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A Level

Biology

Session: 2000 June
Type: Question paper
Code: 9264

OCR
RECOGNISING ACHIEVEMENT

Candidate Name	Centre Number	Candidate Number

General Certificate of Education Advanced Level

former Cambridge linear syllabus

BIOLOGY 9264/1

PAPER 1

Tuesday **6 JUNE 2000** Afternoon 2 hours 30 minutes

Additional materials:
Answer paper
Ruler (cm/mm)

TIME 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page and on all separate answer paper used.

Answer the questions set on **two** of the options.

Within each chosen option, Questions **1** and **2** are to be answered in the spaces provided on the question paper. Question **3** is to be answered on the separate answer paper provided.

The answer to Question **3** should be illustrated by large, clearly labelled diagrams wherever suitable.

At the end of the examination,

(a) fasten the separate answer paper used securely to the question paper;

(b) enter the numbers of the options you have answered in the grid below.

INFORMATION FOR CANDIDATES

The intended number of marks is given in brackets [ ] at the end of each question or part question.

The options are:

You may use a calculator.

You are reminded of the need for good English and clear presentation in your answers.

OPTIONS ANSWERED		
FOR EXAMINER'S USE		
1		
2		
3(a)		
3(b)		
TOTAL		

This question paper consists of 28 printed pages.

[Turn over

For Examiner's Use

OPTION 1 – BIODIVERSITY

1 **(a)** Outline **three** problems caused by living in water rather than on land.

1. .....

.....

2. .....

.....

3. .....

.....[3]

Paramecium is a unicellular organism which lives in water. Fig. 1.1 is a photomicrograph of *Paramecium*.

Fig. 1.1

(b) Describe the structures **X**, **Y** and **Z** in Fig. 1.1.

X .....

.....

.....

Y .....

.....

.....

Z .....

.....

.....

[6]

(c) Calculate the maximum length of the specimen of *Paramecium* shown in Fig. 1.1. Show your working.

.....

.....[1]

(d) **(i)** Name the kingdom in which *Paramecium* is classified.

.....[1]

(ii) Name **one** other organism which is classified in the same kingdom.

.....[1]

(iii) Explain why organisms are placed in this particular kingdom.

.....

.....

.....

.....[3]

[Total : 15]

2 **(a)** State **three** reasons for conserving tropical rainforests.

1. .....

2. .....

3. .....[3]

The islands of the Philippines were once covered almost entirely by tropical rainforest. Much of this forest has been cleared or altered and little untouched virgin forest remains. Trees are removed from the forests for various purposes including production of sawn timber, veneers, pulp for paper production and fuel-wood.

Fig. 2.1 shows estimates of the volume of timber remaining in virgin forests and in all forests of the Philippines in a ten year period from 1977 to 1986.

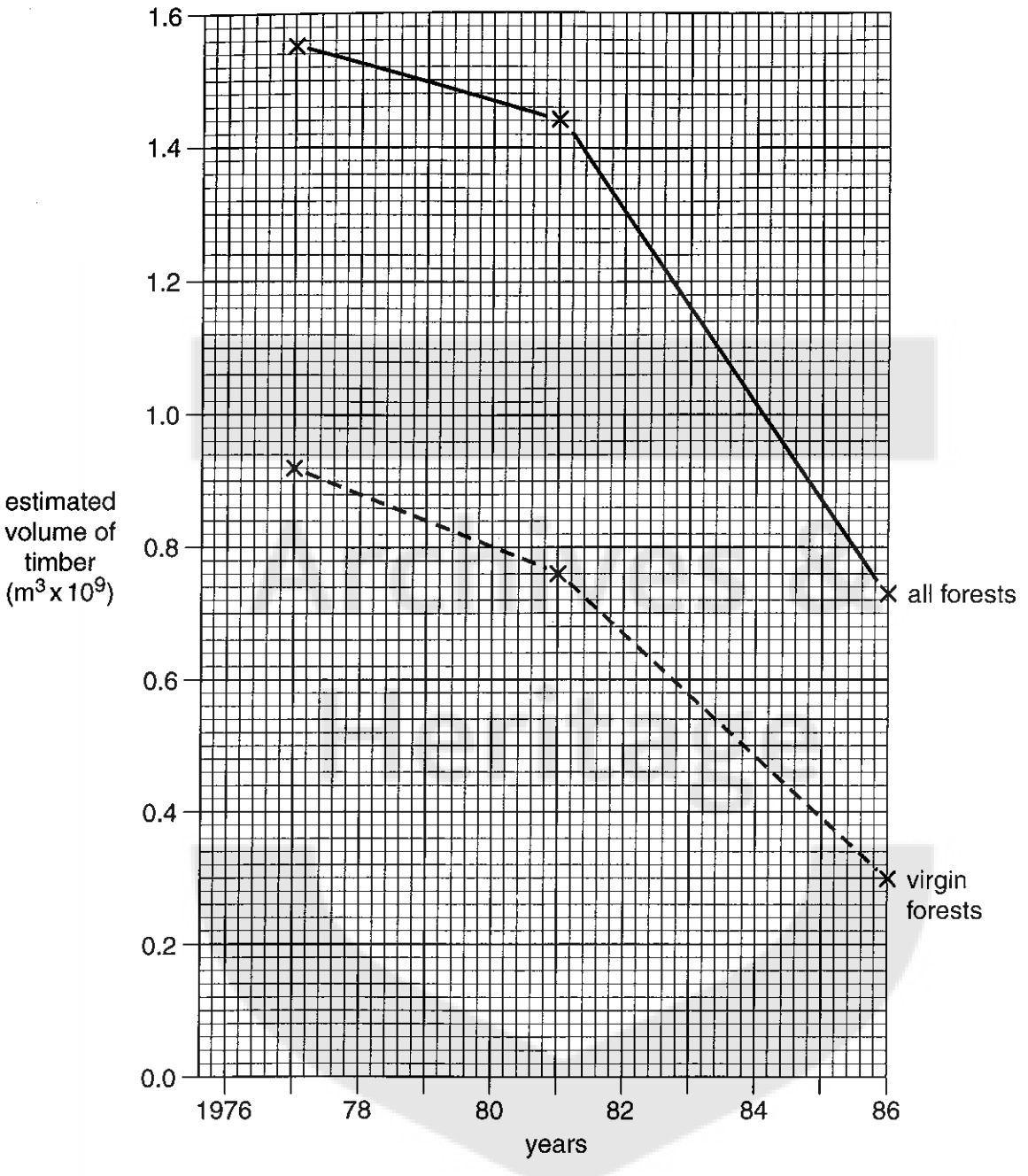

Fig. 2.1

(b) Using the data in Fig. 2.1, outline the changes in the estimated volume of timber remaining in all forests of the Philippines.

.....

.....

.....[2]

According to the estimates, 60% of the timber remaining in 1977 was in virgin forests.

(c) **(i)** Calculate the percentage of the timber remaining in 1986 that was in virgin forests. Show your working.

.....

.....[2]

(ii) Suggest **one** reason for the change in the percentage between 1977 and 1986.

.....

.....[1]

Fig. 2.2 shows the annual volume of production of logs used for sawn timber or veneers in the Philippines from 1976-86.

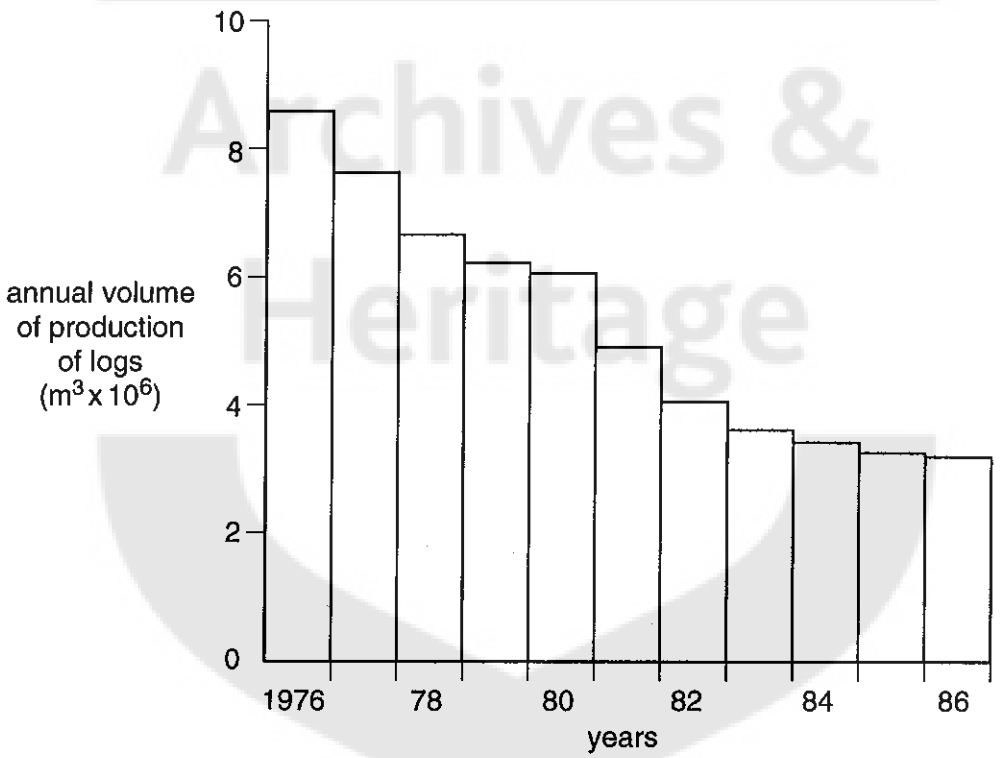

Fig. 2.2

(d) Suggest **two** reasons for the change in volume of production shown in Fig. 2.2.

1. .....

.....

2. .....

.....[2]

The World Bank has designated much of the tropical rainforest of the Philippines as **wildlands of special concern**. Within such areas the World Bank normally refuses to finance development projects which would threaten biodiversity. Clearance of land for agriculture is one example of a project for which finance would be refused.

(e) Name **two** other examples of development projects which would threaten the biodiversity of rainforests.

1. .....

2. .....[2]

In 1973 the World Bank gave US$10 million for a project involving the establishment of tree farms in the Philippines. Eight thousand people living near forest lands were given land, tree seedlings and guaranteed prices from local pulp mills for timber.

(f) Explain how projects such as this could help in the conservation of biodiversity.

.....

.....

.....

.....[3]

[Total : 15]

3 Either

(a) (i) Outline the features which can be used to distinguish between platyhelminths and annelids. [6]

(ii) Describe the feeding method of a **named** endoparasitic platyhelminth. [6]

(iii) Explain the locomotion of earthworms. [8]

Or

(b) (i) Outline the features which can be used to distinguish between the alga *Chlorella* and bryophytes. [6]

(ii) Discuss the ways in which humans use algae. [7]

(iii) Explain the extent to which bryophytes are adapted to life on land. [7]

OPTION 2 – APPLIED PLANT AND ANIMAL SCIENCE

1 The effects of temperature on the rate of photosynthesis of individual leaves of three crop plants are shown in Fig. 1.1. Barley and rice are C_3 plants, sorghum is a C_4 plant.

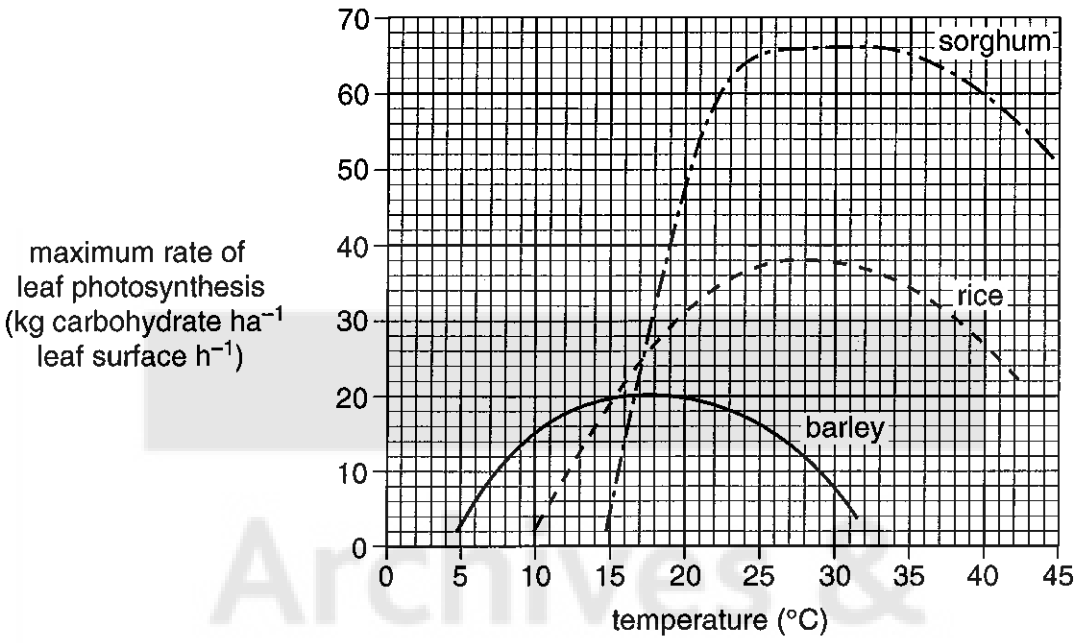

Fig. 1.1

(a) With reference to Fig. 1.1,

(i) state the optimum temperature range for photosynthesis in rice;

.....[1]

(ii) explain the effect of temperature on the rate of photosynthesis in barley;

.....

.....

.....

.....

.....[4]

(iii) suggest the likely worldwide distribution of sorghum. Give a reason for your answer.

.....

.....

.....[2]

[Turn over

Fig. 1.2 shows the effect of increasing the light intensity on the rate of photosynthesis of barley, rice and sorghum, when provided with a concentration of carbon dioxide of 0.04%. The crop plants were kept at the temperatures indicated.

Fig. 1.2

(b) With reference to Fig. 1.1 and Fig. 1.2,

(i) state the reason for the temperatures used in the investigation shown in Fig. 1.2;

.....[1]

(ii) explain why the rate of photosynthesis of sorghum continues to increase in high light intensities, whereas in rice and barley it reaches a plateau.

.....

.....

.....

.....

.....

.....[4]

(c) Outline how dry matter production between sunrise and sunset could be measured in a leaf.

.....

.....

.....

.....

.....[3]

[Total : 15]

2 Large sums of money have been invested in agricultural technology in Mexico, but still the

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varieties. Although there is government finance to build terraces, these often lack ditches.

Adapted from *Regenerating Agriculture*, Jules N. Pretty. Earthscan 1995.

(a) Outline **two** reasons why some countries, such as Mexico, are not self-sufficient in food.

1. .....

.....

2. .....

.....[2]

(b) Explain the following terms that are referred to in the passage:

(i) *external inputs*;

.....

.....

.....[1]

(ii) *sustainable agricultural systems.*

.....

.....

.....[2]

(c) Outline the likely impact on the nutrition of the local population when farmers abandon traditional crops and replace them with a small number of cash crops grown as monocultures.

.....

.....

.....

.....[3]

(d) Outline the advantages of using ditches in upland farming systems in Mexico.

.....

.....

.....

.....

.....[3]

(e) Explain the advantages of using leguminous crops, such as beans, in intercropping and crop rotation.

.....

.....

.....

.....

.....[4]

[Total : 15]

3 Either

(a) (i) Explain what the diets of **either** intensively reared pigs **or** cattle must provide in order to allow rapid growth. [7]

(ii) Explain how animal housing helps to maximise productivity. [6]

(iii) Discuss the problems posed by the disposal of farmyard manure. [7]

Or

(b) (i) Explain the reasons for large applications of nitrogen fertilisers in intensive cereal production. [7]

(ii) Describe how and when fertiliser is applied during the cultivation of **either** maize **or** wheat. [6]

(iii) Discuss the problems posed by the widespread cultivation of **one** crop. [7]

OPTION 3 – APPLICATIONS OF GENETICS

1 Dinitroaniline herbicides are used for the selective control of grassy weeds in broad-leaved crops. Long-term use of these herbicides has resulted in the appearance of resistant grasses.

(a) Explain how herbicide resistance may arise and spread in a weed population.

.....

.....

.....

.....[3]

Dinitroaniline herbicides act by binding to the protein tubulin, thereby disrupting the formation of the spindle and other cellular microtubules. Grasses resistant to these herbicides carry a mutation in the gene for tubulin such that, at one site in the protein, the amino acid isoleucine replaces the normal amino acid threonine.

(b) **(i)** Explain how a mutation can lead to a change of one amino acid in a protein.

.....

.....

.....[2]

(ii) Suggest how changing one amino acid in the protein tubulin might give resistance to dinitroaniline herbicides.

.....

.....

.....[2]

An experiment was performed on maize cells to see whether the mutation in the tubulin gene found in grass was actually responsible for dinitroaniline resistance. Maize cells were grown in tissue culture and divided into four groups (**M2**, **M1**, **N** and **C**) which were treated as follows:

M2 was genetically engineered to express **two** copies of the mutated tubulin gene from grass;
M1 was genetically engineered to express **one** copy of the mutated tubulin gene from grass;
N was genetically engineered to express the normal tubulin gene from grass;
C was not genetically engineered.

Each group of cells was then grown into callus.

(c) Describe briefly how plant cells may be grown into callus.

.....

.....

.....

.....[3]

Equal quantities of each maize callus were then grown in the presence of different concentrations of dinitroaniline herbicide. The results are shown in Fig. 1.1 in which the shaded circles show the relative size of each piece of callus tissue after growth in the presence of herbicide.

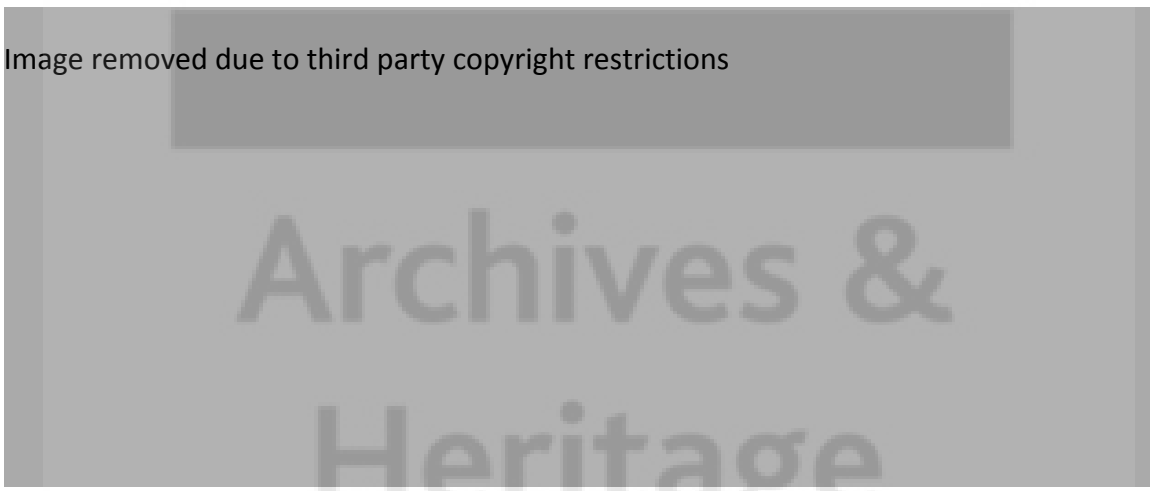


Fig. 1.1

(d) **(i)** Explain why maize calluses N and C were used in this investigation.

N .....

.....

C .....

.....[2]

(ii) Assess the evidence that the mutated tubulin gene from grass is responsible for dinitroaniline resistance.

.....

.....

.....

.....[3]

[Total : 15]

2 **(a)** Describe the inheritance of cystic fibrosis (CF).

.....

.....

.....

.....[3]

A genetic test was performed on DNA from two individuals, **P** and **Q**, to find the base sequence of a small part of the gene involved in CF. **Q** suffers from CF. The different base sequences of **P** and **Q** are shown diagramatically in Fig. 2.1.

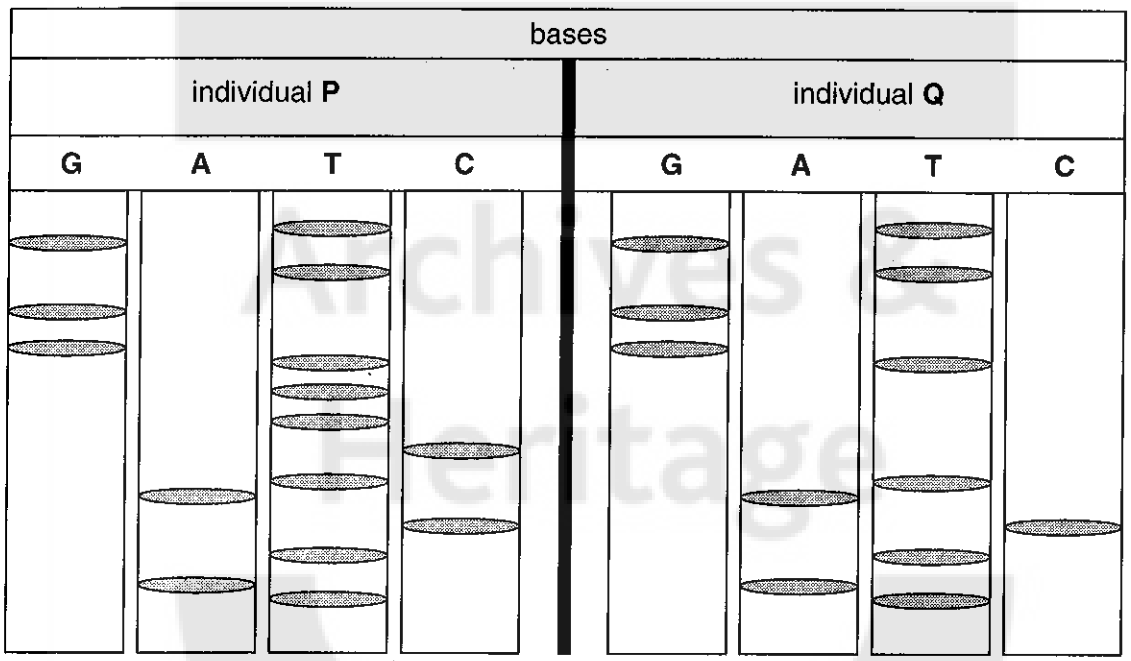


Fig. 2.1

(b) With reference to Fig. 2.1,

(i) identify how the base sequence of individual **Q** differs from that of **P**;

.....[1]

(ii) state the effect this difference would produce in the polypeptide coded for by the gene;

.....[1]

(iii) explain how individual **P** could also suffer from CF.

.....

.....

.....[2]

Heterozygotes for the most common mutant allele causing CF may be more resistant to bacterial infections of the gut than homozygotes for the normal allele.

(c) Explain how such resistance could affect the frequency of the mutant allele in a population.

.....

.....

.....[2]

The bacterium *Salmonella typhi*, which causes typhoid fever in humans, will infect mouse gut cells. Mouse gut epithelium cells were engineered to express either the normal allele or the mutant allele of the gene responsible for cystic fibrosis. Three strains of *S. typhi* were incubated with cells expressing the mutant CF allele and cells expressing the normal allele. Fig. 2.2 shows the numbers of bacteria taken up by these cells.

Fig. 2.2

(d) With reference to Fig. 2.2, compare the effects of the normal and mutant alleles for cystic fibrosis on the number of bacteria taken up by mouse gut cells.

.....

.....

.....

.....[3]

(e) Suggest why the expression of the cystic fibrosis gene affects the number of bacteria taken up.

.....

.....

.....

.....[3]

[Total : 15]

3 Either

(a) Explain the roles in selective breeding of

(i) progeny testing; [6]

(ii) artificial insemination (AI); [7]

(iii) embryo transplantation. [7]

Or

(b) Explain

(i) what is meant by the terms *linkage* and *crossing over*; [7]

(ii) the effect of crossing over on the inheritance of two linked genes; [6]

(iii) the effect of linkage in the major histocompatibility (HLA) system on the availability of transplant donors. [7]

OPTION 4 – GROWTH, DEVELOPMENT AND REPRODUCTION

1 Fig. 1.1 is a drawing of a mature Graafian follicle from a human ovary.

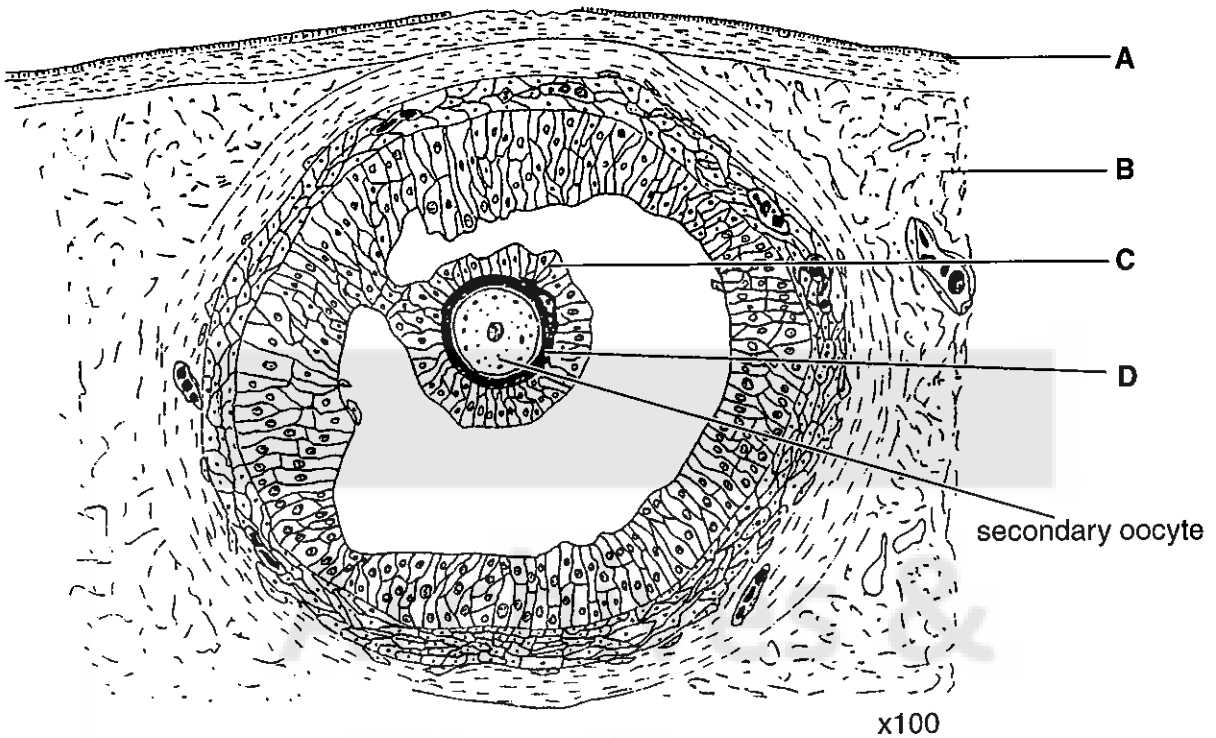


Fig. 1.1

(a) With reference to Fig. 1.1,

(i) name the structures **A** to **D**;

A .....

B .....

C .....

D .....[2]

(ii) calculate the diameter of the secondary oocyte;

.....[1]

(iii) explain how the genetic composition of the secondary oocyte differs from the cells in layer **A**.

.....

.....

.....[2]

(b) Describe the actions of luteinising hormone (LH) on the ovary, during the course of the menstrual cycle.

.....

.....

.....

.....

.....[3]

Following fertilisation and implantation, changes occur in the concentrations of hormones in the blood of a woman. Fig. 1.2 shows the concentrations of progesterone measured in μg per 100 cm^3 of blood and human chorionic gonadotrophin (hCG) given in international units (I.U.) per cm^3 of blood during pregnancy.

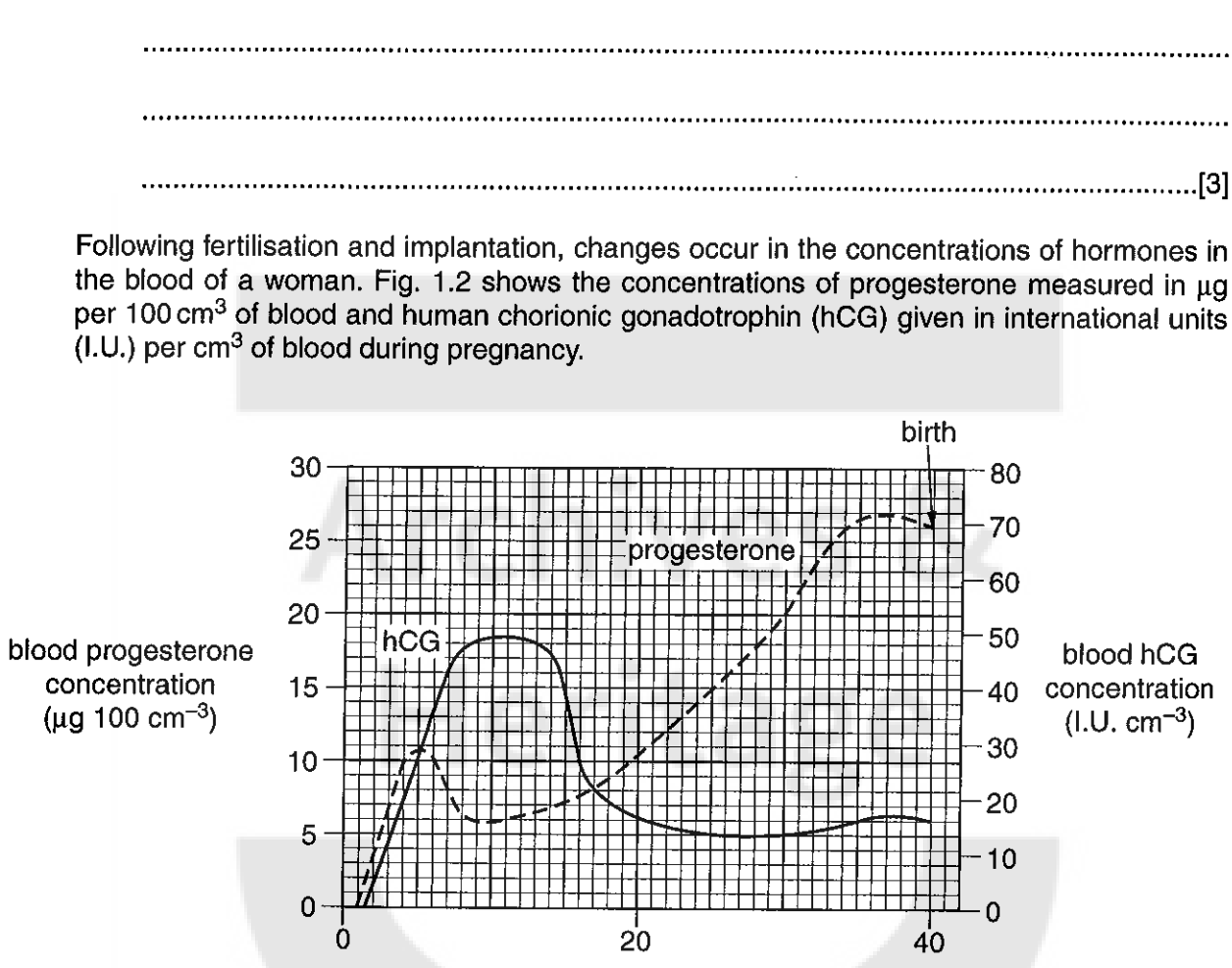


Fig. 1.2

(c) With reference to Fig. 1.2,

(i) state the maximum concentration of progesterone occurring in **1.0 cm^3** of blood during the course of pregnancy;

.....[1]

(ii) compare the changes in the blood concentrations of hCG and progesterone.

.....

.....

.....

.....[3]

(d) Complete the table below, stating the sites of production and functions of hCG and progesterone during pregnancy.

	site of production	function
hCG		....
progesterone		....

[3]

[Total : 15]

2 Tulips are perennial plants that have an active growth period in the spring and early summer, during which leaves grow and photosynthesise. The leafy parts then wither, leaving underground storage organs, known as bulbs, to overwinter. Vegetative reproduction, which gives rise to new bulbs, occurs from the growth of axillary buds. Flowering occurs from the growth of the apical bud. Warm summers and cold winters tend to promote flowering in the following spring.

(a) Explain what is meant by

(i) *vegetative reproduction*; .....

.....

(ii) *axillary bud*. .....

.....[2]

(b) Suggest how flowering is promoted by

(i) warm summers; .....

.....

(ii) cold winters. .....

.....[2]

Fig. 2.1 shows the changes in dry mass and leaf area in the tulip variety 'Paul Richter' after the start of growth in the early spring.

Fig. 2.1

(c) With reference to Fig. 2.1,

(i) calculate the mean rate of growth per week of the new bulb over the four week growing period;

.....

.....[1]

(ii) explain how the initial growth in leaf area is related to the change in mass of the old bulb;

.....

.....

.....

.....[2]

(iii) explain the changes in the total dry mass of the plant.

.....

.....

.....

.....[4]

In an experiment to investigate the effect of planting density on the mass of new bulbs formed by the tulip variety 'Rose Copland', bulbs were planted at three different densities.

When the plants had completed their growth, measurements were made of stem height, leaf area and the mass of new bulbs formed per plant. The results of the experiment are shown in Table 2.1.

Table 2.1

planting density (number of bulbs per m^2)	mean height of stem (mm)	mean total leaf area (cm^2 per plant)	mean mass of new bulbs formed (g)
48	466	314	46
129	521	310	32
258	550	311	21

(d) With reference to Table 2.1, explain the effect of increased planting density on the growth of these tulip plants.

.....

.....

.....

.....

.....

.....[4]

[Total : 15]

3 Either

(a) (i) Describe the structures of a stamen and a pollen grain, including reference to their microscopic organisation. [10]

(ii) Describe the development of pollen grains and the male gametes of the flowering plant. [6]

(iii) Suggest the benefits of knowing when pollen release occurs from plants. [4]

Or

(b) (i) Describe how the passage of sperms from the testes to the oviduct is brought about in humans. [8]

(ii) Explain how fertilisation occurs in humans. [8]

(iii) Discuss the biological reasons for the use of *in vitro* fertilisation (IVF). [4]

For Examiner's Use

OPTION 5 – HUMAN HEALTH AND DISEASE

1 Fig. 1.1 shows the number of cases of AIDS between the years 1981 to 1991 for two groups of people in Europe; those who are homosexual or bisexual and those who are injecting drug users.

Fig. 1.1

(a) (i) State **one similarity** and **one difference** between the data for the two groups of people between 1981 and 1990.

similarity .....

.....

difference .....

.....[2]

(ii) Suggest **one** reason for the **difference** you have identified in **(a)(i)**.

.....

.....[1]

(iii) Explain briefly, the decline in the number of cases of AIDS among injecting drug users between 1990 and 1991.

.....

.....

.....[3]

Fig. 1.2 is a diagram of the structure of the human immunodeficiency virus (HIV), the causative agent of AIDS.

Fig. 1.2

(b) Predict **one** component of the virus, shown in Fig. 1.2, which would be likely to be of importance in producing a vaccine against the virus. Give a reason for your answer.

component .....

reason .....

.....[2]

(c) The drug zidovudine (AZT) is an inhibitor of the enzyme reverse transcriptase. Explain why AZT slows down the progress of HIV infection.

.....

.....

.....[2]

(d) Explain why antibiotics are ineffective against HIV and other viruses.

.....

.....[2]

(e) Explain the link between the infection of T-lymphocytes by HIV and the onset of the symptoms of AIDS.

.....

.....

.....

.....

.....[3]

[Total : 15]

2 **(a)** Explain what is meant by the term *malnutrition.*

.....

.....

.....[2]

Obesity is regarded as a form of malnutrition. One way of defining obesity is by means of the body mass index (BMI). This is calculated for an individual as follows:

$$\text{BMI} = \frac{\text{body mass in kg}}{(\text{height in m})^2}$$

(b) Calculate the BMI for a person of body mass 70 kg and height 1.7 m. Show your working.

.....

.....

.....[2]

An obese person is defined slightly differently in Europe and the USA as follows.

Europe: BMI greater than 30

USA: BMI greater than 27.8 for men, and greater than 27.3 for women

These values were used in producing the data for Table 2.1, which shows the occurrence of obesity in England and Germany (both in Europe) and in the USA between 1978 and 1994.

Table 2.1

Image removed due to third party copyright restrictions

(c) With reference to Table 2.1,

(i) state **two** limitations of the data as presented, other than the slightly different definitions of obesity in Europe and the USA;

1. .....

2. .....[2]

(ii) bearing in mind the limitations of the data, state **two** main conclusions that can be drawn, apart from the fact that obesity is increasing rapidly;

1. .....

2. .....[2]

(iii) if the trend for men in England continued, calculate the percentage of Englishmen who would be obese by the end of the year 2003. Show your working.

.....

.....

.....[2]

The body mass of an individual depends mainly on the difference between energy consumption and energy expenditure. Fig. 2.1 shows the total daily energy expenditure of 9 lean and 7 obese women in an experiment into the cause of obesity.

Image removed due to third party copyright restrictions

Fig. 2.1

It is often suggested that lean people have a higher metabolic rate than obese people, and that this is an important factor in why they do not become obese.

(d) Explain whether this suggestion is supported by the data in Fig. 2.1.

.....

.....

.....

.....[3]

Obese people are frequently advised to take more exercise.

(e) Suggest why exercise, on its own, is unlikely to be effective in reducing obesity.

.....

.....

.....[2]

[Total : 15]

3 Either

(a) (i) Explain why the use of alcohol and tobacco can lead to dependence. [6]

(ii) Describe the possible effects of alcohol on the liver. [8]

(iii) Explain how smoking tobacco can lead to damage of blood vessels. [6]

Or

(b) (i) Explain why, on average, the death rate from cholera is higher in developing countries than developed countries. [7]

(ii) Describe the response that would be mounted by the B cells (B lymphocytes) of the body on their first exposure to cholera bacteria. [7]

(iii) Explain, with examples, the advantages of using monoclonal antibodies. [6]

OCR
RECOGNISING ACHIEVEMENT

General Certificate of Education Advanced Level
Former Cambridge linear syllabus

BIOLOGY 9264/2

PAPER 2 Multiple Choice

Friday **16 JUNE 2000** Morning 1 hour

Additional materials:
Multiple Choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your name, Centre number and candidate number on the answer sheet in the spaces provided unless this has already been done for you.

There are **forty** questions in this paper. Answer **all** questions. For each question there are four possible answers, **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the separate answer sheet.

Read very carefully the instructions on the answer sheet.

INFORMATION FOR CANDIDATES

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

This question paper consists of 14 printed pages and 2 blank pages.

1 What is the order of size of cell components?

	largest ⟶ smallest			
A	mitochondria	ribosomes	starch grains	nuclei
B	nuclei	chloroplasts	mitochondria	ribosomes
C	ribosomes	mitochondria	chloroplasts	starch grains
D	starch grains	mitochondria	chloroplasts	ribosomes

2 The following processes are used in the preparation of specimens for the electron microscope.

1 embedding in resin

2 fixing with glutaraldehyde

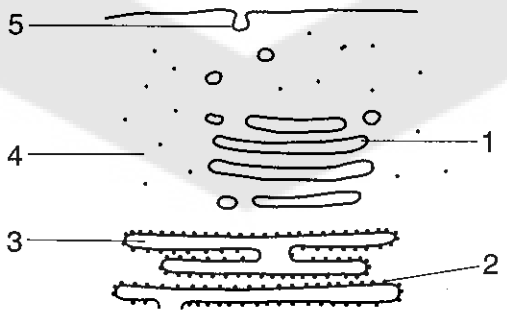
3 mounting on a copper grid

4 sectioning with an ultramicrotome

Which sequence is correct?

	first ⟶ last			
A	1	2	4	3
B	1	4	3	2
C	2	1	3	4
D	2	1	4	3

3 Radioactive amino acids are supplied to a cell that uses them to make insulin.



Which route will the radioactive amino acids take?

	first ⟶ last				
A	4	2	3	1	5
B	4	3	2	1	5
C	5	1	3	2	4
D	5	3	2	4	1

4 Which process is an example of active transport?

A influx of sodium ions into a nerve axon during the conduction of a nerve impulse

B movement of sodium ions from glomerular filtrate into blood plasma

C movement of potassium ions from blood plasma into the lumen of a Bowman's capsule

D shift of chloride ions across the membrane of a red blood cell

5 On an electron micrograph, a mitochondrion measures 36 mm long by 21 mm wide.

If the magnification of the micrograph is x 30 000, what are the actual dimensions of this organelle?

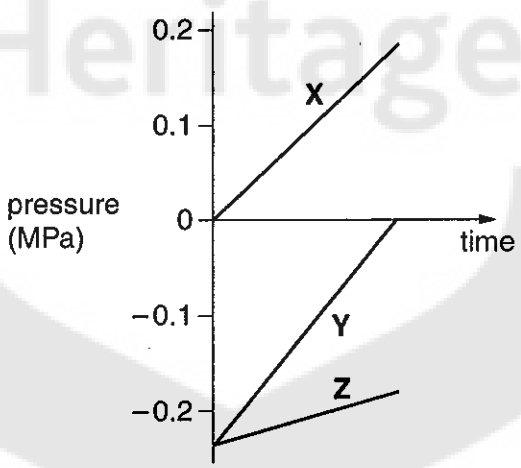
A 0.12 x 0.07 μm

B 0.36 x 0.21 μm

C 1.20 x 0.70 μm

D 3.60 x 2.10 μm

6 The graph shows the relationship between ψ (water potential), ψ_s (solute potential) and ψ_p (pressure potential) for a plant cell placed in pure water.



What are the correct labels for the graph?

	X	Y	Z
A	ψ	ψ_p	ψ_s
B	ψ	ψ_s	ψ_p
C	ψ_p	ψ	ψ_s
D	ψ_p	ψ_s	ψ

[Turn over

7 Which part of a phospholipid molecule contributes most to the thickness of a cell surface membrane?

A glycerol

B hydrocarbon chain

C hydrophilic head

D phosphate group

8 Some microorganisms produce β-glucosidase enzymes, but mammals do not.

The presence of these microorganisms in a mammal's digestive system aids in the digestion of which substance?

A cellulose

B glycogen

C protein

D starch

9 Which protein has a fibrous structure?

A amylase

B collagen

C haemoglobin

D insulin

10 Food tests are carried out on four solutions.

Which solution contains only sucrose and protein?

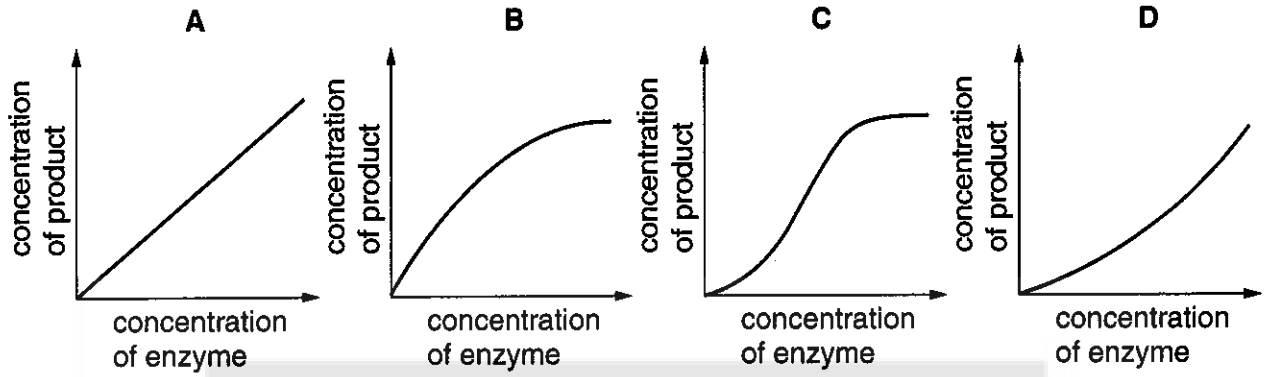
solution	Benedict's test	acid hydrolysis then Benedict's test	iodine in potassium iodide solution	biuret test
A	✘	✓	✘	✓
B	✓	✓	✘	✓
C	✓	✓	✓	✘
D	✓	✘	✓	✘

key

✓ = positive result

✘ = negative result

11 Which graph shows the effect of increasing enzyme concentration on product formation when there is an excess of substrate?



12 The diagram shows how the enzyme glutamine synthetase removes the ammonia produced during plant metabolism.

$$\text{ammonia} + \text{glutamate} \xrightarrow{\text{glutamine synthetase}} \text{glutamine}$$

Some herbicides contain an active agent which resembles glutamate.

What is the likely mode of action of this agent?

A It acts as an end-product inhibitor.

B It acts as a competitive inhibitor.

C It decreases levels of ammonia.

D It increases levels of glutamate.

13 What is the role of centrioles during meiosis in animal cells?

A breaking down the nuclear membrane during prophase

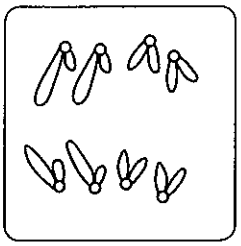
B helping homologous chromosomes to pair and form bivalents

C holding the two chromatids of a chromosome together

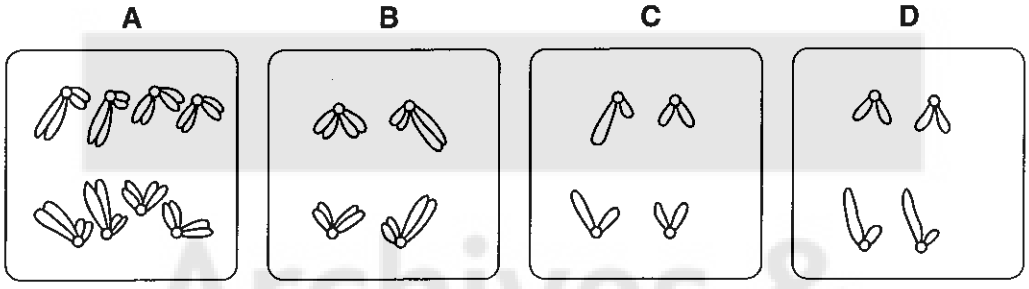
D organising microtubules to form spindle fibres

[Turn over

14 The diagram shows anaphase of mitosis.



Which diagram shows anaphase I during meiosis in the same organism?



15 At which stage of the cell cycle does the quantity of DNA per cell decrease by half?

A anaphase

B cytokinesis

C metaphase

D telophase

16 Maize varieties are being developed in which the leaves produce proteins that are toxic to insects. The DNA coding for these toxic proteins was inserted into a maize chromosome via a bacterial plasmid. Many people are opposed to this process.

Which objection is **not** biologically valid?

A Beneficial insects may be killed if they eat genetically modified maize.

B Genes for antibiotic resistance are present in plasmids and these genes may pass to harmful bacteria.

C Hybridisation may transfer the bacterial genes from maize to weeds, giving the weed species new and harmful characteristics.

D Mutations may be caused in cattle or humans that eat the genetically modified maize.

17 What is the effect of the enzyme DNA ligase?

A DNA is broken up at specific sites.

B DNA fragments are joined together.

C DNA replication occurs.

D DNA transcription occurs.

18 Which sugar and base, in addition to inorganic phosphate, will be released from the hydrolysis of a certain nucleotide?

	sugar	base
A	deoxyribose	uracil
B	fructose	thymine
C	glucose	thymine
D	ribose	uracil

19 The biochemical analysis of a sample of DNA shows that 32% of the nitrogenous bases are cytosine.

What is the total percentage of adenine and uracil in mRNA transcribed from this DNA?

A 16% **B** 18% **C** 32% **D** 36%

20 The chart shows the classification of two species of crocodile.

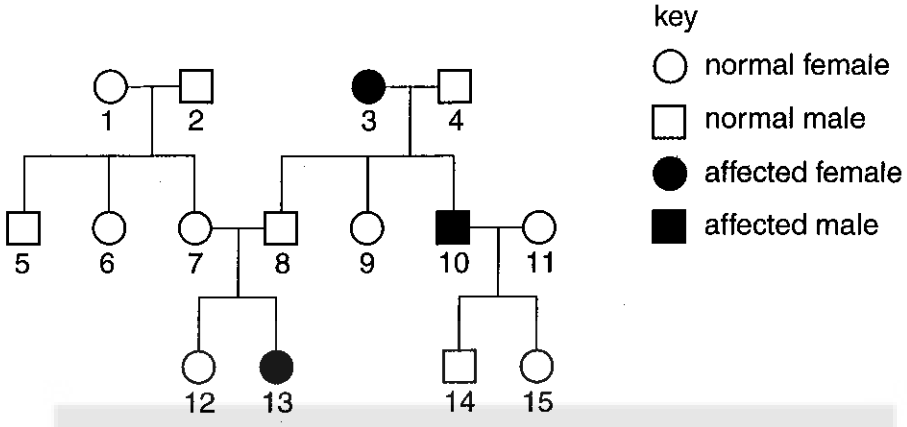
Animalia
Chordata
Reptilia
Loricata
Crocodylidae
Crocodylus
Crocodylus niloticus Nile crocodile
Crocodylus porosus Salt water crocodile

To which order do these crocodiles belong?

A Chordata
B Crocodylidae
C Loricata
D Reptilia

[Turn over

21 The family tree shows the inheritance of a condition caused by the recessive allele **r**.



Which of the females are certain to have the genotype **Rr**?

A 1, 6 and 7

B 1, 7 and 12

C 7, 9 and 15

D 9, 12 and 15

22 A man has normal red-green colour vision. His blood group is rhesus negative (homozygous recessive). His wife also has normal colour vision but is rhesus positive. She is heterozygous at both the red-green colour vision locus and the blood group locus.

What is the probability that their first child will be a rhesus negative, red-green colour blind boy?

A 0 **B** 0.0625 **C** 0.125 **D** 0.25

23 In a small mammal, the allele for grey fur, **G**, is dominant to that for white fur, **g**. The allele for long tail, **T**, is dominant to the allele for short tail, **t**. Animals with grey fur and long tails were crossed with those having white fur and short tails.

The table shows the phenotypes of the 55 offspring.

number of offspring	fur	tail
15	grey	long
14	grey	short
14	white	long
12	white	short

What were the genotypes of the parents?

A **Ggtt** x **ggtt**

B **GGTt** x **Ggtt**

C **GgTt** x **GgTt**

D **GgTt** x **ggtt**

24 A girl has blood group A and her brother has blood group B.

Which combination of genotypes **cannot** belong to their parents?

	mother	father
A	I^AI^A	I^BI^O
B	I^AI^B	I^AI^B
C	I^OI^O	I^AI^B
D	I^BI^O	I^AI^O

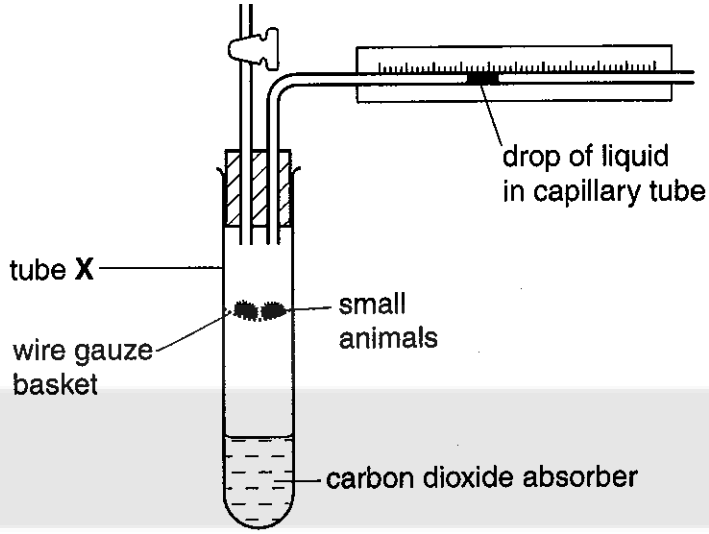
25 It has been found that an aqueous suspension of isolated chloroplasts will evolve oxygen if illuminated in the presence of a certain type of compound.

Which type of compound and which colours of light are required for maximum oxygen evolution?

	type of compound	colours of light at which maximum evolution occurs
A	electron acceptor	blue and green
B	electron acceptor	blue and red
C	electron donor	blue and green
D	electron donor	blue and red

[Turn over

26 The diagram shows a simple respirometer.



The changes in gas volume in the tube are measured at intervals.

time (minutes)	gas volume with carbon dioxide absorber (cm^3)	gas volume without carbon dioxide absorber (cm^3)
0	0.0	0.0
10	–0.4	–0.1
20	–0.8	–0.2
30	–1.2	–0.3

Tube **X** contains 2 g of small animals.

What is the carbon dioxide output per g per hour for these organisms?

A 0.9 cm^3 **B** 1.8 cm^3 **C** 2.4 cm^3 **D** 4.8 cm^3

27 Lactic acid is produced whenever muscle tissue contracts. Muscle tissue can contract in the absence of oxygen and lactic acid accumulates until fatigue sets in. On return to aerobic conditions, the muscle tissue can contract again and the lactic acid is metabolised.

Which of the following is the best interpretation of these observations?

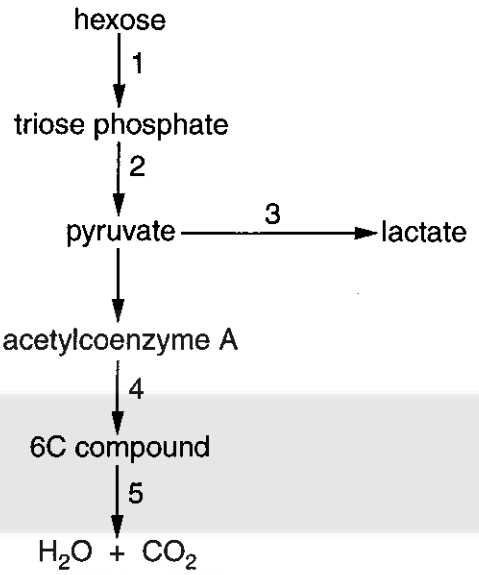
A Formation of lactic acid is oxygen-dependent.

B In anaerobic conditions, lactic acid is produced faster than it can be removed.

C Lactic acid is produced only in anaerobic conditions.

D Muscle contraction is independent of oxygen availability.

28 The diagram summarises the pathway of glucose breakdown.



Which two steps result in a net increase of ATP?

A 1 and 4 **B** 2 and 4 **C** 2 and 5 **D** 3 and 5

29 Which reactants are used in the Calvin cycle?

A carbon dioxide, ADP and NADP

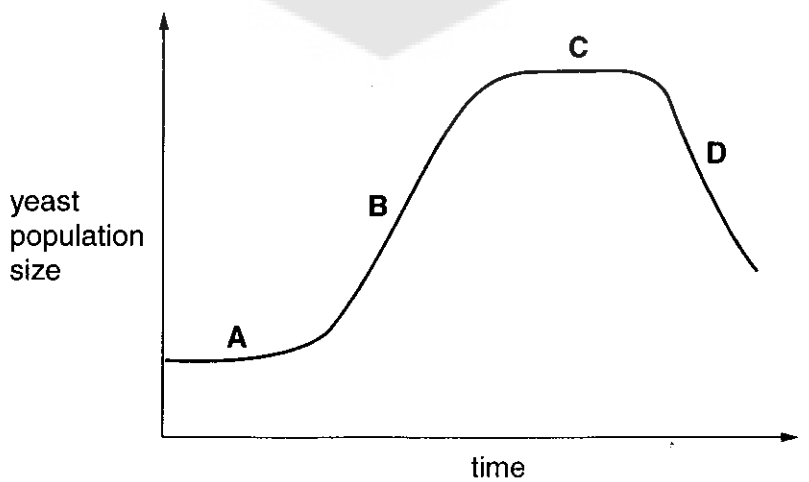
B carbon dioxide, ATP and reduced NADP

C oxygen, ADP and reduced NADP

D oxygen, ATP and NADP

30 The growth curve shows the change in the size of a yeast population maintained under anaerobic conditions.

In which stage of growth is there the greatest mean rate of ethanol production per cell?



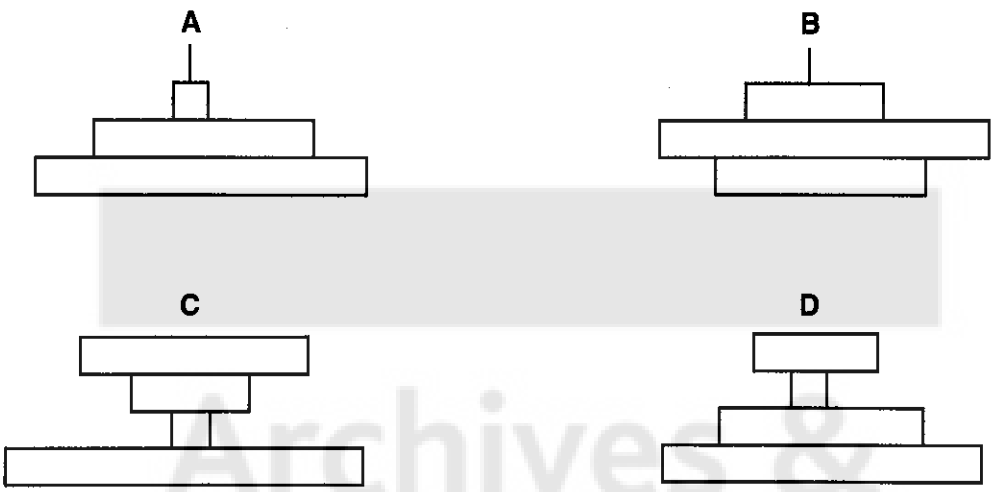
[Turn over

31 The flow chart shows a food chain.

grass ⟶ rabbits ⟶ dogs ⟶ fleas

The biomass of the organisms was measured over a period of one year.

Which pyramid of biomass represents this food chain?



32 Which of the following defines an ecological niche?

A the habitat in which an organism finds its food supply

B the habitat in which an organism finds the most suitable climate

C the relationships between an organism and other species

D the way in which the environment is exploited by an organism

33 Which of the following is **not** recycled in ecosystems?

A carbon

B energy

C sulphur

D water

34 The graph shows the changes in the following factors in a lake during one year.

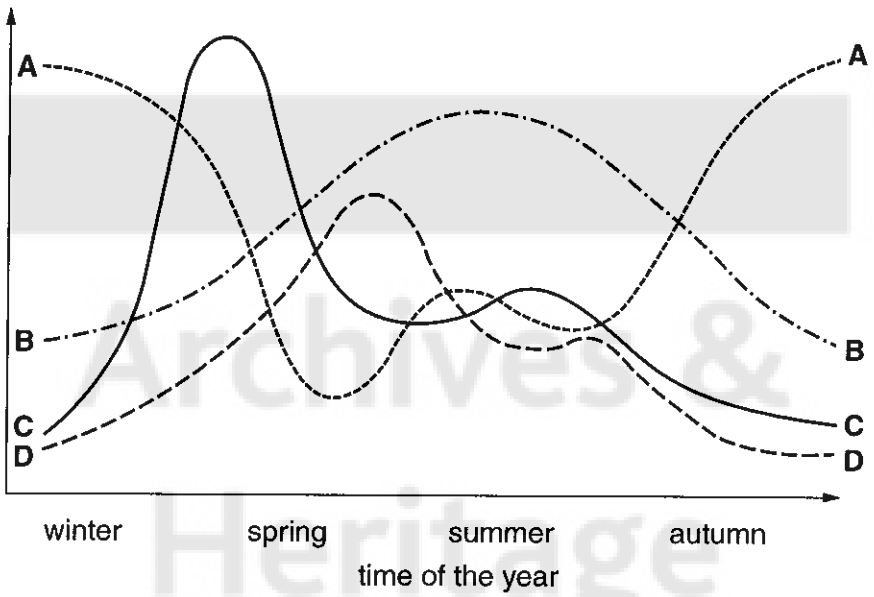
numbers of producers

numbers of primary consumers

quantity of dissolved nutrients

intensity of light

Which curve represents the quantity of dissolved nutrients?



35 Which region of the heart produces action potentials co-ordinating cardiac muscle contraction?

A atrioventricular node

B bundle of His

C Purkyne (Purkinje) tissue

D sinoatrial node

36 In which form is carbon dioxide mainly transported in blood?

A as carbamino-haemoglobin

B as carbonic acid

C as hydrogencarbonate

D in solution

37 Long term kidney failure can be treated by introducing sterile dialysis fluid into the abdominal cavity. The fluid is drained and replaced regularly using a tube inserted surgically through the abdominal wall.

Why does this method work well?

A because osmoregulation and excretion are achieved by diffusion between the blood in the abdominal capillaries and the dialysis fluid

B because osmoregulation and excretion are achieved by the active transport of ions, water and urea between the abdominal capillaries and the dialysis fluid

C because the fluid is in direct contact with the kidneys, and urea and excess ions can pass into it without being filtered by the glomeruli

D because the fluid is in direct contact with the liver and the large intestine and wastes and excess ions can pass into it from these organs

38 Which region of the kidney nephron is the main site of amino acid reabsorption?

A glomerulus

B Bowman's capsule

C proximal convoluted tubule

D distal convoluted tubule

39 Which function of the liver results in the production of bile pigments?

A breakdown of haemoglobin

B deamination of amino acids

C detoxification of metabolic poisons

D release of stored vitamin A

40 During some surgical operations the drug curare, which has a similar shape to acetylcholine, is injected into the muscles to relax them.

Why do the muscles remain relaxed?

A calcium ions cannot be taken up by membrane vesicles

B cholinesterase cannot remove acetylcholine

C postsynaptic membrane receptors are blocked

D sodium channels remain open

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OCR
RECOGNISING ACHIEVEMENT

Candidate Name	Centre Number	Candidate Number

General Certificate of Education Advanced Level

former Cambridge linear syllabus

BIOLOGY 9264/3

PAPER 3

Friday **16 JUNE 2000** Morning 1 hour 30 minutes

Additional materials:
Answer paper
Ruler (cm/mm)

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page and on any separate answer paper used.

Section A

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Section B

Answer **one** question.

Your answer to Section B must be in continuous prose, where appropriate.

Where lined pages are provided at the end of the question paper, write your answer on these and continue on the separate answer paper provided.

At the end of the examination, fasten any separate answer paper used securely to the question paper.

All working for numerical answers must be shown.

INFORMATION FOR CANDIDATES

The intended number of marks is given in brackets [ ] at the end of each question or part question.

You may use a calculator.

The quality of your language will be taken into account in the marking of your answer to Section B.

FOR EXAMINER'S USE	
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

This question paper consists of 9 printed pages and 3 lined pages.

[Turn over

For Examiner's Use

Section A

Answer **all** the questions in this section.

1 Fig. 1.1 shows a section through part of the kidney cortex as seen under the high power of a light microscope.

Fig. 1.1

(a) Name the structures labelled **A** to **C**.

A .....

B .....

C .....[3]

(b) Show, by labelling with an **X** on Fig. 1.1, where ultrafiltration occurs. [1]

Part of the kidney tubule is adapted for the reabsorption of glucose.

(c) State **two** structural adaptations of this region of the kidney tubule and explain how each one assists reabsorption from the glomerular filtrate.

1. *structure* .....

explanation .....

.....

2. *structure* .....

explanation .....

.....[4]

Kidney failure may be treated by use of a kidney dialysis machine.

(d) **(i)** Explain how dialysis differs from ultrafiltration in the kidney.

.....

.....

.....[3]

(ii) Suggest **two** advantages of kidney transplantation over dialysis as a treatment for kidney failure.

1. .....

2. .....[2]

[Total : 13]

2 Fig. 2.1 shows a section through part of the fluid mosaic model of the cell surface membrane with a Na^+/K^+ pump protein.

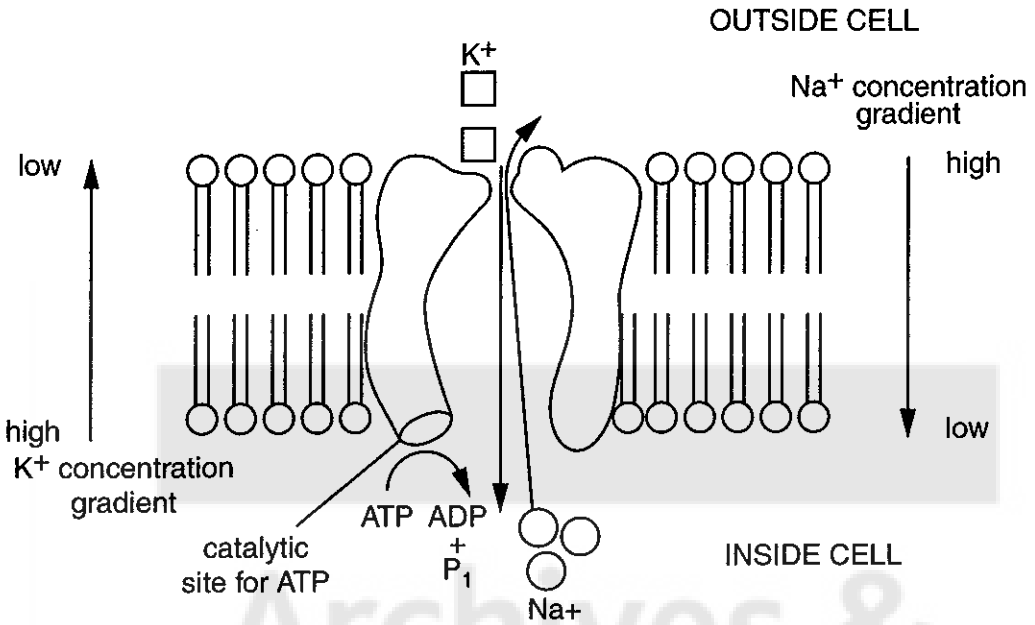

Fig. 2.1

(a) Explain why the cell surface membrane is described as a fluid mosaic.

.....

.....

.....[2]

(b) Describe how the channel surface of the protein differs from its surface next to the phospholipid tails.

.....

.....

.....[2]

(c) Explain why Na^+ and K^+ cannot pass freely across the phospholipid bilayer.

.....

.....

.....[2]

Cholesterol and glycolipids are associated with cell surface membranes.

(d) Suggest **one** function of each compound in membranes.

cholesterol .....

.....

glycolipids .....

.....[2]

[Total : 8]

3 **(a)** **(i)** Draw and label a diagram to show the structure of a triglyceride.

[2]

(ii) Indicate, with an **X** on the diagram, a site where hydrolysis takes place. [1]

(b) Explain the differences in solubility between triglycerides and the products of their hydrolysis.

.....

.....

.....[3]

(c) Suggest why triglycerides release twice as much energy on oxidation compared with an equivalent mass of carbohydrates.

.....

.....

.....[2]

[Total : 8]

4 **(a)** List **three** ways in which transcription differs from translation in protein synthesis.

1. .....

2. .....

3. .....[3]

Fig. 4.1 represents a polyribosome with several translation sites.

Image removed due to third party copyright restrictions

Fig. 4.1

(b) Name the structures labelled **A** to **C**.

A .....

B .....

C .....[3]

(c) Name **two** molecules, in addition to the molecules shown in Fig. 4.1, which are required to complete translation.

1. .....

2. .....[2]

(d) Describe **two** structural features which adapt tRNA to its role in translation.

.....

.....[2]

[Total : 10]

5 Two groups of white mustard plants, *Sinapis alba*, were grown, one group under high illumination, the other under low illumination. When fully grown, the effect of increasing light intensity on the rate of photosynthesis in the two groups of plants was measured. Fig. 5.1 shows the results.

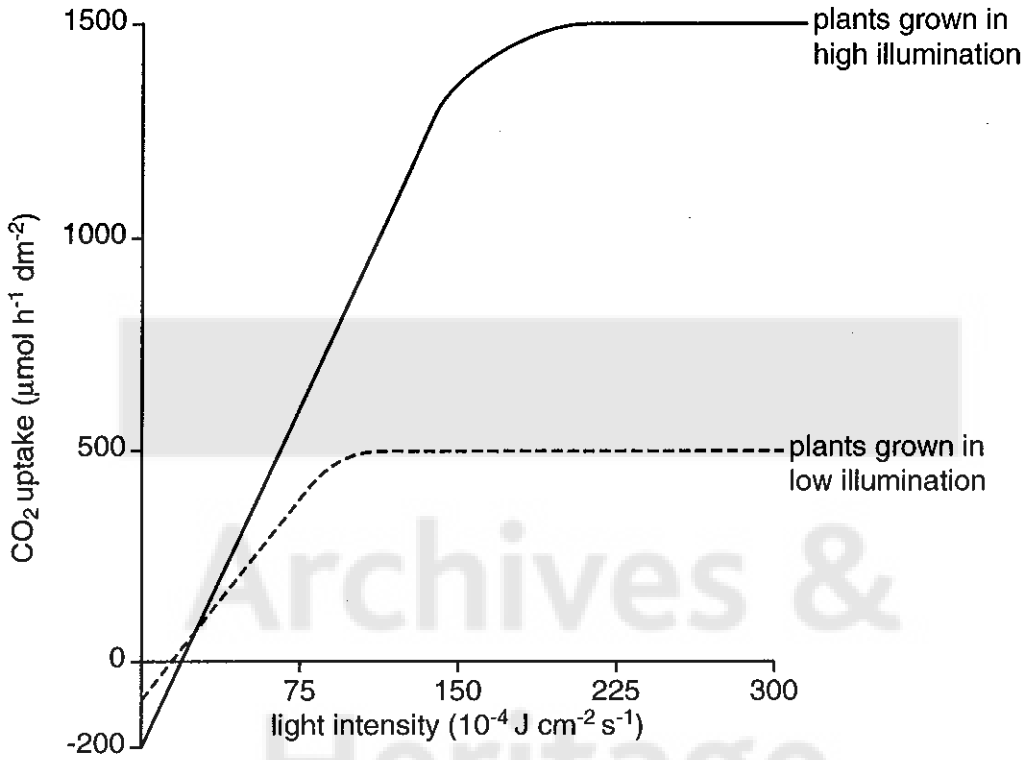

Fig. 5.1

(a) With reference to Fig. 5.1,

(i) explain the effect of light intensities above 200 x 10^{-4} J cm^{-2} s^{-1} on the rate of photosynthesis in plants grown in high illumination;

.....

.....

.....[2]

(ii) state **two** ways in which the two curves differ at light intensities below 75 x 10^{-4} J cm^{-2} s^{-1}.

1. .....

.....

2. .....

.....[2]

(b) From the results of this investigation, suggest why plants growing in shade on the forest floor are able to survive.

.....

.....

.....[2]

[Total : 6]

6 In the garden pea, *Pisum sativum*, two pairs of alleles determine the seed characters green and yellow and round and wrinkled. Table 6.1 shows the results which were obtained from four separate crosses.

Table 6.1

cross	parent	progeny			
		yellow round	yellow wrinkled	green round	green wrinkled
1	yellow round X green wrinkled	138	143	137	142
2	yellow round X yellow round	176	0	60	0
3	yellow round X yellow wrinkled	223	247	75	86
4	green round X yellow wrinkled	371	0	0	0

(a) State which alleles are dominant and explain your answer.

.....

.....

.....[2]

(b) Using suitable symbols, write down the genotypes of the parents of each cross in the table below.

symbols used .....

cross	parent	
1	yellow round	green wrinkled
2	yellow round	yellow round
3	yellow round	yellow wrinkled
4	green round	yellow wrinkled

[8]

[Total : 10]

Section B

Answer only **one** question from this section.

In this section, answers should be illustrated by large clearly labelled diagrams wherever suitable.

Your answer to Section B must be in continuous prose where appropriate.

Up to 4 additional marks are awarded for quality of language.

Your answer must be set out in sections (a), (b) etc., as indicated in the question.

7 **(a)** Describe the main components of mammalian blood. [6]

(b) Explain how oxygen and carbon dioxide are transported by the blood. [10]

8 **(a)** Describe the behaviour of chromosomes during meiosis. [10]

(b) Explain the similarities and differences between homologous chromosomes. [6]

9 **(a)** Describe the structures of a sensory neurone and of a motor neurone and explain their roles in a reflex arc. [8]

(b) Explain how a nerve impulse is transmitted across a synapse. [8]

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RECOGNISING ACHIEVEMENT

General Certificate of Education Advanced Level

former Cambridge linear syllabus

BIOLOGY 9264/5

PAPER 5 Practical Test

INSTRUCTIONS

Tuesday **23 MAY 2000** Morning 2 hours 30 minutes

Great care should be taken that any confidential information given does not reach the candidates either directly or indirectly.

Candidates must be provided with a microscope with low power and high power objectives (e.g. $\frac{2}{3}$ in and $\frac{1}{6}$ in). Each candidate must have sole use of a microscope for 80 minutes.

Supervisors are advised to remind candidates that **all** substances in the examination should be treated with caution. Pipette fillers and safety goggles should be used where necessary.

In accordance with the COSHH (Control of Substances Hazardous to Health) Regulations, operative in the UK, a hazard appraisal of the examination has been carried out.

The following codes are used where relevant.

C = corrosive substance

F = highly flammable substance

H = harmful or irritating substance

O = oxidising substance

T = toxic substance

In this context, the attention of Supervisors is drawn to the following publications relating to safety and first-aid:

(a) 'Hazcards', as published by CLEAPSS Development Group, Brunel University, Uxbridge UB8 3PH (01895-51496);

(b) 'Hazard Data Sheets', published by BDH Laboratory Supplies.

These instructions consist of 4 printed pages.

Each candidate must also be provided with the following apparatus and materials.

To be supplied by the centre

Question 1

Candidates are required to investigate the effects of the enzyme lipase on two different types of milk, **K1** and **K2**.

(i) A corked specimen tube containing 5 cm^3 of **K1** solution labelled as such. Add 10 g of the powder sent from Cambridge to 100 cm^3 of cold, distilled water and stir well. This should be prepared just prior to the examination.

(ii) A corked specimen tube containing 5 cm^3 of **K2** solution labelled as such. This is prepared as for **K1**.

(iii) A corked specimen tube containing 5 cm^3 of **lipase solution** labelled as such. Dissolve 2 g of the powder (**H**, avoid inhalation) sent from Cambridge in 100 cm^3 of cold distilled water. This should be prepared just prior to the examination.

(iv) About 50 cm^3 of 0.2 mol dm^{-3} copper(II) sulphate solution in a suitable container labelled **copper(II) sulphate solution**. Dissolve 5 g of hydrated copper(II) sulphate (**C**, **H**) in 100 cm^3 of water. On standing the solution develops a slight cloudiness which should be removed by adding a few drops of 1 mol dm^{-3} sulphuric acid. This should be done before the solution is dispensed to the candidates.

(v) About 5 cm^3 of 0.1 mol dm^{-3} sodium hydroxide solution in a suitable container labelled **dilute sodium hydroxide solution**.

(vi) About 5 cm^3 of **bromothymol blue (neutral) solution** in a corked specimen tube labelled as such. Dissolve 0.04 g of the powder sent from Cambridge in 100 cm^3 of cold distilled water. Stir thoroughly to dissolve the powder completely. Add drops of 0.1 mol dm^{-3} sodium hydroxide solution to produce a colour just to the blue side of green.

(vii) About 5 cm^3 of distilled water in a labelled specimen tube.

(viii) A supply of Benedict's reagent (qualitative) labelled as such.

(ix) Chemicals for conducting biuret tests, appropriately labelled.

(x) Three rubber teat pipettes with fine ends.

(xi) Seven test-tubes (e.g. 12 x 1.5 cm); test-tube rack.

(xii) Three 1 cm^3 syringes (without needles).

(xiii) A tin or beaker to use as a water-bath.

(xiv) Supply of water at about 40 °C from a hot tap or a constant temperature water-bath.

(xv) Thermometer (°C).

(xvi) Bunsen, tripod and gauze; test-tube holder.

(xvii) Sight of a clock or other timer.

(xviii) Access to a sink.

(xix) Means of marking glassware.

Procedure to be followed by candidates.

Label four test-tubes **A**, **B**, **C** and **D** respectively. Prepare a tin or beaker to act as a water-bath. The temperature of the water should be about 40 °C. It is **not** necessary to maintain this temperature. **Stir K1 and K2 thoroughly.**

To tubes **A** and **C** add 1 cm^3 of **K1**.
To tubes **B** and **D** add 1 cm^3 of **K2**.

To all four tubes add **5 drops** of **bromothymol blue solution** using a teat pipette. Bromothymol blue is an indicator which changes colour as follows:

pH6	yellow
pH7	green
pH 7.6 (and above)	blue

To tubes **A** and **B** add 1 cm^3 of **lipase solution**.

To tubes **C** and **D** add 1 cm^3 of **distilled water**.

Immediately, using a clean teat pipette, add sodium hydroxide solution drop by drop to tube **A**, shaking the tube gently, until the contents just turn blue in colour. Repeat this procedure using tubes **B**, **C** and **D** until all the tubes have a similar blue colour. **Minor variations in colour between the tubes can be ignored as long as the contents are blue.**

Place the four tubes in the water-bath at about 40 °C. After 5 minutes remove the tubes from the water-bath and shake them gently. Examine the contents of the four tubes.

Question 2

Slides **K3** and **K4** (from Cambridge).

Question 3

(i) Slide **K5** (from Cambridge).

(ii) A piece (about thumb-nail size) of latex preparation (from Cambridge) in a watch-glass or Petri dish of water, labelled **latex lung.**

(iii) Two clean microscope slides.

(iv) A hand lens (x10).

(v) A pair of fine forceps.

(vi) Two dissecting needles.

To be supplied by Cambridge

(i) Answer books that also contain the questions.

(ii) Powders for preparing **K1**, **K2**, lipase and bromothymol blue solutions (Question 1).

(iii) Slides **K3** and **K4** (for Question 2 and shared between two candidates).

(iv) Latex lung material.

(v) Slide **K5** (Question 3).

RETURN OF EXAMINATION MATERIALS TO CAMBRIDGE

Please read the following instructions carefully.

Immediately after the examination the slides must be returned to Syndicate Buildings in the containers in which they were received, using the self-adhesive label for the parcel; they must not be included in parcels of scripts. On occasion, it may be possible for the Syndicate to offer certain slides or materials, used in the examination, for sale to Centres. In this case, an Order Form will be enclosed with the materials sent from Cambridge for the examination. Slides and containers not returned in good condition will be charged at the rate of £3 per item.

QUESTIONNAIRE

In order to minimise the disadvantages of a practical examination at which the Examiner is not present, the teacher responsible for the examination is asked to complete the Report Form on the back cover of the script of the candidate whose name appears first on the attendance register. Further comments by teachers need only be made on those scripts where difficulties are encountered.

OCR
RECOGNISING ACHIEVEMENT

Candidate Name	Centre Number	Candidate Number

General Certificate of Education Advanced Level

former Cambridge linear syllabus

BIOLOGY 9264/5

PAPER 5 Practical Test

Tuesday **23 MAY 2000** Morning 2 hours 30 minutes

Candidates answer on the question paper.
Additional materials:
As listed in Instructions to Supervisors

TIME 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The intended number of marks is given in brackets [ ] at the end of each question or part question.

You are advised to spend the first 15 minutes carefully reading through the whole paper before starting to answer any questions.

You should begin with Question 1 on which you should spend about 55 minutes. You are advised to spend 50 minutes on Question 2 and 30 minutes on Question 3.

You may be penalised for recording irrelevant information.

You are reminded of the need for good English and clear presentation in your answers.

FOR EXAMINER'S USE	
1	
2	
3	
TOTAL	

This question paper consists of 9 printed pages, 2 blank pages and a Report Form.

SB (CW/TC) QF04634

[Turn over

Question 1 [55 minutes]

You are required to investigate the effects of the enzyme lipase on two different types of milk, **K1** and **K2**.

Proceed as follows:

Label four test-tubes **A**, **B**, **C** and **D** respectively. Prepare a tin or beaker to act as a water-bath. The temperature of the water should be about 40 °C. It is **not** necessary to maintain this temperature. **Stir K1 and K2 thoroughly.**

To tubes **A** and **C** add 1 cm^3 of **K1**.
To tubes **B** and **D** add 1 cm^3 of **K2**.

To all four tubes add **5 drops** of **bromothymol blue solution** using a teat pipette. Bromothymol blue is an indicator which changes colour as follows:

pH6	yellow
pH7	green
pH 7.6 (and above)	blue

To tubes **A** and **B** add 1 cm^3 of **lipase solution.**

To tubes **C** and **D** add 1 cm^3 of **distilled water.**

Immediately, using a clean teat pipette, add sodium hydroxide solution drop by drop to tube **A**, shaking the tube gently, until the contents just turn blue in colour. Repeat this procedure using tubes **B**, **C** and **D** until all the tubes have a similar blue colour. **Minor variations in colour between the tubes can be ignored as long as the contents are blue.**

Place the four tubes in the water-bath at about 40 °C. After 5 minutes remove the tubes from the water-bath and shake them gently. Examine the contents of the four tubes.

(a) Record your observations of the appearance of the contents of the four tubes.

Tube **A** .....

.....

Tube **B** .....

.....

Tube **C** .....

.....

Tube **D** .....

.....[6]

(b) Explain as fully as possible the different observations that you made on tubes **A** and **C**.

.....

.....

.....[3]

(c) Account for the different observations that you made on tubes **A** and **B**.

.....

.....[2]

(d) Explain the purpose of tubes **C** and **D** in this procedure.

.....

.....[2]

Fill a clean test-tube to within 1 cm from the top with copper(II) sulphate solution. Using a clean pipette, gently release a drop of **K1** into the copper(II) sulphate solution about 1 cm below the surface of the solution, as shown in Fig. 1.1. Withdraw the pipette slowly and observe carefully the movement of the drop of **K1**.

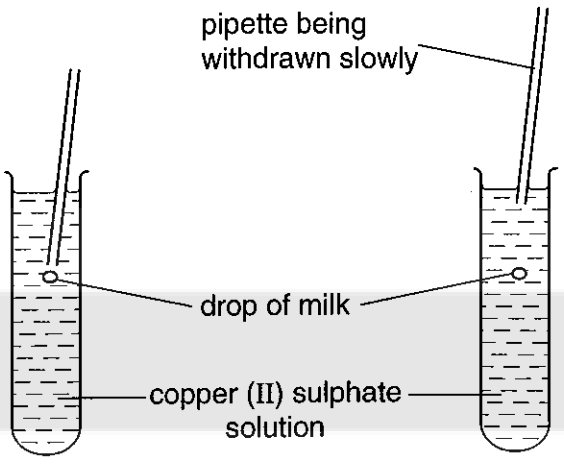

Fig. 1.1

(e) Note your observations.

.....

.....[1]

Repeat the procedure above using fresh copper(II) sulphate solution, clean glass apparatus and a sample of **K2**.

(f) **(i)** Record your observations on the movement of the drop of **K2** and note carefully any differences in the behaviour of the drops of **K1** and **K2**.

.....

.....

.....[2]

(ii) Account, as fully as possible, for the differences you observed in **(e)** and **(f)** **(i)** in the behaviour of the drops of **K1** and **K2**.

.....

.....

.....[2]

(g) (i) Carry out tests to compare the reducing sugar and protein content of **K1** and **K2**. Describe your methods and state what you did to make the tests valid comparisons in each case.

.....

.....

.....

.....

.....

.....

(ii) Record your results and conclusions in a table.

[7]

[Total : 25]

[Turn over

For Examiner's Use

Question 2 [50 minutes]

K3 is a stained longitudinal section of a young root tip.

Examine **K3** carefully using low and high power objectives of your microscope. Note the occurrence and distribution of different kinds of cells in this section.

(a) Make a plan drawing of the entire section, within the outline drawn in Fig. 2.1, to show the different **regions.** These regions result from differences in the *shapes, sizes* and *structure* of the cells as well as in the frequency with which stages of *mitosis* are visible.

Do not draw individual cells. Ignore the cells that make up the root cap region.

Annotate your drawing as fully as possible to **describe** the features of the cells in each region that you map.

[7]

Fig. 2.1

(b) (i) Use the high power of your microscope to find cells that are at various stages of mitosis. Make high power drawings *to the same scale* that illustrate **four different** stages in this process. At least **two** of your drawings should show chromosomes.

No labels are required. Text-book diagrams are not acceptable.

[9]

(ii) Number your drawings from **1** to **4** (**1** being the earliest stage) to show the sequence in which this process takes place in an individual cell. [2]

Slide **K4** is a stained section through an anther of a flowering plant. *You are **not** expected to be familiar with the details of this structure.* Examine **K4** using your microscope.

(c) (i) What evidence can you see that indicates that a process of cell division occurs in this specimen?

.....

.....[2]

Fig. 2.2 is a plan drawing of the anther of a flowering plant similar to **K4**.

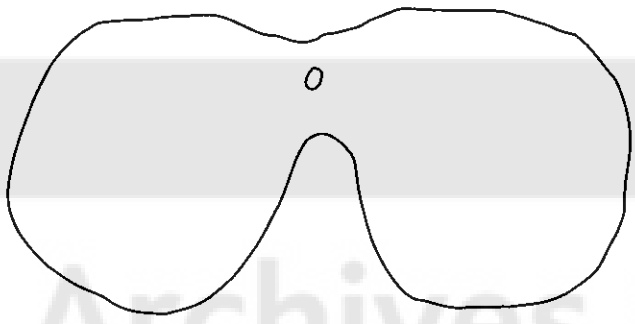

Fig. 2.2

(ii) Mark, with an arrow placed on Fig. 2.2, a position in which you saw evidence of cell or nuclear division. [1]

(iii) State **two** ways in which the products of cell division in **K3** and **K4** are genetically different.

1. .....

2. .....[2]

[Total : 23]

Question 3 [30 minutes]

You are provided with a piece of mammalian lung tissue in which all the air spaces were filled with liquid latex which was then allowed to harden. This procedure results in a perfect cast of the inside of the lungs. Very little of the original lung tissue now remains.

You are required to investigate the details of lung structure revealed by this technique.

Examine the piece of lung cast carefully using a hand lens. Use dissecting needles, fine forceps and your fingers to break off pieces of the lung to show as much of the detail as possible. Different sized pieces will show different structural features.

(a) Make drawings to show as much detail as possible of the airways and other observable features. Label your drawings as fully as you can.

[8]

K5 is a stained section of a mammalian lung. Examine the section using your microscope.

(b) State **two** visible features of this specimen which are not seen in the latex preparation that are adaptations for gaseous exchange.

1. .....

2. .....[2]

(c) State **two** features of the structure of the lung that are more clearly revealed by the latex technique than by the thin section.

1. .....

2. .....[2]

[Total : 12]

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REPORT FORM

The teacher responsible for this subject is asked to answer the following questions.

(a) Was the candidate physically handicapped in drawing, dissecting or using a microscope or is the candidate colourblind? If so, give brief particulars.

(b) Was the candidate handicapped by deficient material or apparatus? If so, give brief particulars.

(c) Was it necessary to make any substitutions for the materials sent from Cambridge? If so, give details and reasons.

(d) Any comments.

Signed .....

N.B. Information which applies to all candidates need be given on the first candidate's answer book only.