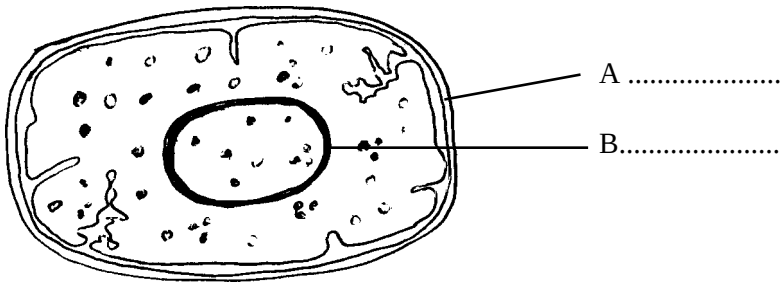
Do not write in margin

The diagram shows a bacterium.



(a) (i) On the diagram, label features A and B. [2]

(ii) State two prokaryotic features shown by this bacterium.

.....

.....
[2]

(b) In optimum conditions this bacterium may divide once every 30 minutes.Assuming that a colony starts from a single cell, calculate the number of cells that would be present after 6 hours in optimum conditions.

.....

.....
[2]

(c) Streptomycin is an antibiotic used to treat human diseases caused by bacteria. It functions by binding to 70s ribosomes. Explain why:

(i) streptomycin inhibits the growth of bacterial cells.

.....

.....

.....
[2]

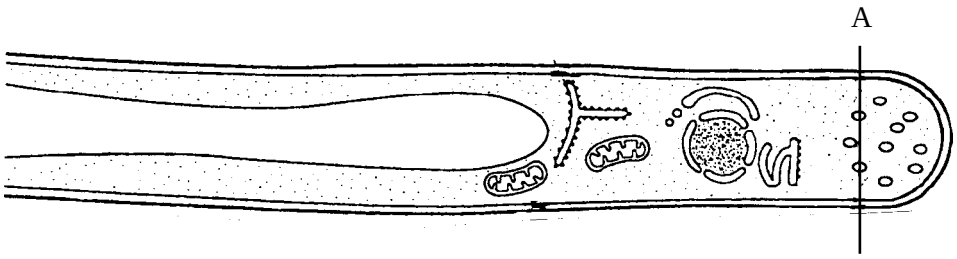
(ii) streptomycin does not affect the growth of human cells.

.....
[1]

TOTAL / 9

Do not write in margin

The drawing shows a section through part of a filamentous fungus, magnified 5000 times.



(a) Give two features which show that this fungus is a eukaryote.

.....

.....
[2]

(b) Calculate the actual diameter of the fungus at position A in the drawing. Show your working.

Answer: ..... [3]

(c) The effect of temperature on the rate of growth of a filamentous fungus was investigated using a liquid culture medium. Five equal volumes of a liquid culture were inoculated with the dry mass equivalent of 1g of fungus. Each was incubated at a different temperature for 48 hours. The table shows the results of this investigation.

Temperature/ °C	10	15	20	25	30
Dry mass after 48 hours/g	2.5	3.2	5.6	5.8	4.0

Explain the pattern shown by these results.

.....

.....
[2]

(d) Describe how the dry mass of fungus in a liquid medium is estimated.

.....

.....

.....

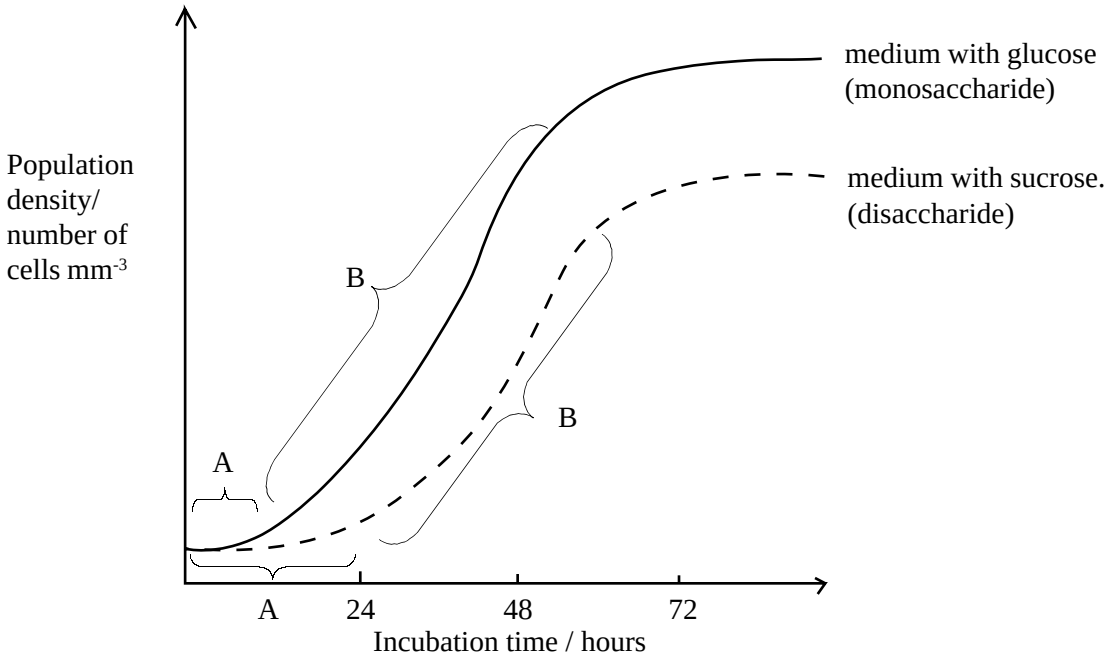
.....
[3]

TOTAL / 10

QUESTIONSHEET 3

Do not write in margin

The graph shows the growth of a population of the same microorganism on two different media.



(a) Identify each of the stages A and B on the curve for nutrient agar with glucose. Give a reason for the shape of the graph at each of these stages.

A: .....

..... [2]

B: .....

..... [2]

(b) This microorganism usually grows using glucose as its carbon source.

(i) Suggest an explanation for the growth of the microorganism during stage A on nutrient agar with sucrose.

.....

..... [1]

(ii) Suggest why the final population size is smaller on nutrient agar with sucrose.

.....

..... [1]

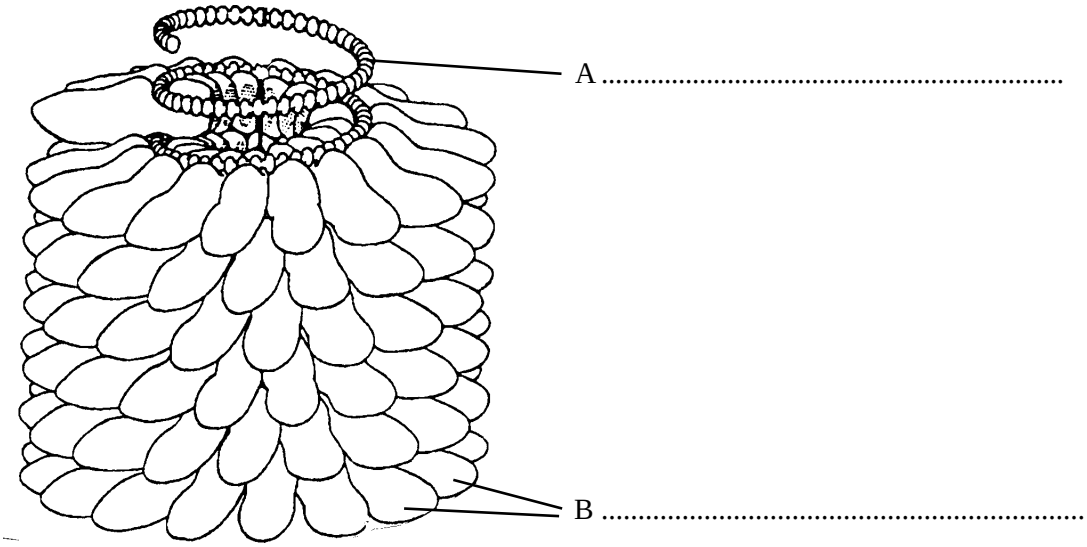
(c) When this microorganism is grown on nutrient agar containing cellulose the population does not increase. Suggest why.

.....

..... [1]

TOTAL / 7

The diagram shows the structure of Tobacco Mosaic Virus.



(a) (i) Name the chemicals which compose features A and B shown on the diagram.

.....

.....

[2]

(ii) Give two differences in structure between Tobacco Mosaic Virus and Human Immunodeficiency Virus.

.....

.....

[2]

(b) Tobacco Mosaic Virus infects the leaves of tobacco. The symptoms include bright yellow and light green patches on the dark green leaves. The disease spreads rapidly by contact with the infected tissue.

(i) Explain how infection by this virus would lead to a decrease in crop yield.

.....

.....

.....

[3]

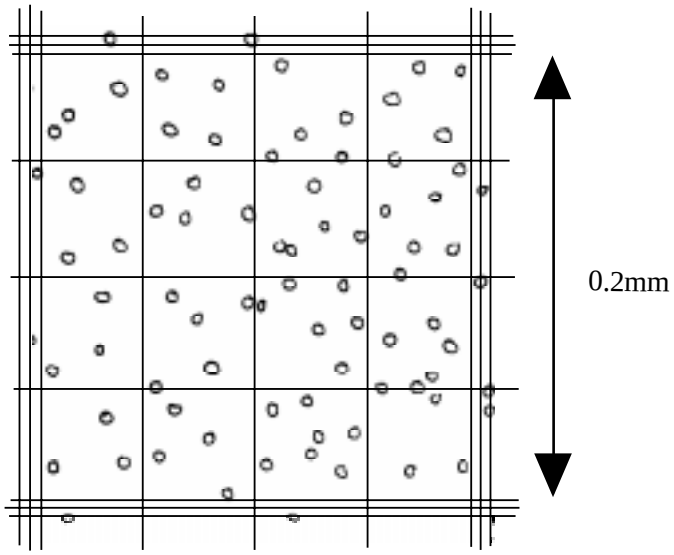
(ii) Suggest one reason for burning crops containing infected plants.

.....

[1]

TOTAL / 8

The diagram shows part of a haemocytometer grid viewed under a microscope. The triple-lined square measures 0.2 mm x 0.2 mm and has a depth of 0.1 mm. The haemocytometer contains a suspension of bacteria cells.



(a) Calculate the number of yeast cells in 1 mm^3 of the suspension.

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.....

.....

[3]

(b) The sample counted had been diluted to 10^{-5}. Calculate the number of yeast cells in 1 dm^3 of the original yeast suspension.

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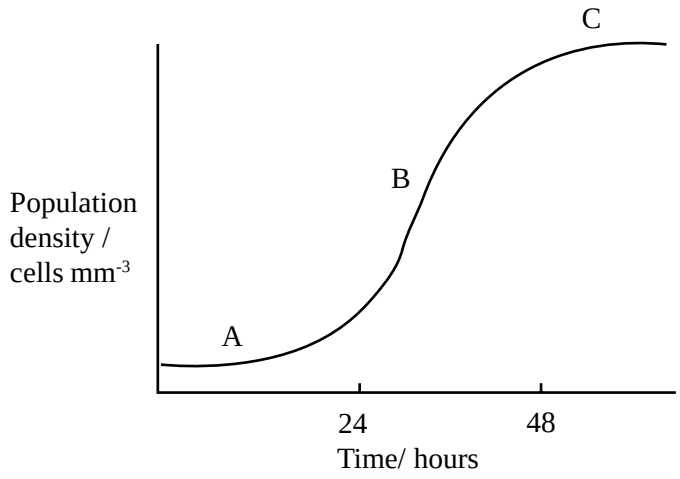
[1]

(Continued...)

Do not write in margin

(c) The graph shows a growth curve of a population of bacteria plotted from haemocytometer counts.



Explain the shape of the curve at points A, B and C.

A: .....

.....

[2]

B: .....

.....

[2]

C: .....

.....

[2]

TOTAL / 10

QUESTIONSHEET 6

Do not write in margin

In an investigation the effects of the antibiotics tetracycline and rifamycin were tested on two different species of bacteria, X and Y. The bacteria were grown as separate cultures and the effect of each antibiotic measured by viable counts. The table shows the results of these investigations.

Time/hours	Number of viable cells/mm^3					
	Bacteria species X			Bacteria species Y		
Antibiotic added after 2 hours	Without antibiotic	With tetracycline	With rifamycin	Without antibiotic	With tetracycline	With rifamycin
0	10^1	10^1	10^1	10^1	10^1	10^1
1	10^2	10^2	10^2	10^2	10^2	10^2
2	10^3	10^3	10^3	10^4	10^4	10^4
3	10^4	10^4	10^4	10^5	10^5	10^5
4	10^5	10^3	10^4	10^6	10^5	10^6
5	10^5	10^2	10^5	10^6	10^5	10^7
6	10^5	0	10^5	10^6	10^5	10^7

(a) Describe the effect of each antibiotic on the population growth of each of the bacterial species.

(i) tetracycline.

.....

.....

.....

.....

[3]

(ii) rifamycin.

.....

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.....

.....

[3]

(Continued.....)

Do not write in margin

(b) (i) To obtain a viable count a serial dilution of the culture of bacteria must be made. Describe how a serial dilution is made.

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.....

.....

[3]

(ii) The table shows the number of colonies counted from a serial dilution.

	1st dilution	2nd dilution	3rd dilution	4th dilution	5th dilution
Number of colonies	Too many to count	Too many to count	500	55	4

Explain why the count for the 4th dilution would be the most suitable to use to calculate the total population of bacteria in the culture.

.....

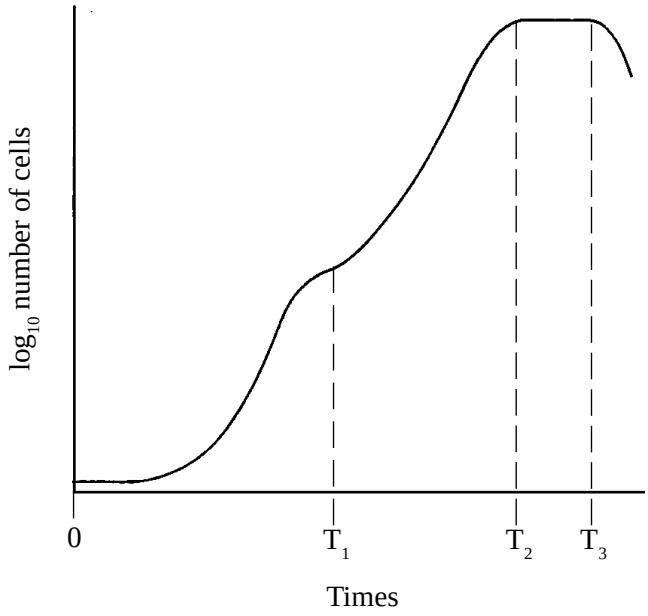
.....

[2]

TOTAL / 11

Do not write in margin

The graph shows the population growth curve for E. coli grown in a medium containing glucose and lactose.



(a) Describe and explain the form of the graph between time 0 and T_1.

.....

.....

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.....

.....

[4]

(b) Analysis of the medium at time T_1 indicates that 96% of the glucose and 0% of the lactose had been metabolised. Suggest why the bacteria have used glucose before lactose.

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.....

[2]

(c) Analysis of the medium at time T_2 showed that 90% of the lactose had been metabolised. Outline the process by which the lactose would have been metabolised.

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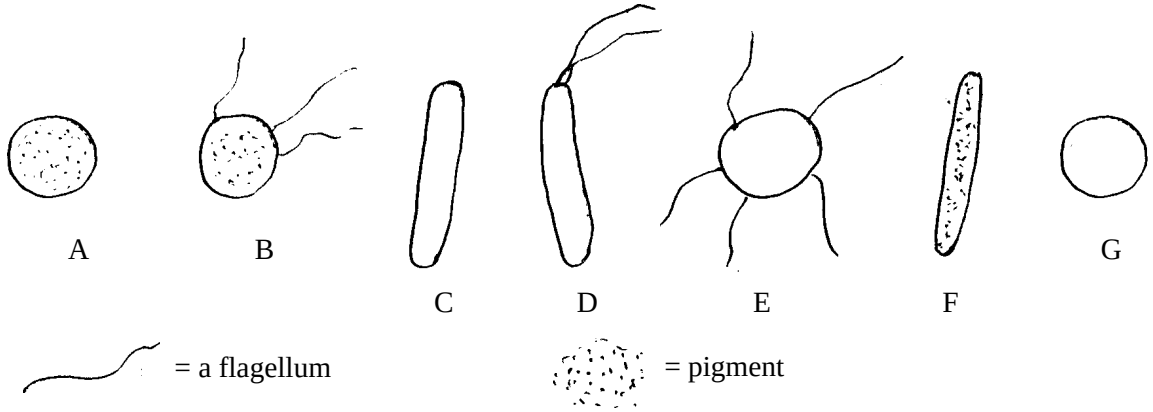
.....

[4]

TOTAL / 10

Do not write in margin

Several different species of bacteria, labelled A to G, are shown in the diagram below.



(a) Devise a simple dichotomous key which would enable you to distinguish between the bacteria using only features that are visible in the diagram.

[5]

(Continued...)

Do not write in margin

(b) Bacteria may also be classified according to their reactions with Gram stain.

(i) Outline how you would Gram stain a heat fixed smear of bacteria.

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[4]

(ii) Explain the difference in staining between Gram positive and Gram negative bacteria.

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[2]

(iii) Name one example of a Gram positive bacterium and one example of a Gram negative bacterium.

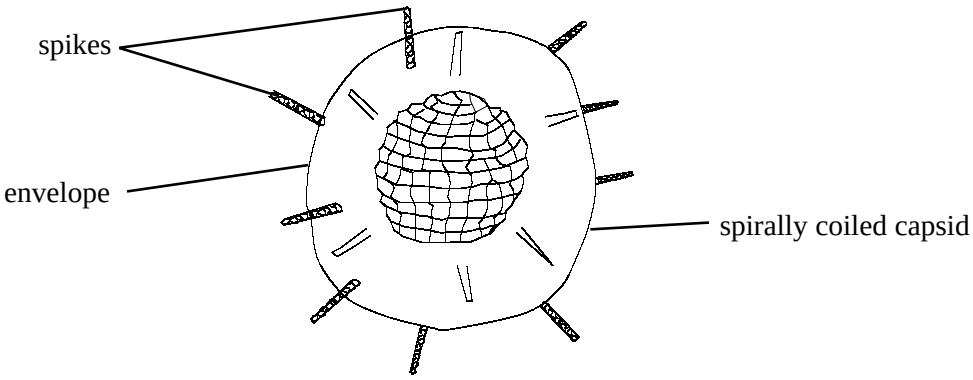
Gram positive. .....

Gram negative. .....

[2]

Do not write in margin

The diagram below shows the structure of the virus which causes influenza.



Suggest explanations for each of the following:

(a) most viruses only attack one species.

.....

.....

..... [2]

(b) individuals may repeatedly suffer from influenza.

.....

.....

..... [2]

(c) influenza may cause epidemics and pandemics.

.....

.....

..... [3]

TOTAL / 7

Do not write in margin

(a) (i) The table shows some microorganisms and some of their features. Complete the table by putting a tick (✓) in the box if a feature is present and an (✗) if the feature is absent.

Microorganism	Feature			
	Nucleus	Mitochondria	Ribosomes	Cell wall
Amoeba				
Fungi				
Bacteria				
Viruses				

[4]

(ii) Name two chemicals you would expect to find in all the microorganisms.

1. .....

2. ..... [2]

(b) Describe how a fungus obtains its food.

.....

.....

.....

.....

.....

..... [4]

TOTAL / 10

QUESTIONSHEET 11

Do not write in margin

Read through the following passage which gives information about viruses.

In the lytic life cycle, the host cells are destroyed by the synthesis of new viruses. However, in the lysogenic life cycle, viruses may remain in the host cell for many years. They can also be passed on to new cells formed by the division of infected cells. Some lysogenic viruses have been linked to the development of cancer due to the integration of the virus DNA into a gene involved in the control of cell division.

(a) Describe the main events in the 'lytic life cycle' of a virus.

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..... [6]

(b) (i) What is meant by 'integration of the virus DNA'?

..... [1]

(ii) Explain why a lysogenic virus can be passed on to new cells during cell division.

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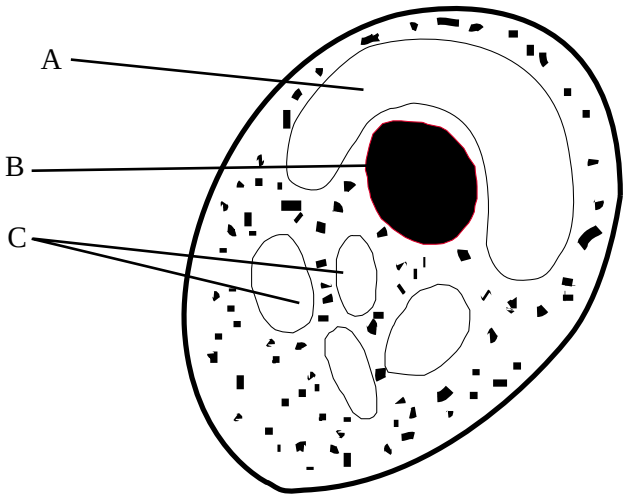
..... [3]

TOTAL / 10

Do not write in margin

The drawing shows the structure of a single celled alga.



(a) (i) Name features A, B and C.

A. ..... B. ..... C. ..... [3]

(ii) State one difference between the cell wall of an alga and the cell wall of a bacterium.

..... [1]

(b) In tropical countries, single celled algae are grown in sewage treatment tanks as a source of single cell protein.

(i) What is single cell protein?

..... [1]

(ii) Suggest and explain two advantages of growing algae in sewage treatment tanks.

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..... [4]

(iii) Suggest why the algae do not grow successfully in the United Kingdom.

..... [1]

TOTAL / 10

Do not write in margin

(a) Describe the process of binary fission in bacteria.

.....

.....

.....

..... [4]

(b) Describe three ways by which bacteria can obtain energy.

1. .....

..... [2]

2. .....

..... [2]

3. .....

..... [2]

TOTAL / 10