Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **0610/42**

Paper 4 Theory (Extended) **February/March 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **15** printed pages and **1** blank page.

DC (ST/SG) 165036/2

1 The kidney is one of the main excretory organs of the body.

(a) Define the term *excretion*.

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.....

..... [3]

(b) One of the roles of the kidney is to filter the blood.

Fig. 1.1 shows a section of a kidney.

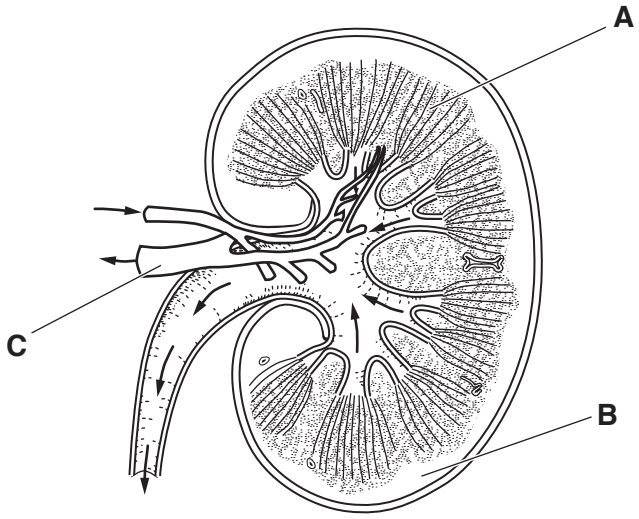

Fig. 1.1

State the name of the parts labelled **A**, **B** and **C** on Fig. 1.1.

A .....

B .....

C .....

[3]

(c) Table 1.1 shows the concentrations of four solutes:

- in the blood in the renal artery
- in the fluid in the kidney tubule
- in the urine.

Table 1.1

solute	solute concentration / g dm^{-3}		
	blood in the renal artery	fluid in the kidney tubule	urine
glucose	0.9	0.9	0.0
protein	83.0	0.0	0.0
salts	8.0	8.0	16.5
urea	0.2	0.2	20.0

(i) Calculate the percentage increase in the concentration of urea between the blood in the renal artery and the urine.

Show your working.

..... %
[2]

(ii) Describe the results for the concentration of salts shown in Table 1.1.

.....

.....

.....

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..... [2]

(iii) State the reason for the difference in the concentration of protein between the blood in the renal artery and the fluid in the kidney tubule.

.....

..... [1]

[Turn over

(iv) State the reason for the difference in the concentration of glucose between the fluid in the kidney tubule and the urine.

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..... [1]

(d) Dialysis is a treatment used for people with kidney failure.

Some people with kidney failure are given a kidney transplant.

State the advantages of having a kidney transplant instead of dialysis.

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..... [3]

[Total: 15]

2 **(a)** Fig. 2.1 shows some flowers of a snapdragon plant, *Antirrhinum majus*.

Snapdragons are insect-pollinated plants.

Fig. 2.1

(i) State **one** feature visible in Fig. 2.1 that suggests these flowers are insect-pollinated.

..... [1]

(ii) State how self-pollination differs from cross-pollination.

.....

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..... [1]

(iii) Suggest why self-pollination might be advantageous to a population of plants.

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..... [3]

[Turn over

(b) Petal colour in the flowers of snapdragon plants shows co-dominance.

The gene for petal colour has two co-dominant alleles:

- $\mathbf{C^R}$ for red petals
- $\mathbf{C^W}$ for white petals

Table 2.1 shows the genotypes and phenotypes of snapdragon plants with different petal colours.

Table 2.1

genotype	phenotype
$\mathbf{C^RC^R}$	red
$\mathbf{C^WC^W}$	white
$\mathbf{C^RC^W}$	pink

(i) Explain the term *co-dominance*.

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..... [2]

(ii) A botanist crossed two snapdragon plants with pink flowers.

Complete the genetic diagram to show the ratio of expected phenotypes in the offspring.

parental phenotypes pink flower × pink flower

parental genotypes C^RC^W × C^RC^W

gametes ....

offspring genotypes ....

offspring phenotypes ....

phenotypic ratio .....
[4]

(iii) The botanist wanted to produce a generation of snapdragons that all had pink flowers.

State the phenotypes of the parent plants that the botanist would need to cross.

Explain your answer.

parent phenotypes .....

explanation .....

.....

.....
[2]

[Total: 13]

3 Reflexes are simple responses that protect the body.

(a) The letters **A** to **G** show the components involved in a reflex action.

A stimulus
B motor neurone
C sensory neurone
D receptor cell
E response
F relay neurone
G effector

Put the letters into the correct sequence involved in a reflex action. Two have been done for you.

A						**E**

[1]

(b) Impulses travel along neurones.

Describe how impulses pass from one neurone to another neurone across a synapse.

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..... [4]

(c) Drugs such as heroin affect the nervous system. When users stop taking heroin they may experience withdrawal symptoms.

(i) Outline the short-term effects of heroin on the body.

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..... [3]

(ii) State **two** withdrawal symptoms that heroin users may experience.

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..... [2]

(iii) Suggest why heroin abuse may increase criminal activity.

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..... [1]

[Total: 11]

4 Pollution is the harm done to the environment by the release of substances from human activities.

Table 4.1 shows the names of some pollutants, their sources and their effects on the environment.

Table 4.1

pollutant	source	effect on environment
		acid rain
carbon dioxide		enhanced greenhouse effect
	cattle and rice farming	enhanced greenhouse effect
fertilisers	crop farming	eutrophication

(a) Complete Table 4.1. [4]

(b) When fertiliser is applied to fields, it can lead to eutrophication in lakes and rivers.

(i) Describe **and** explain what happens in lakes when eutrophication occurs.

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..... [6]

(ii) Suggest ways in which a farmer could reduce the chances of eutrophication occurring when applying fertiliser to crops.

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..... [2]

[Total: 12]

5 Scientists investigated the effect of cuticle thickness on water loss from the leaves of the balsam fir tree, *Abies balsamea*.

The leaves were divided into three groups:

A – thick cuticle
B – medium cuticle
C – thin cuticle

Samples of leaves from each group were weighed. The leaves were placed on a tray in dry air at 20 °C. The samples of leaves were reweighed, at intervals, over 15 hours.

The scientists calculated the mass of each sample of leaves as a percentage of the initial mass.

Fig. 5.1 shows the results.

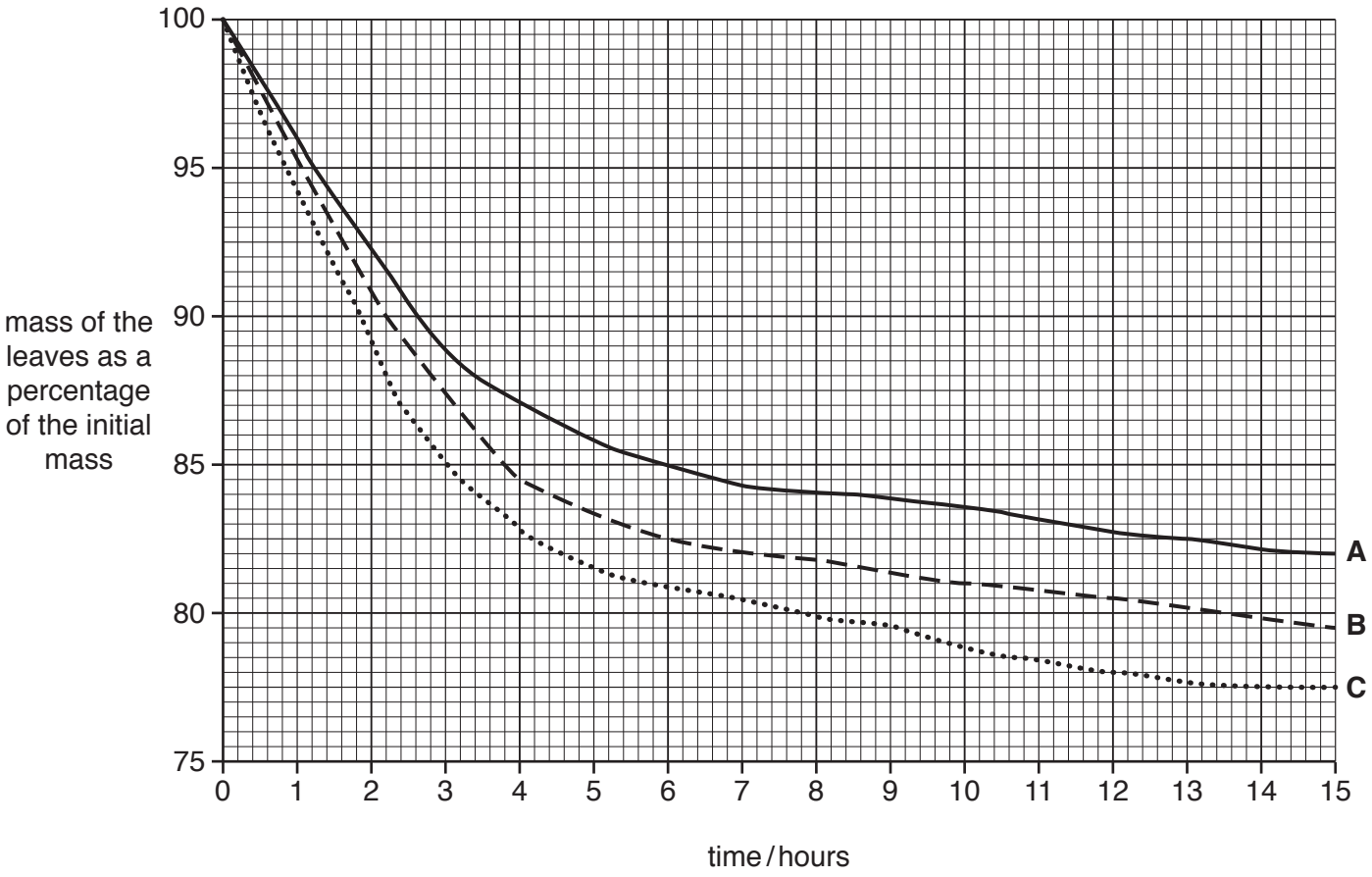

Fig. 5.1

(a) (i) Describe **and** explain the results shown in Fig. 5.1.

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..... [5]

(ii) The investigation was repeated on a day when the air humidity was higher.

Suggest **and** explain the effect that this would have on the results.

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..... [3]

(b) The leaves of pine trees show xerophytic features. Stems and roots also show xerophytic adaptations.

State **one** adaptation of the stem and **one** adaptation of the root in xerophytes.

stem .....

root .....
[2]

(c) Water is one of the raw materials needed for the production of sugars in photosynthesis.

(i) State the name of the other raw material needed for photosynthesis.

..... [1]

(ii) State **three** ways a plant uses the sugars produced in photosynthesis.

1 .....

2 .....

3 .....

[3]

[Total: 14]

6 Fig. 6.1 is a diagram of the virus that causes measles.

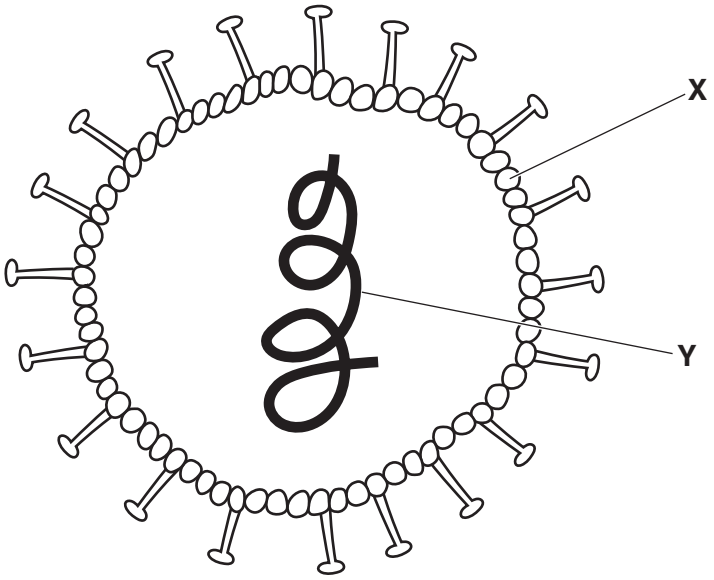

Fig. 6.1

(a) **(i)** State the name of the parts of the virus shown in Fig. 6.1 labelled **X** and **Y**.

X .....

Y .....

[2]

(ii) Bacteria belong to the Prokaryote kingdom.

State **two** ways in which the structure of bacteria differs from the structure of viruses.

1 .....

2 .....

[2]

(b) Viruses and some bacteria are pathogenic. Diseases caused by pathogens are transmissible.

(i) State **two** ways that a pathogen can be transmitted **indirectly**.

1 .....

2 .....
[2]

(ii) The body has barriers to defend itself against pathogens.

State **two** mechanical barriers of the body.

1 .....

2 .....
[2]

(c) Some white blood cells produce antibodies as part of the body's defence against pathogens.

Describe the role of antibodies in defence of the body.

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..... [4]

(d) The immunity gained after infection by a pathogen is active immunity.

Explain how active immunity differs from passive immunity.

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..... [3]

[Total: 15]

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