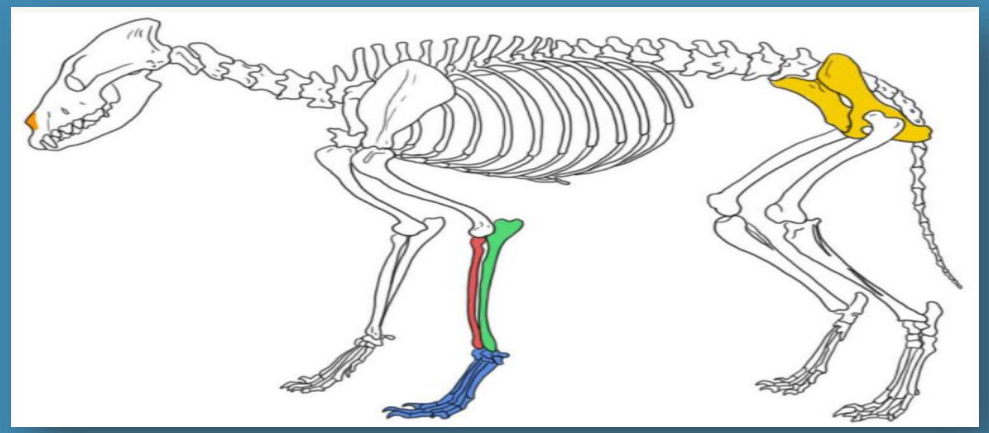
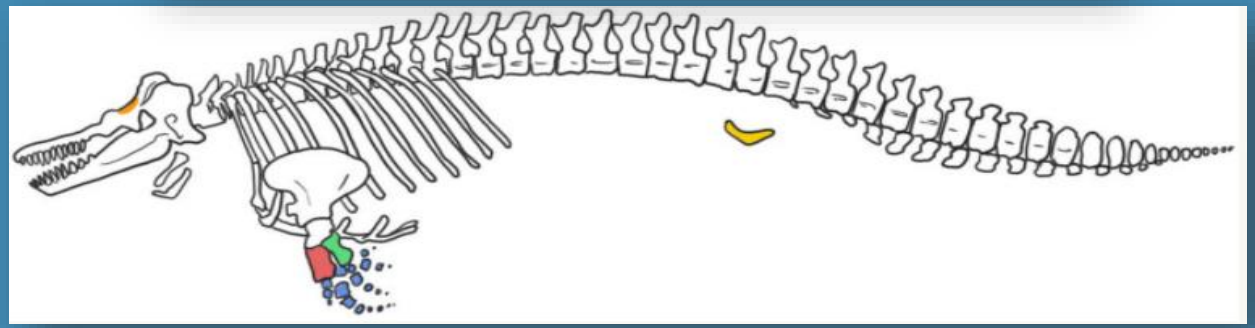
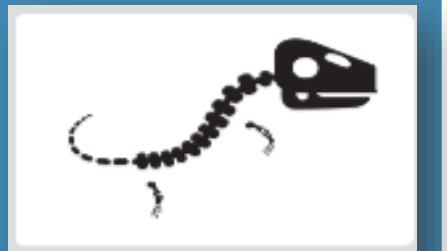
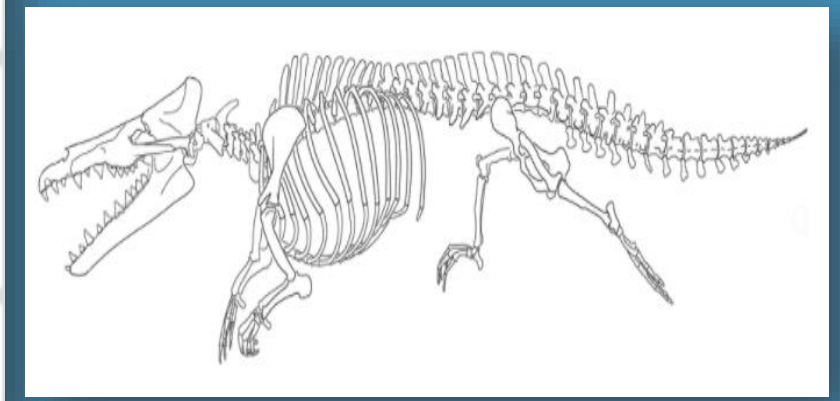
CH.2 – INVESTIGATING BODY STRUCTURE DIFFERENCES









1 WARM UP
Warm-Up

EH: 2.5.1 WARM-UP

HAND IN

Reflect on the sequences of events involved in evolutionary change. (5 min)

Warm-Up

Changes Over Evolutionary Time

Put the following sequence of events in the correct order:

- Two descendant populations are very similar but have small differences in their structures.
- An ancestor population is living in a stable environment.
- Two descendant populations look very different, even though they have many similar structures.
- An ancestor population gets separated into different environments.

Arrange these events by sliding them into the correct order.

Later in today's lesson, you will have a chance to answer the Chapter 2 Question. Take some time now to write down your ideas about this question: *How did wolves, whales, and the Mystery Fossil become so different from their common ancestor population?*

Write your ideas here!!

1 WARM UP
Warm-Up

EH: 2.5.1 WARM-UP

Warm-Up

Changes Over Evolutionary Time

Put the following sequence of events in the correct order:

- An ancestor population is living in a stable environment.
- An ancestor population gets separated into different environments.
- Two descendant populations are very similar but have small differences in their structures.
- Two descendant populations look very different, even though they have many similar structures.

Later in today's lesson, you will have a chance to answer the Chapter 2 Question. Take some time now to write down your ideas about this question: *How did wolves, whales, and the Mystery Fossil become so different from their common ancestor population?*

Be ready to share your ideas!

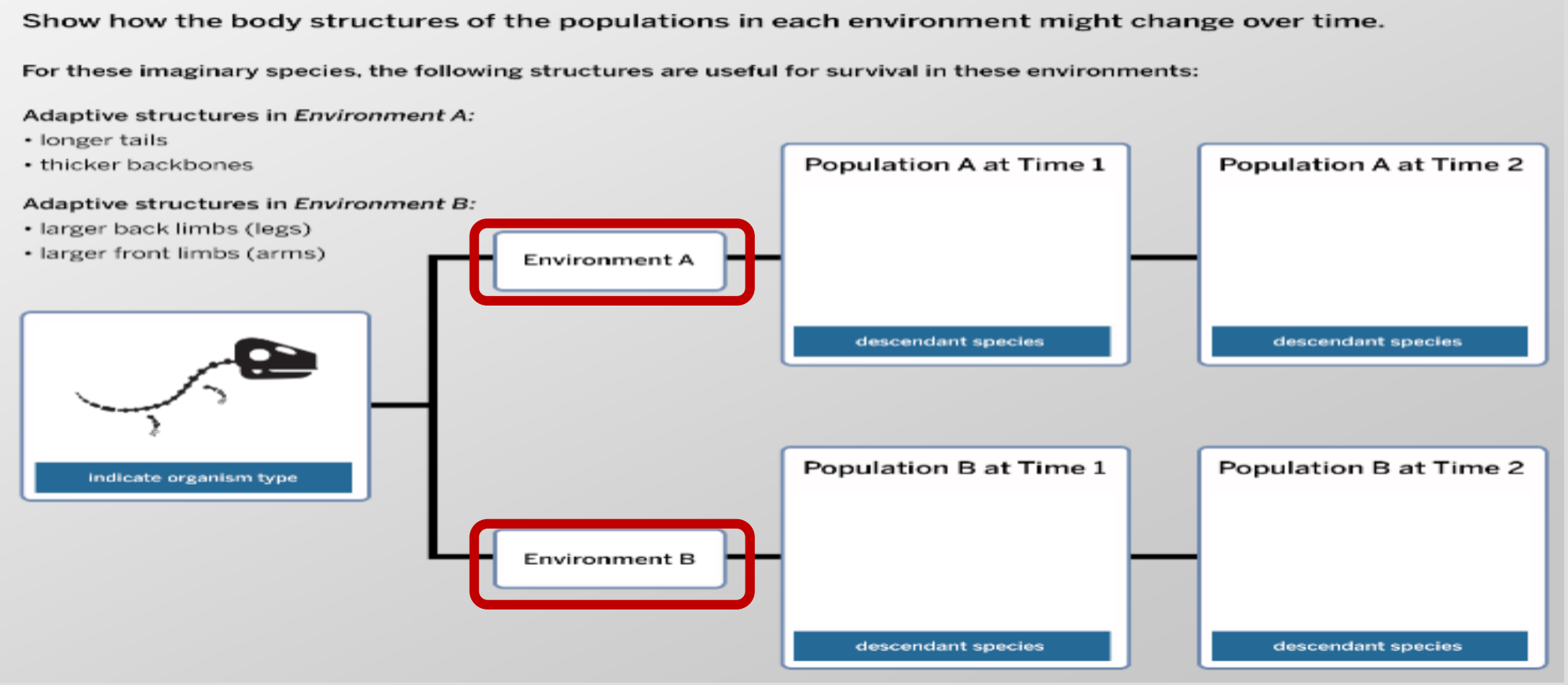
2 MODELING TOOL
Modeling Changes Over Evolutionary Time

EH – 2.5.2: MODELING CHANGES OVER EVOLUTIONARY TIME

You will model how different changes to body structures can occur when populations are separated into different environments. (15 min)

Take a moment to observe the **Population Changes** **Modeling Tool activity**. Be ready to share what you notice, as well as any questions you have. Attend to the following features:

- The screen shows a population that was split into two different environments, Environments A and B.



2 MODELING TOOL
Modeling Changes Over Evolutionary Time

EH – 2.5.2: MODELING CHANGES OVER EVOLUTIONARY TIME

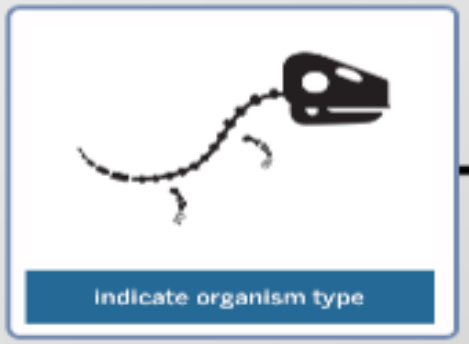
- There is information about which structures are helpful in Environments A and B.
- There are two different times with open spaces for the organisms in each environment.

Show how the body structures of the populations in each environment might change over time.

For these imaginary species, the following structures are useful for survival in these environments:

Adaptive structures in *Environment A:*
- longer tails
- thicker backbones

Adaptive structures in *Environment B:*
- larger back limbs (legs)
- larger front limbs (arms)



Environment A

Environment B

Population A at Time 1
descendant species

Population A at Time 2
descendant species

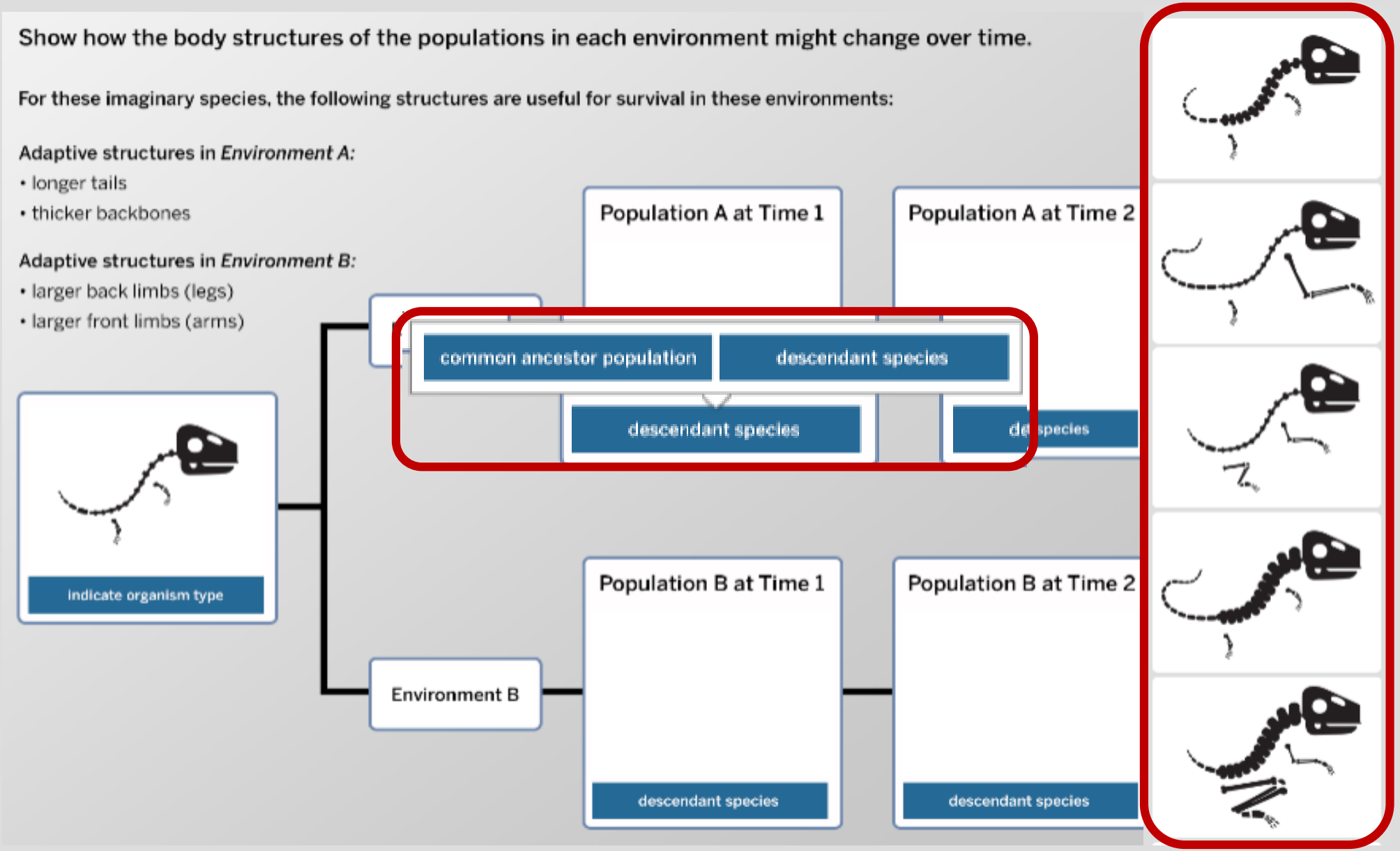
Population B at Time 1
descendant species

Population B at Time 2
descendant species

2 **MODELING TOOL**
Modeling Changes Over Evolutionary Time

EH – 2.5.2: MODELING CHANGES OVER EVOLUTIONARY TIME

- There are organism images to choose from in the toolbar.
- There are boxes where students can indicate whether each species is a common ancestor or descendant species.



2 MODELING TOOL
Modeling Changes Over Evolutionary Time

EH – 2.5.2: MODELING CHANGES OVER EVOLUTIONARY TIME

Let's Review the Modeling Tool instructions.

Modeling Population Changes Over Time

Launch *Evolutionary History* Modeling Tool activity: Population Changes.

In the Modeling Tool, a population is divided into two populations in different environments. In each environment, different structures are useful for survival.

Goal: Show how the body structures of the populations in each environment might change over time.

Do:

- Read the information at the top of the screen.
- Move organisms from the toolbar to the open locations in both branches of the tree.
- Press INDICATE ORGANISM TYPE and select an option for each organism.

Tip:

- You do not have to use all the organisms in the toolbar.

2 **MODELING TOOL**
Modeling Changes Over Evolutionary Time

EH – 2.5.2: MODELING CHANGES OVER EVOLUTIONARY TIME

Modeling Population Changes Over Time

Launch *Evolutionary History* Modeling Tool activity: Population Changes.

Launch the Modeling Tool activity and begin.

In the Modeling Tool, a population is divided into … structures are useful for survival.

Goal: Show how the body structures of the popu…

Do:

- Read the i…
- Move orga…
- Press IND…

Tip:

- You do not have to use all the organisms in the toolbar.

Press HAND IN in the Modeling Tool to see a screenshot of your completed model.

UPLOAD AN IMAGE

Reflection Questions

How does this model show how species that share a common ancestor can become very different from one another?

What remains stable over time in your model? What changes?

2 MODELING TOOL
Modeling Changes Over Evolutionary Time

EH – 2.5.2: MODELING CHANGES OVER EVOLUTIONARY TIME

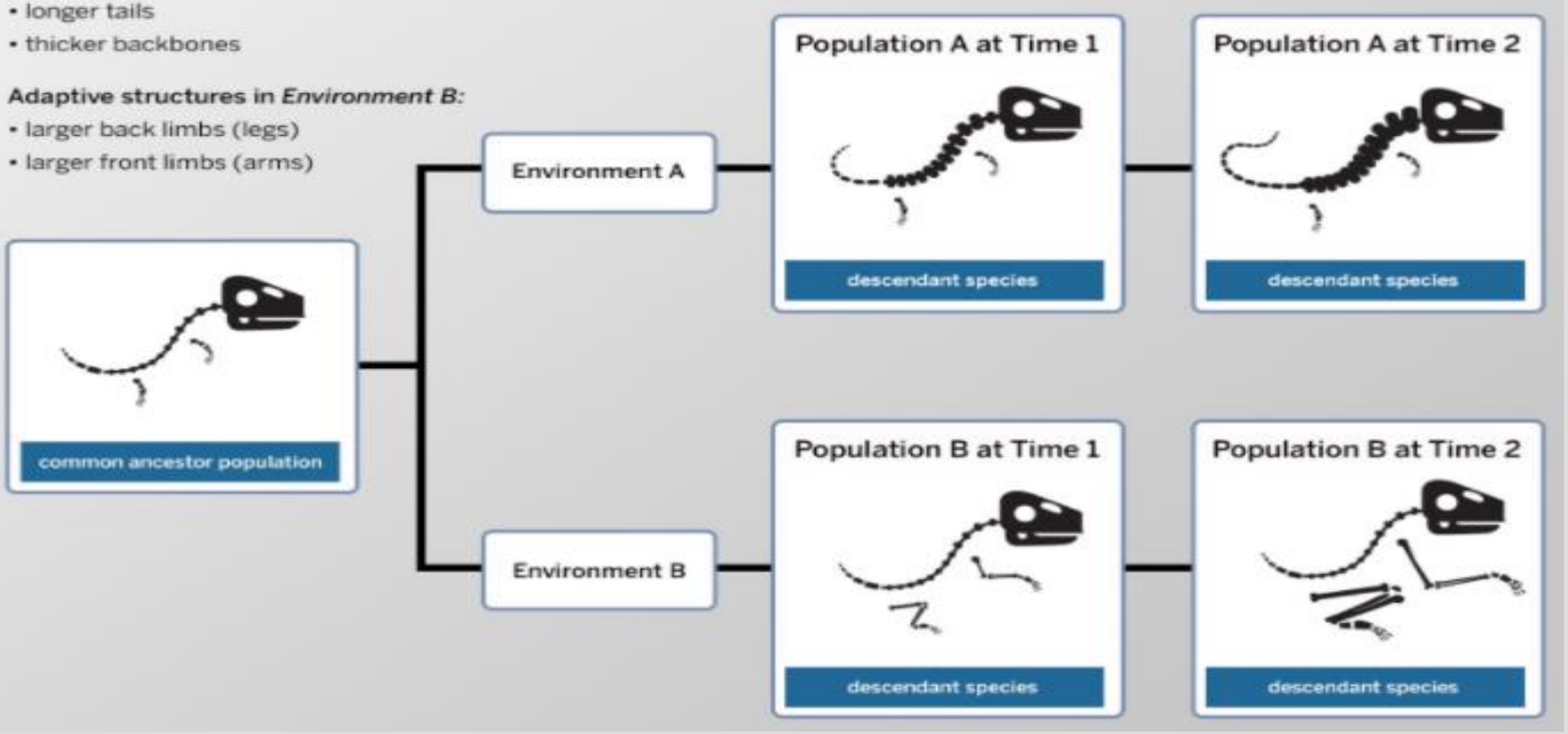
POSSIBLE ANSWER

Show how the body structures of the populations in each environment might change over time.

For these imaginary species, the following structures are useful for survival in these environments:

Adaptive structures in *Environment A*:
- longer tails
- thicker backbones

Adaptive structures in *Environment B*:
- larger back limbs (legs)
- larger front limbs (arms)



How does this model show how species that share a common ancestor can become very different from one another?

The common ancestor population got separated into two different environments, and different traits were adaptive in those environments, so Population A and Population B ended up very different from each other.

2 MODELING TOOL
Modeling Changes Over Evolutionary Time

EH – 2.5.2: MODELING CHANGES OVER EVOLUTIONARY TIME

POSSIBLE ANSWER

Show how the body structures of the populations in each environment might change over time.

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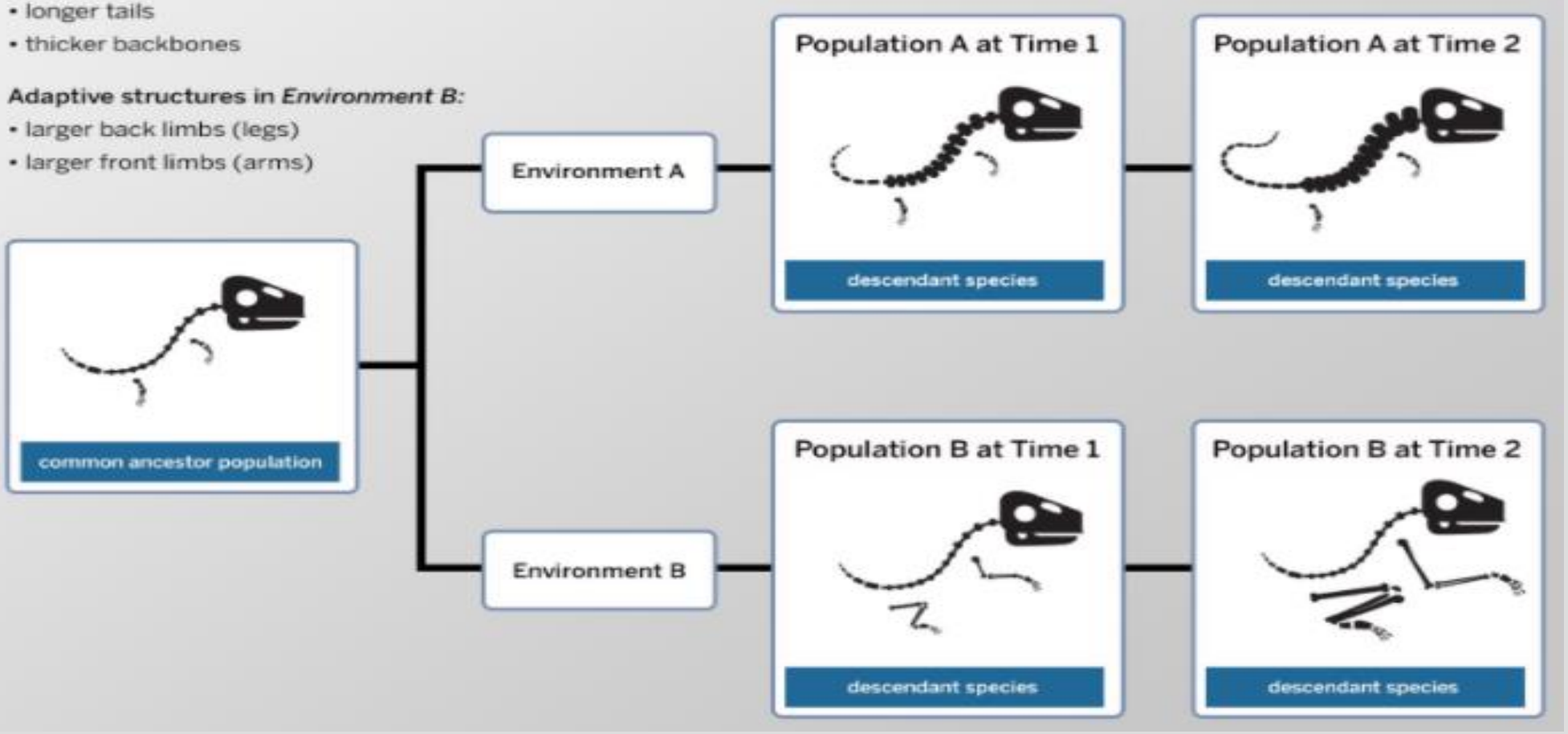

What remains stable over time in your model? What changes?

The skull and nostril shapes stayed stable, and both species still have backbones. But the thickness of the backbones and the size of the tails and limbs changed.

3 STUDENT TO STUDENT DISCUSSION
Word Relationships

EH – 2.5.3: STUDENT DISCUSSION WORD RELATIONSHIPS

Students respond to the Chapter 2 Question through a discussion with their peers. (20 min)

Review the Chapter 2 Question.

How did wolves, whales, and the Mystery Fossil become so different from their common ancestor population?

This is an important question that we've been preparing to answer for the last few lessons.

I'm sure you all have many ideas about how you might answer it now.

We are going to use a discussion routine called Word Relationships to help you share your thoughts and come up with different ways of answering this question together.

3 STUDENT TO STUDENT DISCUSSION
Word Relationships

EH – 2.5.3: STUDENT DISCUSSION WORD RELATIONSHIPS

Word Relationships routine.

In this routine, you will work in small groups of four students.

Each group will receive a set of cards that will support you as you construct sentences together.

The most important part of the activity is discussing your ideas in your groups.

Word Relationships Routine

As you know, whales, wolves, and the Mystery Fossil have shared structures, but those structures look very different from one another.

Today you will work with your group and use the Word Relationships Cards to create sentences that answer the question:

How did wolves, whales, and the Mystery Fossil become so different from their common ancestor population?

- Use at least two different Word Relationships Cards in each sentence. In your group of four, take turns as both the speaker and the listener.
- Your group may use the same word more than once. You do not need to use all the vocabulary words.
- There are many different ways to answer the Chapter 2 Question, and you will need to create more than one sentence in order to express your ideas completely.

3 STUDENT TO STUDENT DISCUSSION
Word Relationships

EH – 2.5.3: STUDENT DISCUSSION WORD RELATIONSHIPS

Modeling how to create a sentence.

Let's examine the cards for *shared structure* and *common ancestor population*. How might you create a sentence using these terms.

- Based on what we've learned so far in this unit, I could start answering the Chapter 2 Question with a statement that connects *shared structure* and *common ancestor population*.
- Using these two cards, I might start by saying, "When species have shared structures, this means that they descended from a common ancestor population . . ."

This is just one part of the answer to the question. It will take more than one sentence for students to completely answer the Chapter 2 Question.

You can also use other words from the unit—words like *species*, *evolution*, etc.— that are posted on the wall.

Word Bank

- common ancestor population
- descendant species
- evolutionary time
- shared structure
- speciation

3 **STUDENT TO STUDENT DISCUSSION**
Word Relationships

EH – 2.5.3: STUDENT DISCUSSION WORD RELATIONSHIPS

Word Bank

- common ancestor population
- descendant species
- evolutionary time
- shared structure
- speciation

Begin constructing sentences

Be ready to share your sentences in small groups as well as with the class.

3 STUDENT TO STUDENT DISCUSSION
Word Relationships

EH – 2.5.3: STUDENT DISCUSSION WORD RELATIONSHIPS

Word Bank

- common ancestor population
- descendant species
- evolutionary time
- shared structure
- speciation

Example Sentences:

They all started with a **common ancestor population**, but when the environment changed and different populations became separated, their **shared structures** changed over time so they could survive in different environments. This is called **speciation**. Over evolutionary time, the **descendant species** ended up with **shared structures** that looked very different from one another.

Clip together the Word Relationships Card for the next class.

4 **STUDENT TO STUDENT DISCUSSION**
Considering Whale and Wolf Claims

EH - 2.5.4 STUDENT DISCUSSION

Students discuss the claims about where in the museum the Mystery Fossil should be placed, then record their thinking. (5 min)

Review claims.

You haven't examined much direct evidence from bone structures of these species yet, so you won't have a final opinion about which claim is strongest or best supported.

However, since you will be making your arguments to the museum soon, we'd like you to share your thinking with each other for a few minutes today.

Considering Whale and Wolf Claims

Take turns discussing the following questions with your partner:

- Which claim do you think is best supported, based on what you know so far?
- Why do you think this?

Claim 1: The Mystery Fossil belongs with the whales, in the Whale (Cetacea) exhibit.

Claim 2: The Mystery Fossil belongs with the wolves, in the Carnivore (Carnivora) exhibit.

Explain where you think the Mystery Fossil should be placed in the museum and why.

4 **STUDENT TO STUDENT DISCUSSION**
Considering Whale and Wolf Claims

EH - 2.5.4 STUDENT DISCUSSION

Students discuss the claims about where in the museum the Mystery Fossil should be placed, then record their thinking. (5 min)

Discuss first and then write.

Turn to a partner and discuss the questions on your screens, then respond to the final prompt independently.

Considering Whale and Wolf Claims

Take turns discussing the following questions with your partner:

- Which claim do you think is best supported, based on what you know so far?
- Why do you think this?

Claim 1: The Mystery Fossil belongs with the whales, in the Whale (Cetacea) exhibit.

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Explain where you think the Mystery Fossil should be placed in the museum and why.