KS3 · Science

Sharks: Masters of the Ocean



Sharks have existed for over 400 million years, before trees appeared on land.

How has a fish-eating predator survived unchanged in its basic design for hundreds of millions of years?

Do Now

Answer in silence, with no notes. 5 minutes.

1. Explain the difference between an endotherm and an ectotherm, giving one example of each.
2. Give one difference between a skeleton made of bone and a skeleton made of cartilage.
3. Name the type of skeleton that a fish such as a cod has.
4. How does a sense organ help an animal respond to its surroundings?

By the end of this lesson

1. I can explain how a shark's cartilaginous skeleton and placoid scales help it survive in the sea.
2. I can analyse how sharks detect prey using the lateral line and ampullae of Lorenzini.
3. I can evaluate how countercurrent heat exchange helps some sharks keep their muscles warm.

Key words

Cartilage
Flexible connective tissue that forms a shark's skeleton

Placoid scale
Tooth-like scale covering a shark's skin

Lateral line
Sense organ detecting water movement and vibrations

Ampullae of Lorenzini
Jelly-filled pores detecting weak electric fields

Countercurrent heat exchange
Blood vessels that conserve body heat in some sharks

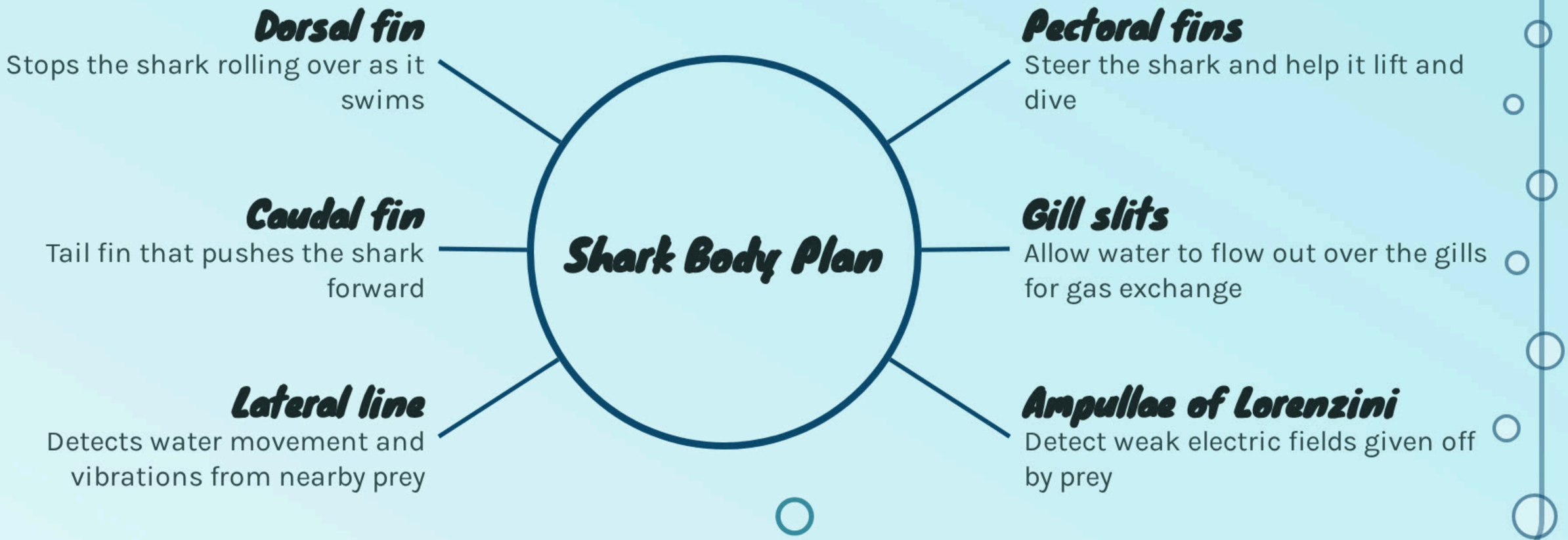
A Cartilage Skeleton

Why might a lighter skeleton help a fast swimmer?

Sharks have no swim bladder, so their skeleton is made of **cartilage**, which is lighter than bone. A large oily liver provides buoyancy, helping the shark stay afloat with less effort. Its skin is covered in placoid scales, which reduce drag as the shark glides through the water.



Body Parts and Their Jobs



Dorsal fin
Stops the shark rolling over as it swims

Caudal fin
Tail fin that pushes the shark forward

Lateral line
Detects water movement and vibrations from nearby prey

Pectoral fins
Steer the shark and help it lift and dive

Gill slits
Allow water to flow out over the gills for gas exchange

Ampullae of Lorenzini
Detect weak electric fields given off by prey

Keeping Muscles Warm

How can a shark keep its muscles warmer than the sea?

> **Great white and mako sharks keep their swimming muscles warmer than the sea water.**

They use **countercurrent heat exchange**: warm blood leaving the muscles passes close to cold blood returning from the gills, so heat is conserved.



> Why would warm swimming muscles help a shark hunt in cold water?

Match the Sense or Feature

Match each term on the left to its job on the right. Use slides 5 to 7 to help you.

1. **Cartilage**
2. **Placoid scale**
3. **Lateral line**
4. **Ampullae of Lorenzini**
5. **Countercurrent exchange**

a. Blood vessels that conserve body heat in the swimming muscles

b. Flexible tissue that forms the shark's light skeleton

c. Tooth-like scale covering the skin that reduces drag

d. Sense organ that detects water movement and vibrations

e. Jelly-filled pores that detect weak electric fields from prey

Answers: Match the Sense or Feature

- ✓ Cartilage: Flexible tissue that forms the shark's light skeleton
- ✓ Placoid scale: Tooth-like scale covering the skin that reduces drag
- ✓ Lateral line: Sense organ that detects water movement and vibrations
- ✓ Ampullae of Lorenzini: Jelly-filled pores that detect weak electric fields from prey
- ✓ Countercurrent exchange: Blood vessels that conserve body heat in the swimming muscles

Shark Adaptation Challenge

1. Read slide 5 and slide 6 again. Find one adaptation for hunting in murky water.
2. Write one sentence that starts: A shark hunting in murky water can find prey because _____.
3. Read slide 5 and slide 7 again. Find one adaptation for swimming efficiently.
4. Write one sentence that starts: A shark swims efficiently because _____.
5. Check both sentences use a named body part and a scientific reason. Tick them off.

Work alone for 16 minutes. Write your two sentences in full