Section A
[60 marks]

Answer **all** questions in this section.

1. Diagram 1 shows a plant cell.

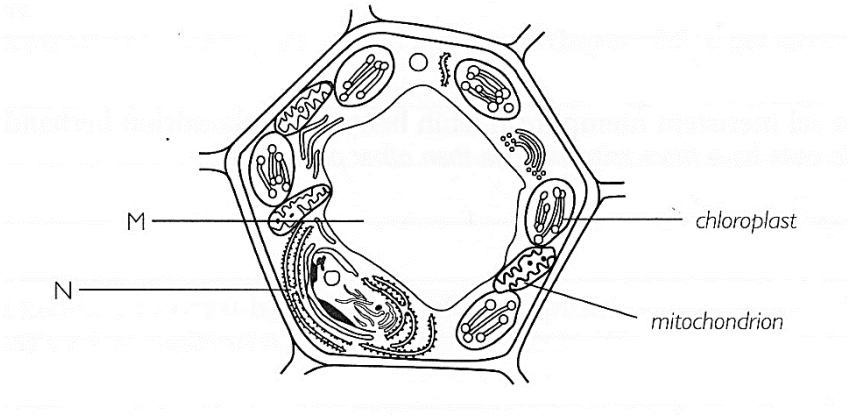

Diagram 1

(a) (i) Name organelle M.
Vacuole
[1 mark]

(ii) Explain the role of organelle M in a herbaceous plant.
Create turgor pressure for support in herbaceous plant
[1 mark]

(b) (i) Name organelle N.
Rough endoplasmic reticulum
[1 mark]

(ii) State the effect if the cell does not have organelle N.
Proteins synthesis by ribosomes cannot be transport to Golgi apparatus
[1 mark]

(c) (i) Name the type of cell that has highest density of chloroplast.
Palisade mesophyll cells
[1 mark]

(ii) Explain briefly the function of chloroplasts in photosynthesis.
Contain chlorophyll pigment to capture light energy and convert it into chemical energy
[2 marks]

(iii) Explain why chloroplasts are not found in animal cells.
The function of chloroplasts is to carry out photosynthesis. Animal cells do not carry out
Photosynthesis, thus they do not need chloroplast
[2 marks]

(d) State one similarity between the structure of a chloroplast and a mitochondrion.
Have double layers of membrane
[1 mark]

(e) Explain why meristematic cells have more mitochondria than other plant cells.

Meristemic cells in the root and shoot need more energy because they have to undergo mitosis repeatedly To produce more similar cells.

[2 mark]

2. Diagram 2 shows the conditions of three plant cells which have been immersed in three different solutions.

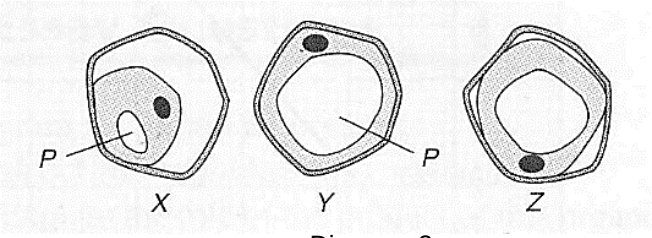

Diagram 2

(a) (i) Name structure P.

Vacuole

[1 mark]

(ii) State one function of P in plant cells.

P store chemical substances such as organic compounds, dissolved gases and waste products.

[1 mark]

(b) One of the cells in Diagram 2 has been placed in distilled water and the other two in 30% sucrose solution for 30 minutes. After 30 minutes, one of the plant cells was transferred and placed in distilled water while the other cell was left in sucrose solution. Identify which cell was

(i) left in the distilled water at the beginning of the experiment

Y

[1 mark]

(ii) transferred into distilled water

Z

[1 mark]

(iii) left in the sucrose solution

X

[1 mark]

(c) Explain the difference in appearance between the cell that was transferred into distilled water and the cell that was left in the sucrose solution.

Initially, both the cells are plasmolysed. However, the process of plasmolysis is more severe in cell X.
This is because the concentrated sucrose solution causes water to leave the cell by osmosis.
The vacuole and cytoplasm shrink and the plasma membrane is pulled away from the cell wall.
Cell Z was transferred and placed in distilled water. Water diffuses into the cell by osmosis, causing the cytoplasm and vacuole to expand. The cell undergo deplasmolysis.

[3 marks]

(d) A student placed some cheek cells in distilled water on a slide. After one hour, he could not see any cheek cells on the slide. Explain why.

No cheek cells are seen because water diffuses into the cell by osmosis; and causes the cells to expand and eventually burst. This is because a cheek cell (an animal cell) does not have a cell wall which can withstand the pressure that builds up within the cell.

Distilled water is hypotonic to the cheek cell. Water diffuses into the cheek cell by osmosis.

[3 marks]

(e) A doctor sometimes injects fluid into a patient. Suggest **two** precautionary steps in administering the injection so that the patient's life is not endangered.

The doctor has to ensure that the fluid has the same concentration as the patient's blood plasma.

The fluid has to be sterile and not contaminated with foreign or toxic substances.

[2 marks]

3. Diagram 3 shows an alveolus.

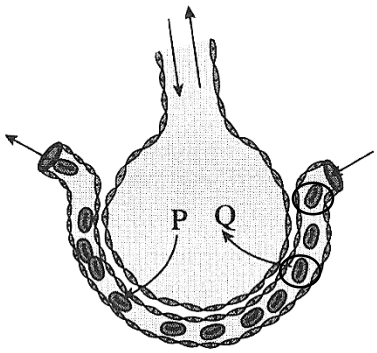

Diagram 3

(a) (i) Name a process that takes place in the alveolus.

Gaseous exchange

[1 mark]

(ii) Explain the structural adaptations of the alveolus for the process you have named in 3(a)(i).

An alveolus has its inner lining made up of moist epithelial cells to allow the diffusion of oxygen and Carbon dioxide to take place. The outer surface of an alveolus is covered by a vast network of blood capillaries to speed up the diffusion of respiratory gases.

[2 marks]

(b) The sequence below shows the passage of respiratory gases in human respiratory system. Complete the sequence below.

Rongga hidung → Trachea → Bronchus → Bronchiole → Alveolus

[2 marks]

(c) (i) Circle two red blood cells that have high concentration of carbon dioxide on Diagram 3.

[1 mark]

(ii) P and Q are respiratory gases. Identify gases P and Q and complete Table 3.1 to show the partial pressure of gases P and Q in the alveoli and blood capillaries.

	Respiratory gases	Partial pressure		Effects on the gases
		In the alveolus	In the blood capillaries	
P:	Oxygen	High	Low	Oxygen flows from the alveoli into the blood capillaries by diffusion
Q:	Carbon dioxide	Low	High	Carbon dioxide diffuses from the blood capillaries into the alveoli by diffusion

Table 3.1

[4 marks]

(d) Differentiate between the characteristics of the human respiratory system and the respiratory system of amphibians in Table 3.2.

Characteristics	Humans	Amphibians
Respiratory organs	Lungs	Skin and lungs
Respiratory structures	Alveoli	Skin and lungs

Table 3.2

[2 marks]

4. Diagram 4 shows the human hip joint.

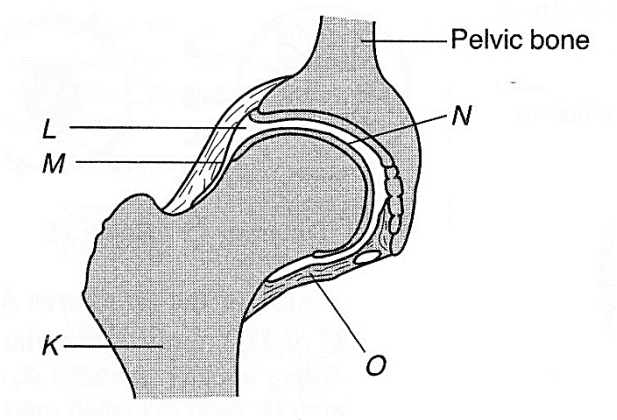

Diagram 4

(a) Name the structures labelled K, L, M, N and O.

K: Femur

L: Synovial fluid

M: Synovial membrane

N: Cartilage

O: Ligament

[5 marks]

(b) List the functions of:

L: To lubricate the joint so that friction can be reduced

M: To produce synovial fluid

N: To act as a shock absorber during movement

O: To join one bone to another

[4 marks]

(c) Name the type of joint shown.

Ball and socket joint

[1 mark]

(d) What kind of movement is allowed by this type of joint?

Movement in all planes

[1 mark]

(e) List another example of this type of joint in human body.

Shoulder joint

[1 mark]

5. Diagram 5 shows a defence mechanism when pathogens get into the circulatory system.

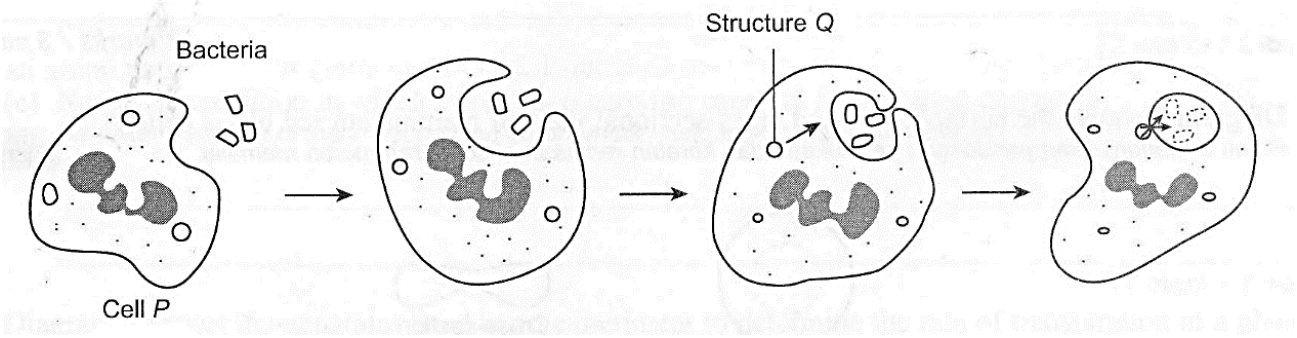

Diagram 5

(a) State the name of this process.

Phagocytosis

[1 mark]

(b) (i) State the specific name given to cell P.

Neutrophil

[1 mark]

(ii) State two features of cell P that enable you to identify the cell.

Lobed nucleus // granular // amoeboid shaped

[2 marks]

(c) (i) Name the structure Q.

Q is a lysosome

[1 mark]

(ii) Explain how Q helps in destroying the bacteria.

It contains digestive enzymes. The lysosome fuses with the vacuole containing bacteria and releases its Enzymes which then hydrolysed the bacterial cells.

[3 marks]

(d) When the pathogens are not destroyed by this line of defence, a specific immune response takes place which gives a long-term immunity.

(i) Name the white blood cells involved in the specific immune response.

Lymphocyte

[1 mark]

(ii) Explain how a long-term immunity is achieved.

When lymphocytes detect a specific antigen, they are stimulated to divide and produce a clone of Antibody-secreting cells and memory cells. The memory cells are long-lived and if there are Subsequent infections by the same pathogen, these cells will immediately stimulate the production of Large quantities of antibody.

[3 marks]

Section B
[40 marks]

Answer any **two** questions from this section.

6. Two types of action controlled by the human nervous system are voluntary and involuntary actions. An involuntary action that occurs in response to a stimulus is known as a reflex action.

Diagram 6 shows a reflex arc in the human coordination system.

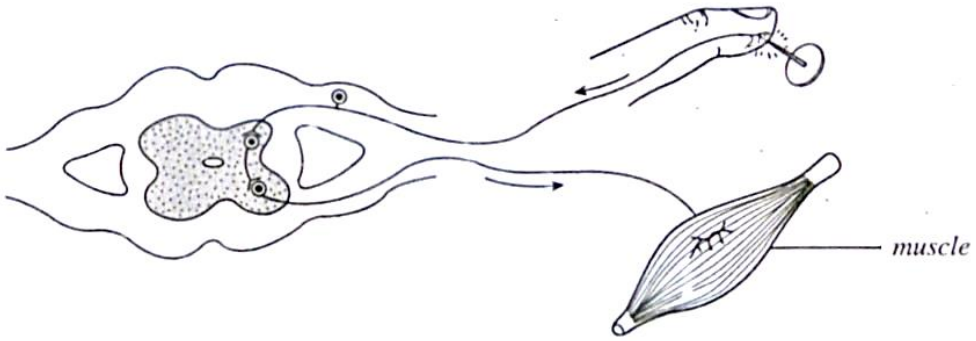

Diagram 6

(a) (i) Describe the reflex arc shown in Diagram 6.

[4 marks]

(ii) Give **three** differences between voluntary and involuntary actions.

[6 marks]

(b) Ali has taken food with a high salt content and drunk only a small amount of water. To control his blood pressure, his body needs to undergo a certain mechanism. Describe this mechanism.

[10 marks]

7. (a) Diagram 7.1 shows a type of interaction between organisms.

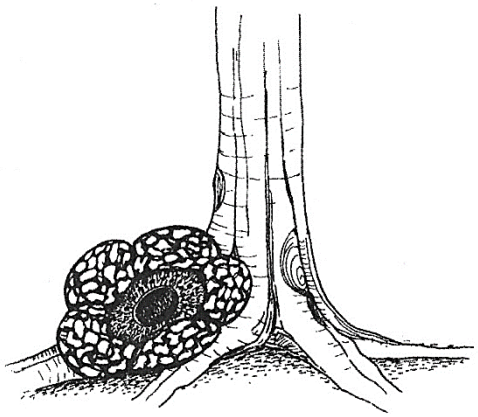

Diagram 7.1

Name and describe the interaction shown in Diagram 7.1.

[4 marks]

(b) A farmer found that when the number of mice increases, the yield of palm fruits decreases. Suggest how the farmer can control the population of mice without the use of pesticides. Explain how the method works.

[5 marks]

(c) Diagram 7.2 shows the roles of useful microorganisms in an ecosystem.

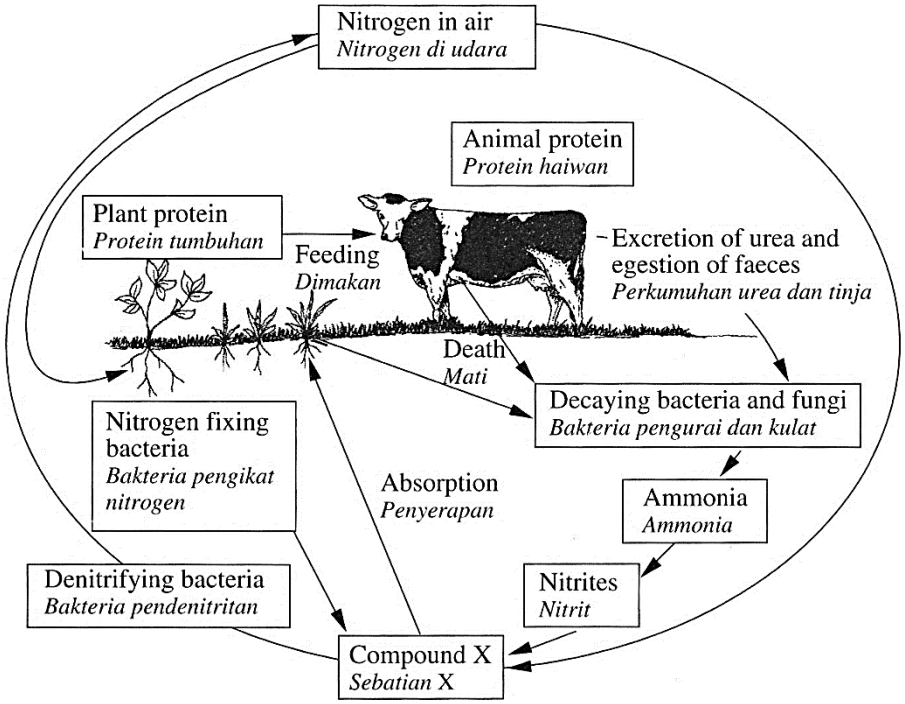

Diagram 7.2

(i) Based on Diagram 7.2, explain how the microorganisms maintain the content of compound X in the soil.

[8 marks]

(ii) Explain what will happen to the ecosystem if all the decaying bacteria and fungi die.

[3 marks]

8. Diagram 8 shows examples of processed food.

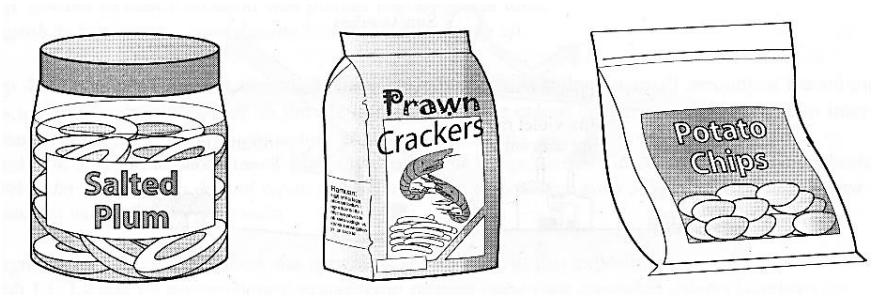

Diagram 8

(a) Based on your biological knowledge, explain the advantages and the disadvantages of food processing on human being.

[10 marks]

(b) Explain the food processing methods which are related to the factors that cause food spoilage.

[10 marks]

9. No species can live by themselves without affecting and being affected by the environment.

(a) Prove that the above statement is true by using examples of plant species in an unused mining pond.

[10 marks]

(b) Some bacteria are harmless and some are useful to humans. Discuss the use of bacteria in producing or manufacturing useful products for humans.

[10 marks]

END OF QUESTION

ANSWER:

6(a)	*A prick by a sharp object (such as a thumbtack) is a stimulus that is detected by the sensory-*	
(i)	*receptors in the skin which generate nerve impulses.*	
	The nerve impulses are transmitted along an afferent neurone towards the spinal cord. In the grey	
	matter of the spinal cord, the nerve impulses are transmitted from the afferent neurone to an	
	interneurone.	
	From the interneurone, the nerve impulses are transmitted to an efferent neurone. The efferent	
	neurone carries the nerve impulses from the spinal cord to the effector which is the muscle tissue	
	The muscle contracts, so that the finger is released from the thumbtack immediately.	

6(a)(ii)

Voluntary action	Involuntary action
Involves thought Is controlled by the cerebrum The speed of action is slow	Does not involve thought Is controlled by the spinal cord and medulla oblongata The speed of action is fast

6(b)	Osmoregulation is the process of maintaining the water content of the blood at a constant level.	
	Osmoregulation is achieved by regulating the production of urine by the kidneys via a	
	Negative feedback mechanism.	
	When the water level in the body drops below the normal range, the concentration of solutes in	
	The blood increases.	
	The blood osmotic pressure increases.	
	The osmoreceptor cells in the hypothalamus detect this increase in blood osmotic pressure.	
	This will stimulate the pituitary glands to release more antidiuretic hormone (ADH) into the blood.	
	ADH travels in the blood to the kidneys where it increases the permeability of the distal	
	Convoluted tubules and collecting ducts.	
	Water reabsorption from the filtrate into the blood capillaries is increased.	
	This results in a decrease in the blood osmotic pressure which returns to the normal range.	
	The water content of the urine decreases and the urine becomes more concentrated.	

7(a)	Parasitism. The organism (*Rafflesia sp*.) benefits by living and obtaining nutrients from its	
	living host and causes harm and weakens its host in the process by using its modified root.	
(b)	Use biological control which involves prey-predator relationship.	
	Predator (snake/owl) are used to catch prey (mice). Thus population of mice decreases.	
	The predator must be specific/natural and must not harm the oil palm tree.	
	This prey-predator interaction will ensure that the population of each other will be regulated	
	in a cyclical manner which maintains the populations of both organisms in a dynamic	
	equilibrium.	

(c)(i)	Nitrogen-fixing bacteria in the root nodules of leguminous plants use nitrogen in the air to make	
	nitrates. The nitrates are then absorbed by plants to make proteins. When animals eat plants,	
	the proteins are transferred to the animals. When plants and animals die (excrete nitrogenous	
	substances), these dead organisms or nitrogenous substances are broken down to ammonia by	
	bacteria of decay. Nitrifying bacteria convert ammonium compounds to nitrites. Nitrifying	
	bacteria change nitrites to nitrates. Denitrifying bacteria convert nitrates to nitrogen and	
	release to atmosphere.	
(ii)	No decomposition will take place. As a result the remains of dead organisms including animal	
	waste products are not broken down into simpler inorganic substances which are to be used	
	by plants. The soil becomes infertile and photosynthesis cannot take place.	

8(a)	Good (Advantages)	
	To preserve food	[1]
	Avoid wastage of food // prevent food spoilage // can be stored (for future use).	[1]
	To increase its commercial value // uses of food additives	[1]
	Improve the taste // appearance // texture of food // to preserve the freshness	[1]
	To diversify the uses of food substances	[1]
	Increases the variety of product	[1]
		Max 5
	Bad (Disadvantages)	
	Uses food additive	[1]
	Give long term side effect // reduce the nutrient // vitamin in the food	[1]
	Too much sugar	[1]
	Increases the risk of diabetes.	[1]
	Food colouring // yellow dye // tartrazine	[1]
	Causes allergy reaction	[1]
	Too much salt	[1]
	Increase the risk of high blood pressure	[1]
	Sodium nitrate	[1]
	Cause nausea // asthma (to certain people)	[1]
		Max 5

8(b)	Food can be preserved	[1]
	by destroying the microorganism present in the food //	[1]
	by stopping the activities ol the microorganism.	[1]
	Cooking at high temperature kill the microorganisms.	[1]
	Denature the activities of the microorganism.	[1]
	Treating food with sugar // salt	[1]
	Causes the microorganism to lose water due to osmosis.	[1]
	Adding vinegar will reduce the pH	[1]
	Prevent microorganism from growing.	[1]
	Fermentation of fruit juices and other food by adding yeast.	[1]
	High concentration of alcohol prevent the microorganism lrom growing.	[1]
	Dry under hot sun (meat/flsh/fruits).	[1]

	Removes water from food-dehydrated.	[1]
	Ultraviolets rays	[1]
	Kills microorganism	[1]
	Pasteurisation	[1]
	Destroy bacteria which cause tuberculosis and typhoid	[1]
	(Technique) Food is heated to 63^{o}C for 30 minutes //	[1]
	72^{o}C for 15 seconds followed by rapid cooling to 10^{o}C.	[1]
	(Pasteurisation) retains the natural flavour and nutrients.	[1]
	Canning	[1]
	uses heat sterilisation to kill microorganisms and their spores	[1]
	(Technique) Food is packed in cans, steamed at high temperafure and pressure to drive out air	[1]
	The vacum created within the cans prevent growth of microorganism	[1]
	Refrigeration	[1]
	Food stored at temperature below 0^{o}C prevent growth // germination of microorganism.	[1]
	Food remain fresh for a long period of time.	[1]
		Max
		10

9	The pioneer species are microscopic algae (phytoplankton) and submerged water plants.	
(a)	The pioneer species die and decompose to become humus or organic substance which is deposited	
	at the bottom of the pond.	
	Soil at the side of the pond is eroded and deposited at the base of the pond.	
	As a result, the pond becomes shallower and now is not suitable for submerged water plants.	
	Floating water plants which are the successors replace the submerged water plants.	
	The floating water plants grow rapidly and cover the water surface of the pond.	
	This prevents sunlight from reaching the plants in the pond.	
	The submerged water plants cannot carry out photosynthesis and soon die.	
	The decayed organic substance from the submerged water plants and floating water plants continue to be	
	deposited at the bottom of the pond.	
	As a result, the pond becomes too shallow for the floating water plants.	
	Gradually, the floating water plants are replaced by amphibious plants.	
	When the old amphibious plants die and decompose, more organic substances are being added to the	
	Pond. The pond becomes very shallow and is not suitable for amphibious plants.	
	Another succession occurs and the amphibious plants are replaced by the lower land plants.	
	The land plants spread rapidly and a secondary forest is formed.	
	Finally, a climax community like the tropical rain forest is formed.	

9	Production of antibiotics	
(b)	Antibiotics are chemical substances that are used to destroy or inhibit the growth of microorganisms.	
	Example of antibiotics is streptomycin which is produced by the bacteria *Streptomyces sp*.	
	Cleaning of oil spills	
	Certain bacteria can be used to clean up oil spills from the ships.	
	Sea and beaches that are contaminated with oil can be sprayed with this bacteria.	
	The bacteria break down the oil into carbon dioxide and water.	

	Waste treatment	
	Waste materials such as domestic waste (soap and detergent), sewage waste and organic waste from	
	industry can be treated by bacteria.	
	In the treatment, waste materials in the liquid form are pumped into a treatment plant.	
	Bacteria, together with oxygen and minerals (needed by the bacteria) are added to break down the	
	waste materials into harmless substances.	
	Food processing	
	Yogurt is produced from fermented milk by adding bacteria such as *Lactobacillus bulgaricus* and	
	Streptococcus thermophillus.	
	The bacteria act to lactose in the milk and convert it into lactic acid.	
	The lactic acid then curdles and coagulates the casein (protein in the milk) to form curd.	
	The bacteria *Azobacter sp.* is used to produce vinegar.	