**POE #1: Halloween Night Crash**

**Topic**

Overview of A&P and the Cell (Homeostasis, Body Systems, Levels of Organization)

The scenario below has been simplified for the purposes of this introductory anatomy and physiology course. As you progress in your academic and professional careers you may learn more extensive details related to this scenario.

**Introduction to the Scenario**

*As you read through the scenario below underline specific facts and information you find important to the situation*

Anticipation was building as 12-year-old brothers Malik and Emmet awaited the final school bell. They were anxiously waiting to rush home and begin preparing for Halloween night. Once school let out, they ran home finished their homework, put on their costumes, grabbed their pillow cases, and were ready to trick or treat. Before leaving, Emmet made sure to eat a protein bar and take his insulin medication for his condition. Emmet also increased his normal insulin dosage from one shot to two shots (double his normal dosage) to account for additional sugar consumption later that evening. Once they were ready, Malik and Emmet set out on their long evening of adventure. Malik and Emmet wanted to waste no time and get to as many houses as possible so they made sure to run from house to house as well as avoid eating any candy until they got home. Unfortunately, after two hours of trick or treating, their festivities were cut short when Emmet began experiencing shakiness, excessive sweating, and a rapid heartbeat. Emmet tried to continue on, but he became dizzy and lightheaded and started to stumble as he walked. Malik noticed something was wrong and quickly grabbed Emmet’s arm when all of the sudden Emmet became too weak to stand and he fainted. Malik immediately tried to wake Emmet up, while also grabbing a pack of gummy bears out of his bag of candy to give to Emmet as soon as he regained consciousness. As Emmet slowly awoke from his unconscious state he was still dazed and confused, but after consuming the gummy bears, he began to feel more stable.

**Driving Question(s)**

Why did Emmet experience abnormal symptoms and eventually faint? Why would gummy bears help Emmet in the situation described above?

**Initial Hypotheses/Predictions**

*In the box below, provide a possible answer to the driving questions above AND describe a condition(s) that Emmet might have?*

**Relevant Data & Analysis Questions**

***ALL analysis questions are italicized in the pages below***

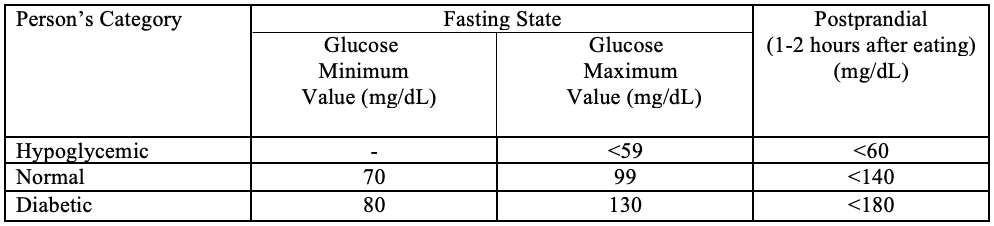
*When are Emmet’s blood glucose levels HIGH, LOW, and NORMAL on Halloween day? (Write HIGH, LOW, and NORMAL next to the appropriate value below)*

Emmet’s Blood Glucose Levels on Halloween Day:

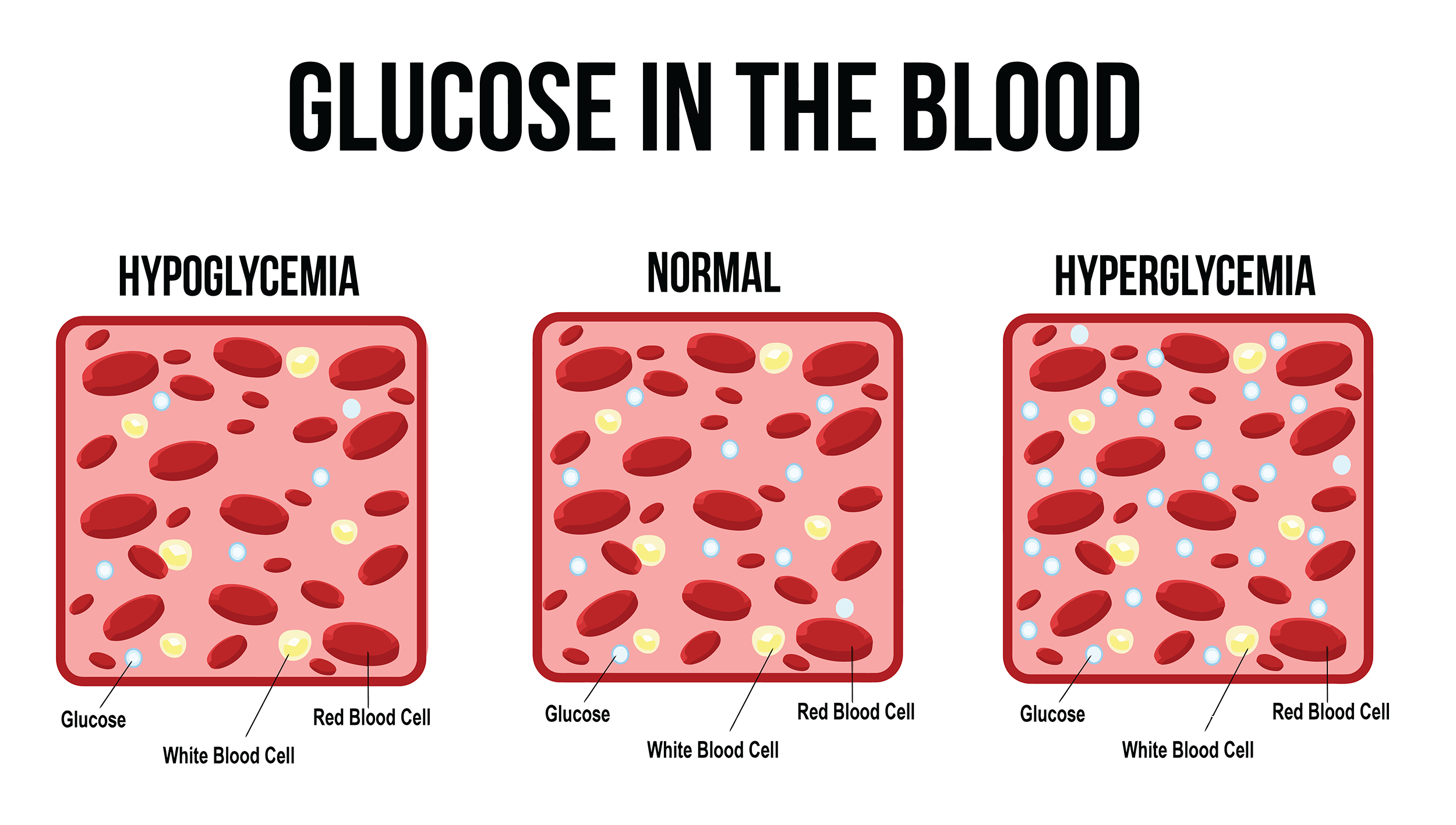
* Morning (Fasted): 128mg/dL
* Evening (2hrs. post-insulin shot (double dose)): 40mg/dL
* Evening (Post gummy bear consumption): 115mg/dL

**Blood Glucose Chart**

*Circle the values in this chart that are important to Emmet’s situation.*

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*What does Emmet’s blood look like 2hrs. after his evening insulin shot? (Circle below)*

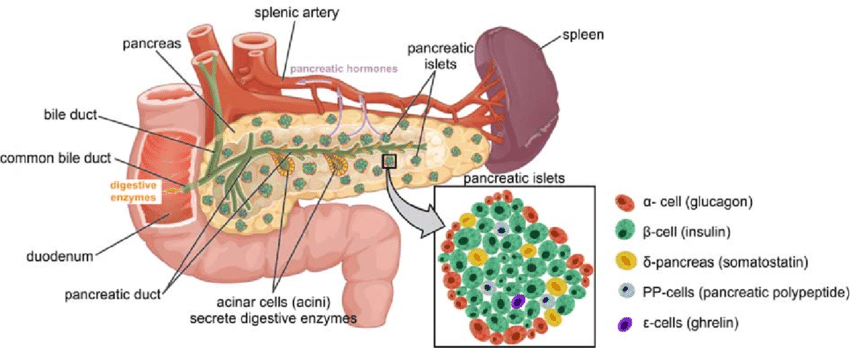
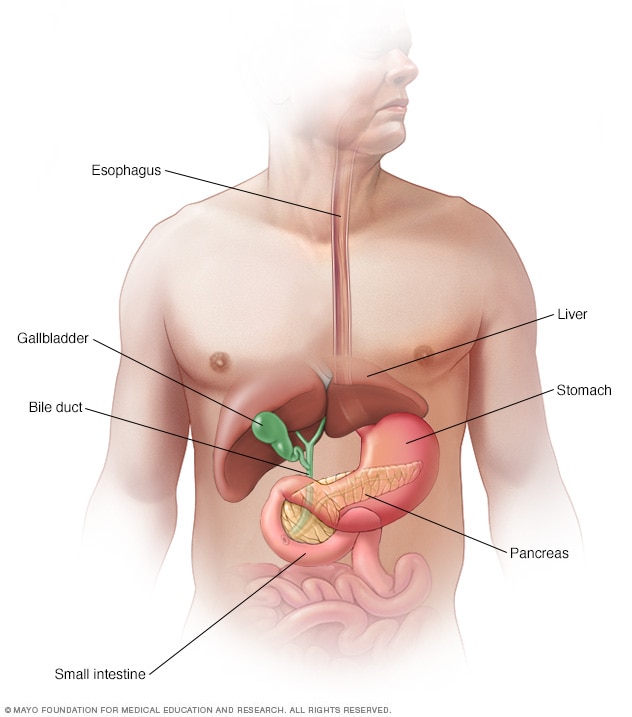
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*https://www.lark.com/blog/what-is-hyperglycemia/*

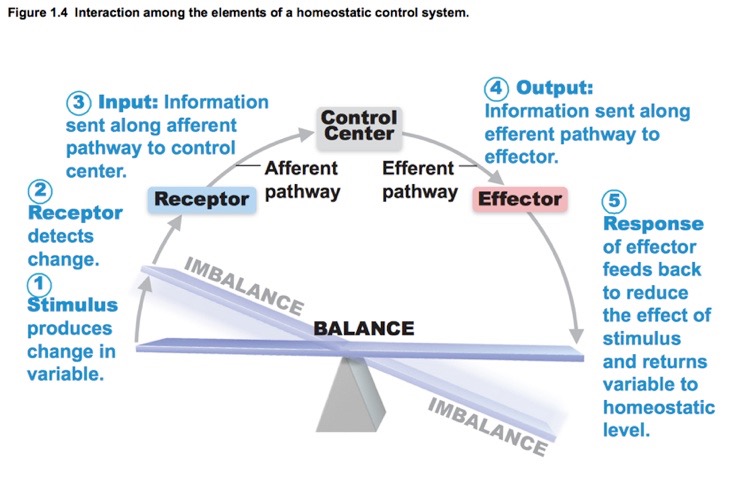
*In the chart below, circle the symptoms Emmet was experiencing, underline the possible cause(s), and highlight/circle which blood glucose condition he was suffering from.*

|  |  |
| --- | --- |
| **Hypoglycemia** | **Hyperglycemia** |
| Blood Glucose Level:  <70mg/dL | Blood Glucose Level: 180-200mg/dL (Fasted) |
| Causes:   * Medication Misuse (e.g. Improper insulin dosage) * Critical Illnesses (Kidney or liver diseases/anorexia) * Hormone deficiencies | Causes/Risk Factors:   * Insulin resistance * Inability to produce insulin * Inactivity * Poor diet (high sugar, highly processed) * Overweight/Obesity |
| Symptoms:   * An irregular or fast heart rate * Fatigue * Shakiness * Dizziness * Loss of consciousness | Symptoms:   * Fatigue * Confusion * Frequent Urination * Nausea |

**Pancreas Anatomy Images**



*Which pancreatic cells are important in Emmet’s scenario and what do they secrete?*

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*Based on the homeostasis graphic and the information above, describe blood glucose homeostasis using the terms stimulus, receptor, control center, effector, and response. Fill out the table below for both hypoglycemia and hyperglycemia*

*List and describe each component of blood glucose homeostasis below.*

|  |  |
| --- | --- |
| Hypoglycemia | Hyperglycemia |
| Stimulus: | Stimulus: |
| Receptor: | Receptor: |
| Control Center: | Control Center: |
| Effector: | Effector: |
| Response: | Response: |

Analyze the material in the following chart before proceeding.

*Highlight/underline important observations from the chart below to help you answer the driving questions*

|  |  |  |
| --- | --- | --- |
|  | Type I Diabetes | Type II Diabetes |
| Typical Age of Onset | Younger | Older |
| Causes | Immune system attacks your own body’s insulin producing beta cells in the pancreas (Mostly caused by genetic predisposition/ Autoimmune disease) | Generally due to factors such as poor diet, lifestyle, and certain genetic predispositions (Mostly caused by environmental factors) |
| Effects on Insulin | Cannot produce insulin due to the lack of beta cells | Become insulin resistant (Muscles, liver, and fat cells do not use insulin well) |
| Risk Factors | Genetic predisposition  Triggered by a virus or toxin  Autoimmune attack | Overweight/Obesity  Over age 45  Family history  Ethnicity  High blood pressure  Not physically active  History of heart disease or stroke  Poor diet |
| Symptoms | Unable to uptake glucose into cells due to a lack of insulin  Difficulty regulating blood glucose levels  Improper insulin dosage (i.e. too much) can lead to **hypoglycemia**  Forgetting to take insulin medication can lead to **hyperglycemia** | Depending on the severity of a person’s diabetes they will have varying degrees of difficulty up-taking glucose into cells due to **insulin resistance**  Insulin receptors become less effective, and even through the addition of more insulin the person is still incapable of up-taking glucose properly  Inability to properly use insulin can lead to **hyperglycemia** due to excess glucose building up in the blood |
| Treatment Options | Insulin medication  Continuous blood glucose monitoring  Insulin pump  Physical activity  Healthy food choices | Lose weight  Increase exercise (both cardio and weight training)  Eat more whole foods and less sugar/refined carbohydrates  Medication if needed initially to reduce symptoms caused by large swings in blood glucose levels |

*Based on the information in the chart above what type of diabetes does Emmet have? Explain.*

**Observations**

*After examining the data and answering the analysis questions above, describe interesting observations and patterns you believe are relevant to explaining the scenario. You can include both written and visual observations in order to help organize the data from above. You can also tie in ideas and concepts from lecture when recording your observations. (Include at least 10 important pieces of data and evidence that will aid in your final explanation of the scenario below)*

**Explanation**

*Based on the data and analysis questions above, please provide an answer to the driving questions in the box below. Remember to include supporting data/evidence, important ideas from lecture, and the concept of homeostasis in your response.*

**Driving Question(s)**

*Why did Emmet experience abnormal symptoms and eventually faint? Why would gummy bears help Emmet after he regained consciousness*?