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.

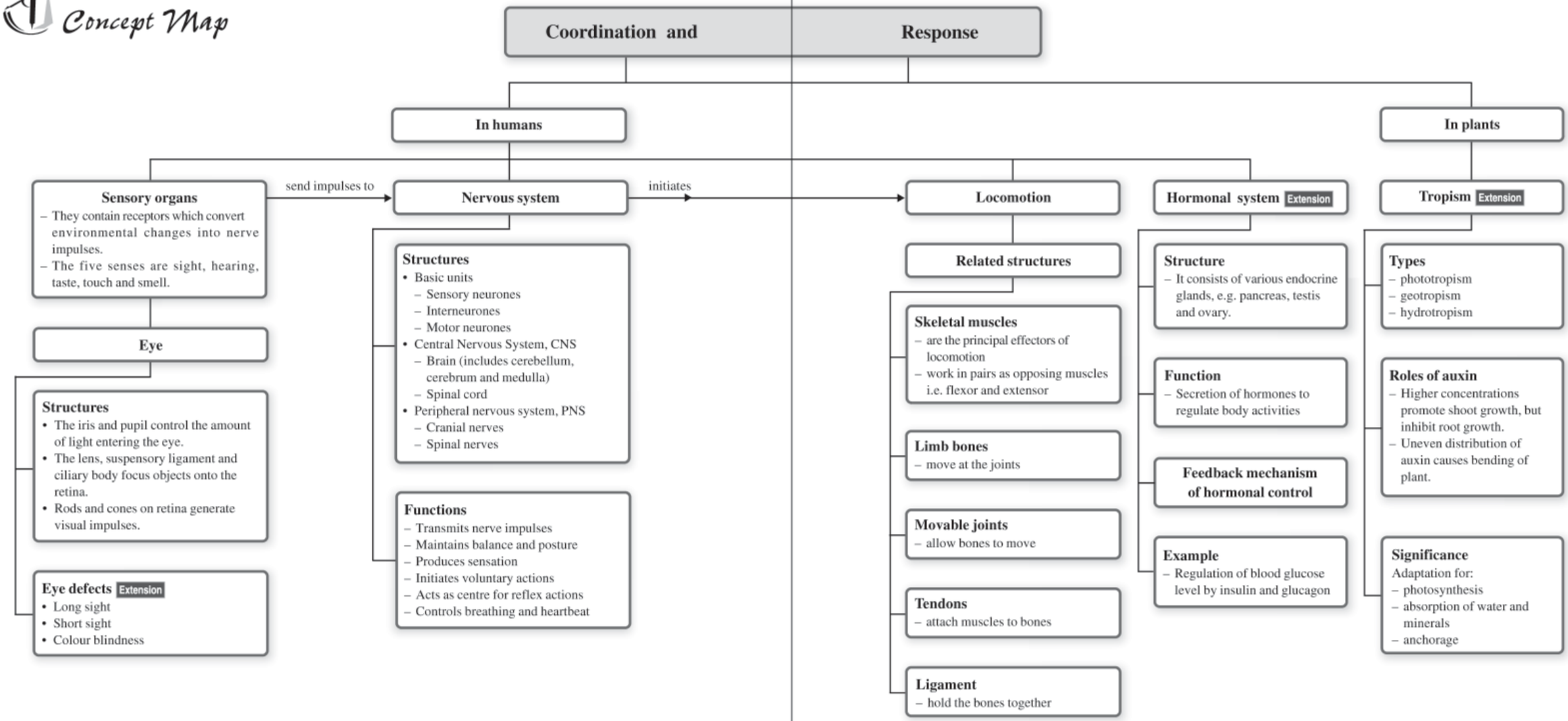
(a) Topics added to the syllabus

Sections	Topics added
The Cell	• Discovery of cells • Functions of mitochondrion
Organisms and Their Environment	• Classification of organisms into five kingdoms • Virus as a non-cellular entity • Concept of sustainable development
Energetics	——
Obtaining Essentials for Life	• Using data logger to study: (P) – 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 • Peridontal disease and its prevention
Coordination and Response	• General effects of glucagon • Similarities and differences between hormonal and nervous coordination • Feedback mechanism in homeostasis
Regulation and Defence	• Regulatory role of glucagon in blood glucose level
Reproduction and Growth	• Structure of ovum • Formation of identical twins and fraternal twins • Advantages of breast-feeding
Genetics and Evolution	• Down syndrome, colour blindness and G6PD deficiency • Human Genome Project • Genetic engineering • Evolution

Key: (P) Practical work

5 Coordination and Response

Concept Map



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.

Reminder
This ability is known as irritability（感應性）.

- Although the type of response may vary, the order of events involved follows a common pathway as shown below:

Reminder
Stimuli take the form of energy changes.

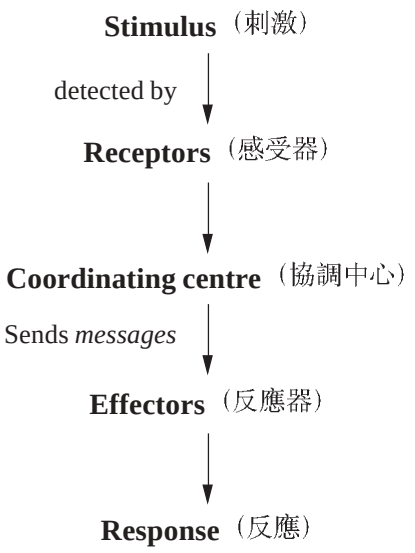


Figure 5.1

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:

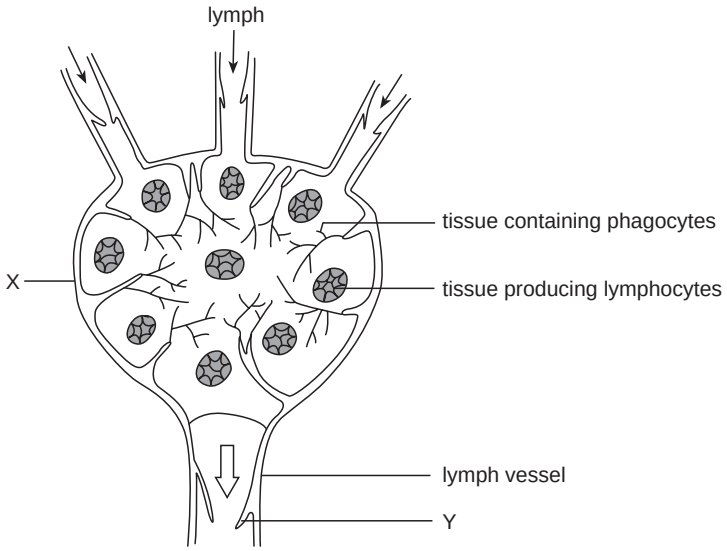


Figure 4.82

(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
alimentary canal	消化道
alveoli(us)	肺胞
anaemia	貧血
anterior vena cava	前腔大靜脈
aorta	大動脈
appendix	蚓突
arteriole	小動脈
artery	動脈
assimilation	同化作用
balanced diet	均衡膳食
bicarbonate salt	碳酸氫鹽
bicuspid valve	二尖瓣
bile	膽汁
bile duct	膽管
bile pigment	膽色素
bile salt	膽鹽
blood	血液
blood cell	血細胞
blood platelet	血小板
blood vessel	血管
breathing system	呼吸系統
bronchi(us)	支氣管
bronchiole	小支氣管
bubble potometer	氣泡蒸騰計
caecum	盲腸
cambium	形成層
canine	犬齒
capillary	微血管
carbohydrases	碳水化合物酶
cardiac cycle	心搏週期
cellulose	纖維素
cement	牙骨質
chemical digestion	化學性消化
chemical fertilizer	化學肥
chyme	食糜
cilia	纖毛
colon	結腸
companion cell	伴細胞
constipation	便秘
cortex	皮層
crown	齒冠
cuticle	角質層
data logger	數據收集儀
DCPIP (dichlorophenol indophenol) solution	二氯酚靛酚溶液
deamination	脱氨作用
dental disclosing agent	牙垢膜顯示劑
dental floss	牙線
dental formula	齒式
dentine	牙本質
dentition	齒系
deoxygenated	缺氧
detoxification	解毒作用
diabetes	糖尿病
diaphragm	橫膈膜
diastole	心舒期
dietary fibre	食用纖維
digestion	消化作用
digestive enzyme	消化酶
digestive juice	消化液
digestive system	消化系統
double circulation	雙循環
duodenum	十二指腸
egestion	排遺作用
enamel	琺瑯質
eosin solution	曙紅溶液
epidermis	表皮
epiglottis	會厭軟骨
epithelium	上皮
expiration	呼氣
faeces	糞便
fertilizer	肥料
fluoride	氟化物
food pyramid	食物金字塔
gall bladder	膽囊
gas exchange	氣體交換
gastric juice	胃液
haemoglobin	血紅素
heart	心臟
heartbeat	心跳
heart tendon	腱索
hepatic artery	肝動脈
hepatic portal vein	肝門靜脈
hepatic vein	肝靜脈
herbaceous plant	草本植物
herbaceous stem	草質莖
heterotroph	異養生物
holozoic nutrition	動物式營養
humus	腐植質
hydrochloric acid	鹽酸
hydrogencarbonate ion	碳酸氫根離子
ileum	迴腸
incisor	門齒
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 cm^2 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:

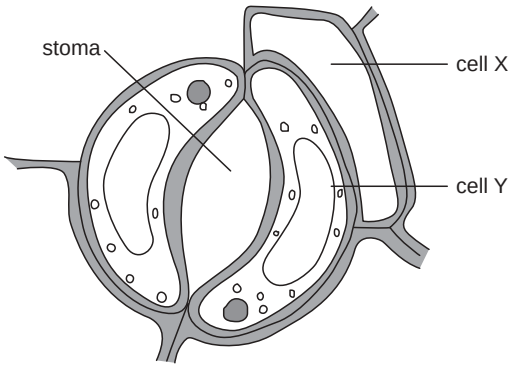


Figure 4.96

Guidelines

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

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

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:

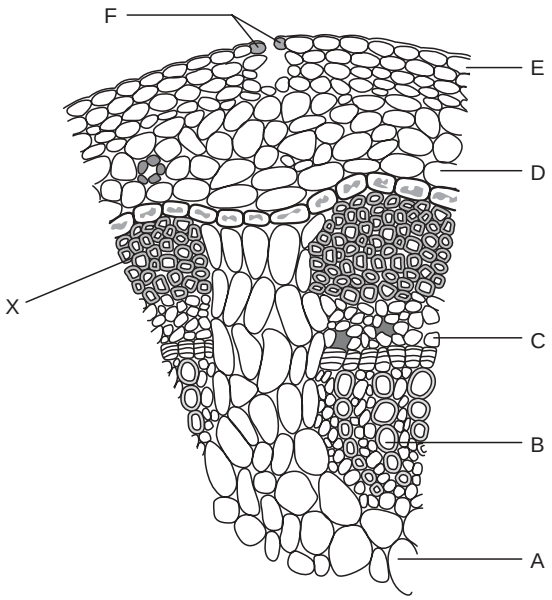


Figure 4.102

(a) Identify labels B, C, D and F. (2 marks)

(b) From which organ, root or stem, was the section taken? Give *two* reasons to support your answer. Hint 1 (3 marks)

(c) With reference to the diagram, suggest *one* possible function of cell type X in the stem. Explain your answer. (2 marks)

(d) 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.

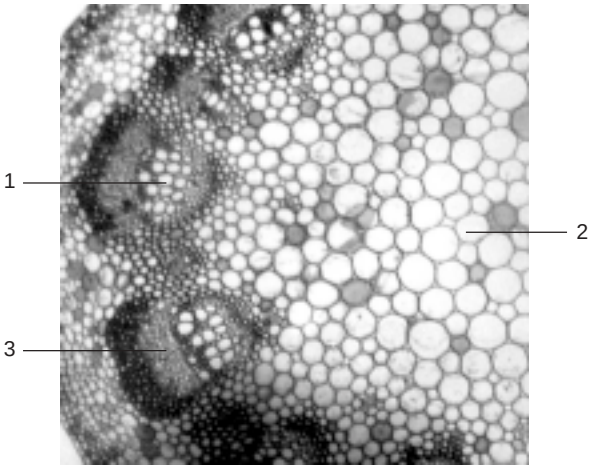


Figure 4.120

1. The plant organ is a Hint 32

   A. fruit.
   B. leaf.
   C. stem.
   D. root.

2. Which of the following correctly describes the functions of labels 1 and 2?

   A. Transport of organic food
   B. Support
   C. Transport of minerals or water
   D. Food storage

3. The diagram below shows an experiment in which a green plant was fed with radioactive carbon dioxide ($^{14}CO_2$) and left in the light for 3 hours in order to allow transportation of the ^{14}C compound to take place. Hint 33

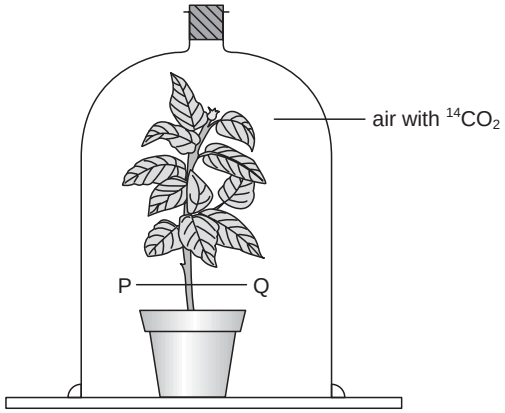


Figure 4.121

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?

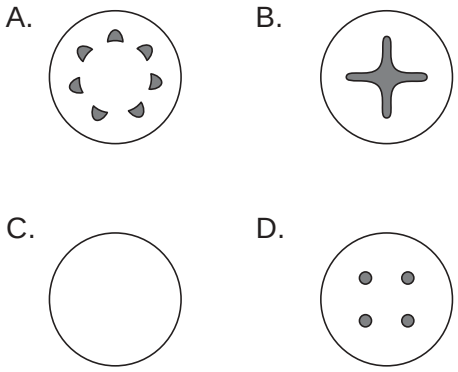


Figure 4.122

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Question Commands

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

<table>
<tr><th>Question commands</th><th>Examples</th></tr>
<tr><td>Account for * ...
(Give reasons for, but do NOT calculate)</td><td>The table below shows the change in total dry mass in seeds before and after germination:
<table><tr><th></th><th>Seeds</th><th>Seedlings formed after germination</th></tr><tr><td>Total dry mass</td><td>39.2</td><td>28.4</td></tr></table>
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 g – 28.4 g = 10.8 g</td></tr>
<tr><td>Arrange in ascending order ...
(The lowest first and the highest last)
Arrange in descending order ...
(The highest first and the lowest last)</td><td>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.)</td></tr>
<tr><td>Calculate ...
(Show all the steps of calculation and give the answer with appropriate unit)</td><td>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 breaths / min
Wrong answer: Breathing rate = 18</td></tr>
<tr><td>Compare ...
(Point out the similarities and / or differences between two or more subjects)</td><td>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).</td></tr>
<tr><td>Define / What is meant by ...
(State briefly the meaning of the term)</td><td>Define ‘dry weight’ of germinating seedlings.
Answer: The weight of germinating seedlings after removing all of the water from them.</td></tr>
</table>