Name: _____ Date: _____ Period: _____

Studying feeding habits of sharks using pH values

Read, annotate, and complete each section.

Digestion in sharks is responsible for the breakdown of ingested prey. The role of the stomach is particularly important because many sharks ingest their prey whole. After ingestion, two phases of digestion occur: chemical digestion and mechanical digestion. Chemical digestion is accomplished by the secretion of hydrochloric acid (HCl) and digestive enzymes. Mechanical digestion is accomplished by the muscular contraction of the stomach wall. Due to these phases of digestion, a specific change in stomach pH occurs after a shark consumes its prey.

1. (RST.9-10.4.) Explain the meaning of these words using context clues and prefixes/suffixes.

   Ingested: _____

   Secretion: _____

   Contraction: _____

2. (RST.9-10.2.) Sharks need both chemical and mechanical digestion because-
   a. they eat a large quantity of prey
   b. they secrete hydrochloric acid
   c. they ingest their prey whole
   d. they have large stomachs

An experiment was conducted with three adult blacktip reef sharks. Data recorders were inserted into the stomach of each shark to measure stomach pH during fasting (not eating) and following ingestion of food. Figure 1 below summarizes the physical characteristics of each captive shark.

Shark	Total Length (in cm)	Mass (in kg)	Sex	Minimum pH	Maximum pH	Mean pH
1	139	19	F	1.2	3.6	1.7
2	144	21	F	0.8	3.4	2.0
3	150	24	F	1.2	4.0	1.9

Figure 1

3. (IOD 201) According to Figure 1, what do all three sharks have in common?
   a. All three sharks have the same mean pH.
   b. All three sharks are female.
   c. All three sharks have the same total length.
   d. All three sharks have the same mass.

4. (IOD 301) Put the sharks in order from most acidic mean pH value to least acidic mean pH value.
   a. Shark 1, Shark 2, Shark 3
   b. Shark 3, Shark 2, Shark 1
   c. Shark 2, Shark 3, Shark 1
   d. Shark 1, Shark 3, Shark 2

5. (EMI 401) A fourth shark is 141 cm in length. Use Figure 1 to predict the mass of the shark.
   a. 18 kg
   b. 20 kg
   c. 22 kg
   d. 24 kg

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Figure 2 illustrates measurements of stomach pH in three blacktip reef sharks. The lower line in each graph is the pH and the upper line is the temperature. Arrows point to when sharks consumed prey.

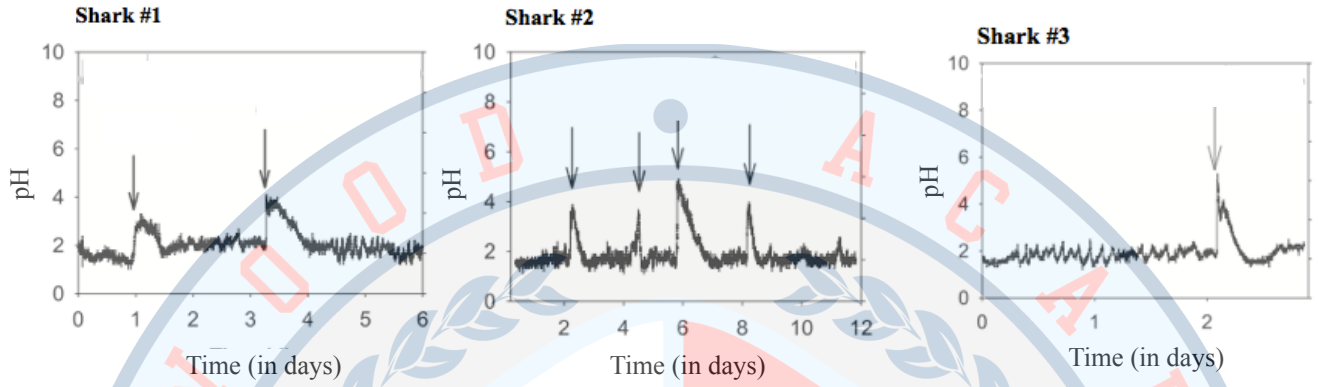

Figure 2

6. (IOD 301) According to Figure 2, how many meals did Shark #2 consume in a 12 day period?
   a. 2 meals
   b. 4 meals
   c. 1 meal
   d. 5 meals

7. (IOD 301) According to Figure 1, which of the following statements describes Shark #1 during day 2?
   a. Shark #1 was consuming prey.
   b. Shark #1 eat two meals.
   c. Shark #1 was fasting, or not eating.
   d. There is not information to determine what Shark #1 was doing.

8. (IOD 301) In all sharks, what happens to stomach pH when prey is consumed?
   a. The pH of the stomach becomes less acidic.
   b. The pH of the stomach becomes more acidic.
   c. The pH of the stomach becomes more acidic or more basic depending on the size of the meal.
   d. There is no change to pH of the stomach when prey is consumed.

When prey are consumed, the distention of the stomach stimulates the release of Hydrochloric acid, HCl. This results in a decrease in gastric pH.

9. (EMI 401) Which conclusion can be made about changes to stomach pH during consumption of prey?
   a. The stomach pH between meals is lower than during meals because there is less HCl in the stomach in between meals.
   b. The stomach pH between meals is higher than during meals because there is less HCl in the stomach in between meals.
   c. The stomach pH between meals is higher than during meals because there is the same amount of HCl in the stomach at all times.
   d. The stomach pH between meals is lower than during meals because there is more HCl in the stomach in between meals.

Data Representations and Research Summary adapted from:
Papastamatiou, Yannis. (2007). The response of gastric pH and motility to fasting and feeding in free swimming blacktip reef sharks, *Carcharhinus melanopterus*. *Journal of Experimental Marine Biology and Ecology,* 129-140.