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.

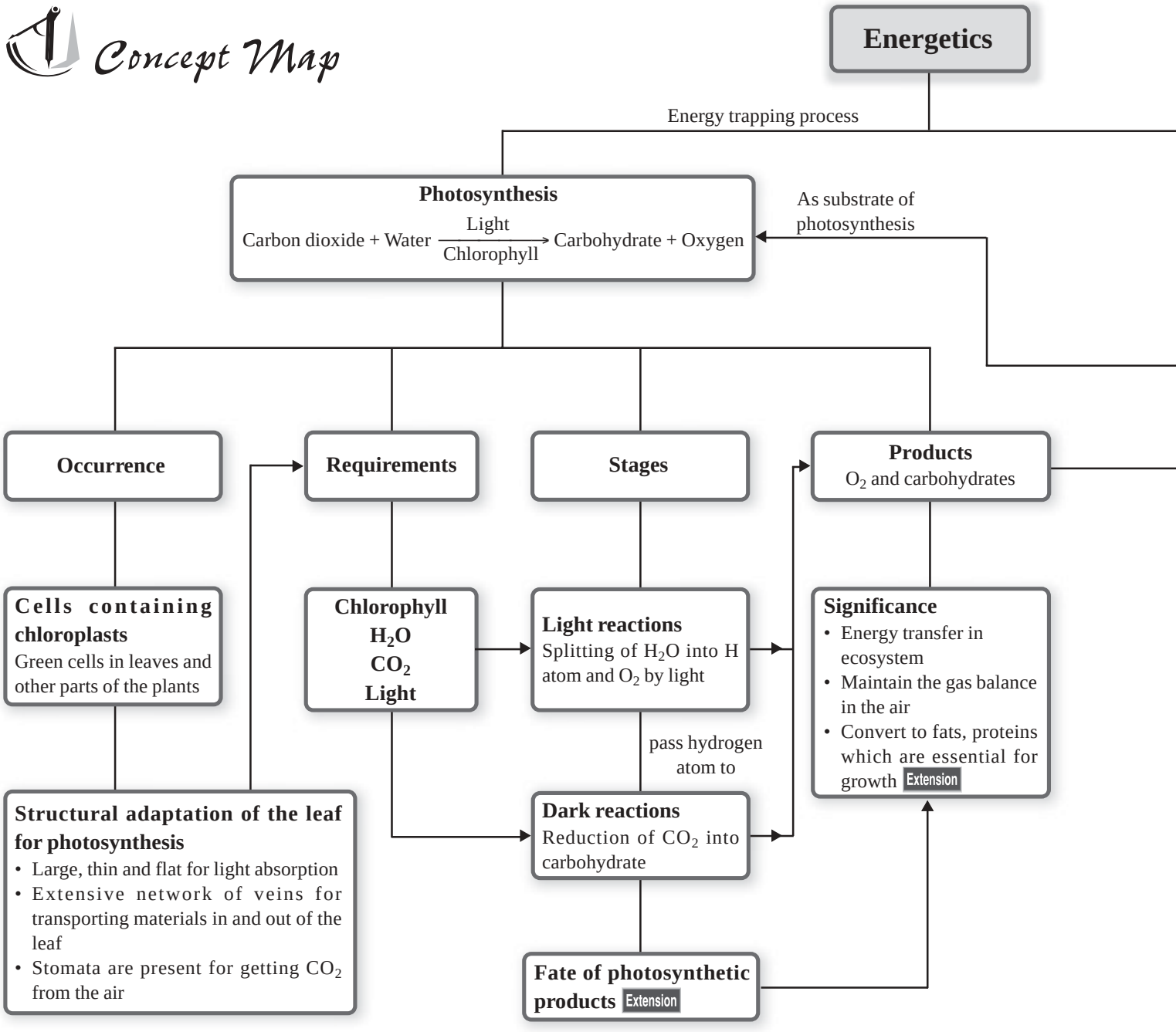
(a) Topics added to the syllabus

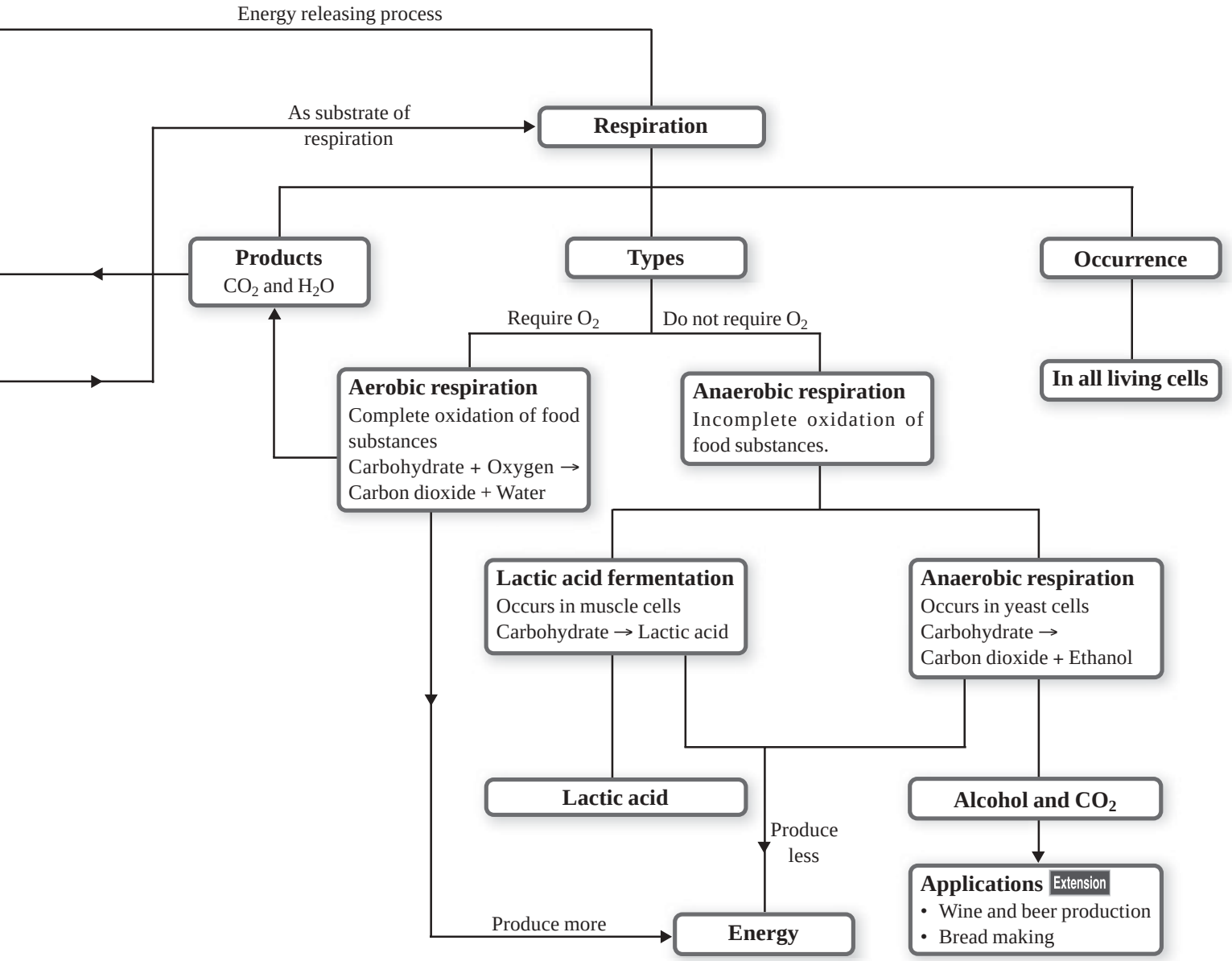
Sections	Topics added
The Cell	• Discovery of cells • Functions of mitochondrion
Organisms and Their Environment	• Classification of organisms into five kingdoms • Virus as a non-cellular entity • Concept of sustainable development
Energetics	——
Obtaining Essentials for Life	• Using data logger to study: (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

Key: (P) Practical work

3 Energetics

Concept Map




Energy releasing process
As substrate of respiration
Respiration
Products
CO_2 and H_2O
Types
Occurrence
Require O_2
Do not require O_2
Aerobic respiration
Complete oxidation of food substances
Carbohydrate + Oxygen → Carbon dioxide + Water
Anaerobic respiration
Incomplete oxidation of food substances.
In all living cells
Lactic acid fermentation
Occurs in muscle cells
Carbohydrate → Lactic acid
Anaerobic respiration
Occurs in yeast cells
Carbohydrate → Carbon dioxide + Ethanol
Lactic acid
Alcohol and CO_2
Produce less
Applications Extension
• Wine and beer production
• Bread making
Produce more
Energy

3.1 Photosynthesis

Learning Focus

- Explore the significance of photosynthesis in converting light energy to chemical energy in plants.
- Understand the requirements for photosynthesis, including light, carbon dioxide, water and chlorophyll.
- Learn the photosynthetic process involving the splitting of water and the formation of carbohydrate.
- Explore the fate of photosynthetic products in plants. Extension
- Explore the effects of environmental factors on the rate of photosynthesis. Extension
- Understand the relationship between the structural features of leaf and its adaptation as a photosynthetic organ.
- Design and perform investigations to:
  - detect the photosynthetic product;
  - study the requirements for photosynthesis; and
  - study the effects of environmental factors on the rate of photosynthesis. Extension

- Green plants are photosynthetic autotrophs（自養生物） which use light energy to make complex food from simple inorganic substances.
- Not all autotrophs use light energy to produce food.
- Some autotrophic bacteria can obtain chemical energy through oxidation.

A. Definition of photosynthesis

- Photosynthesis（光合作用）is an anabolic process in which green plants produce complex organic food (e.g. glucose) from simple inorganic substance.
- Plants use chlorophyll（葉綠素）to absorb solar energy.
- Oxygen is released as a by-product.
- Word equation for photosynthesis:

$$\text{Carbon dioxide + Water} \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} \text{Carbohydrate + Oxygen}$$

- Chemical equation for photosynthesis (for reference only):

$$6CO_2 + 6H_2O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6 + 6O_2$$

Reminder

All plants containing chlorophyll can carry out photosynthesis. But not all of them may be green in colour.

Reminder

- Only word equation is required in the HKCEE.
- Oxygen released in photosynthesis comes from water rather than carbon dioxide.

Guided Example 6

The diagram below shows the feeding relationship between certain organisms which are found in grassland:

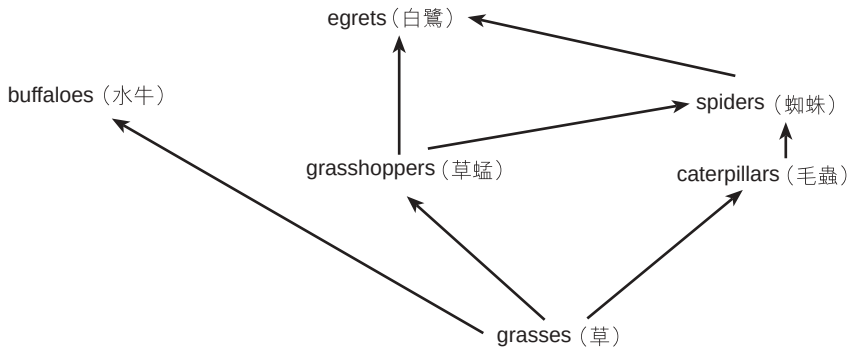


Figure 2.59

(a) Name the relationship between
  (i) grasshoppers and caterpillars:
  (ii) caterpillars and spiders; and
  (iii) egrets and spiders.

Reminder

Two species living in the same area may have more than one type of interaction.

(b) The diagram below shows an association of the egret and buffalo:

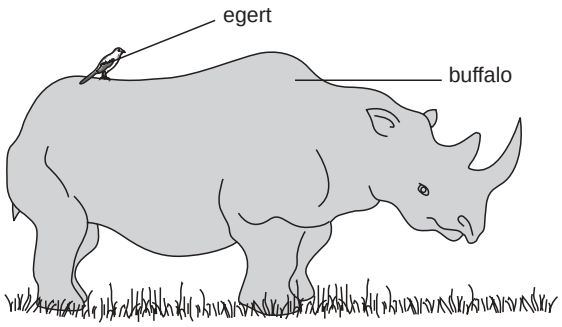


Figure 2.60

Reminder

The buffalo neither benefits nor is harmed in this assocation.

The egret feeds on the insects hidden in the grass which are disturbed by the buffalo when it move around the grass. Name the association between the egret and the buffalo.

Suggested Answer

(a) (i) Competition
  (ii) Predation
  (iii) Predation and competition

(b) Commensalism

1. Boil a glucose solution and cool it to room temperature.
2. Mix the glucose solution with the yeast in a sterilized flask.
3. Pour a layer of liquid paraffin oil on the top of the solution.
4. Prepare a control by setting the same apparatus but using killed yeast.
5. Leave the set-up for a few hours and record the results.

Reminder

Sterilization kills other microorganisms which, if do exist, may affect the normal growth of yeast cells.

- Result

	Bicarbonate indicator	Temperature	Smell of alcohol
Experimental set (with living yeast)	Turns from orange to yellow (Carbon dioxide is released.)	Rises (Heat is released.)	Yes
Control set (with killed yeast)	Remains orange	No change	No

Table 3.9

- Explanation
  - Yeast cells carry out anaerobic respiration (fermentation) in the presence of glucose.
  - Carbon dioxide, heat energy and alcohol are produced during the process.

Glossary

aerobic respiration	需氧呼吸	lactic acid fermentation	乳酸發酵
air space	氣室	light reaction	光反應
alcoholic fermentation	酒精發酵	limiting factor	限制因素
anaerobic respiration	缺氧呼吸	lower epidermis	下表皮
ATP	三磷酸腺苷	mesophyll	葉肉
autotroph	自養生物	mitochondrion	粒腺體
breathing	呼吸	oxygen debt	氧債
chlorophyll	葉綠素	palisade tissue	柵狀組織
chloroplast	葉綠體	phloem	韌皮部
cuticle	角質層	photosynthesis	光合作用
cytoplasm	細胞質	respiration	呼吸作用
dark reaction	暗反應	sodium hydrogencarbonate	碳酸氫鈉
destarching	脱澱粉	spongy tissue	海綿組織
differential air thermometer	差示空氣溫度計	stoma / stomata	氣孔
epidermis	表皮	upper epidermis	上表皮
ethanol	乙醇	variegated leaf	斑葉
guard cell	保衛細胞	vein	葉脈
hydrogencarbonate indicator	碳酸氫鹽指示劑	xylem	木質部
lactic acid	乳酸	yeast	酵母菌

Examination Question Analysis

Topics	Structured Questions (Year)	Multiple-choice Questions (Year)
Significance of photosynthesis	——	93(17)
Requirements for photosynthesis	97(4a)	96(10)
Processes of photosynthesis	95(4aiii)	93(23), 94(7), 01(13), 02(05)
Factors affecting photosynthesis Extension	01(2bi, ii)	93(16)
Utilization of photosynthetic products Extension	——	93(15), 94(8), 98(12), 02(21)
Leaf structure	94(2bi), 95(4ai, ii), 98(2aii), 00(1b), 02(2bi, ii)	95(10), 97(17, 18)
Significance of respiration	——	——
Aerobic respiration	91(4a), 96(3c), 98(3c), 99(4b), 01(2biii)	96(17, 18), 00(04)
Alcoholic fermentation	94(1b)	96(22, 23), 98(17, 18, 19), 00(05), 02(07)
Lactic acid fermentation	——	00(4), 01(6), 02(07, 32, 33)
Importance of anaerobic respiration Extension	97(4bi, ii, iii)	00(05)
Comparison of aerobic and anaerobic respiration	——	——
Experiments on heat production	——	93(24, 25)
Experiments on CO_2 production	98(3c)	——
Experiments on O_2 consumption	91(4a), 96(3c), 99(4b), 01(2biii)	——

Demonstration

Paper I Structured Questions

Section A

1. The following diagrams describe the steps in testing for starch in a green leaf:

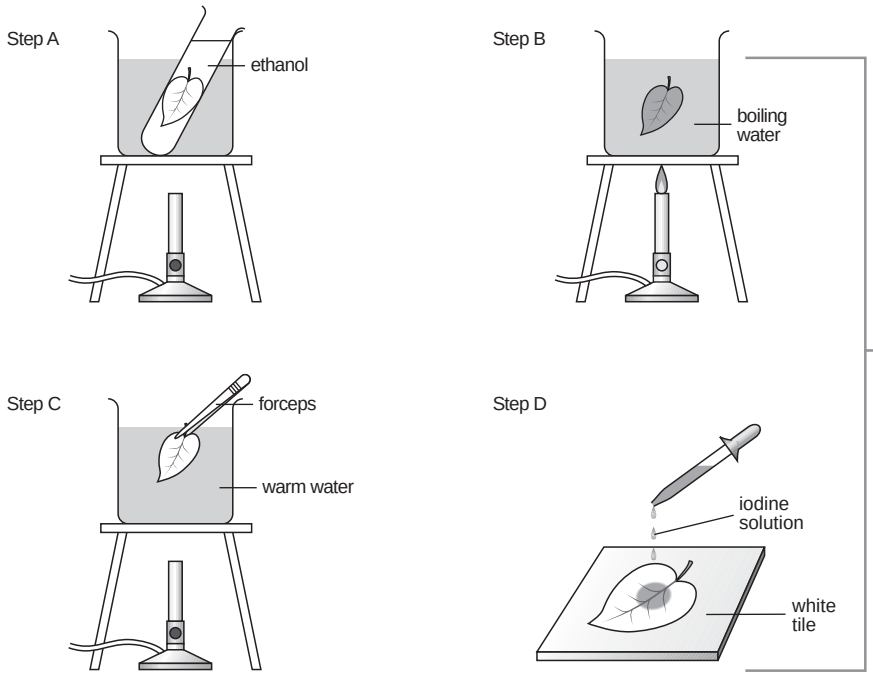


Figure 3.41

(a) Arrange the above steps in the correct sequence. (2 marks)

(b) Complete the following table which shows *one* purpose of each step in the above diagrams. (3 marks)

Steps	Purposes
A	
B	
C	
D	To test for the presence of starch in the leaf.

Table 3.10

Total: 5 marks

Guidelines

- In step A, ethanol, an organic solvent, is used to dissolve chlorophyll.
- In step B, all the enzymatic activities can be stopped by a high temperature.

Guidelines

Prior to the test for the presence of starch, the leaf should be killed, decolorized and softened.

Paper II Multiple-choice Questions

Section A

1. The following table lists some features of three animals X, Y and Z:

	Animals		
	X	Y	Z
Backbone	✓	✗	✓
Scales	✗	✗	✓
Lungs	✓	✗	✓

Key: ✓ = present
✗ = absent

Table 2.15

The three animals are probably

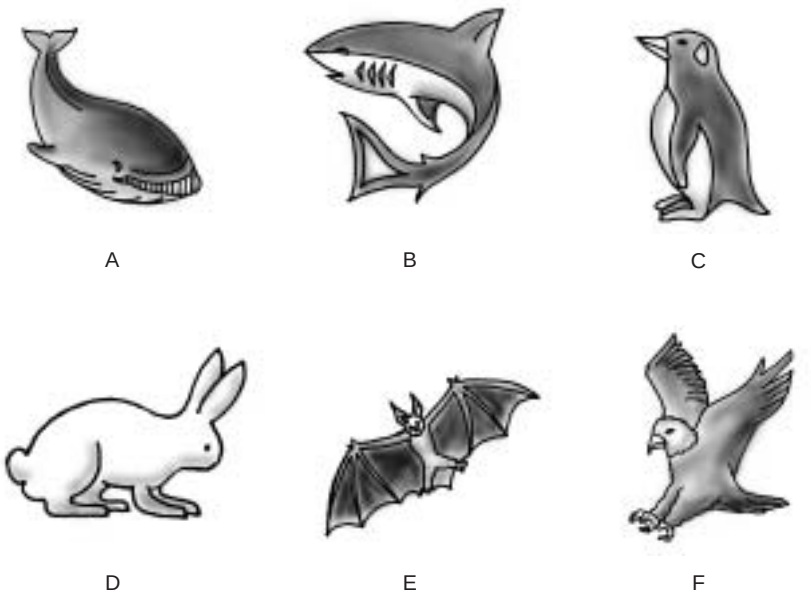
	X	*Y*	*Z*
A.	rabbit	jelly fish	sparrow
B.	frog	jelly fish	salamander
C.	frog	goldfish	snake
D.	starfish	goldfish	turtle

Answer: A

Guidelines

Both X and Z are vertebrates while Y is an invertebrate. Note that a salamander is an amphibian and its body is not covered with scales.

2. Which of the following pairs of animals are correctly classified?



A B C D E F

Figure 2.76

Practice

Paper I Structured Questions

Section A

1. The diagram below shows six types of organisms:

A

B

C

D

E

F

Figure 2.80

(a) (i) Organism F lacks an important internal structure that all the other five have. Name the structure. Hint 1 (1 mark)

(ii) Hence, name the group which organism F belongs to. (1 mark)

(b) Organism A student wrongly sorted organisms D and E into the same group.

(i) State *one* external feature for organisms D and E respectively in order to distinguish them. Hint 2 (2 marks)

(ii) Which organism can be put in the same group with organism D? Give the name of this group. (2 marks)

Index

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><td></td><td colspan="2">Dry mass (g)</td></tr><tr><td></td><td>Seeds</td><td>Seedlings formed after germination</td></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)</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>