Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

BIOLOGY **0610/31**

Paper 3 Theory (Core) **October/November 2022**

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

© UCLES 2022

1 **(a)** **(i)** Keys can be used to identify a species.

State the name of the type of key that uses paired choices of features.

View solution

..... [1]

(ii) Fig. 1.1 shows drawings of six different birds and their names.

View solution

Ammodramus bairdii



Buceros rhinoceros



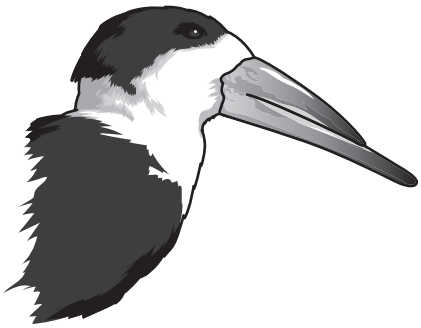
Pandion haliaetus



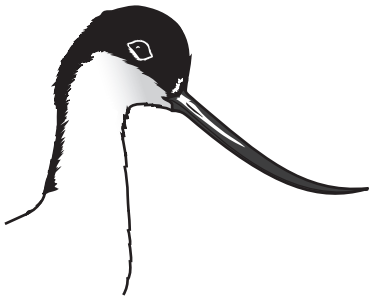
Haliaeetus leucocephalus



Rynchops niger



Recurvirostra avosetta



not to scale

Fig. 1.1

Use the key to identify the birds in Fig. 1.1.

Complete Table 1.1 by writing the letters of the birds **A** to **F** in the correct box.

		key	letter of the bird
1	(a)	beak is longer than the head	go to 2
	(b)	beak is shorter than the head	go to 3
2	(a)	beak curves upwards	**C**
	(b)	beak does **not** curve upwards	go to 4
3	(a)	top part of the beak is hooked over the bottom part of the beak	go to 5
	(b)	top part of the beak is **not** hooked over the bottom part of the beak	**E**
4	(a)	top part of the beak is shorter than bottom part of the beak	**A**
	(b)	has a large projection above the beak	**B**
5	(a)	head has a stripe	**F**
	(b)	head does **not** have a stripe	**D**

Table 1.1

name of the bird in Fig. 1.1	letter of the bird in the key
Ammodramus bairdii	
Buceros rhinoceros	
Pandion haliaetus	
Haliaeetus leucocephalus	
Rynchops niger	
Recurvirostra avosetta	

[5]

(iii) State **two** features of birds, other than the beak, that can be used to classify them as birds.

1 .....

2 .....

[2]

View solution

(b) The population size of the avocet bird (*Recurvirostra avosetta*) was reduced to zero in one country. After more than 100 years, conservation has helped the number of avocet birds in this country to increase again.

View solution

(i) State the genus of the avocet bird.

..... [1]

(ii) In one area of this country, avocet bird numbers have increased from 25 birds to 2000 birds in 30 years.

View solution

Calculate the percentage increase in avocet bird numbers.

Space for working.

.....%
[2]

(iii) Explain why organisms such as the avocet bird become endangered or extinct.

View solution

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 15]

2 **(a)** Inheritance is the transmission of genetic information from generation to generation.

View solution

The boxes on the left show some of the terms used when describing inheritance.

The boxes on the right show definitions for these terms.

Draw **four** straight lines to link each term with its definition.

term	**definition**
	an allele that is expressed if it is present
dominant	
	genetic make-up of an organism
genotype	
	having two different alleles of a particular gene
heterozygous	
	having two identical alleles of a particular gene
phenotype	
	observable features of an organism

[4]

(b) The three structures listed are found inside cells.

View solution

allele **chromosome** **nucleus**

List these **three** components in order of size starting with the smallest.

..... smallest

.....

.....



..... largest

[1]

(c) Table 2.1 contains statements about mitosis and meiosis.

Complete Table 2.1 by placing ticks (✓) in the boxes to show the correct statements about mitosis and meiosis.

View solution

Table 2.1

statement	mitosis	meiosis
a type of nuclear division		
gives rise to genetically different cells		
important for the repair of damaged tissues		
needed for growth		
produces gametes		
used in asexual reproduction		

[6]

[Total: 11]

3 **(a)** Fig. 3.1 shows the human male reproductive system and part of the excretory system.

View solution

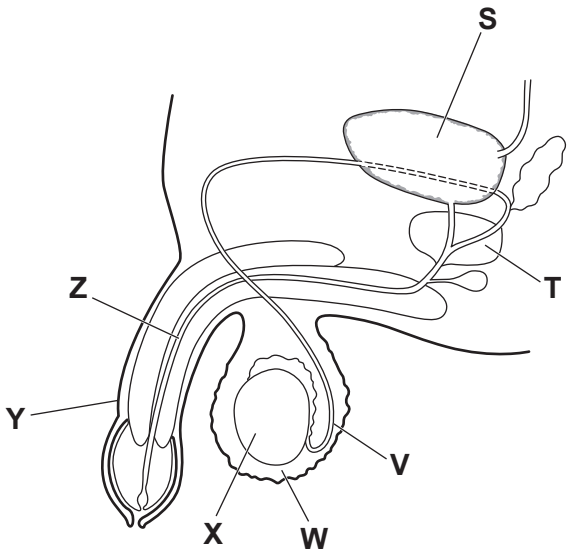


Fig. 3.1

Table 3.1 shows the letters, names and functions of parts from Fig. 3.1.

Complete Table 3.1 using Fig. 3.1.

Table 3.1

letter from Fig. 3.1	name	function
V	.....	carries sperm away from the testis
.....	urethra	carries urine and sperm out of the body
Y	.....	deposits sperm into the vagina
.....	prostate gland	makes the fluid for the sperm to swim in
W	scrotum	....
X	testis	....

[6]

© UCLES 2022

(b) (i) Table 3.2 shows some of the events (**G** to **M**) that can occur after the sperm leaves the male reproductive system.

View solution

Table 3.2

G	an embryo is formed
H	nuclei of the sperm and egg cell fuse
J	sperm enters the oviduct
K	sperm passes through the uterus
L	sperm is deposited into the vagina
M	sperm travels through the cervix

Write the letters of the events in the correct sequence, in the spaces provided.

One has been done for you.

L					

[3]

(ii) State all the possible sex chromosomes that can be found in a sperm cell.

..... [1]

View solution

(c) When a person approaches sexual maturity, secondary sexual characteristics start to develop.

(i) State the name of the hormone that causes the development of secondary sexual characteristics in boys.

..... [1]

(ii) Place ticks (✓) in the correct boxes to identify **three** secondary sexual characteristics that develop in boys.

View solution

breasts develop	
deepening of the voice	
growth of facial and pubic hair	
menstruation begins	
muscular development	
pelvis widens	

[3]

[Total: 14]

4 **(a)** A balanced diet is needed to maintain health.

View solution

(i) State what is meant by the term balanced diet.

.....

.....

.....

.....

..... [2]

(ii) Fat is an important component of a balanced diet.

Draw (circles) around **two** foods that are a good source of fat.

apples **beans** **bread** **cheese**

pasta **rice** **vegetable oil**

[2]

(iii) State **two** health problems associated with having an excessive amount of fat in the diet.

1 .....

2 .....

[2]

(iv) List **two** nutrient groups, other than fat, in a balanced diet and outline their dietary importance.

nutrient 1 .....

importance 1 .....

.....

nutrient 2 .....

importance 2 .....

.....

[4]

(b) Fig. 4.1 shows the estimated daily energy requirements for different groups of people.

View solution

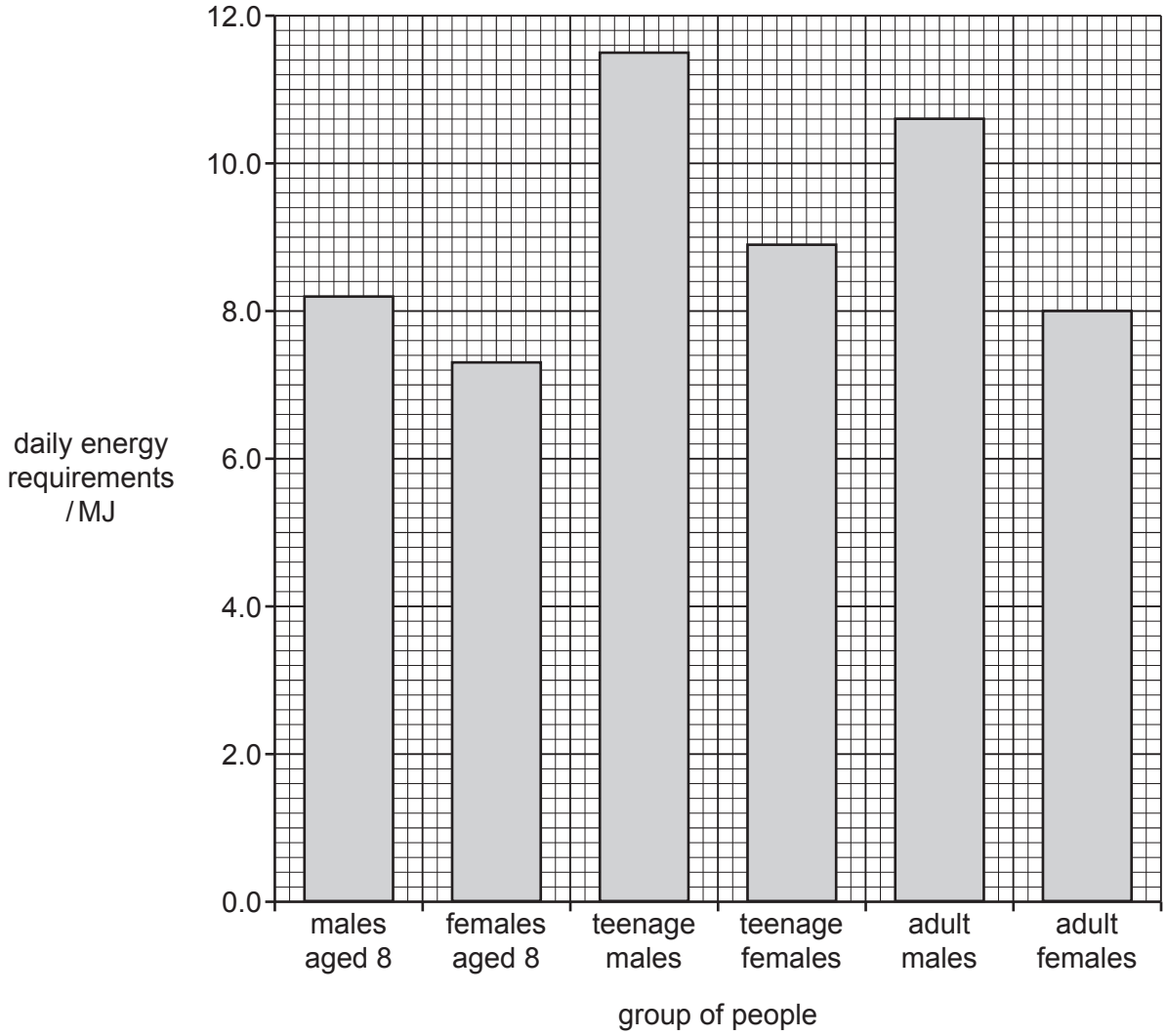


Fig. 4.1

(i) State the group of people shown in Fig. 4.1 that have the greatest daily energy requirements.

..... [1]

(ii) Using the information in Fig. 4.1, calculate the difference in energy requirements between adult males and adult females.

View solution

..... MJ [1]

(iii) Describe the overall trend between males and females shown in Fig. 4.1.

View solution

.....

.....

..... [1]

© UCLES 2022

(iv) Pregnant females have a larger daily energy requirement than females who are not pregnant.

View solution

Suggest why.

.....

.....

..... [1]

[Total: 14]

5 (a) (i) The box on the left shows the beginning of a sentence.

The boxes on the right show some sentence endings.

View solution

Draw **three** straight lines to make three correct sentences about aerobic respiration.

Aerobic respiration	involves enzymes.
	only occurs in animals.
	produces carbon dioxide and water.
	produces lactic acid.
	requires chlorophyll.
	uses glucose and oxygen.

[3]

(ii) Complete the sentence by circling the correct word or phrase shown **in bold**.

Aerobic respiration releases **less / more / the same amount of** energy compared with anaerobic respiration.

[1]

(iii) Describe how respiration in yeast is used in industry to produce useful products for humans.

.....

.....

.....

.....

.....

.....

..... [3]

(b) A student breathed into a machine while they were at rest.

View solution

The machine recorded the volume of air as they breathed in and out.

The results are shown in Fig. 5.1.

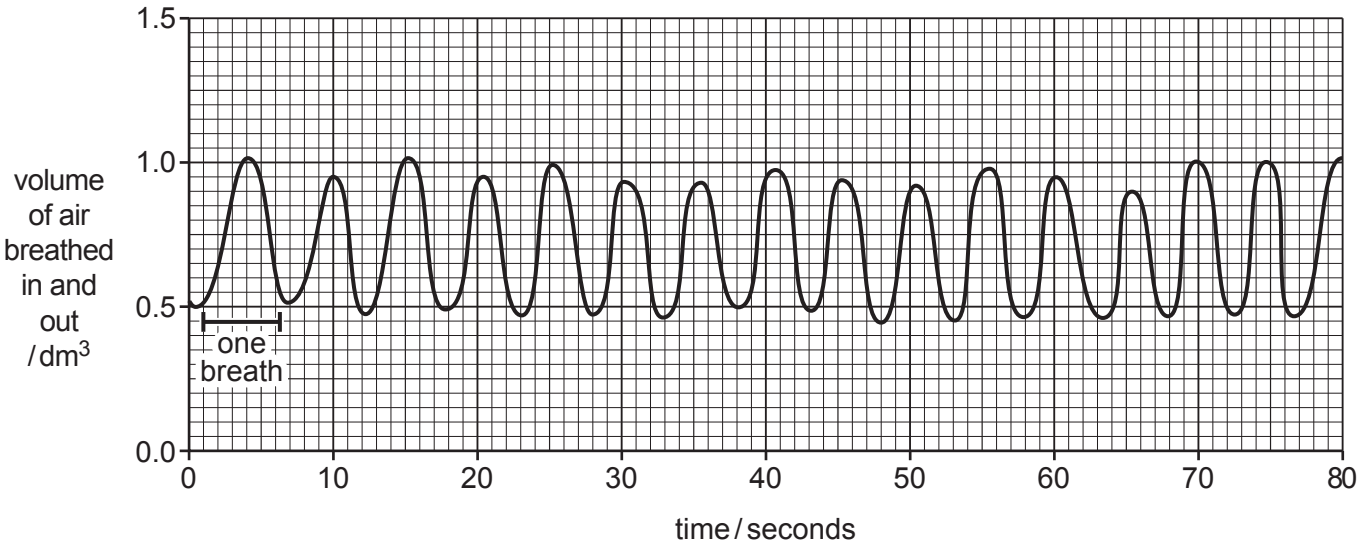


Fig. 5.1

(i) Estimate the number of breaths per minute the student took at rest.

..... breaths per minute [1]

(ii) State the volume of air breathed in during the first breath shown in Fig. 5.1.

..... dm^3 [1]

(iii) The rate and depth of breathing increases during physical activity.

Sketch another line **on Fig. 5.1** between 60 and 80 seconds to show this. [2]

(c) Some drugs can decrease the breathing rate.

View solution

Define what is meant by the term drug.

.....

.....

.....

.....

..... [2]

[Total: 13]

© UCLES 2022

6 **(a)** Fig. 6.1 is a diagram of a section through a plant leaf.

View solution

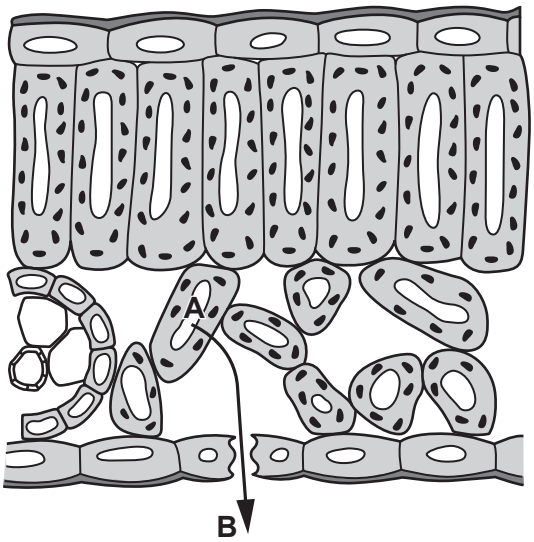


Fig. 6.1

(i) Draw a label line and a label to identify:

- a palisade mesophyll cell
- a vacuole.

[2]

(ii) Complete the sentence about the diffusion of gases.

Gases diffuse between the leaf and the surrounding air from a .....

concentration to a ..... concentration by .....

movement of particles.

[2]

(iii) State the name of the main gas that will diffuse from inside cell **A** to position **B** in Fig. 6.1 on a **sunny**, humid day.

..... [1]

(iv) State the name of the **cell** component through which substances diffuse as they enter or leave the cell.

..... [1]

© UCLES 2022

(b) A group of students investigated the effect of light intensity on the rate of photosynthesis.

View solution

They used this method:

- An aquatic plant was placed in a test-tube containing water.
- A lamp was placed 10 cm from the aquatic plant.
- The number of bubbles of gas produced in one minute was counted and recorded in Table 6.1.
- The investigation was repeated with the lamp at different distances from the aquatic plant.

Fig. 6.2 is a diagram of the equipment used.

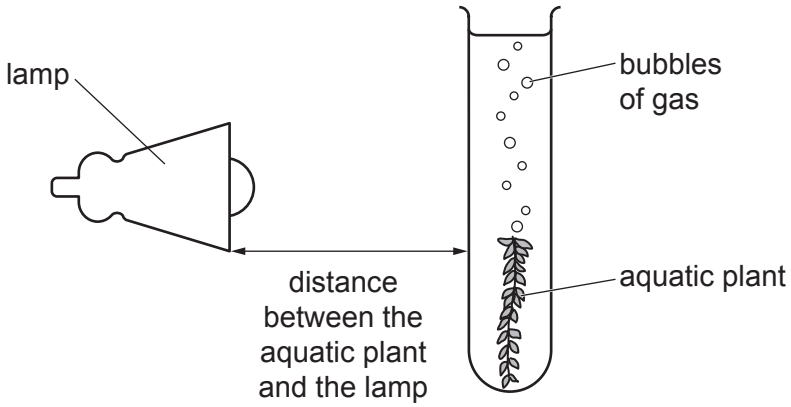


Fig. 6.2

The results are shown in Table 6.1.

Table 6.1

distance from the aquatic plant / cm	number of bubbles produced in one minute
10	90
15	85
20	75
40	50
50	30

(i) State the distance which gives the highest rate of photosynthesis.

..... cm [1]

(ii) Describe the effect of increasing light intensity on the rate of photosynthesis.

View solution

.....

.....

..... [1]

(iii) The student repeated the investigation but added a source of carbon dioxide to the water in the test-tube.

View solution

Suggest how this would affect the rate of photosynthesis.

.....

.....

..... [1]

(c) (i) State the name of **two** large carbohydrate molecules found in plants that can be made from glucose.

1 .....

2 .....

[2]

(ii) Plants can make glucose and proteins.

Using the words from the list, complete Table 6.2 to show **all** of the chemical elements that are found in glucose and all proteins.

View solution

Each word may be used once, more than once or not at all.

carbon **hydrogen** **oxygen**

nitrogen **magnesium**

Table 6.2

glucose	all proteins

[2]

[Total: 13]

BLANK PAGE

BLANK PAGE

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

© UCLES 2022