Manufacturing of Fermented Dairy Products

(OFO-code: 681301)

EXTERNAL SUMMATIVE ASSESSMENT: THEORY

Learner name & surname: _____

Assessor name & surname: _____

Date: _____

DECLARATION OF COMPETENCE	
To be completed by the External Assessor (tick the applicable block)	
Learner competent (C)	
Learner not yet competent (NYC)	

Instructions to the Learner:

1. Answer all of the following questions without referring to any notes.
2. No group work is allowed, i.e. complete the questionnaire on your own individual effort.
3. After completion, hand the questionnaire to the External Assessor for evaluation.
4. You need to obtain a minimum of 70% for this assessment in order to be found competent in the theory component.

1. Fit column A to column B by drawing a line from the sentence in column A to the correct word in column B. (½ mark each) (2)

During fermented dairy products manufacturing, pasteurisation of the dairy mixture is performed in order to:

Column A	Column B
Expel _____ and thus create aerophilic conditions, which is favourable of the growth of starter bacteria.	kill
_____ all pathogenic (disease-causing) micro-organisms.	hydration
Reduce the number of spoilage micro-organisms to such a level that the _____ of the fermented dairy product is extended.	oxygen
Supply sufficient heat for _____ of heat stabilisers.	shelf-life

2. Name the specified minimum time-temperature combination for pasteurisation of milk/dairy mixture for:

Yoghurt: _____ (2)

Maas: _____ (2)

3. (a) Why are the raw materials heated to 50 - 60°C during mixing and blending for yoghurt manufacturing? (1)

_____

_____

(b) Name 2 functions of a slow stirring action in the tank whilst adding raw materials for yoghurt manufacturing. (2)

_____

_____

4. Complete the table below by listing 4 main ingredients of low fat sweetened fruit yoghurt, with the function of each. (8)

Ingredient	Function
1.	
2.	
3.	
4.	

5. (a) Name the 2 micro-organisms that are commonly found in yoghurt cultures. (2)

_____

_____

(b) Why are *Bifidobacterium*- and *acidophilus*-cultures added to the above-mentioned organisms in yoghurt cultures? (1)

_____

_____

_____

6. What is the function of stabilisers during yoghurt manufacturing? (2)

7. (a) How is a stabilising effect obtained through a stabiliser? (6)

(b) What does “iso-electric point” mean? (2)

_____

_____

_____

_____

8. What is the time-temperature combination for incubation of 2 of the fermented dairy products manufactured at your factory? (2)

Product 1: _____

Product 2: _____

9. What will happen if the incubation temperature:

(a) Increases during coagulation? (2)

_____

_____

(b) Decreases during coagulation? (2)

_____

_____

10. Why must the inoculum size not be too big or too small during inoculation of milk/dairy mixture for manufacturing of fermented dairy products? (4)

_____

_____

_____

_____

_____

_____

11. What will happen if the incubation period is:

(a) Too long? (1)

_____

_____

_____

(b) Too short? (1)

_____

_____

_____

12. Name and shortly describe 2 types of incubation/fermentation processes for maas. (4)

_____

_____

_____

_____

_____

_____

_____

_____

13. Name 2 factors that will affect coagulation. (2)

_____

_____

14. What is the difference between acid coagulation and sweet coagulation? (2)

_____

_____

_____

_____

15. (a) At what temperature should fruit pulp be mixed into the yoghurt base? (1)

_____

(b) Why at this temperature? (2)

_____

_____

_____

TOTAL: (53)

Occupational Certificate: Fermented Dairy Products Maker

EXTERNAL SUMMATIVE ASSESSMENT

LEARNER NAME & SURNAME_____

LEARNER ID NUMBER:_____

ASSESSOR NAME & SURNAME:_____

DATE:_____

DECLARATION OF COMPETENCE	
To be completed by external assessor (Tick applicable box)	
Learner Competent (C)	
Learner not yet Competent (NYC)	

Instructions to the Learner:

1. Answer all of the following questions without referring to any notes.

2. No group work is allowed, i.e. complete the questionnaire on your own individual effort.

3. After completion, hand the script to the invigilator
4. You need to obtain a minimum of 50% in both theory and application sections for this assessment in order to be found competent.

TOTAL MARKS	**170**
LEARNER MARK	

Duration: 4 Hours

SECTION A (THEORY)

Question 1: Prepare raw milk and make additions for the manufacturing of fermented dairy products.

1.1 Interpret production instructions for the manufacturing of fermented dairy products milk

Multiple choice (Circle the correct answer)

1.1.1 Which of the following bacteria is used in the fermentation of yogurt? (1)

A. Lactobacillus bulgaricus
B. Streptococcus thermophilus
C. Bifidobacterium Bifidum
D. All of the above

1.1.2 A coagulant formed during the fermentation of yogurt is? (1)

A. Calcium lactate
B. Potassium chloride
C. Lactic acid
D. Rennet

1.1.3 Which of the following is Not a function of Starter cultures in cheese production? (1)

A. They provide acidity and flavor
B. They coagulates milk proteins
C. They inhibit the growth of photogenic bacteria
D. They produce Carbon dioxide

1.1.4 Milk must be heated to a temperature of at least..... To be pasteurized? (1)

A. 100 degrees Celsius
B. 140 degrees Celsius
C. 85 degrees Celsius
D. 212 degrees Celsius

1.1.5 The equipment used to heat milk and hold it at a constant temperature during fermentation is called? (1)

A. Fermentation vat
B. Pasteurizer
C. Heat exchanger
D. Homogenizer

1.1.6 What is the process of converting milk or dairy mixture for manufacturing of fermented dairy products? (1)

A. Pasteurization
B. Homogenization
C. Fermentation
D. Coagulation

1.1.7 In the production of fermented dairy products what role does Lactic acid bacteria play in the coagulation process? (1)

A. It acts as a sweetening agent
B. It improves the aroma of the product
C. It lowers the PH to promote coagulation
D. It helps to increase the fat content

1.1.8 Which factor is crucial to monitor for successful fermentation in dairy production? (1)

A. Sugar content
B. Fat content
C. pH level
D. Protein content

1.1.9 Which stage is necessary before preparing milk for the manufacturing of fermented dairy products? (1)

A. Filtration
B. Skimming
C. Cooling
D. Aging

1.1.10 What is the term used to describe coagulated milk or dairy mixture for further processing? (1)

A. Condensation
B. Coagulum
C. Homogenization
D. Pasteurization

Question 2 : Obtain other raw materials required for fermented dairy product manufacturing where applicable

TRUE Or FALSE

1.2.1 Pasteurization is a process used in dairy industry to kill pathogenic bacteria in milk.(2)

A. True

B. False

1.2.2 Probiotics are living microorganisms that can provide health benefits when consumed in adequate amounts, commonly found in yogurt and other fermented dairy products. (2)

A. True

B False

1.2.3 Homogenization is a process used to separate the cream from the milk in dairy products. (2)

A True

B False

1.2.4 The process of centrifuging milk to separate the solids is known as pasteurization.(2)

A True

B False

1.2.5 Casein is the primary protein found in milk, accounting for about 80% of the total protein content. (2)

A True

B False

2.1 Fermented dairy product ready for packaging

2.1 .1 What are the key factors to consider when determining the optimal fermentation time for the dairy product?(3)

_____

_____

_____

_____

2.1.2 How does the consistency of the final product change based on the coagulation time of the dairy mixture? (2)

_____

_____

2.1.3 What role do starter cultures play in the fermentation of dairy products?(1)

_____

_____

_____

_____

_____

_____

2.1.4 What is the significance of monitoring and controlling the coagulation process in dairy product manufacturing? (2)

_____

_____

_____

_____

_____

_____

_____

2.1.5 How does the coagulation process impact the texture and flavor of fermented dairy products?(2)

_____

_____

_____

_____

_____

_____

_____

_____

2.1.6 Name the specified minimum time-temperature combination for pasteurization of milk/dairy mixture for:

Yogurt:

_____

_____

_____(1)

Maas:

_____

_____

_____

_____

_____(1)

2.2 Perform food safety practices (personal hygiene, manual and in-place cleaning and sanitizing, good manufacturing practices) and occupational health and safety practices

2.2.1 What role does proper ventilation play in maintaining a safe working environment in a food production facility?(2)

2.2.2 What procedures should be in place to handle and dispose of hazardous materials safely in a food manufacturing facility?(2)

_____

_____

_____

_____

_____

_____

_____

_____

2.2.3 What are some common hazards that workers in a food production facility may face, and how can they be mitigated?(2)

_____

_____

_____

_____

_____

_____

_____

2.2.4 Why is it important to regularly assess and update occupational health and safety practices in a food production facility?(4)

_____

_____

_____

_____

_____

_____

_____

_____

2.2.5 How can personal hygiene practices contribute to food safety in a food manufacturing setting? (3)

_____

_____

_____

_____

_____

_____

_____

Question 3 : Demonstrate the ability to control production during manufacturing of fermented dairy products.

3.1

3.3.1 How do you ensure the quality of fermented dairy products during production? (3)

_____

_____

_____

3.3.2 How can profitability be increased in the production of fermented dairy products?(4)

_____

_____

_____

_____

_____

_____

_____

_____

3.3.3 What strategies can be implemented to improve productivity in the production of fermented dairy products?(5)

_____

_____

_____

_____

_____

_____

_____

3.3.4 How can sensory evaluation be used to assess the quality of fermented dairy products? (3)

_____

_____

_____

_____

_____

_____

_____

3.3.5 How can market trends and consumer preferences influence the production of fermented dairy products?(3)

_____

_____

_____

_____

_____

3.3.5 What are some sustainable packaging options that can be used for fermented dairy products? (2)

_____

_____

_____

_____

4.1 **Fill in the blanks**

4.1.1 The process of homogenization works by breaking up the _____ of the milk. The process of pasteurization heats the milk to a temperature of at least _____ degrees Celsius. When pasteurizing milk, it's important to monitor the temperature of the milk throughout the process using a _____. The process of pasteurization is often done in a device called a _____The process of causing a food to ferment by adding microorganisms is called_____. The process of heating a food to a specific temperature to kill off bacteria and other microorganisms _____ machine used to homogenize milk by forcing it through a narrow tube under pressure. _____.The addition of microorganisms, such as yeast or bacteria, to a food to cause fermentation_____. The breaking down of the fat in milk into smaller particles_____. (9)

SECTION B (APPLICATION)

QUESTION1: Prepare raw milk and make additions for the manufacturing of fermented dairy

1.1 Interpret production instructions obtain fermented dairy products milk

1.1.1 You're a dairy production manager at a facility that produces a variety of fermented dairy products. You're responsible for ensuring that the products are manufactured to the highest standards of quality and food safety. You're also responsible for ensuring that the products are profitable.

You receive a shipment of raw milk and need to make a series of decisions about how to prepare the milk and what additions to make to manufacture fermented dairy products.

I. Identify the properties of raw milk and the types of bacteria used in fermentation ? (4)

_____

_____

_____

_____

_____

_____

_____

_____

II. What are the key bacteria used in the fermentation of raw milk? (2)

_____

_____

_____

_____

_____

_____

III. How does pasteurization affect the ability of bacteria to ferment milk?(4)

_____

_____

_____

_____

_____

_____

_____

_____

IV. You receive a shipment of raw milk, but it's not quite up to the quality standards you require. What are some possible reasons for this, and what could you do to fix the problem?(5)

_____

_____

_____

_____

_____

_____

_____

_____

_____

1.1.2 In this case study, you're responsible for managing the production of a fermented dairy product, such as yogurt, cheese, or kefir. You've identified a problem with the manufacturing process that's causing a decrease in the quality of the product. Using the information you've learned about the production process, you need to figure out what the problem is and how to fix it.

I. What are the three main steps you would follow in the production of fermented dairy products? (3)

_____

_____

_____

_____

_____

_____

_____

II. Based on your response above(I) explain the three main steps in the production of fermented dairy products? (6)

_____

_____

_____

_____

_____

_____

_____

_____

III. During pasteurization, what are the three factors that need to be controlled to ensure that the process is effective?(3)

_____

_____

_____

_____

_____

_____

_____

IV. Imagine that you've just taken over the management of a dairy processing plant, and you've noticed that the pasteurization process isn't working properly. The milk is not being heated to the correct temperature, and the product quality is suffering. What do you think is the most likely cause of this problem?(5)

_____

_____

_____

_____

_____

_____

_____

_____

_____

1.2 **Obtain other raw materials required for fermented dairy product manufacturing where applicable.**

1.2.1 You've developed a fermented dairy product that has been successfully processed and is ready for packaging. However, you need to choose the most suitable packaging option. What factors would you consider when making this decision?(5)

_____

_____

_____

_____

_____

_____

_____

_____

1.2.2 Imagine you've been asked to develop a new fermented dairy product using coagulated milk or dairy mixture. However, the product must meet certain health and safety standards set by a regulatory body. How would you modify the production process to ensure the product meets these standards?(5)

_____

_____

_____

_____

_____

_____

_____

1.2.3 Analyze the process of producing coagulated milk or dairy mixtures and identify the key factors that affect the fermentation process? (4)

_____

_____

_____

_____

_____

_____

1.2.4 Mr Jonathan who is a food scientist has been tasked with improving the process of producing coagulated milk or dairy mixture for the purpose of making fermented dairy products. He is given a budget and access to a laboratory, but he is not allowed to change the basic ingredients of the milk or dairy mixture. What changes would you recommend he does to the production process to improve the quality and efficiency of the final product? (6)

_____

_____

_____

_____

_____

_____

_____

_____

1.2.5 You've been asked to develop a new non-fermented dairy product, and you're in charge of the production process. You're given a set of requirements for the product, and you need to design the production process to meet those requirements.

I. What is the difference between non-fermented dairy products and fermented dairy products?(2)

_____

_____

_____

_____

_____

_____

_____

QUESTION 2 :

2.1 **Inoculate milk/dairy mixture with starter culture, incubate and coagulate milk/dairy mixture.**

2.1.1 How does the inoculation of milk/dairy mixture with a starter culture affect the fermentation process? (2)

_____

_____

_____

_____

_____

_____

_____

2.1.2 Why is it important to maintain precise incubation conditions during the fermentation process? (3)

_____

_____

_____

_____

_____

_____

_____

2.1.3 What are the characteristics of a well-coagulated milk/dairy mixture following incubation? (3)

_____

_____

_____

_____

_____

_____

_____

_____

2.1.4 What are some common challenges or issues that may arise during the inoculation and coagulation of milk/dairy mixtures and discuss possible solutions?(4)

_____

_____

_____

_____

_____

_____

_____

_____

2.1.5 How does the coagulation process in dairy product production reflect the principles of food microbiology and biochemistry? Elaborate (5)

_____

_____

_____

_____

_____

_____

_____

_____

_____

2.1.6 Explain the importance of controlling the cooling process when processing a coagulated milk/dairy mixture for fermented dairy products?(4)

_____

_____

_____

_____

_____

_____

_____

_____

_____

2.1.7 What are some challenges associated with processing coagulated milk/dairy mixtures for fermented dairy products?(3)

_____

_____

_____

_____

_____

_____

_____

QUESTION 3 :DEMONSTRATE THE ABILITY TO CONTROL PRODUCTION DURING MANUFACTURING OF FERMENTED DAIRY PRODUCTS

3.1]

3.1.1 Explain measures that can be taken to ensure the food safety of fermented dairy products during production?(3)

_____

_____

_____

_____

_____

_____

_____

_____

3.1.2 Discuss the role of quality control in maintaining consistency in the production of fermented dairy products.(3)

_____

_____

_____

_____

_____

_____

_____

_____

3.1.3 Describe how do regulations and compliance standards influence the production of fermented dairy products?(4)

_____

_____

_____

_____

_____

_____

_____

_____

_____

3.1.4 Explain the importance of traceability in ensuring the quality and safety of fermented dairy products.(4)

_____

_____

_____

_____

_____

_____

_____

_____

3.1.5 Discuss the balance between maintaining high-quality standards and maximizing profitability in the production of fermented dairy products.(5)

_____

_____

_____

_____

_____

_____

_____

_____

_____

3.1.6 How does the coagulation process in dairy product production reflect the principles of food microbiology and biochemistry? Describe fully(3)

_____

_____

_____

_____

_____

_____

_____

3.1.7 Explain how the taste and aroma of dairy products are influenced by the coagulation process? (2)

_____

_____

_____

Manufacturing of Fermented Dairy Products

(OFO-code: 681301)

MODEL ANSWERS FOR EXTERNAL SUMMATIVE THEORY ASSESSMENT

Instructions to the External Assessor:

1. Evaluate each learner's answers at the hand of the model answers provided below.
2. Learners must answer all questions, without referring to any notes. No group work is allowed, i.e. each learner's questionnaire must be completed on own individual effort.
3. The learner must achieve a minimum of 70% for this assessment in order to be found competent in the theory component.
4. After evaluation, complete the Declaration of Competence on the first page of the learner's knowledge questionnaire, as well as the Summative Declaration in **Section 8** of the Assessment Guide.

1. During fermented dairy products manufacturing, pasteurisation of the dairy mixture is performed in order to: (2)

Column A	Column B
Expel _____ and thus create aerophilic conditions, which is favourable of the growth of starter bacteria.	kill
_____ all pathogenic (disease-causing) micro-organisms.	hydration
Reduce the number of spoilage micro-organisms to such a level that the _____ of the fermented dairy product is extended.	oxygen
Supply sufficient heat for _____ of heat stabilisers.	shelf-life

2. Yoghurt: 88 - 92°C for 5 minutes, or as specified by the factory. (2)
Maas: 95°C for 5 minutes, or as specified by the factory. (2)

3. (a) In order to aid in dissolution of the raw materials. (1)

(b) A slow stirring action in the tank whilst adding the product ingredients:
- Ensures a homogeneous dispersion.
- Prevents dehydrated components from sinking to the bottom of the tank.
- De-aerates the mixture.

(Any 2) (2)

4. Any 4 of the following ingredients, with a corresponding function: (8)

Ingredient	Function
Skimmed or full cream milk	Main raw material that provides protein, fat, lactose and calcium for curd formation.
Skimmed milk powder	Binds and replaces water (hydration), thereby contributing to the smooth body and texture of yoghurt.
Sugar/non-sugar sweetener	Provides a sweet taste.
Stabilisers	Binds water and forms a gel (hydration) that prevents the water molecules from moving freely (separate through syneresis), thereby contributing to the smooth body and texture of yoghurt.
Starter culture	Facilitates lactic acid fermentation.
Fruit pulp; to be added after fermentation	Provides taste, flavour and texture to fruit yoghurt.
Preservative	Prevents spoilage of yoghurt by bacteria, yeasts and moulds.

5. (a) *Streptococcus thermophilus* and *Lactobacillus bulgaricus*. (2)

(b) It is claimed that these organisms **aid in digestive action** in the human body. (1)

6. Both of the following: (2)
- They **form a network of links** between the protein and milk ingredients and ensure a **firm consistency** in especially fruit yoghurts (**increase the viscosity**).
- They **bind water** thus **preventing whey separation**.

7. (a) At the normal pH of milk (pH 6,7), protein molecules has a net negative charge (1). The protein molecules remain separated because identical charges repel each other (1). (2)
If H+ ions are added they are absorbed by the protein molecules. At a pH value where the positive charge of the protein is equal to the negative charge, the net total charge of the protein is zero (1). The protein molecules no longer repel each other, but the positive charges on one molecule links up with negative charges on the neighboring molecules and large protein clusters are formed. The protein is then precipitated from the solution (1). (2)
As the pH of milk drops below 4,6 the protein cluster begins to obtain a net positive charge (1). The charge on stabiliser molecules is negative, therefore they attach to the milk proteins to stabilise the mixture (1). (2)

(b) The pH where the positive charge of the protein is equal to the negative charge, the net total charge of the protein is zero (1). The protein molecules no longer repel each other and large protein clusters are formed. This happens at pH 4,6 and is called the **iso-electric point** of the protein (1). (2)

8. Applicable products: (2)

Yoghurt:
- Long set method: 32°C/12 – 18h, or as specified by the factory.
- Short set method: 40 - 44°C/2 – 8h, or as specified by the factory.

Maas, sour cream and cultured buttermilk:
- Long set method: 22°C/12 – 18h, or as specified by the factory.

9. (a) If the temperature increases during coagulation the **bacteria will grow faster** and the **product can be over incubated with usually a layer of whey on top** (1). This is unacceptable in a dairy product. If the temperature increases higher than the maximum growth temperature of the starter, the **bacteria will die**, **fermentation will stop** and **coagulation will not take place** (1). (2)

(b) If the temperature decreases during coagulation the **bacteria will grow slower** and the **coagulation time will increase** (1). If the temperature drops too far the **bacteria can stop growing** and **coagulation will not take place**. (2)

10. If the inoculum size is **too big** the **culture** will **grow too fast** and will result in a **poor product (over acid** and **wheying off)**. (2)
If the inoculum size is **too small** the **culture** will **grow too slow** and **other unwanted fermentations can take place** that will also produce a **poor product**. (2)

11. (a) **Too long**: It will result in a poor product (wheying off). (1)

(b) **Too short**: It will result in a very sloppy thin product. (1)

12. Tank fermented (1) maas is inoculated and incubated/fermented inside the fermentation tank, after which it is packed in retail containers (1). (2)

In-package fermented (1) maas is inoculated inside the mixing tank, immediately packed into retail containers and then moved to an incubation room where the product is fermented inside the retail containers (1). (2)

13. Any 2 of the following: (2)
- Mastitis
- Rancidity
- Temperature history of the milk
- Temperature of milk for coagulating
- Homogenisation
- Protein content
- Mineral salts
- Acidity of the milk
- Stage of lactation
- Fat content

14. **Acid coagulation** is coagulation by means of **starter cultures only**, whereas **sweet coagulation** is coagulation by means of **starter cultures in combination with enzymes**. (2)

15. (a) At 15 - 17°C (1)

(b) At this temperature the coagulum can **bear a certain degree of mechanical handling (e.g. mixing and stirring) without undergoing physical changes in texture and viscosity (e.g. whey separation)**. (2)

TOTAL: (53)

Occupational Certificate: Fermented Dairy Products Maker

MODEL ANSWERS FOR EXTERNAL SUMMATIVE THEORY ASSESSMENT

Instructions to the External Assessor:

1. Evaluate each learner's answers at the hand of the model answers provided below.

2. Learners must answer all questions, without referring to any notes. No group work is allowed, i.e. each learner's questionnaire must be completed on own individual effort.

3. The learner must achieve a minimum of 50% for this assessment in order to be found competent in the theory component.

4. After evaluation, complete the Declaration of Competence on the first page of the learner's knowledge questionnaire.

MARKING GUIDE

SECTION A

Question 1

Multiple choice

1.1.1 D

1.1.2 D

1.1.3 A or B is correct

1.1.4 C

1.1.5 A

1.1.6 C

1.1.7 C

1.1.8 A

1.1.9 C

1.2.1 B

Questions 2

TRUE Or FALSE

1.2.1 True

1.2.2 True

1.2.3 False

1.2.4 False

1.2.5 True

2.1 **Fermented dairy product ready for packaging**

2.1.1 Factors such as desired acidity level, texture, flavor profile and specific bacterial strains used all play a role in determining the optimal fermentation time.

2.1.2 Longer coagulation times tend to result in firmer and denser textures in the final product , while shorter coagulation times may lead to a softer and creamier consistency.

2.1.3 Starter cultures contain live bacteria that convert lactose into lactic acid during fermentation, which thickens the dairy mixture and adds a characteristic sour taste to the final product.

2.1.4 Monitoring and controlling the coagulation process ensures the consistency in texture, flavor and quality life of the final product, as variations in coagulation can lead to undesirable outcomes.

2.1.5 The coagulation process results in the formation of coagulum or gel, which contributes to the creamy texture and tangy flavor of fermented dairy products like yogurt.

2.1.6 The specified minimum time-temperature combination for pasteurization of milk/dairy mixture for yogurt is:

- Heat to 86°C (186°F) for at least 2 minutes and can be up to 5 minutes, then cool rapidly to 4°C (39°F) or lower.

- Hold at 4°C (39°F) or lower until the product is packaged.

The time-temperature combination for pasteurizing maas is:

- Heat to 88°C (190°F) for 30 seconds, then cool rapidly to 4°C (39°F) or lower.

- Hold at 4°C (39°F) or lower until the product is packaged.

2.2 Perform food safety practices (personal hygiene, manual and in-place cleaning and sanitizing, good manufacturing practices) occupational health and safety practices.

2.2.1 Proper ventilation helps remove airborne contaminants such as fumes and dust that could pose health risks to employees and prevent the buildup of odors that could affect food quality.

2.2.2 Proper labeling, storage and disposal procedures should be followed to minimize the risks of spills and exposure to hazardous materials, protecting both worker safety and the integrity of the food products being manufactured.

2.2.3 Common hazards include spills and falls, burns from hot equipment and exposure to harmful chemicals. These risks can be mitigated through regular training, appropriate signage , and the implementation of safety protocols.

2.2.4 Regular assessments and updates to occupational health and safety practices ensures that workers are protected from hazards and risks in the workplace ,ultimately promoting a safer and more productive work environment.

2.2.5 personal hygiene practices such as proper hand washing , can help prevent the transfer of harmful bacteria and contaminants onto food products.

Question 3 :Control production of fermented dairy products in terms of quality, food safety, profitability and productivity.

3.3.1 Quality assurance during the production of fermented dairy products involves a number of steps. First, the quality of the raw materials must be checked to ensure they are free from contaminants and meet specifications. Next, the manufacturing process is carefully monitored and controlled to ensure that all quality standards are met. Finally, finished products are tested for quality and safety before being released to the market.

3.3.2 Implementing efficient production processes, reducing wastage, and optimizing supply chain logistics can help improve profitability.

3.3.3 Investing in modern equipment, providing training to staff, and implementing streamlined production workflows can help increase productivity.

3.3.4 Sensory evaluation involves trained panelists assessing the appearance, flavor, texture, and overall acceptability of dairy products to ensure quality standards are met.

3.3.5 Market trends and consumer preferences can have a big impact on the production of fermented dairy products. For example, if there is a trend towards healthier foods, producers might choose to make products with lower sugar or fat content. Or, if there is a trend towards more natural or organic products, producers might choose to use only natural ingredients or avoid using additives. These market trends can also affect the packaging and marketing of fermented dairy products.

Filling the blanks

4.1.1

I. Fat

II. 72 ℃ for 15 to 20 seconds

III. Cooking Thermometer

IV. Pasteurizer

V. Fermentation

VI. Pasteurization

VII. Homogenizer

VIII. Inoculation

VIIII .Homogenization

Section B

Question 1 :**Prepare raw milk and make additions for the manufacturing of fermented dairy**

1.1 Interpret production instructions obtain fermented dairy products milk

1.1.1(i) Raw milk contains a variety of components that can affect the fermentation process. These include:

- Lipids, such as fats, oils, and waxes.

- Proteins, such as casein and whey.

- Carbohydrates, such as lactose and other sugars.

- Minerals, such as calcium, magnesium, and potassium.

All of these components can affect the fermentation process in different ways. For example, the fat content of the milk can influence the consistency of the final product, while the protein content can affect the amount of curd that is formed. The carbohydrates in the milk can be converted into lactic acid by the bacteria, which is what causes the milk to coagulate. The minerals can also affect the fermentation process, as they can serve as nutrients for the bacteria. Finally, the raw milk also contains a variety of bacteria that can affect the fermentation process. These include:

- Lactococcus lactis, which is responsible for producing lactic acid.

- Streptococcus thermophilus, which produces flavor compounds.

- Leuconostoc mesenteroides, which produces diacetyl,

(II) There are a few key bacteria that are commonly used in the fermentation of raw milk. These include:

- Lactococcus lactis subsp. cremoris, which is commonly used in the production of hard cheeses like Parmesan and cheddar.

- Lactococcus lactis subsp. lactis, which is commonly used in the production of soft cheeses like Camembert and Brie.

- Lactococcus lactis subsp. lactis biovar diacetylactis, which is used to produce buttery flavors in cheese.

- Lactococcus lactis sub

(III)Pasteurization kills any harmful bacteria that may be present in the milk, but it also affects the types of bacteria that are able to ferment the milk. The heat of pasteurization kills some of the bacteria that are essential for fermentation, while leaving others intact. As a result, it's important to add specific cultures of bacteria to the milk to ensure successful fermentation.

IV) Some possible reasons for poor quality milk include:

- Poor sanitation of the milking equipment or storage containers

- Contamination from bacteria or other microorganisms

- Poor health or diet of the dairy animals

- Improper transportation or storage of the milk

If any of these problems are identified, you can take steps to correct them, such as improving sanitation procedures, testing for contamination, improving the animals' diet, or improving transportation and storage conditions.

1.1.2 (I) First step is Pasteurization

Second step ; Fermentation

Last step ; Packaging

(II) Pasteurization kills any harmful bacteria and prepares the milk for fermentation. Fermentation converts the lactose in the milk into lactic acid, which gives the product its characteristic flavor and texture. Finally, the product is packaged and stored for distribution.

(III) The three factors that need to be controlled during pasteurization are temperature, time, and turbulence. The milk needs to be heated to a specific temperature for a specific amount of time, and the mixture needs to be agitated to ensure that all of the milk is heated evenly. If any of these factors are not controlled properly, the pasteurization process will not be effective.

(IV) Based on your knowledge of the pasteurization process, the most likely cause of the problem is an issue with the heating system. If the heating system is not working properly, the milk will not reach the correct temperature. This could be due to a faulty thermostat, a problem with the heating coils, or an issue with the circulation pump.

1.2 Obtain other raw materials required for fermented dairy product manufacturing where applicable.

1.2.1. Factors to consider: the shelf life of the product, the cost of the packaging, the environmental impact of the packaging, the ability of the packaging to protect the product from damage or contamination, and the customer's preferences regarding packaging.

1.2.2 First, I'd make sure that the production facility has the appropriate certifications and accreditations. Then, I'd put in place rigorous quality control measures to ensure the product is safe and of high quality. Next, I'd test the product for any potential allergens or toxins. Finally, I'd design the packaging to meet any specific requirements set by the regulatory body.

1.2.3 Temperature is one of the key factors that affects the fermentation process. If the milk is too cold ,the fermentation will be too slow. If the milk is too hot , it can kill the bacteria and prevent fermentation from taking place. The ideal temperature for fermentation is around 18-22°C

1.2.4 First, I'd suggest using a process called ultra-pasteurization to heat the milk or dairy mixture. This process is more effective than traditional pasteurization at removing pathogens and improving the shelf life of the final product. Next, I'd suggest using a homogenizer to reduce the size of the fat globules in the milk or dairy mixture. This will make the product smoother and more consistent. Finally, I'd suggest using a starter culture that contains multiple strains of lactic acid bacteria. This will improve the taste and texture of the product.

1.2.5 Non-fermented dairy products are produced by heating milk to a specific temperature, and then cooling and packaging it. Fermented dairy products, on the other hand, are produced by adding specific cultures of bacteria to the milk, and then allowing the bacteria to ferment the lactose into lactic acid. This fermentation process gives fermented dairy products their distinctive flavor and texture.

Question 2

2.1 Inoculate milk/dairy mixture with starter culture, incubate and coagulate milk/dairy mixture.

2.1.1 Without the starter culture, the fermentation process would not be able to take place. The starter culture provides the necessary microorganisms that convert the sugars in the milk or dairy mixture into lactic acid, which is what gives fermented dairy products their characteristic flavor and the starter culture also helps to control the growth of other microorganisms that could cause spoilage or off flavors. So, without the starter culture, the fermentation process would not be able to take place and the end product would not be safe to consume.

2.1.2 Incubation refers to the stage of the fermentation process where the mixture is kept at a specific temperature for a certain period of time. This is important because it allows the microorganisms in the starter culture to grow and produce the desired results. If the temperature is too high or too low, or if the incubation time is too short or too long, it can result in a sub-optimal product.

2.1.3 A well-coagulated milk or dairy mixture following incubation will have the following characteristics:

1) The mixture will be thick and firm, indicating that the desired level of acidity has been achieved.

2) The mixture will have a clean, fresh aroma and taste, without any sour or off flavors

3) The mixture will have a uniform texture and color, without any lumps or discoloration.

2.1.4 Some common challenges or issues that may arise during the inoculation and coagulation of milk or dairy mixtures include:

1) Inadequate mixing of the starter culture with the milk or dairy mixture, which can result in uneven coagulation.

2) Temperature fluctuations during the incubation process, which can affect the growth of the microorganisms and the coagulation process.

3) Insufficient acidification, which can lead to a weak coagulum.

1) Check the temperature and levels to make sure they're optimal for the fermentation process.

2) Make sure the ingredients are fresh and of good quality.

3) Check the equipment used for the fermentation process to make sure it's clean and functioning properly.

4) Check the recipe and process to make sure everything is being done correctly.

2.1.5 In the case of dairy products, the fermentation process relies on the activity of lactic acid bacteria (LAB), which are microorganisms that convert lactose into lactic acid. The coagulation process in dairy product production reflects the principles of food microbiology and biochemistry in a few ways:

1) The LAB used in the fermentation process produce enzymes that convert lactose into lactic acid, which causes the milk to coagulate.

2) The growth and activity of the LAB are affected by temperature, pH, and the presence of other microorganisms.

3) The composition of the final product, including the texture and flavor, is determined by the fermentation process.

When the LAB convert lactose into lactic acid, they also produce a variety of other compounds, including diacetyl, acetaldehyde, and other flavor compounds. These compounds contribute to the taste and aroma of fermented dairy products like cheese and yogurt.

2.1.6 The cooling process is important for several reasons:

1) It helps to control the growth of microorganisms, ensuring that the desired LAB are able to grow and produce the desired fermentation products.

2) It affects the texture and flavor of the final product.

3) It prevents the growth of spoilage organisms, which could cause the product to go bad.

2.1.7 There are several challenges that can occur when processing coagulated milk or dairy mixtures for fermented dairy products. Some of the most common challenges include:

1) Separation of the curd and whey (the solid and liquid components of the mixture) during the coagulation process.

2) Formation of undesirable flavor compounds during fermentation.

3) Variability in the final product, due to differences in raw materials or processing conditions.

Question 3 : Demonstrate the ability to control production during manufacturing of fermented dairy products .

3.1.1 The food safety of fermented dairy products can be ensured through several measures, including:

- Proper pasteurization. This means heating the milk or dairy mixture to a specific temperature for a specific length of time, in order to kill any harmful bacteria.

- Proper storage conditions. This means storing the product at the appropriate temperature, with the appropriate humidity levels, to prevent spoilage.

- Time-temperature monitoring. This means monitoring the temperature of the product at each stage of production, to ensure that it remains within the safe range.

- Proper sanitation. This means ensuring that all equipment and surfaces are clean and free from bacteria.

3.1.2 Quality control is a critical part of maintaining consistency in the production of fermented dairy products. There are several aspects of quality control that are important, including:

1) Testing the milk or dairy mixture for quality parameters, such as fat content, protein content, and pH.

2) Testing the final product for quality parameters, such as flavor, texture, and nutritional content.

3) Regular audits and inspections of the manufacturing facility, to ensure that all quality standards are being met.

Without quality control, there would be a high risk of producing inconsistent or substandard products.

3.1.3Regulations and compliance standards play a major role in the production of fermented dairy products. There are a number of regulations and standards that must be followed, including:

1) Federal regulations, such as the Food Safety Modernization Act (FSMA) and the Pasteurized Milk Ordinance (PMO).

2) State regulations, such as dairy product licensing requirements.

3) Industry standards, such as those set by the International Dairy Federation (IDF).

These regulations and standards cover everything from food safety to labeling requirements, and they are critical to ensuring the safety and quality of fermented dairy products.

3.1.4 Traceability is a key part of the quality control process for fermented dairy products. Traceability refers to the ability to track the origin and journey of a product from the farm to the consumer's table. This is important for a few reasons:

1) It allows for the identification and isolation of potential sources of contamination, so that any problems can be quickly addressed.

2) It allows for the identification of any products that may have been affected by a contamination event, so that they can be recalled.

3) It provides transparency for consumers, who can be confident that the product they are buying is safe and of high quality.

3.1.5 It is essential to maintain high quality standards in order to produce safe and healthy products that consumers will want to buy. On the other hand, it's also important to consider the cost of production and the need to remain profitable. Finding the right balance between these two competing priorities can be a real challenge. There are a few strategies that can help:

1) Investing in quality control systems and technology that can help to streamline the production process and reduce costs.

2) Finding ways to reduce waste and improve efficiency in the production process.

3) Balancing consumer demands with production costs.

3.1.6 The coagulation process in dairy product production relies heavily on both of these areas of study. Coagulation is essentially a chemical reaction that is catalyzed by enzymes produced by bacteria. These enzymes break down milk proteins into smaller peptides and amino acids, causing the milk to coagulate or curdle. So, the coagulation process is a perfect example of how the principles of food microbiology and biochemistry work together to produce the desired end product." The enzymes that cause the milk to coagulate are produced by specific bacteria that have been selected for their ability to produce these enzymes. The amount of bacteria present, the temperature at which they are incubated, and the length of time they are allowed to grow all affect the final product. In this way, food microbiology and biochemistry work together to produce the coagulation process.

3.1.7 The taste and aroma of dairy products are influenced by a number of factors, including the coagulation process. The coagulation process influences the taste and aroma of dairy products in several ways:

1) The specific enzymes used in the coagulation process can influence the flavor of the final product. For example, the enzyme chymosin is known to produce a sweeter, more buttery flavor, while the enzyme pepsin produces a more acidic, tangy flavor.

2) The temperature and time of incubation can also affect the flavor of the final product. Lower temperatures and longer incubation times tend to produce a milder flavor, while higher temperatures and shorter incubation times produce a more intense flavor.

3) The bacterial cultures used in the coagulation process can also have a significant impact on the flavor of the product. Different bacterial cultures produce different flavor compounds, such as diacetyl, which is responsible for a buttery flavor, and acetaldehyde, which is responsible for a fruity flavor.

4) Finally, the fat content of the milk used in the coagulation process can also influence the flavor of the final product. Higher fat content typically results in a creamier, richer