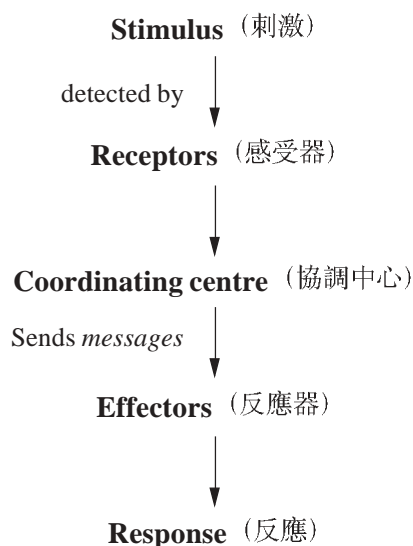


Figure 5.1

Reminder

This ability is known as irritability (感應性).

Reminder

Stimuli take the form of energy changes.

Reminder

The messages are either in the form of electrical signals (nerve impulses) or chemicals (hormones).

Guided Example 9

The diagram below shows a cross-section of a distinct structure X that is found in the lymphatic system:

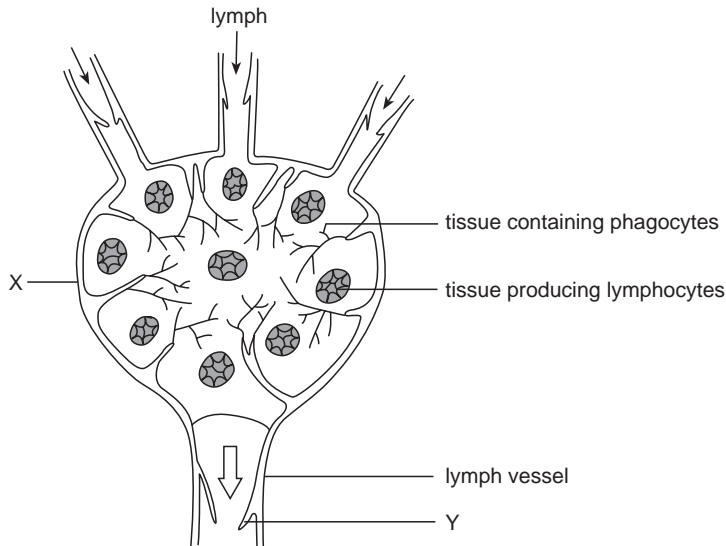


Figure 4.82

- (a) Name structure X.
- (b) With reference to the above diagram, suggest the possible function of the lymph node. Give *two* reasons to support your answer.
- (c) (i) What is structure Y?
(ii) State how the lymph flow can be maintained in the lymph vessel.

Reminder

Use the functions of phagocytes and lymphocytes in body defence to explain the answer.

Suggested Answer

- (a) Lymph node
- (b) It filters germs and toxic materials brought with the lymph:
 - the phagocytes engulf and digest germs; and
 - the lymphocytes produce antibodies to kill germs and neutralize the toxins released by germs.
- (c) (i) Valve
(ii) The lymph is squeezed to flow towards the heart by the contraction of skeletal muscle.
Valves (structure Y) are present to prevent the backflow of lymph.

Reminder

The flow of lymph in lymph vessels is similar to that of blood in veins.

Glossary

absorption	吸收作用	dental floss	牙線
alimentary canal	消化道	dental formula	齒式
alveoli(us)	肺泡	dentine	牙本質
anaemia	貧血	dentition	齒系
anterior vena cava	前腔大靜脈	deoxygenated	缺氧
aorta	大動脈	detoxification	解毒作用
appendix	蚓突	diabetes	糖尿病
arteriole	小動脈	diaphragm	橫膈膜
artery	動脈	diastole	心舒期
assimilation	同化作用	dietary fibre	食用纖維
balanced diet	均衡膳食	digestion	消化作用
bicarbonate salt	碳酸氫鹽	digestive enzyme	消化酶
bicuspid valve	二尖瓣	digestive juice	消化液
bile	膽汁	digestive system	消化系統
bile duct	膽管	double circulation	雙循環
bile pigment	膽色素	duodenum	十二指腸
bile salt	膽鹽	egestion	排遺作用
blood	血液	enamel	琺瑯質
blood cell	血細胞	eosin solution	曙紅溶液
blood platelet	血小板	epidermis	表皮
blood vessel	血管	epiglottis	會厭軟骨
breathing system	呼吸系統	epithelium	上皮
bronchi(us)	支氣管	expiration	呼氣
bronchiole	小支氣管	faeces	糞便
bubble potometer	氣泡蒸騰計	fertilizer	肥料
caecum	盲腸	fluoride	氟化物
callus	形成層	food pyramid	食物金字塔
canine	犬齒	gall bladder	膽囊
capillary	微血管	gas exchange	氣體交換
carbohydrases	碳水化合物酶	gastric juice	胃液
cardiac cycle	心搏週期	haemoglobin	血紅素
cellulose	纖維素	heart	心臟
cement	牙骨質	heartbeat	心跳
chemical digestion	化學性消化	heart tendon	腱索
chemical fertilizer	化學肥	hepatic artery	肝動脈
chyme	食糜	hepatic portal vein	肝門靜脈
cilia	纖毛	hepatic vein	肝靜脈
colon	結腸	herbaceous plant	草本植物
companion cell	伴細胞	herbaceous stem	草質莖
constipation	便秘	heterotroph	異養生物
cortex	皮層	holozoic nutrition	動物式營養
crown	齒冠	humus	腐植質
cuticle	角質層	hydrochloric acid	鹽酸
data logger	數據收集儀	hydrogencarbonate ion	碳酸氫根離子
DCPIP (dichlorophenol indophenol) solution	二氯酚靛酚溶液	ileum	迴腸
deamination	脫氮作用	incisor	門齒
dental disclosing agent	牙垢膜顯示劑	ingestion	攝食
		inorganic fertilizer	無機肥
		inspiration	吸氣

Exam Questions Analysis

Topics	Structured Questions (Year)	Multiple-choice Questions (Year)
Mineral requirements and the application of fertilizer Extension	95(3cii), 03(4ai, ii, iii)	93(15), 98(13)
Histology of dicotyledonous plants	94(4c), 95(2ci), 03(3ci)	96(25, 32), 97(23, 24), 02(43, 44)
Features of leaves	98(2ai, ii), 02(2b)	96(13, 14), 98(11)
Gas exchange in leaves with respect to light intensity Extension	93(4b), 94(2bii), 02(2bi)	97(15, 16), 00(30)
Process of transpiration	—	—
Factors affecting transpiration rate Extension	93(3b), 94(2biii), 96(2a), 97(1a), 99(2a), 02(3a)	95(20, 21), 98(22, 23, 24), 99(21), 00(14, 17, 18, 19), 03(19, 20)
Absorption of water and minerals in roots	95(2ciii, 3ci)	96(24)
Transport of water and minerals in plants	00(1biv), 01(3ci), 03(3ciii)	93(29), 94(21, 22), 96(24), 99(29)
Transport of organic food in plants	98(2aiii), 03(3cii)	95(30)
Support in plants Extension	94(4cii), 01(3c)	95(28, 29), 96(26), 00(31), 02(45)
Food requirements of humans	94(4biv), 00(2ai, ii, iii)	93(14, 22), 94(9, 10), 95(13), 96(4, 5, 6, 7, 8, 12), 98(6, 7, 8), 99(10, 11, 12), 00(59, 60), 01(9, 10), 02(10, 12)
Food tests	94(4ciii), 97(1b), 98(4civ), 00(2aiv)	95(9), 96(3), 01(7)
Ingestion and oral health	93(1cii), 95(3a), 01(1c)	93(12, 13), 94(3, 4), 97(10), 98(10), 99(17), 01(14), 02(15, 16, 17, 22), 03(14)
Digestion	93(1ci), 94(1a), 96(2cii, iii), 98(4ci, ii, iii), 99(2bi), 02(4ciii), 03(2ci, ii)	94(6), 97(11, 12, 13), 98(5), 00(6, 7, 34), 02(14), 03(4, 26)
Absorption	96(2civ), 99(2bii)	94(5), 95(14, 15), 98(9), 99(15, 16, 28), 00(8), 01(12), 02(19, 23), 03(5)
Assimilation	96(2cv)	99(14, 20), 03(13)
Egestion	—	02(8)

Demonstration

Paper I Structured Questions

Section A

1. An experiment was performed to study how the rate of water loss relates to the number and position of the stomata. Three different plants, A, B and C were grown under identical conditions, a healthy leaf from each plant was selected and information about them was recorded in the table below:

Leaf from	Number of stomata per cm ² of leaf surface		Rate of water loss per leaf (g h ⁻¹)	Total surface area of the leaf (cm ²)
	Upper epidermis	Lower epidermis		
Plant A	4 321	11 900	5.3	20.1
Plant B	0	26 530	2.6	19.8
Plant C	0	2 537	0.1	4.2

Table 4.39

- (a) (i) Calculate the rate of water loss per unit area (in g cm⁻² h⁻¹) of each leaf. Tabulate your answer. (3 marks)
- (ii) Deduce which plant is most likely to be a xerophyte. (1 mark)
- (iii) Apart from the information shown in the table, name *two* features of xerophytic plants that enable them to conserve water. (2 marks)
- (b) (i) What is the total number of stomata per cm² in the leaves from plant A and plant B respectively? (1 mark)
- (ii) Decide whether the position or the number of the stomata is more important in determining water loss. (4 marks)
- Total: 11 marks

Guidelines

The steps of calculation and the units should be included in the answer.

Guidelines

'Xerophyte' refers to plants that adapt to dry condition.

Guidelines

Compare the answers in parts a (i) and b (i). Note also the distribution of stomata in plants A and B.

Paper II Multiple-choice Questions

Section A

1. An experiment is carried out to compare the transpiration rate of the upper and lower epidermis of a leaf by fixing dry cobalt chloride paper on to both of its surfaces. The table below gives the result of this experiment:

	Time for the cobalt chloride changing from blue to pink
Upper surface	35 s
Lower surface	50 s

Table 4.45

Guidelines

To answer this kind of question, students are advised to find the answer directly from the table.

What conclusion can be drawn from the above result?

- A. The leaves have been taken from a floating plant.
- B. There are more stomata on the upper surface than on the lower surface.
- C. There are fewer stomata on the upper surface than on the lower surface.
- D. The rate of transpiration of the upper surface is faster than that of the lower surface.

Answer: D

2. The drawing below shows a part of the lower epidermal tissue of a green leaf:

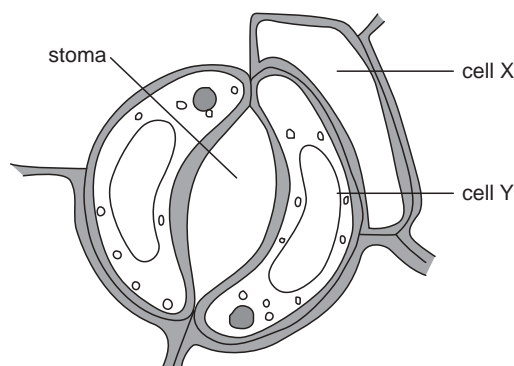


Figure 4.96

Which of the following statements about the epidermis is correct?

- A. Mitochondria are present in cell Y but not in cell X.
- B. Water has been moved from cell X to cell Y by osmosis.
- C. Cell Y is flaccid.
- D. Photosynthesis takes place in cells X and Y.

Answer: B

Guidelines

Mitochondria are present in most living plant cells, while chloroplasts are only present in green cells.

Practice

Paper I Structured Questions

Section A

1. The following diagram shows a part of a transverse section of certain organ of a dicotyledonous plant:

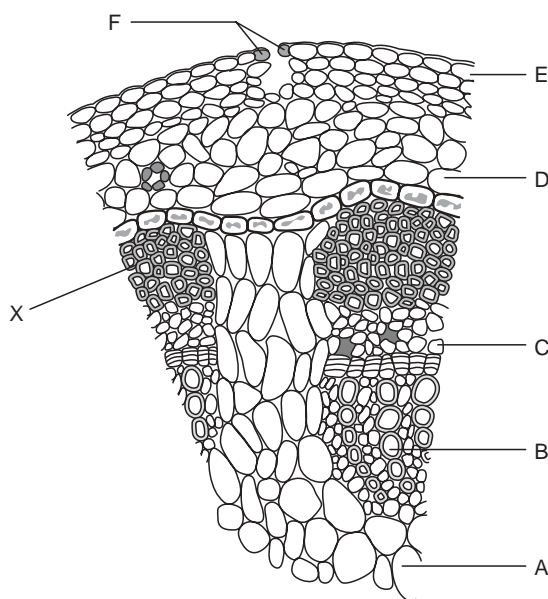


Figure 4.102

- Identify labels B, C, D and F. (2 marks)
- From which organ, root or stem, was the section taken? Give **two** reasons to support your answer. Hint 1 (3 marks)
- With reference to the diagram, suggest **one** possible function of cell type X in the stem. Explain your answer. (2 marks)
- Using the letters in the diagram, indicate **two** cell types in which a nucleus cannot be found. Hint 2 (2 marks)

Total: 9 marks

Paper II Multiple-choice Questions

Section A

Directions: Questions 1 to 2 refer to the photomicrograph below, which shows a transverse section of a plant organ.

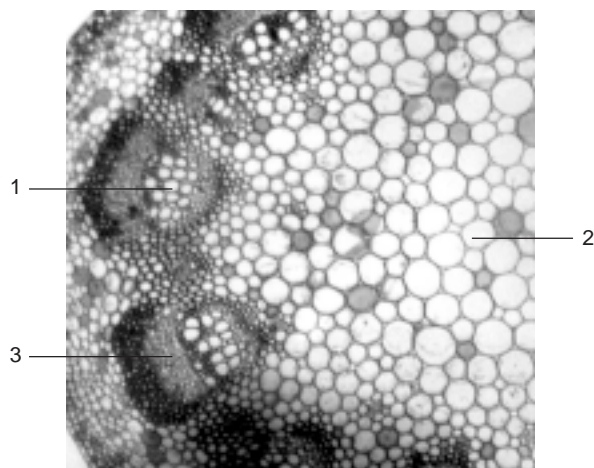


Figure 4.120

- The plant organ is a Hint 32
 - fruit.
 - leaf.
 - stem.
 - root.
- Which of the following correctly describes the functions of labels 1 and 2?
 - Transport of organic food
 - Support
 - Transport of minerals or water
 - Food storage

- The diagram below shows an experiment in which a green plant was fed with radioactive carbon dioxide ($^{14}\text{CO}_2$) and left in the light for 3 hours in order to allow transportation of the ^{14}C compound to take place. Hint 33

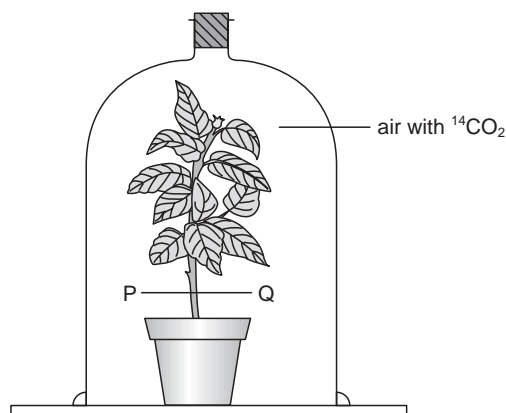


Figure 4.121

After the experiment, a thin section was cut from the stem at region PQ and placed on a photographic film, which becomes black if exposed to radioactivity.

Which diagram shows the appearance of the photographic film after the experiment?

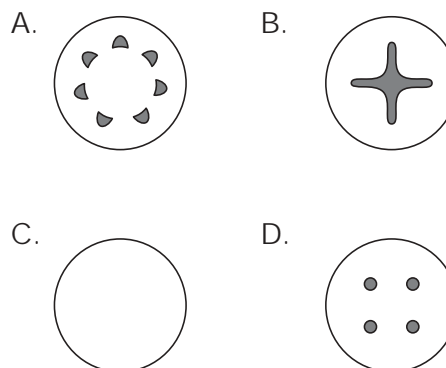


Figure 4.122

Index

A			
absorption 吸收作用	43, 55	blood vessel 血管	75, 81
accommodation 視覺調節	149	bone 骨	173
alimentary canal 消化道	50	brain 腦	154
alveoli(us) 肺泡	63	breathing system 呼吸系統	61
anaemia 貧血	37	bronchi(us) 支氣管	61
antagonistic muscle 拮抗肌	180	bronchiole 小支氣管	63
anterior vena cava 前腔大靜脈	76	bubble potometer 氣泡蒸騰計	25
aorta 大動脈	76		
appendicular skeleton 附肢骨骼	177	C	
appendix 蚓突	55	caecum 盲腸	55
aqueous humour 水狀液	146	cambium 形成層	11
arteriole 小動脈	81	canine 犬齒	45
artery 動脈	81	capillary 微血管	81
articular cartilage 關節軟骨	175, 178	carbohydrases 碳水化合物酶	54
assimilation 同化作用	43, 58	cardiac cycle 心搏週期	80
association area 聯合區	165	cell body 細胞體	157
auditory area 聽覺區	165	cell elongation 細胞延長	185
auditory nerve 聽神經	143	cellulase 纖維素	55
auxin 生長素	185	cement 牙骨質	44
axial skeleton 中軸骨骼	176	central canal 中央管	155, 159
axon 軸突	157	central nervous system (CNS) 中樞神經系統	154
		cerebellum 小腦	164
		cerebral cortex 大腦皮層	164
		cerebral ventricle 腦室	155
		cerebrospinal fluid 腦脊髓液	155
		cerebrum 大腦	160, 164
		chemical digestion 化學性消化	49
		chemical fertilizer 化學肥	7
		choroid 脈絡膜	145
		chyme 食糜	52
		cilia 纖毛	62
		ciliary body 睫狀體	145
		ciliary muscle 睫狀肌	145
		circular muscle 環狀肌	150
		clinostat 旋轉器	189
		colon 結腸	55
		colour blindness 色盲	153
B			
balanced diet 均衡膳食	41		
ball and socket joint 球窩關節	179		
bicarbonate salt 碳酸氫鹽	50		
biceps 二頭肌	181		
bicuspid valve 二尖瓣	76		
bile 膽汁	53		
bile duct 膽管	53		
bile pigment 膽色素	53		
bile salt 膽鹽	53		
blind spot 盲點	145		
blood 血液	75, 83		
blood cell 血細胞	83		
blood platelet 血小板	86		

Question Commands

The following table lists the question command(s) which showing the requirements of answering questions:

Question commands	Examples						
<p>Account for * ... (Give reasons for, but do NOT calculate)</p>	<p>The table below shows the change in total dry mass in seeds before and after germination:</p> <table border="1" data-bbox="724 537 1373 674"> <thead> <tr> <th></th> <th>Seeds</th> <th>Seedlings formed after germination</th> </tr> </thead> <tbody> <tr> <th>Total dry mass</th> <td>39.2</td> <td>28.4</td> </tr> </tbody> </table> <p>Account for the difference in total dry mass between the seeds and the seedlings after germination. Correct answer: Some stored food in the seeds is used in respiration. Wrong answer: $39.2 \text{ g} - 28.4 \text{ g} = 10.8 \text{ g}$</p>		Seeds	Seedlings formed after germination	Total dry mass	39.2	28.4
	Seeds	Seedlings formed after germination					
Total dry mass	39.2	28.4					
<p>Arrange in ascending order ... (The lowest first and the highest last) Arrange in descending order ... (The highest first and the lowest last)</p>	<p>Arrange the complexity of the following terms in ascending order : Tissue, cell, system, organ Correct answer: Cell, tissue, organ, system Wrong answer: System, organ, tissue, cell (Remarks: No mark will be awarded for descending order.)</p>						
<p>Calculate ... (Show all the steps of calculation and give the answer with appropriate unit)</p>	<p>A boy breathes three times per ten seconds, calculate the rate of breathing of the boy. Correct answer: Breathing rate of the boy $= \frac{3}{10} \times 60$$= 18 \text{ breaths / min}$ Wrong answer: Breathing rate = 18</p>						
<p>Compare ... (Point out the similarities and / or differences between two or more subjects)</p>	<p>Compare the chromosome number of the sperm with that of the fertilized egg. Answer: The chromosome number of the sperm is haploid (n) while that of the fertilized egg is diploid (2n).</p>						
<p>Define / What is meant by ... (State briefly the meaning of the term)</p>	<p>Define 'dry weight' of germinating seedlings. Answer: The weight of germinating seedlings after removing all of the water from them.</p>						