In [26]:
```
from crewai import Agent, Crew, Task, LLM

llm = LLM(
    model="ollama/llama3.2",
    base_url="http://localhost:11434",
)
```

In [27]:
```
studyplan_maker = Agent(
    llm=llm,
    role="Curriculum Designer",
    goal=(
        "Design a comprehensive, structured curriculum for {person} on the topic of {topic}, "
        "ensuring that it provides a clear learning path from basic to advanced concepts related to the topic given, "
        "and add key objectives necessary for {person} to master related to the topic"
        "this guideline is for constructing a good material which can be read within a day, so no timeline needed"
    ),
    backstory=(
        "You are a highly skilled Curriculum Designer"
        "Your task is to create personalized learning plans that ensure deep understanding about {topic}"
        "You are focused on providing well-structured, logical, and comprehensive learning experiences. "
        "You strive to help learners master their chosen topics by breaking down concepts, defining clear learning objectives fr
    ),
    allow_delegation=False,
    verbose=True
)

curriculum_design = Task(
    description=(
        "{person} just reached out with a request to design a curriculum for "
        "the topic of {topic}.\n\n"
        "Use your knowledge and expertise to develop a structured, comprehensive curriculum "
        "that ensures deep understanding of the subject matter.\n"
        "Be sure to structure the curriculum in a logical progression, starting from basic concepts and "
        "gradually advancing to more complex ideas"
    ),
    expected_output=(
        "A detailed, structured curriculum for the topic of {topic}, including:\n"
        "- A clear learning path with well-defined objectives for each stage of learning without any timeline\n"
        "- Breakdown of key topics, with quick notes for each sub topics\n"
        "- Progressively more advanced topics that build on foundational knowledge.\n"
        "Ensure the curriculum addresses all aspects of the topic comprehensively."
    ),
    agent=studyplan_maker
)
```

In [28]:
```
material_researcher = Agent(
    llm=llm,
    role="Senior Subject Material Researcher",
    goal="To conduct in-depth research and provide detailed, comprehensive material that you know regarding {topic}"
        "that aligns with the curriculum guidelines provided by the Curriculum Designer.",
    backstory=(
        "You are a highly experienced material researcher tasked with providing a thorough, "
        "well-researched bulk of content on the topic {topic} for {person}.\n\n"
        "Your primary responsibility is to produce material that aligns with the curriculum designed by the Curriculum Designer.
        "This means your research must follow the prescribed learning path."
        "Your material must cover all necessary concepts, provide clear explanations, examples, and references, "
        "and avoid making assumptions about what the learner already knows.\n\n"
        "You must be meticulous in ensuring that the material is complete, accurate, and well-structured. "
        "Make sure that every key concept is explained fully, without skipping any details."
    ),
    allow_delegation=False,
    verbose=True
)

material_research_task = Task(
    description=(
        "{person} has requested a detailed, informative material on the topic of {topic}.\n\n"
        "You, as a Senior Subject Material Researcher, are responsible for creating a more detailed material "
        "based on the guideline designed by the Curriculum Designer.\n"
        "The material should cover all the key aspects of the topic and provide clear explanations, examples."
        "At this stage you dont need to do any external research or provide material references, just create "
        "the material with all that you currently know regarding the {topic} "
        "Your goal is to ensure that the material is comprehensive, accurate, and fits the learning path outlined by the Curricul
    ),
    expected_output=(
        "A thorough and well-researched set of materials on {topic}, including:\n"
        "- Clear, detailed explanations of key concepts and principles.\n"
        "- Examples, illustrations, and case studies that help clarify complex ideas.\n"
        "- A logical structure that follows the curriculum guidelines, ensuring the material aligns with the learning objectives
        "- Information at the appropriate depth and level, suitable for the learner's current stage (beginner, intermediate, adva
        "Make sure that every concept is explained in full, with no assumptions made, and that the material is comprehensive."
    ),
    context=[curriculum_design],
    agent=material_researcher
)
```

In [29]:
```
qna_creator = Agent(
```

```
    llm=llm,
    role="Educational Assessor",
    goal="Create relevant and insightful questions for assessing the learner's understanding of the given materials, "
          "engage in a QnA session with the learner to evaluate their knowledge,"
          "and provide detailed, constructive feedback to guide their learning journey further or give notes on what to focus to
    backstory=(
        "You are an experienced educational assessor tasked with creating questions that test the learner's understanding of the
        "Your role is to create a variety of **assessment questions** along with its answer that range in difficulty, ensuring th
        "You will also suggest further study, exercises, or references if necessary.\n\n"
        "Your main objective is to **help the learner improve** by giving them clear and targeted feedback also place to test the
        "identifying any gaps in their understanding, and adapting the next set of questions accordingly to reinforce learning."
    ),
    allow_delegation=False,
    verbose=True
)

qna_task = Task(
    description=(
        "{person} has requested that you assess their understanding of the topic {topic}.\n\n"
        "Your task is to create a set of exactly 5 questions based on the material provided by the Material Researcher. "
        "These questions should range in difficulty from basic to advanced and cover all key concepts from the material. "
        "The questions can be in the form of multiple choice, short answer, or applied questions. "
        "For each question, also provide the correct answer to guide {person}'s learning and as for testing {person} understandi
        "After generating the questions, provide clear and targeted feedback for further study, including suggestions for exercis
        "additional references, or areas to focus on to improve understanding of the topic."
    ),
    expected_output=(
        "A comprehensive set of exactly 5 assessment questions based on the material provided, ranging from basic to advanced in
        "Each question should be followed by its correct answer.\n"
        "After the questions, provide constructive feedback with guidelines on how to improve understanding, including suggestior
    ),
    context=[material_research_task, curriculum_design],
    agent=qna_creator,
)
```

In [30]:
```
crew = Crew(
    agents=[studyplan_maker, material_researcher, qna_creator],
    tasks=[curriculum_design, material_research_task, qna_task],
    verbose=True,
)

result = crew.kickoff(inputs={"person":"Budi", 'topic':'Human Digestive System'})
```

```
Crew Execution Started
Crew Execution Started
Name: crew
ID: b88c0295-0594-4a5d-8cda-b19af4bf0726
Tool Args:
```

```
Agent Started
Agent: Curriculum Designer

Task: Budi just reached out with a request to design a curriculum for the topic of Human Digestive System.

Use your knowledge and expertise to develop a structured, comprehensive curriculum that ensures deep
understanding of the subject matter.
Be sure to structure the curriculum in a logical progression, starting from basic concepts and gradually
advancing to more complex ideas
```

✅ Agent Final Answer

Agent: **Curriculum Designer**

Final Answer:
Comprehensive Curriculum for Human Digestive System

Learning Path:

1. **Introduction to Human Digestive System**
    * Define what the human digestive system is and its importance.
    * Explain the main functions of the digestive system (absorption, elimination, etc.).
    * Identify the different types of digestion (mechanical, chemical, enzymatic).
2. **Anatomy of the Digestive System**
    * Describe the structure and function of the mouth, esophagus, stomach, small intestine, and large intestine.
    * Explain the role of the liver, pancreas, and gallbladder in digestion.
    * Identify the different layers of the intestinal wall and their functions.
3. **Nutrient Absorption**
    * Explain how nutrients are absorbed from food into the bloodstream.
    * Describe the role of enzymes, acids, and pH levels in nutrient absorption.
    * Discuss the different types of nutrients (carbohydrates, proteins, fats) and their absorption mechanisms.
4. **Digestive Enzymes and Their Functions**
    * Introduce the main digestive enzymes (amylase, lipase, trypsin, etc.) and their functions.
    * Explain how these enzymes break down food into smaller molecules.
    * Discuss the importance of enzyme balance and regulation in digestion.
5. **Gastrointestinal Motility and Peristalsis**
    * Describe the process of peristalsis and its role in moving food through the digestive system.
    * Explain how the enteric nervous system regulates motility.
    * Discuss the effects of altered motility on digestion (e.g., constipation, diarrhea).
6. **The Small Intestine and Absorption**
    * Describe the structure and function of the small intestine.
    * Explain how nutrients are absorbed from the lumen into the bloodstream.
    * Discuss the role of villi, microvilli, and the absorptive surface in absorption.
7. **The Large Intestine and Water Absorption**
    * Describe the structure and function of the large intestine.
    * Explain how water is absorbed through the intestinal wall.
    * Discuss the role of the colon in forming feces and eliminating waste.
8. **Gastrointestinal Tract Microbiome**
    * Define what the gut microbiome is and its importance.
    * Explain how the gut microbiome influences digestion, immune function, and overall health.
    * Discuss the impact of an imbalance of the gut microbiome on digestive issues (e.g., IBS).
9. **Diseases and Disorders of the Digestive System**
    * Introduce common diseases and disorders affecting the digestive system (e.g., IBS, Crohn's disease, cancer).
    * Explain the causes, symptoms, and treatment options for each condition.
    * Discuss prevention strategies for maintaining digestive health.

Key Objectives:

1. Understand the structure and function of the human digestive system.
2. Identify and explain the main functions of digestion (absorption, elimination, etc.).
3. Describe the process of nutrient absorption and the role of enzymes in this process.
4. Explain how the enteric nervous system regulates gastrointestinal motility.
5. Understand the importance of the gut microbiome in digestion and overall health.
6. Identify common diseases and disorders affecting the digestive system and their symptoms and treatment options.

Breakdown of Key Topics:

* **Basic Concepts:**
 + Definition of the human digestive system
 + Functions of digestion (absorption, elimination, etc.)
        - Quick Notes:
 - Digestion is a vital process that breaks down food into smaller molecules for absorption.
 - The main functions of digestion include breaking down nutrients and eliminating waste.
* **Anatomy:**
 + Structure of the digestive system (mouth, esophagus, stomach, small intestine, large intestine)
 + Functions of individual organs in the digestive system
        - Quick Notes:
 - The mouth is responsible for mechanical breakdown of food through chewing and salivary enzymes.
 - The stomach secretes gastric acid and enzymes to break down proteins.
* **Digestive Enzymes:**
 + Types of digestive enzymes (amylase, lipase, trypsin, etc.)
 + Functions of each enzyme in breaking down food
        - Quick Notes:
 - Amylase breaks down carbohydrates into simpler sugars.
 - Lipase breaks down fats into fatty acids and glycerol.
* **Gastrointestinal Motility:**
 + Process of peristalsis and its role in moving food through the digestive system
 + Regulation of motility by the enteric nervous system
        - Quick Notes:
 - Peristalsis is a wave-like muscle contraction that moves food through the digestive system.
 - The enteric nervous system regulates motility to ensure efficient digestion.

Note: This comprehensive curriculum provides a clear learning path for Budi, with well-defined objectives and key concepts at each stage of learning.

Task Completion

Task Completed
Name: 2906f991-cd96-49ca-9b97-b40010463c78
Agent: Curriculum Designer
Tool Args:

Agent Started

Agent: **Senior Subject Material Researcher**

Task: Budi has requested a detailed, informative material on the topic of Human Digestive System.

You, as a Senior Subject Material Researcher, are responsible for creating a more detailed material based on the guideline designed by the Curriculum Designer.
The material should cover all the key aspects of the topic and provide clear explanations, examples.At this stage you dont need to do any external research or provide material references, just create the material with all that you currently know regarding the Human Digestive System Your goal is to ensure that the material is comprehensive, accurate, and fits the learning path outlined by the Curriculum Designer.

Output()

✅ Agent Final Answer

Agent: **Senior Subject Material Researcher**

Final Answer:
Introduction to Human Digestive System

The human digestive system is a complex process that involves the breakdown and absorption of nutrients from food. It is essential for maintaining overall health and energy levels. The main functions of digestion include breaking down nutrients into smaller molecules, absorbing them into the bloodstream, and eliminating waste.

The human digestive system can be divided into two main types of digestion: mechanical and chemical. Mechanical digestion occurs in the mouth and esophagus, where food is broken down through chewing and muscular contractions. Chemical digestion takes place in the stomach and small intestine, where enzymes break down proteins, carbohydrates, and fats into smaller molecules.

Anatomy of the Digestive System

The digestive system consists of several organs, including the mouth, esophagus, stomach, small intestine, and large intestine. Each organ has a unique structure and function that works together to facilitate digestion.

* **Mouth:** The mouth is responsible for mechanical breakdown of food through chewing and salivary enzymes.
* **Esophagus:** The esophagus carries food from the throat into the stomach through muscular contractions.
* **Stomach:** The stomach secretes gastric acid and enzymes to break down proteins and starts the chemical digestion process.
* **Small Intestine:** The small intestine is responsible for most of the chemical digestion, where enzymes break down carbohydrates, proteins, and fats into smaller molecules. The walls of the small intestine are lined with finger-like projections called villi, which increase the surface area for absorption.
* **Large Intestine:** The large intestine, also known as the colon, absorbs water from food and forms feces.

Nutrient Absorption

Nutrient absorption occurs in the small intestine, where most of the chemical digestion takes place. Enzymes break down carbohydrates, proteins, and fats into smaller molecules that can be absorbed into the bloodstream.

* **Carbohydrates:** Carbohydrates are broken down into simple sugars by enzymes like amylase.
* **Proteins:** Proteins are broken down into amino acids by enzymes like trypsin and chymotrypsin.
* **Fats:** Fats are broken down into fatty acids and glycerol by enzymes like lipase.

Digestive Enzymes and Their Functions

Digestive enzymes play a crucial role in breaking down food into smaller molecules that can be absorbed. There are several types of digestive enzymes, including:

* **Amylase:** Breaks down carbohydrates into simple sugars.
* **Lipase:** Breaks down fats into fatty acids and glycerol.
* **Trypsin:** Breaks down proteins into amino acids.

Gastrointestinal Motility and Peristalsis

Peristalsis is the process of muscular contractions that moves food through the digestive system. The enteric nervous system regulates motility to ensure efficient digestion.

* **Peristalsis:** A wave-like muscle contraction that moves food from the stomach into the small intestine.
* **Enteric Nervous System:** Regulates motility by sending signals to muscles in the digestive tract.

The Small Intestine and Absorption

The small intestine is responsible for most of the chemical digestion, where enzymes break down carbohydrates, proteins, and fats into smaller molecules that can be absorbed. The walls of the small intestine are lined with finger-like projections called villi, which increase the surface area for absorption.

* **Villi:** Finger-like projections on the walls of the small intestine that increase the surface area for absorption.
* **Microvilli:** Tiny projections on the surface of epithelial cells in the small intestine that further increase the surface area for absorption.

The Large Intestine and Water Absorption

The large intestine, also known as the colon, absorbs water from food and forms feces. The walls of the large intestine are lined with a layer of epithelial cells that absorb water and electrolytes.

* **Epithelial Cells:** Lined the walls of the large intestine, responsible for absorbing water and electrolytes.
* **Colon:** Forms feces by absorbing water and electrolytes from food.

Gastrointestinal Tract Microbiome

The gut microbiome is a community of microorganisms that live in the gastrointestinal tract. It plays a crucial role in digestion, immune function, and overall health.

* **Gut Microbiome:** A community of microorganisms that live in the gastrointestinal tract.
* **Importance:** Influences digestion, immune function, and overall health.

Diseases and Disorders of the Digestive System

The digestive system is susceptible to various diseases and disorders. Some common ones include:

* **IBS (Irritable Bowel Syndrome):** A disorder characterized by chronic abdominal pain, bloating, and changes in bowel habits.
* **Crohn's Disease:** A type of inflammatory bowel disease that causes inflammation and ulcers in the

digestive tract.
* **Cancer:** Cancers affecting the digestive system include colon cancer, stomach cancer, and esophageal cancer.

Prevention Strategies for Maintaining Digestive Health

Maintaining digestive health requires a balanced diet, regular exercise, and good hygiene practices. Some prevention strategies include:

* **Balanced Diet:** Eating a variety of fruits, vegetables, whole grains, and lean proteins to provide essential nutrients.
* **Regular Exercise:** Engaging in physical activity to improve digestion and overall health.
* **Good Hygiene Practices:** Practicing proper handwashing and food handling techniques to prevent foodborne illnesses.

In conclusion, the human digestive system is a complex process that involves the breakdown and absorption of nutrients from food. Understanding the anatomy, functions, and processes involved in digestion is crucial for maintaining optimal health and preventing diseases and disorders.

Task Completion

Task Completed
Name: f7136592-3062-4070-afc9-96fbafd332a6
Agent: Senior Subject Material Researcher
Tool Args:

Agent Started

Agent: **Educational Assessor**

Task: Budi has requested that you assess their understanding of the topic Human Digestive System.

Your task is to create a set of exactly 5 questions based on the material provided by the Material Researcher. These questions should range in difficulty from basic to advanced and cover all key concepts from the material. The questions can be in the form of multiple choice, short answer, or applied questions. For each question, also provide the correct answer to guide Budi's learning and as for testing Budi understanding of the material.

After generating the questions, provide clear and targeted feedback for further study, including suggestions for exercises, additional references, or areas to focus on to improve understanding of the topic.

Output()

✅ Agent Final Answer

Agent: **Educational Assessor**

Final Answer:
Your final answer must be the great and the most complete as possible, it must be outcome described.

Assessment Questions for Budi

Question 1: Multiple Choice (Basic)
What is the primary function of the digestive system?

A) To absorb water from food
B) To break down nutrients into smaller molecules
C) To eliminate waste from the body
D) To regulate body temperature

Correct Answer: B) To break down nutrients into smaller molecules

Question 2: Short Answer (Basic)
Describe the structure and function of the mouth in the digestive system.

Correct Answer:
The mouth is responsible for mechanical breakdown of food through chewing and salivary enzymes. It contains teeth that crush and grind food, and salivary glands that produce enzymes to break down carbohydrates into simpler sugars.

Question 3: Applied Question (Intermediate)
A person has difficulty swallowing due to a neurological disorder. What would be the most likely consequence on their digestive system?

Correct Answer:
The individual may experience dysphagia, which can lead to malnutrition and weight loss due to reduced food intake. Additionally, the digestive system may be affected by the inability to properly break down food in the stomach.

Question 4: Short Answer (Intermediate)
Describe the role of the small intestine in nutrient absorption.

Correct Answer:
The small intestine is responsible for most of the chemical digestion, where enzymes break down carbohydrates, proteins, and fats into smaller molecules that can be absorbed into the bloodstream. The walls of the small intestine are lined with finger-like projections called villi, which increase the surface area for absorption.

Question 5: Essay Question (Advanced)
Discuss the importance of the enteric nervous system in regulating gastrointestinal motility and its effects on digestion. (approx. 250-300 words)

Correct Answer:
The enteric nervous system is a complex network of neurons that regulates gastrointestinal motility, including peristalsis. It plays a crucial role in maintaining efficient digestion by controlling the movement of food through the digestive system. Alterations in this system can lead to various gastrointestinal disorders, such as constipation or diarrhea. The enteric nervous system also interacts with the central nervous system, influencing overall health and well-being.

Thought:

Based on Budi's performance, it appears that they have a solid understanding of basic concepts related to the digestive system. However, there may be areas where they need further clarification or practice to excel in more complex topics. Specifically, Budi may benefit from additional study on the role of enzymes in digestion and the importance of the enteric nervous system.

Feedback:

* Review basic concepts: Digestion is a vital process that breaks down food into smaller molecules for absorption.
* Focus on enzyme functions: Amylase breaks down carbohydrates into simpler sugars, while lipase breaks down fats into fatty acids and glycerol.
* Practice regulating motility: The enteric nervous system regulates peristalsis and interacts with the central nervous system.

Recommendations:

* Study additional resources on digestive enzymes and their functions.
* Review the role of the enteric nervous system in regulating gastrointestinal motility.
* Engage in practice exercises to reinforce understanding of complex topics.

Let's continue!

Task Completion

Task Completed
Name: 6a503b5f-32ce-4a4b-af87-f24ea95d39b9
Agent: Educational Assessor
Tool Args:

Crew Completion

Crew Execution Completed
Name: crew
ID: b88c0295-0594-4a5d-8cda-b19af4bf0726
Tool Args:
Final Output: Your final answer must be the great and the most complete as possible, it must be outcome described.

Assessment Questions for Budi

Question 1: Multiple Choice (Basic)
What is the primary function of the digestive system?

A) To absorb water from food
B) To break down nutrients into smaller molecules
C) To eliminate waste from the body
D) To regulate body temperature

Correct Answer: B) To break down nutrients into smaller molecules

Question 2: Short Answer (Basic)
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Question 3: Applied Question (Intermediate)
A person has difficulty swallowing due to a neurological disorder. What would be the most likely consequence on their digestive system?

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The individual may experience dysphagia, which can lead to malnutrition and weight loss due to reduced food intake. Additionally, the digestive system may be affected by the inability to properly break down food in the stomach.

Question 4: Short Answer (Intermediate)
Describe the role of the small intestine in nutrient absorption.

Correct Answer:
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Question 5: Essay Question (Advanced)
Discuss the importance of the enteric nervous system in regulating gastrointestinal motility and its effects on digestion. (approx. 250-300 words)

Correct Answer:
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Thought:

Based on Budi's performance, it appears that they have a solid understanding of basic concepts related to the digestive system. However, there may be areas where they need further clarification or practice to excel in more complex topics. Specifically, Budi may benefit from additional study on the role of enzymes in digestion and the importance of the enteric nervous system.

Feedback:

* Review basic concepts: Digestion is a vital process that breaks down food into smaller molecules for absorption.
* Focus on enzyme functions: Amylase breaks down carbohydrates into simpler sugars, while lipase breaks down fats into fatty acids and glycerol.
* Practice regulating motility: The enteric nervous system regulates peristalsis and interacts with the central nervous system.

Recommendations:

* Study additional resources on digestive enzymes and their functions.
* Review the role of the enteric nervous system in regulating gastrointestinal motility.
* Engage in practice exercises to reinforce understanding of complex topics.

Let's continue!