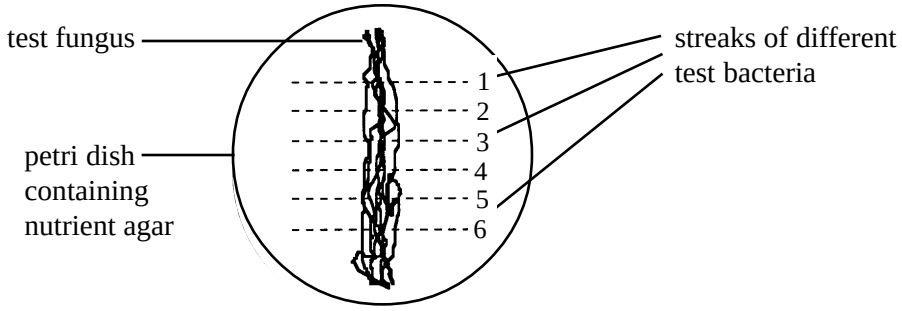
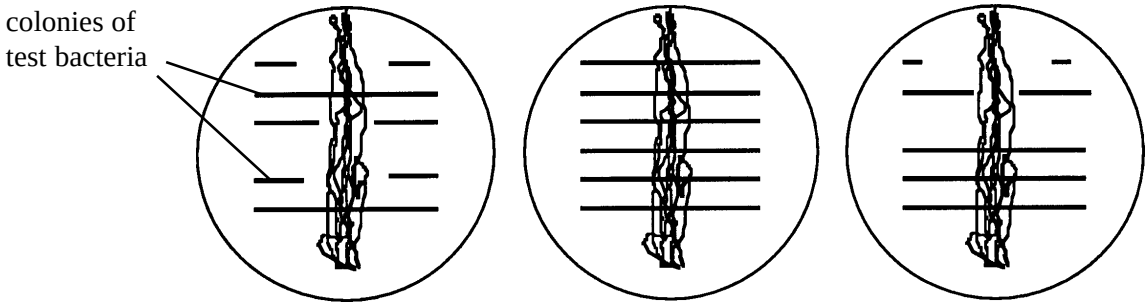
QUESTIONSHEET 1

Do not write in margin

The diagram shows a method of screening fungi for the production of an antibiotic.



The diagrams below show the results of three different fungi, A, B and C after incubating the petri dishes for 48 hours at a suitable temperature.



fungus **A** fungus **B** fungus **C**

(a) (i) Which of these fungi produces an antibiotic or antibiotics against these test bacteria? Explain your answer.

.....

.....

[2]

(ii) Suggest how these results could be used to estimate the effectiveness of the antibiotic against the different test bacteria.

..... [1]

(b) Antibiotics identified by screening fungi may not be developed for treating disease. Suggest two features of these antibiotics which may prevent their development.

.....

.....

[2]

(c) As bacterial cells grow their walls are constantly being broken down and reformed. One type of enzyme breaks down links between cell wall polymers and another enzyme adds new monomers. In some types of bacteria the antibiotic penicillin inhibits the enzyme which adds new monomers. Explain why penicillin causes the cells of these bacteria to burst.

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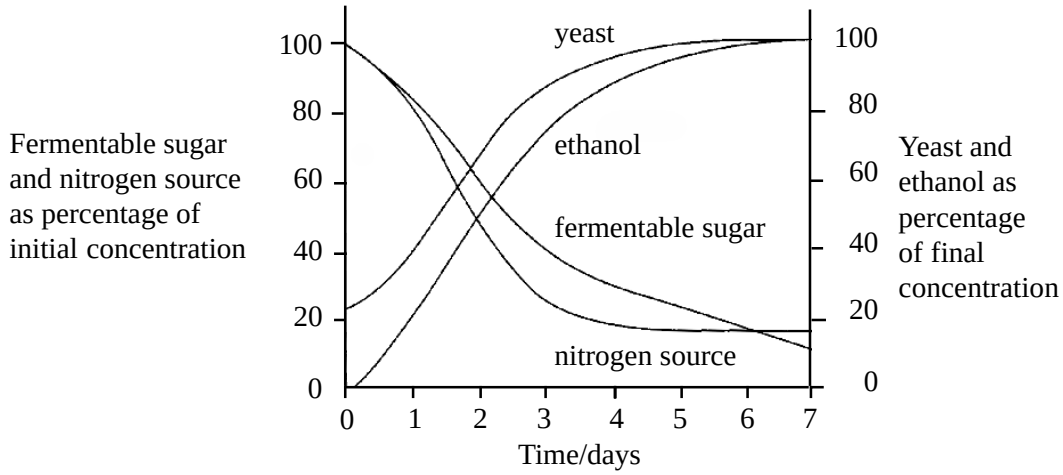
.....

[3]

TOTAL / 8

QUESTIONSHEET 2

(a) The graph shows some of the changes in concentration during the industrial production of ethanol by yeast.



(a) (i) Explain why the yeast population stops increasing.

.....

[1]

(ii) At which time would it be most economic to harvest the alcohol?
Give one reason for your answer.

.....

.....

[2]

(b) Beer is brewed using specially developed strains of yeast.

(i) Name the fermentable sugar in the culture medium.

.....

[1]

(ii) Explain why brewers favour the use of alcohol tolerant strains of yeast.

.....

[1]

(c) A brewing company has developed a number of mutant strains of yeast, some of which might have high tolerance to alcohol. Describe how these mutants might be screened to obtain a strain with a high alcohol tolerance.

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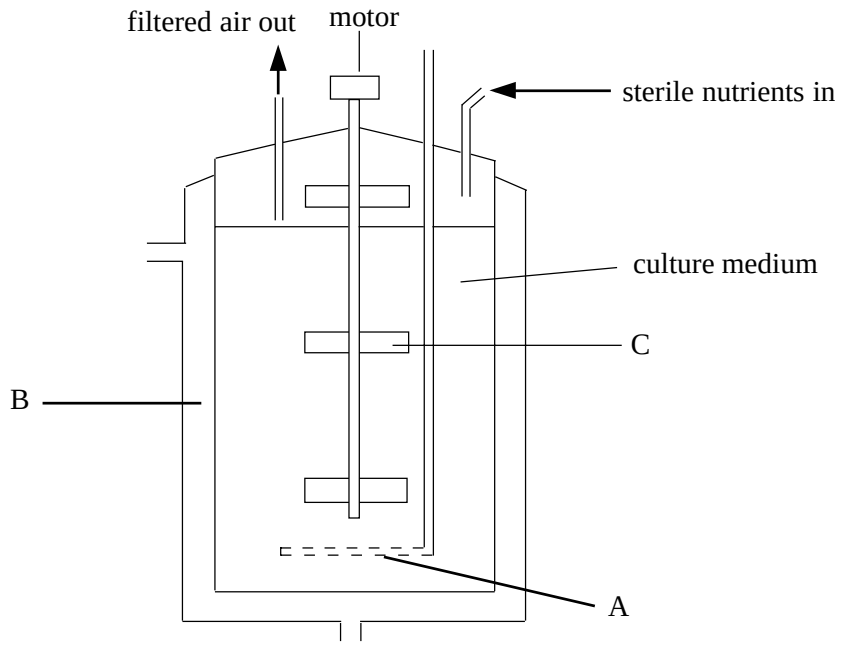
.....

.....

[3]

TOTAL / 8

The diagram shows one type of aerobic fermenter used by industry.



(a) What is the purpose of the part labelled A in the fermentation process?

.....

.....

[2]

(b) Explain how the parts labelled B and C help to maintain a constant temperature in an industrial fermenter.

.....

.....

.....

[2]

(c) An industrial fermenter may be used for the production of amino acids using microorganisms. Give one reason for the presence, in the culture medium used during the fermentation, of:

(i) glucose:

.....

[1]

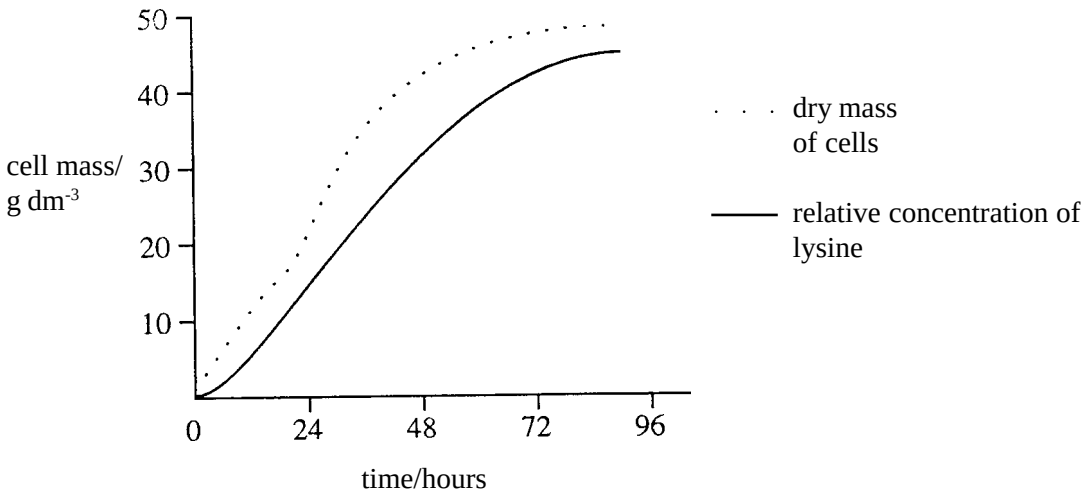
(ii) urea:

.....

[1]

(Continued...)

(d) The graph shows the production of the amino acid lysine by a bacterium.



(i) Lysine is a primary metabolite. What is the evidence from the graph which supports this statement?

.....

.....

[1]

(ii) How does the function of a primary metabolite differ from that of a secondary metabolite?

.....

.....

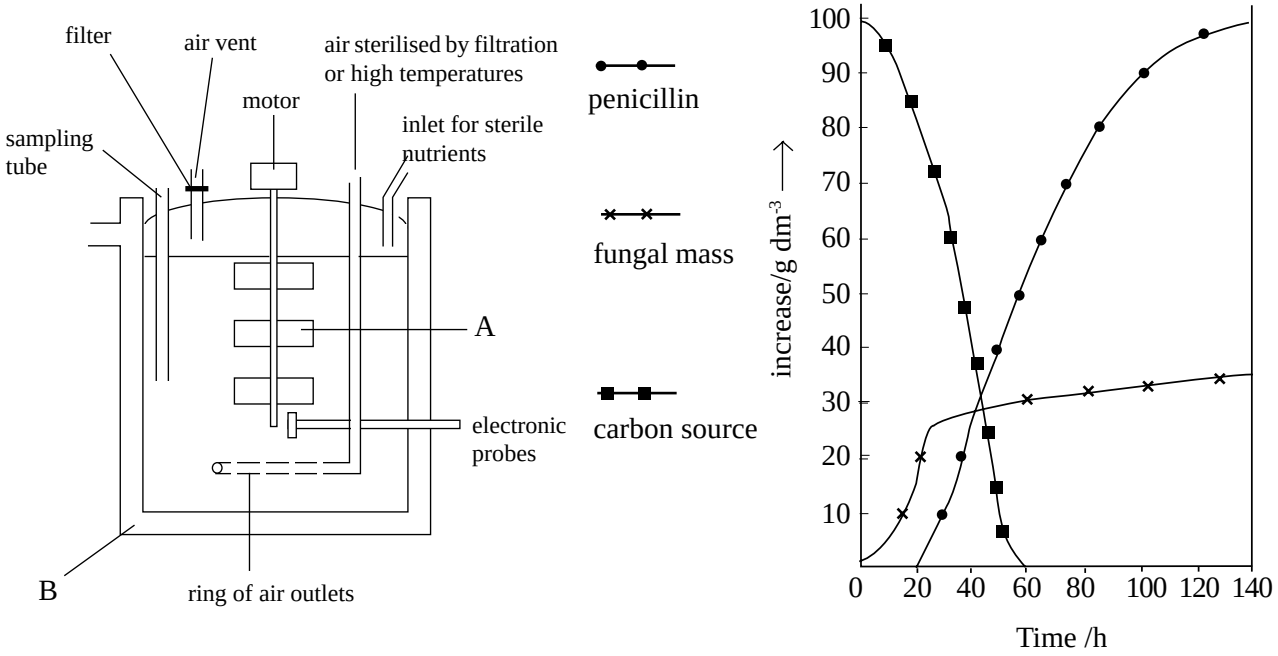
.....

[2]

TOTAL / 9

Do not write in margin

Penicillin may be manufactured by a process of batch fermentation. A suitable fermenter is shown below. The graph shows the pattern of penicillin production, fungal growth and utilisation of the carbon source.



(a) State the function of the following:

(i) A: ..... [1]

(ii) B: ..... [1]

(b) State three factors which will affect the total yield of penicillin obtained.

1: .....

2: .....

3: .....

[3]

(c) Using information in the graph, explain the term secondary metabolite.

.....

.....

.....

[2]

(d) Explain why penicillin production cannot be increased simply by adding larger quantities of nutrients when the fungi reach the plateau stage.

.....

.....

[1]

TOTAL / 8

Do not write in margin

(a) In a enzyme production process, state one advantage and one disadvantage of using submerged culture over surface culture for micro-organisms.

Advantage: ..... [1]

Disadvantage: ..... [1]

(b) State three industrial uses of enzyme production from microorganisms.

1: .....

2: .....

3: .....
[3]

(c) State two ways in which enzymes may be immobilised.

1. .....

2. .....
[2]

(d) State two advantages of using immobilised enzymes.

.....

.....

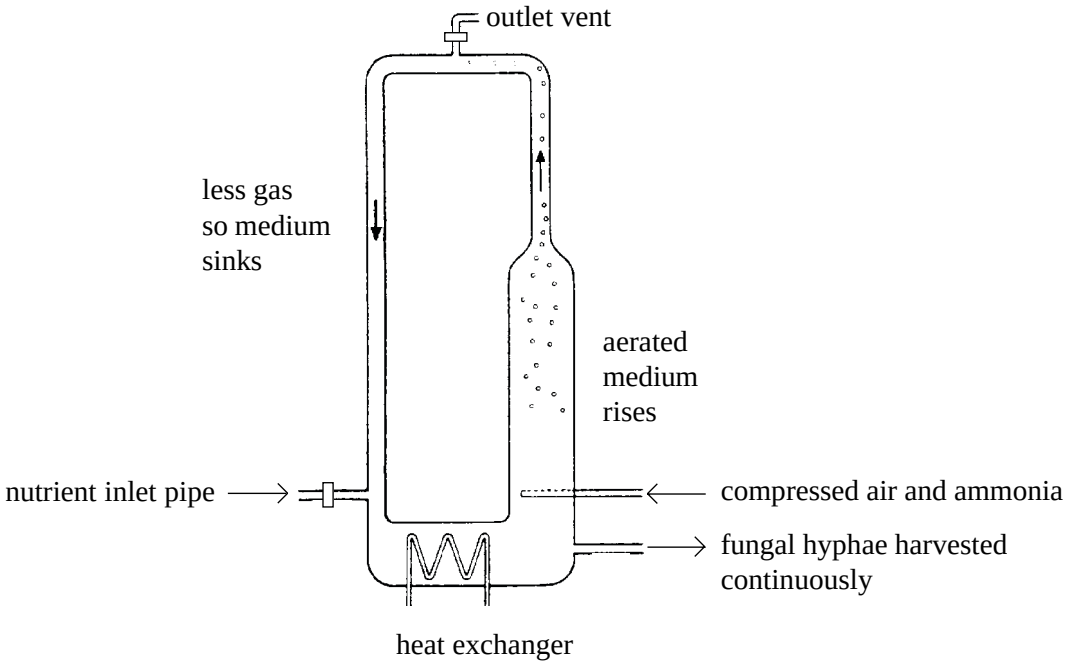
.....
[2]

TOTAL / 9

QUESTIONSHEET 6

Do not write in margin

The diagram shows a fermenter used in the industrial production of mycoprotein, using the fungus Fusarium graminearum.



(a) Explain why each of the following are added to the fermenter:

(i) Cereal starch: .....

..... [1]

(ii) ammonia: .....

..... [1]

(iii) RNA-digesting enzymes: .....

..... [2]

(b) State one advantage of continuous culture.

.....

[1]

(c) Suggest why mycoprotein is considered by many to be a healthy alternative to meat.

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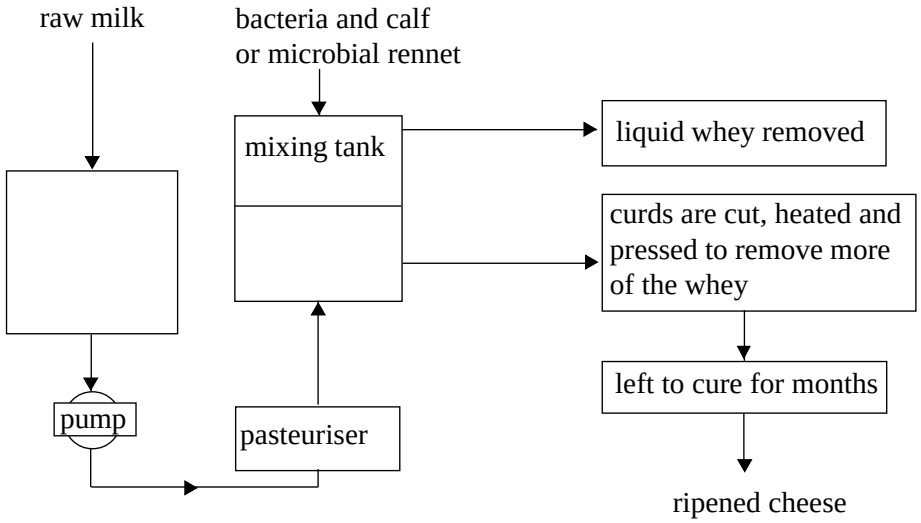
[1]

TOTAL / 6

QUESTIONSHEET 7

Do not write in margin

The diagram shows some of the stages in the manufacture of cheese.



(a) Name a bacterial species used in the initial stages of this process.

.....

[1]

(b) Outline the role of bacteria in cheese manufacture.

.....

.....

[2]

(c) Describe the action of the rennet in cheese manufacture.

.....

.....

.....

[2]

Chymosin, which is used in vegetarian cheese manufacture as a substitute for calf rennin, has been genetically engineered from the yeast, Kluyveromyces marxianus var. lactis.

(d) Outline the process of making genetically modified yeast cells which would produce chymosin.

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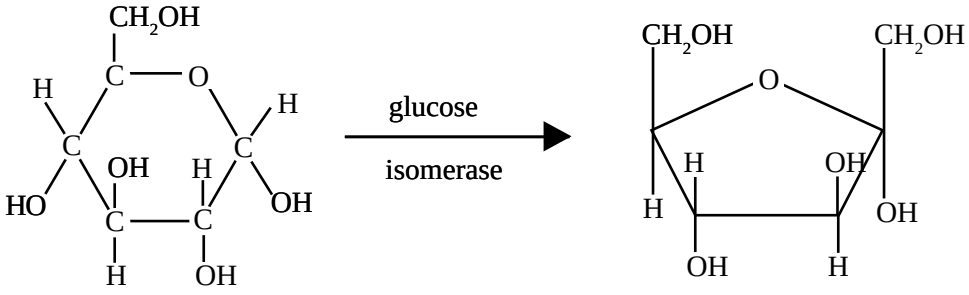
.....

[4]

TOTAL / 9

Do not write in margin

The diagram below shows the production of high-fructose corn syrup from glucose using the enzyme glucose isomerase.



α-glucose α-fructose

(a) Using the above reaction as an example, explain the term specificity.

.....

.....

.....

.....

[3]

(b) Outline the advantages of using:

(i) bacteria as a source of enzymes.

.....

.....

.....

[2]

(ii) enzymes as catalysts.

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.....

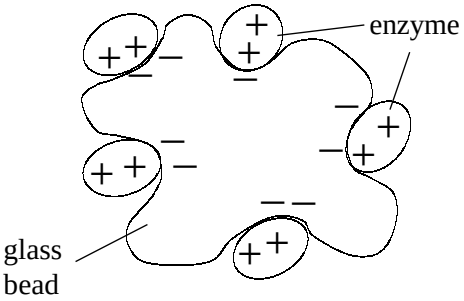
.....

[3]

TOTAL / 8

Do not write in margin

The diagram below shows one method by which enzymes may become attached to glass beads by adsorption which involves interaction between oppositely charged particles.



(a) What term is used to describe the technique in which enzymes are bound to surfaces?

.....

[1]

(b) State two advantages and two disadvantages of the use of enzymes bound by this technique.

Advantage 1: .....

Advantage 2: .....

Disadvantage 1: .....

Disadvantage 2: .....

[4]

(c) State two examples of the use of bound enzymes.

1 .....

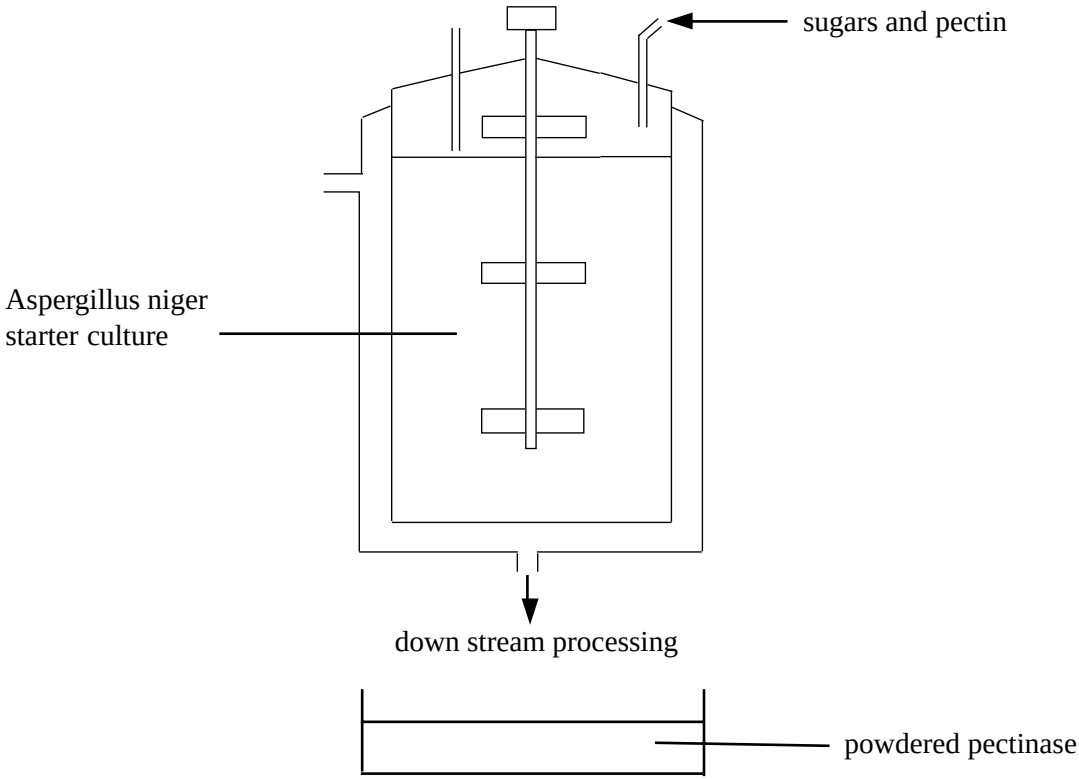
2 .....

[2]

TOTAL / 7

QUESTIONSHEET 10

(a) The diagram below shows some of the stages in the production of pectinase in the fruit juice industry.



(a) Explain the role of each of the following in the above process:

(i) Sugars.

.....

..... [2]

(ii) Pectin.

.....

..... [2]

(b) What is meant by the term ‘downstream processing’?

.....

.....

..... [2]

(c) Describe why pectinase is used in the fruit juice industry.

.....

..... [2]

TOTAL / 8

(a) Explain the following terms:

(i) continuous fermenter.

.....

.....

.....

[3]

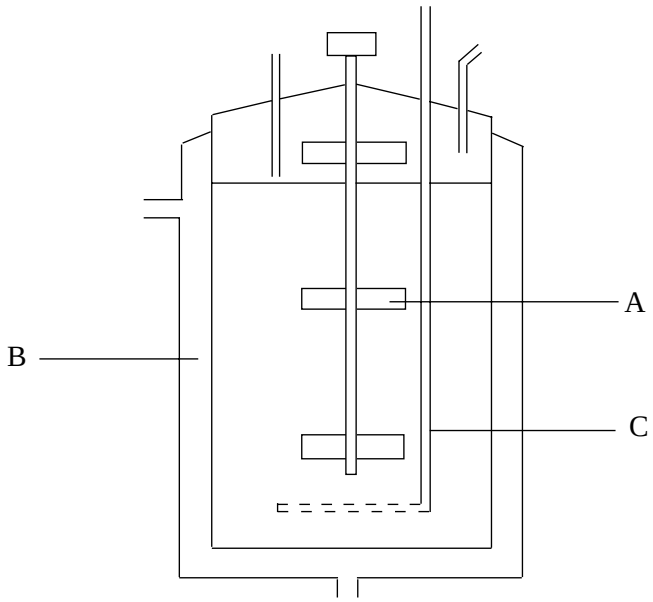
(ii) biocatalyst.

.....

.....

[2]

The diagram below shows one type of aerobic fermenter.



(b) Outline the role of each of the following in the fermenter:

(i) A . ..... [1]

(ii) B. ..... [1]

(iii) C. ..... [1]

(c) State an example of continuous fermentation used in industry.

..... [1]

TOTAL / 9

Do not write in margin

The table shows the volume of carbon dioxide collected from the fermentation of a number of carbohydrate sources by a strain of yeast used in the brewing of beer.

Carbohydrate source	Carbon dioxide/cm^3
starch(polysaccharide)	0
sucrose(disaccharide)	26
glucose(monosaccharide)	25
maltose(disaccharide)	20
fructose(monosaccharide)	28
lactose(disaccharide)	1

Germinated barley is used for brewing beer. During germination the starch stores are converted to maltose (malting).

(a) Use the information in the table to explain why the barley must be germinated before it is used for brewing.

.....

.....

.....

..... [3]

(b) The yeast is kept in a separate culture and a new inoculum added to each batch of beer being brewed. Explain why:

(i) the yeast is kept in a separate culture.

.....

.....

..... [2]

(ii) the yeast left at the end of the fermentation of beer cannot be used again.

.....

.....

..... [2]

(c) Suggest one use of the yeast left at the end of fermentation.

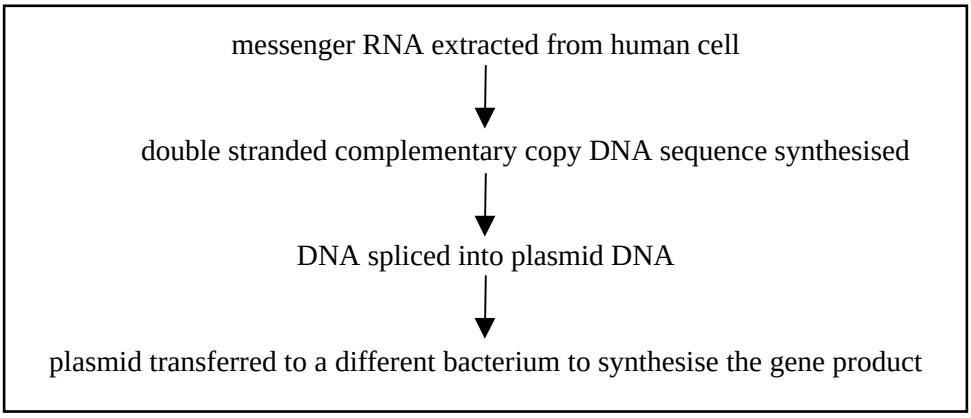
..... [1]

TOTAL / 8

QUESTIONSHEET 13

Do not write in margin

The diagram shows a sequence of events during genetic engineering.



(a) Describe how complementary copy DNA is synthesised from messenger RNA.

.....

.....

..... [3]

(b) Describe how enzymes are used to transfer copy DNA into a plasmid.

.....

.....

..... [3]

(c) Give two advantages of using bacteria to synthesise human gene products.

1. .....

2. ..... [2]

TOTAL / 8

QUESTIONSHEET 14

Do not write in margin

Enzymes used in biological washing powders are derived mainly from bacteria. The bacteria are grown by batch fermentation and secrete their enzymes into the culture medium.

(a) Explain why it is an advantage for these enzymes to be stable over a wide range of temperatures.

..... [1]

(b) (i) Describe how batch fermentation is carried out.

.....

.....

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.....

.....

..... [5]

(ii) Suggest how the enzymes might be obtained from the culture medium.

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.....

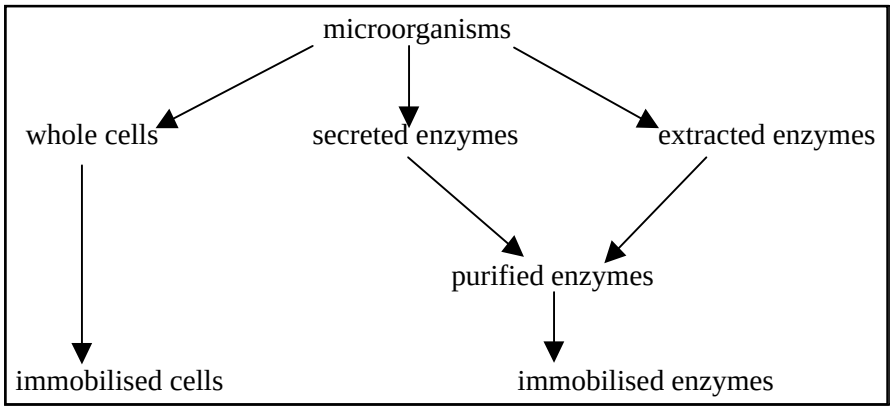
..... [3]

TOTAL / 9

QUESTIONSHEET 15

Do not write in margin

The flow diagram shows two ways in which enzymes for industrial processes may be produced.



(a) Describe two ways by which enzymes or cells may be immobilised.

1. .....

..... [2]

2. .....

..... [2]

(b) (i) Explain the advantages of using immobilised enzymes.

.....

.....

.....

.....

.....

..... [4]

(ii) Many enzymes used for industrial processes are obtained from microorganisms that are thermophilic (able to grow at high temperatures). Suggest why.

.....

.....

..... [2]

TOTAL / 10