

Answer ALL questions in the spaces provided.

1. The table below refers to three major stages of aerobic respiration and the products of each stage.

Complete the table by inserting the part of the cell in which the stage occurs and two products in the blank spaces.

Stage	Part of cell in which it occurs	Two products
Glycolysis		
Krebs cycle	Matrix of mitochondrion	
Electron transport chain		ATP and water

Q1

(Total 4 marks)

2. (a) The mammalian hormones, glucagon and follicle-stimulating hormone (FSH), both exert their effects on cells by binding to a receptor molecule on the cell surface membrane and stimulating an enzyme called adenyl cyclase.

Glucagon and FSH have different target organs. The cells of the target organs will only respond to the hormones if they have specific receptors on their surface membranes.

- (i) Name **one** organ in the body of a mammal in which the cells have glucagon receptors.

.....

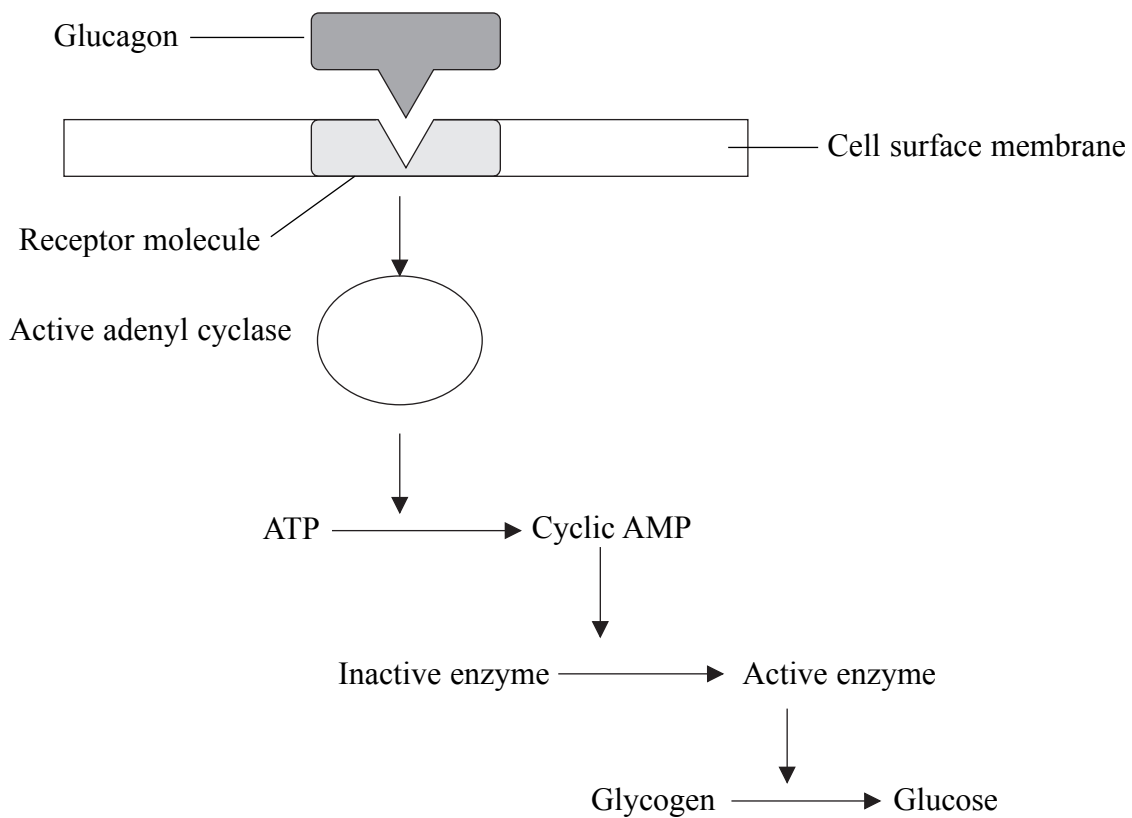
- (ii) Name **one** organ in the body of a mammal in which the cells have FSH receptors.

.....

(2)



(b) The diagram below shows the action of glucagon when it combines with its target cell.



Use the diagram to explain how one molecule of glucagon can cause a relatively large increase in the concentration of glucose in the blood plasma.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(3) Q2

(Total 5 marks)



3. (a) Distinguish between the terms **anabolism** and **catabolism**. Give an example of each.

.....

.....

.....

.....

.....

.....

.....

.....

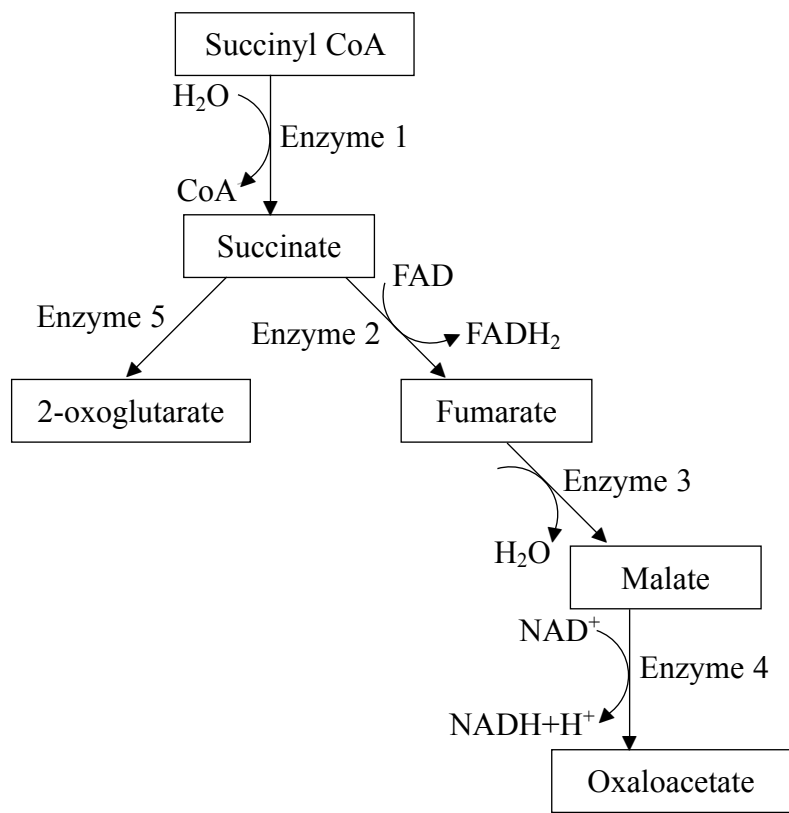
.....

.....

.....

(3)

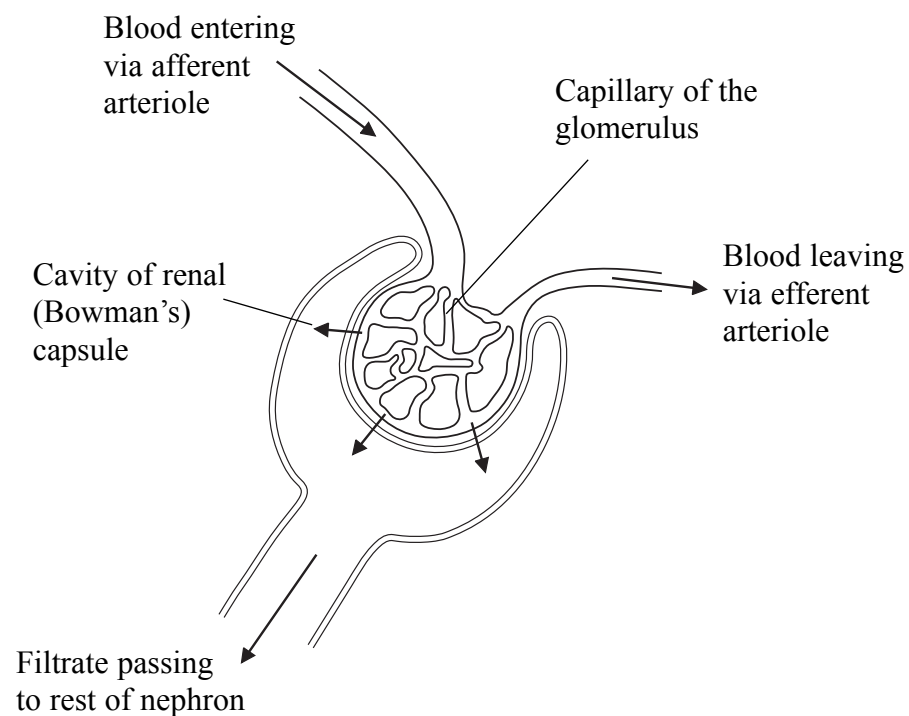
(b) The diagram below shows part of a metabolic pathway. Each reaction in the pathway is catalysed by a different enzyme. The enzymes have been numbered 1 to 5.



BLANK PAGE



4. The diagram below shows part of a nephron from a mammalian kidney.



Atrial natriuretic factor (ANF) is a hormone that increases the diameter of the afferent arteriole and decreases the diameter of the efferent arteriole.

(a) Describe and explain the effects that this hormone will have on the rate of ultrafiltration.

.....

.....

.....

.....

.....

.....

(2)



Leave
blank

(b) Urea is present in urine. Describe how urea is produced.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

(3)

(c) A student measured the volume of urine that she produced on two different days. The concentration of urea in the urine on each day was determined. The results are shown in the table below.

Day	Volume of urine produced / dm ³	Concentration of urea / g dm ⁻³
1	1.2	15
2	1.8	8

(i) Calculate the percentage change in the concentration of urea between day 1 and day 2. Show your working.

Answer%
(3)



Leave
blank

(ii) Suggest **two** possible reasons why the concentration of urea in the urine was lower on day 2. For each reason, explain why there would be a decrease in the concentration of urea in the urine.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(3)

Q4

(Total 11 marks)

--	--



Leave
blank

Option A: Microbiology and Biotechnology

6. (a) Describe the role of bacteria in the production of yoghurt.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

(3)

(b) Describe the role of yeast in the production of bread dough.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

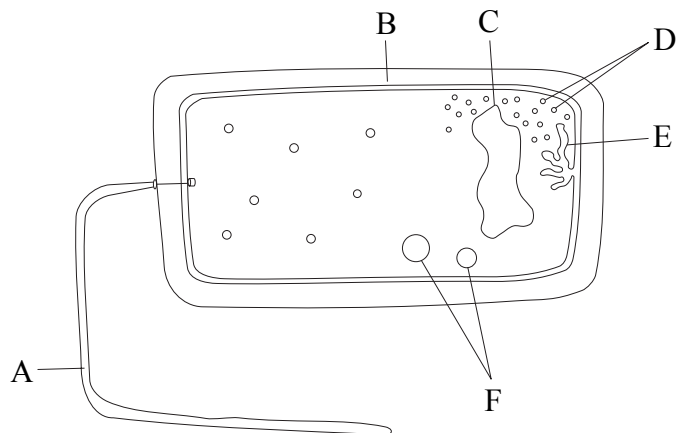
(3)

(Total 6 marks)

Q6



7. The diagram below shows the general structure of a bacterial cell.



(a) Use the letters on the diagram to identify the structures described below.

(i) Contains antibiotic resistance genes which may be transferred to other bacteria.

..... (1)

(ii) Sites of protein synthesis.

..... (1)

(iii) Contains the enzymes for respiration.

..... (1)

(b) The table below refers to three viruses.

Complete the table by writing the most appropriate word or words in the spaces provided.

Virus	Shape	Type of nucleic acid
Tobacco Mosaic Virus (TMV)		
Human Immunodeficiency Virus (HIV)		
Lambda (λ) phage		

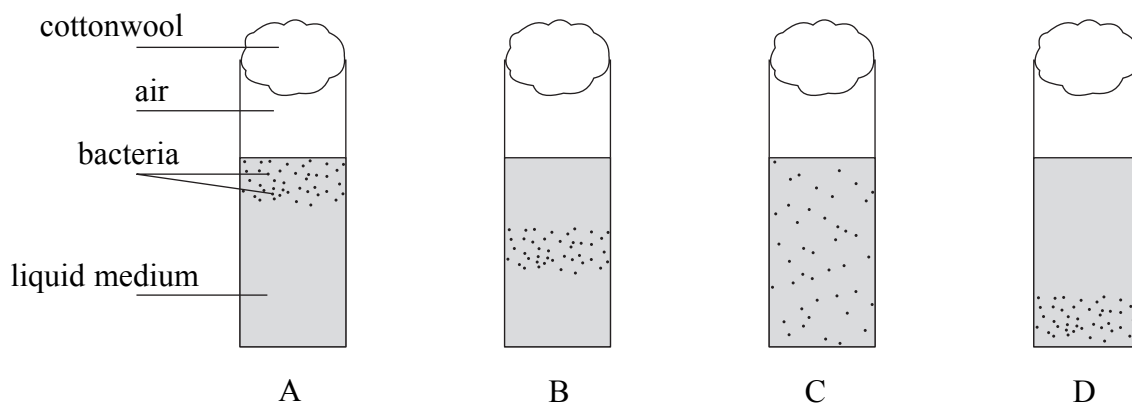
(3) Q7

(Total 6 marks)



8. (a) Obligate aerobes are bacteria that need oxygen. Oxygen is toxic to other bacteria, known as obligate anaerobes.

The diagram below shows four test tubes, A, B, C and D, each containing a different type of bacterium, in a liquid medium. There is an air-filled space at the top of each tube.



- (i) Describe how these tubes were inoculated with bacteria.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(4)



Leave
blank

(ii) Suggest which tube, A, B, C or D, contains the obligate anaerobes. Give a reason for your answer.

.....
.....
.....
.....
.....
.....

(2)

(iii) Suggest which tube, A, B, C or D, contains bacteria that are unaffected by oxygen concentration.

.....
.....

(1)

(b) Dilution plating was used to find the number of bacteria in tube C. Serial dilutions of the culture were made and used to inoculate petri dishes of nutrient agar. The dishes were incubated at 30°C for 2 days.

A 0.2 cm³ sample of each dilution was used to inoculate the agar. A total of 250 colonies was counted on the nutrient agar that had been inoculated with the 1 in 10 000 dilution of the culture.

Calculate the number of bacteria in 1 cm³ of the original culture sample. Show your working.

Answer cells cm⁻³
(3)

(Total 10 marks)

Q8

15

Turn over



BLANK PAGE



Leave
blank

9. (a) (i) Describe the structure of the cell wall of a Gram positive bacterium.

.....
.....
.....
.....
.....
.....

(2)

(ii) State **one** difference between the structure of the cell wall of a Gram negative bacterium and the structure of the cell wall of a Gram positive bacterium.

.....
.....
.....
.....

(1)



- (b) Some people take garlic extracts as they believe that these contain natural chemicals capable of reducing infection.

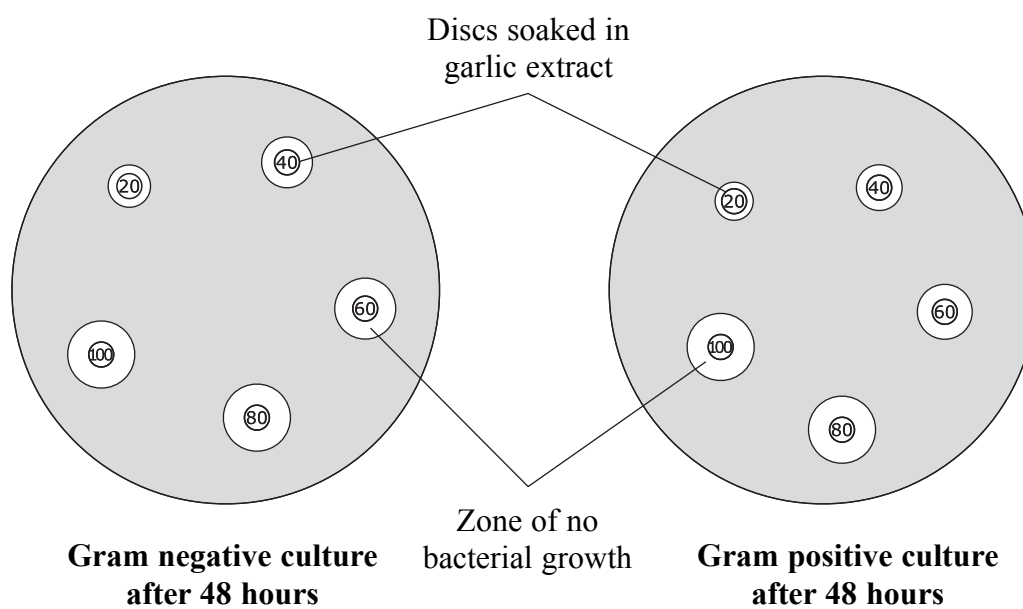
An experiment was carried out to study the effect of garlic extracts on the growth of Gram negative and Gram positive bacteria.

The 100% extract was obtained by crushing the garlic. This extract was diluted with water to give 4 different concentrations (80%, 60%, 40% and 20%). Small discs of filter paper were then soaked in the 100% extract and the diluted extracts, removed and dried.

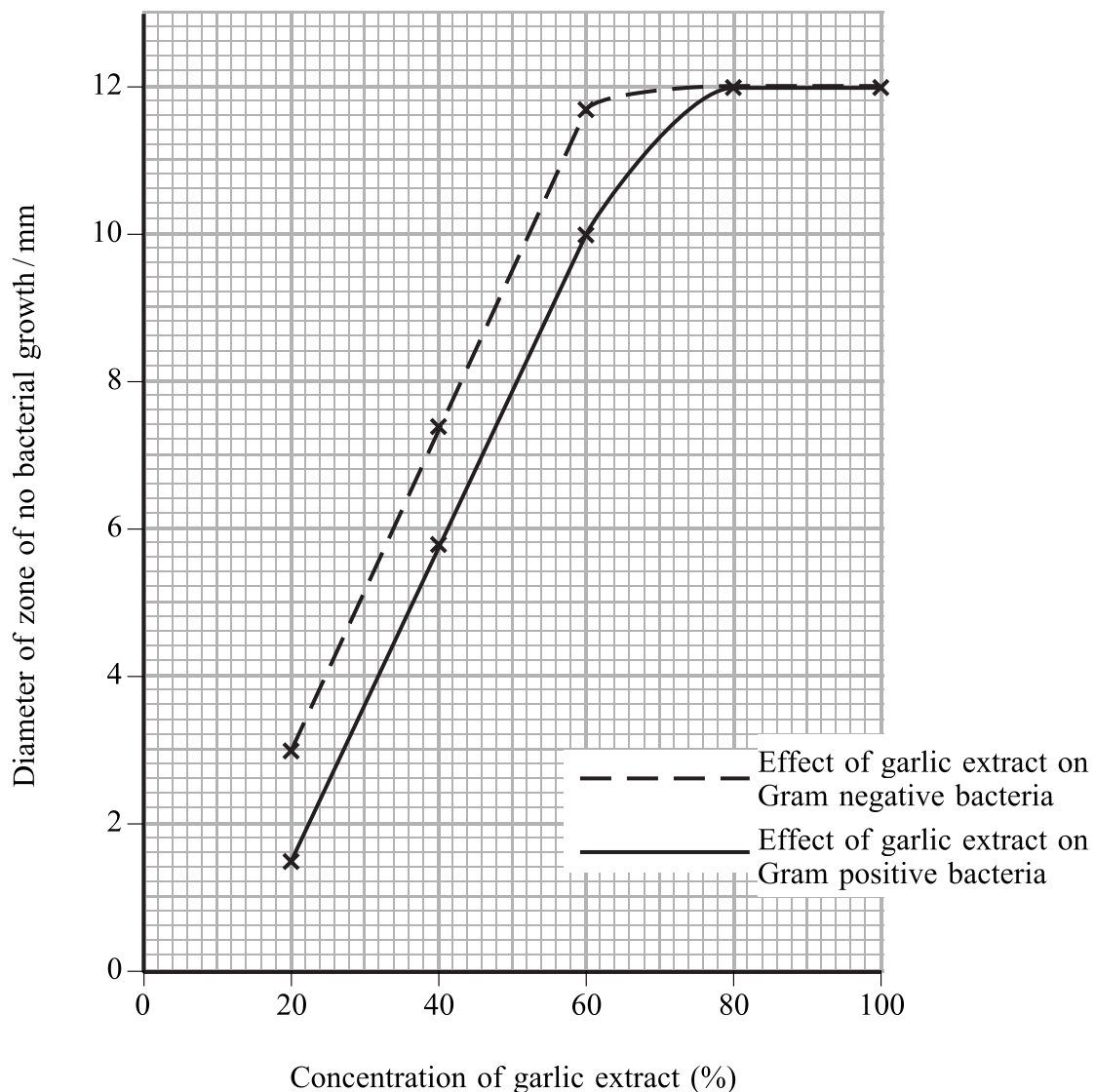
A suspension of Gram negative bacteria was spread evenly over a solid medium in a petri dish. One disc from each dilution of the garlic extract was placed on the surface of the medium. The culture was incubated for 48 hours.

This procedure was repeated with a suspension of Gram positive bacteria.

The appearance of the cultures after 48 hours is shown below. The numbers show the percentage concentration of garlic extract used.



The diameter of the zone of no bacterial growth was measured for each disc on each plate.
The graph below shows these results.



Describe the effect of diluting the garlic extract on the growth of Gram negative bacteria.

.....

.....

.....

.....

.....

.....

(2)

QUESTION 9 CONTINUES ON PAGE 21



BLANK PAGE



(c) Suggest how the information shown in the graph supports the following conclusions drawn from this experiment.

(i) The chemicals in the garlic extract do not interfere with the cell wall.

.....
.....
.....

(1)

(ii) The cell wall of Gram negative bacteria is more permeable to the chemicals contained in the garlic extract than the cell wall of Gram positive bacteria.

.....
.....
.....

(1)

(d) Suggest why the chemicals in the garlic extract are harmful to bacteria but not to human cells.

.....

(1)

Q9

(Total 8 marks)

TOTAL FOR PAPER: 70 MARKS

END



BLANK PAGE



BLANK PAGE



N 2 5 7 9 1 A 0 2 3 2 4

BLANK PAGE

