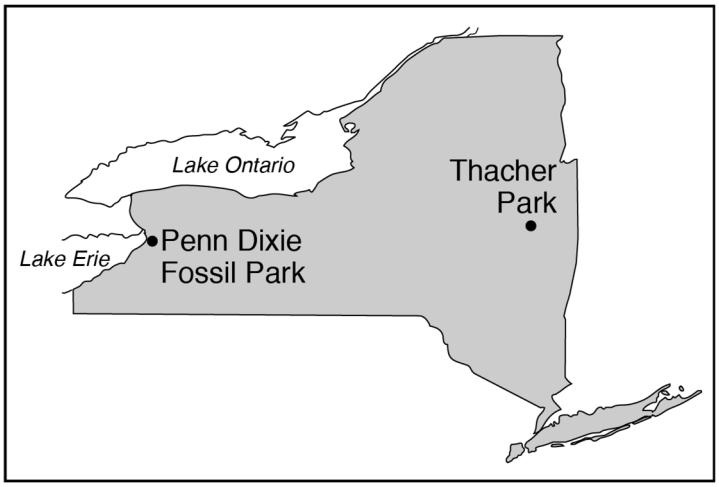
Base your answers to questions 1 through 5 on the information below and on your knowledge of science.

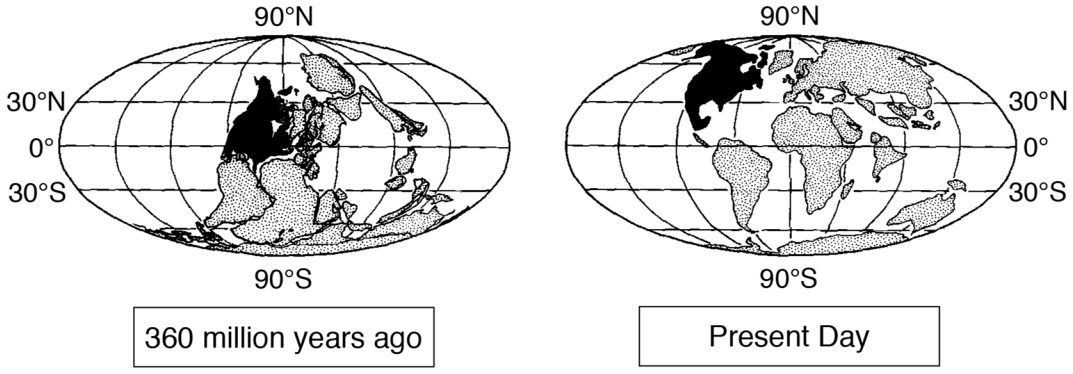
The map below shows the location of Penn Dixie Fossil Park and Thacher Park in New York State.

Fossil Parks in New York State



400 million years ago planet Earth was much different than it is today. Seas covered much of New York State. The environment at the time formed rock layers that included fossils of many tropical marine organisms such as brachiopod shells, corals, crinoids (sea lilies) and a form of sea sponges. The Penn Dixie Fossil Park, in western New York, and Thacher Park, located in eastern New York, both contain examples of this past ocean environment. The Penn Dixie Fossil Park has layers of shale that were deposited in deep water about 380 million years ago but are now exposed at Earth's surface. Thacher Park consists of sedimentary rock layers such as limestone, sandstone and shale, that began forming about 410 million years ago as a result of deposition of sediments at a time of changing sea levels. This area was eventually uplifted, exposing these layers and the fossils in them.

The maps below show the inferred location of the continent of North America, shaded in black, relative to other continents, 360 million years ago and the present day location of the continents.



1 Which piece of evidence could be used to support the claim that New York State was covered by water about 400 million years ago?

A Both Penn Dixie Park and Thacher Park have eroded surfaces.
B Penn Dixie Park has rock layers similar in age to those in Thacher Park.
C Both Penn Dixie Park and Thacher Park contain marine fossils in the exposed rock layers.
D Both Penn Dixie Park and Thacher Park were located over the equator.

2 The continent of North America is inferred to have moved from its location 360 million years ago to its present-day location. Provide *one* piece of evidence that supports this past plate motion. [1]

Evidence: _____

_____

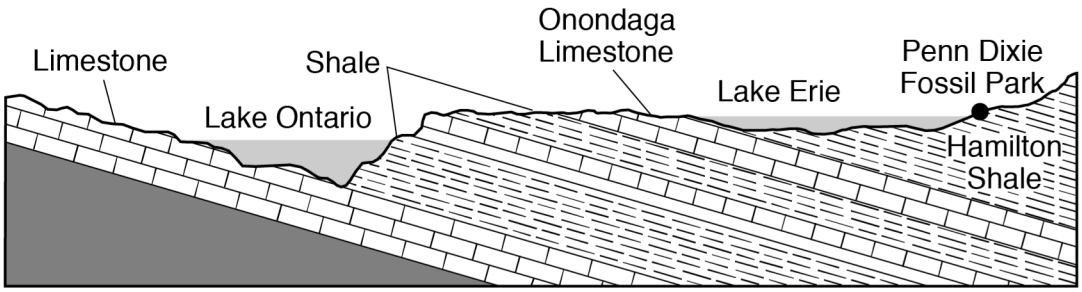
_____

3 Penn Dixie Fossil Park and Thacher Park can be used to organize the geologic history of New York State. Which evidence can be used to support this claim?

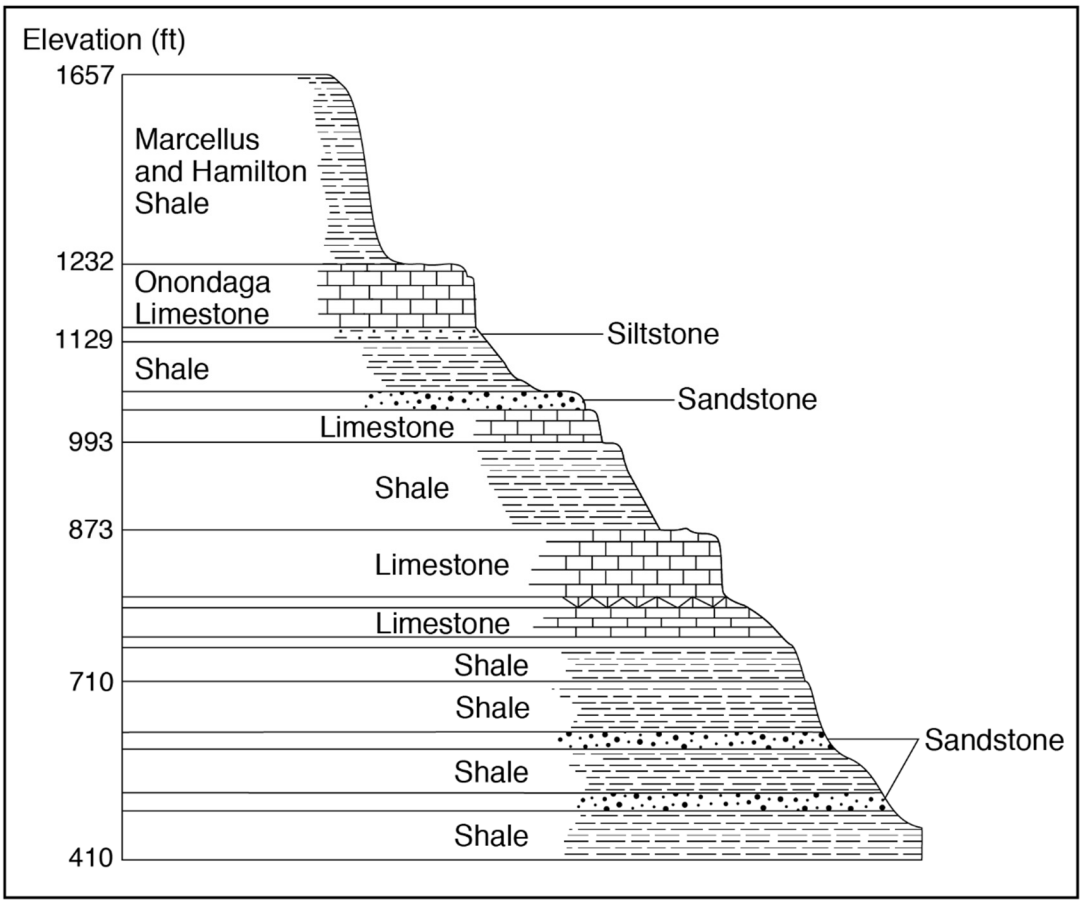
A Analysis of rock strata and fossils at Penn Dixie Park and Thacher Park.
B Analysis of the present day elevations of Penn Dixie Park and Thacher Park.
C The distance of Penn Dixie Park and Thacher Park from the equator.
D The distance of Penn Dixie Park and Thacher Park from Lake Erie and Lake Ontario.

The cross-sections below show the rock formations at Penn Dixie Fossil Park and Thacher Park. The names of some rock formations and types of rock are shown.

Penn Dixie Cross-Section



Thacher Park Cross-Section



4 Geoscience processes have changed Earth's surface. Interpret the cross-sections of Penn Dixie Park and Thacher Park to identify *two* pieces of evidence from either cross-section that supports this statement. [1]

1) _____

_____

2) _____

_____

5 The surface bedrock at Penn Dixie Fossil Park and Thacher Park are approximately the same geologic age. Identify *one* piece of evidence shown in both cross-sections that supports this statement. [1]

_____

_____

_____

Base your answers to questions 1 through 5 on the information below and on your knowledge of science.

The photograph below shows a floating globe apparatus. A metal globe is suspended in air at a fixed position a certain distance away from an electromagnet. Diagram 1 shows the location of the electromagnet in the top arm of the apparatus and the directions of two forces, labeled *X* and *Y*, that act on the globe to keep it in place.

Floating Globe Apparatus

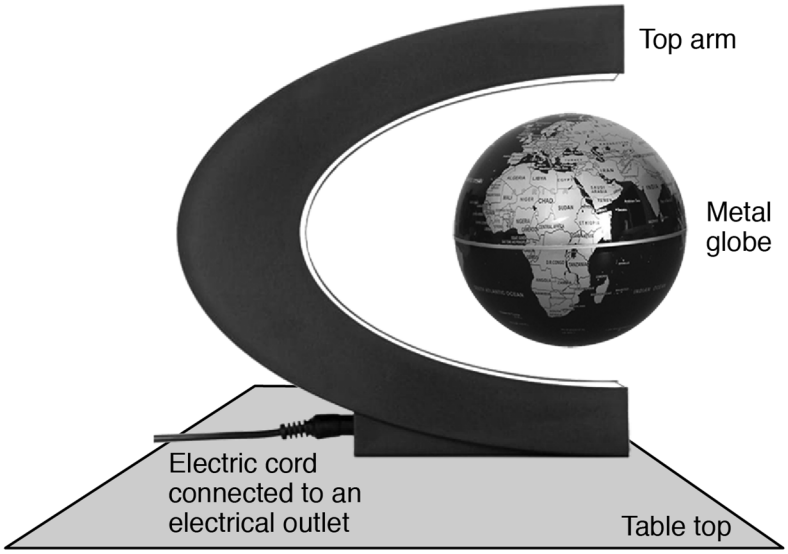
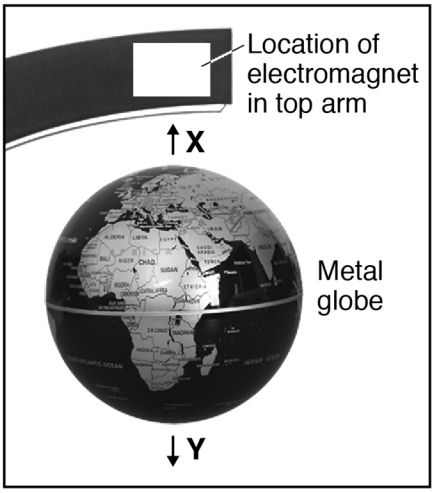


Diagram 1



1 Which claim explains why the metal globe is suspended in air at a fixed position in the floating globe apparatus?

A Fields exist between objects that only attract each other.
B Fields exist between objects that are in contact with each other.
C Fields exist between objects that only repel each other.
D Fields exist between objects that are not in contact with each other.

2 In terms of force *X* and force *Y*, explain why the metal globe remains suspended in air at a fixed position. [1]

_____

_____

3 A student increases the current through the electromagnet causing the metal globe to move upwards, closer to the top arm of the apparatus. Which question was the student investigating?

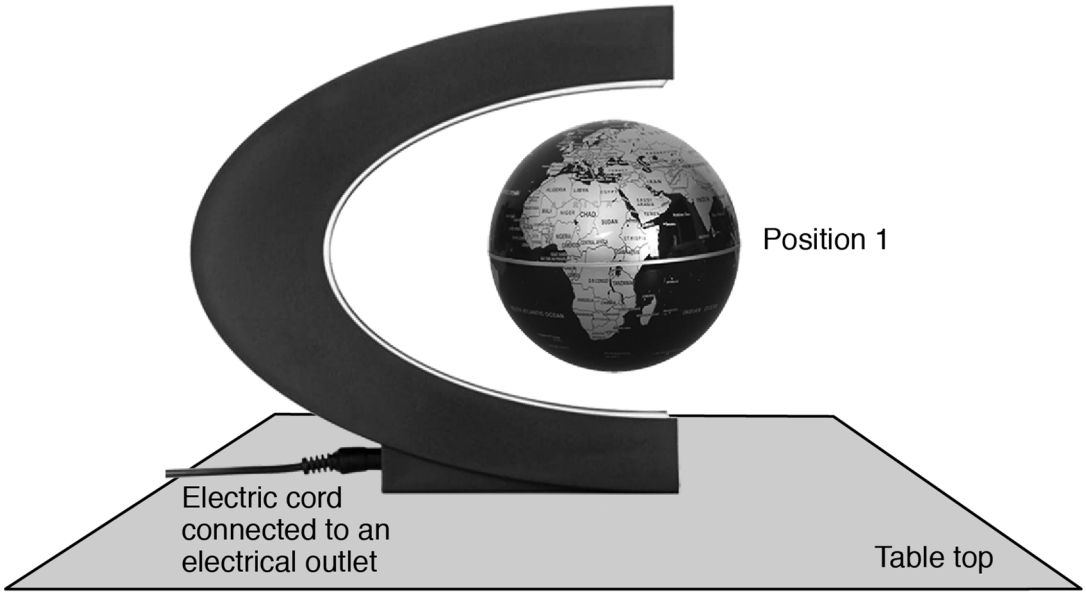
A How does the amount of current affect the size of the magnetic force on the globe?
B How does the amount of current affect the direction of the magnetic force on the globe?
C How does the amount of current affect the size of the gravitational force on the globe?
D How does the amount of current affect the direction of the gravitational force on the globe?

4 How did increasing the current through the electromagnet affect the strength of force *X* and force *Y*?

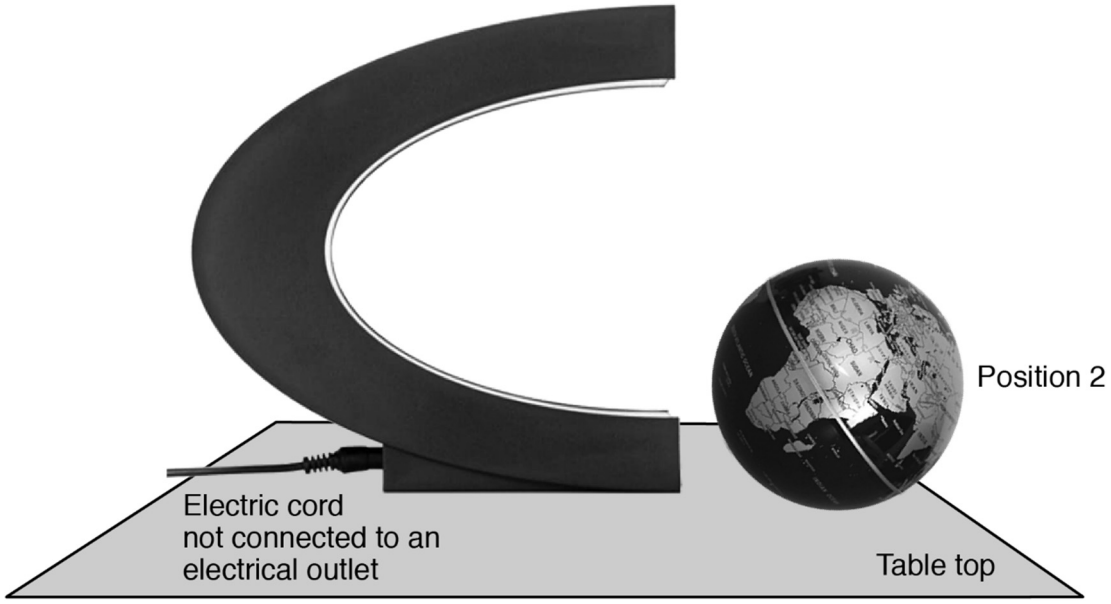
A Force *X* decreased and force *Y* was not affected.
B Force *X* increased and force *Y* was not affected.
C Force *Y* decreased and force *X* was not affected.
D Force *Y* increased and force *X* was not affected.

The models below show the floating globe apparatus with current going to the electromagnet and after the current was stopped from going to the electromagnet.

Current Going to Electromagnet



After Current Was Stopped



5 Using evidence from the models, describe how the amount of potential energy in the metal globe changes as the globe moves from position 1 to position 2.

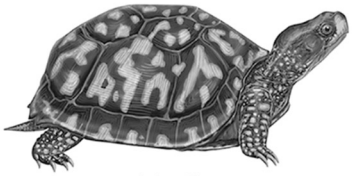
_____

_____

Base your answers to questions 1 through 5 on the information below and on your knowledge of science.

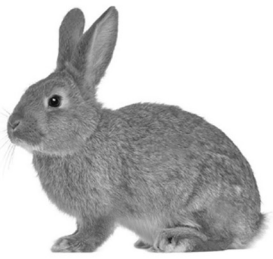
The five organisms below all have different observable characteristics. Anatomical and embryological similarities and differences can be used to determine common evolutionary descent.

Fish



Turtle

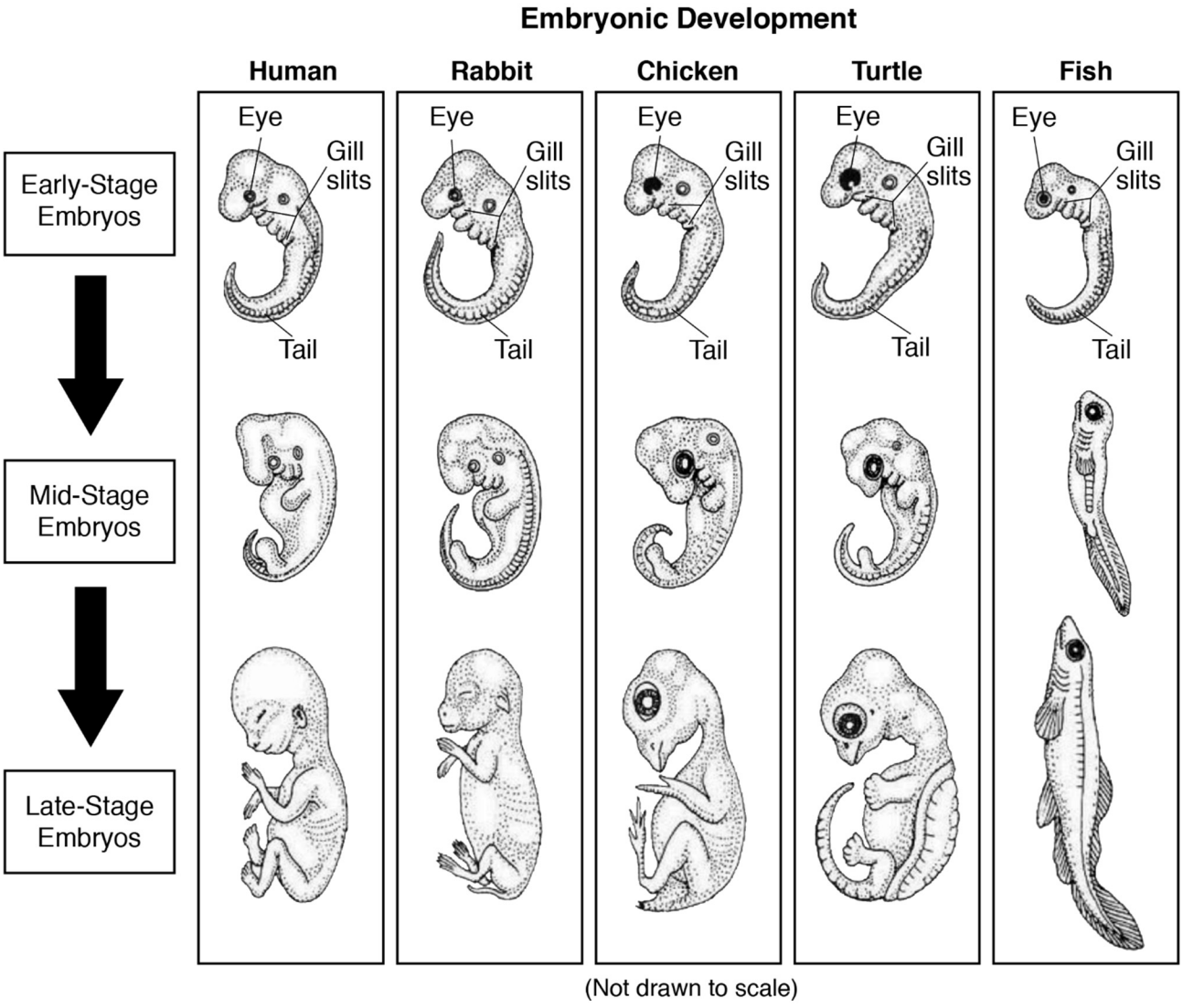
Chicken



Rabbit

Human

(Not drawn to scale)



1 What is the one structure that is found in the early embryonic stages of both the rabbit and the turtle that is not found in their adult forms?

A shell
B tail
C eye
D gill slits

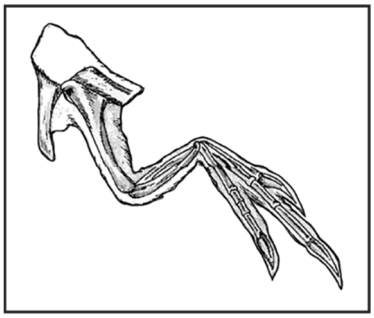
2 Provide two pieces of evidence to support the claim that the chicken is more closely related to the rabbit than it is to the fish. [1]

1) _____

2) _____

The model below represents the bones in the arm of an extinct dinosaur called *Velociraptor*.

Velociraptor



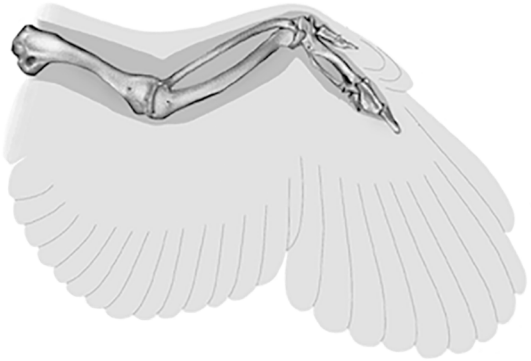
The models below represent the bones in the arms of four organisms currently alive today.

Bat wing

Human arm

Dolphin flipper

Bird wing



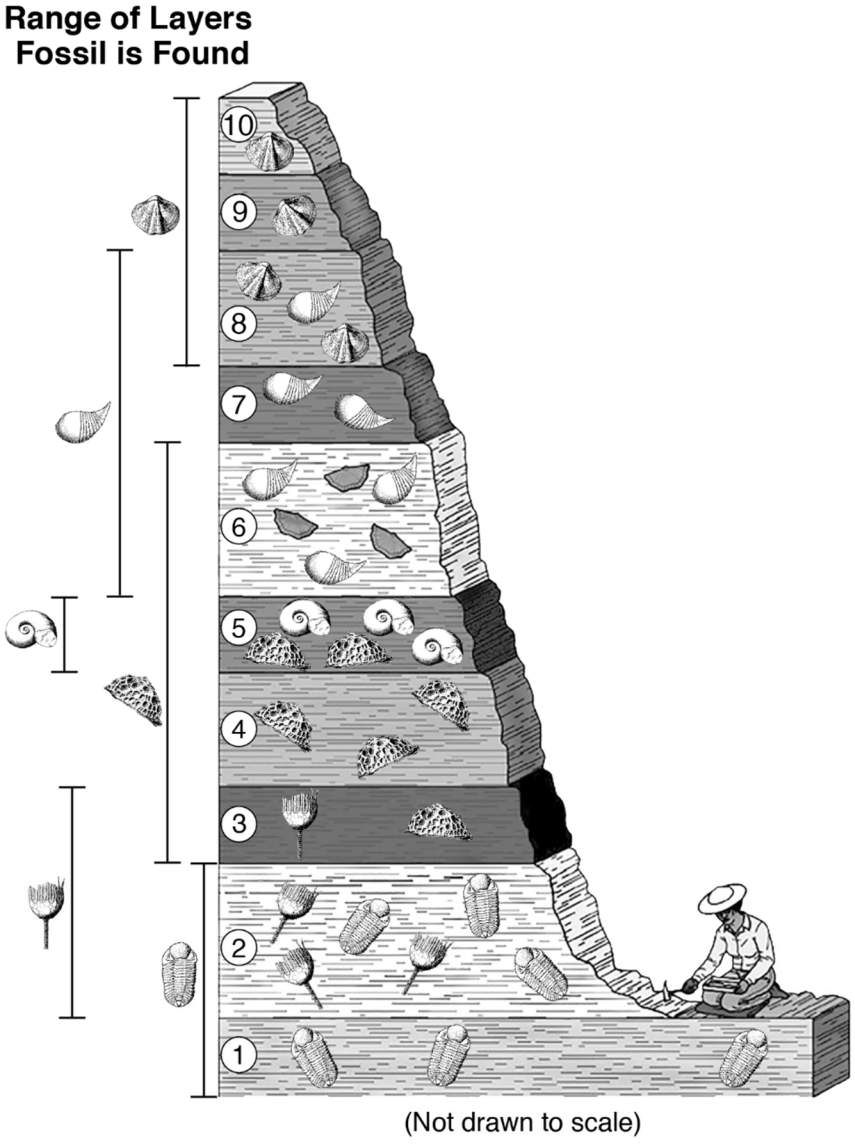
3 Identify the organism alive today that is most closely related to the *Velociraptor*. Use evidence from the models to support your choice. [1]

Organism: _____

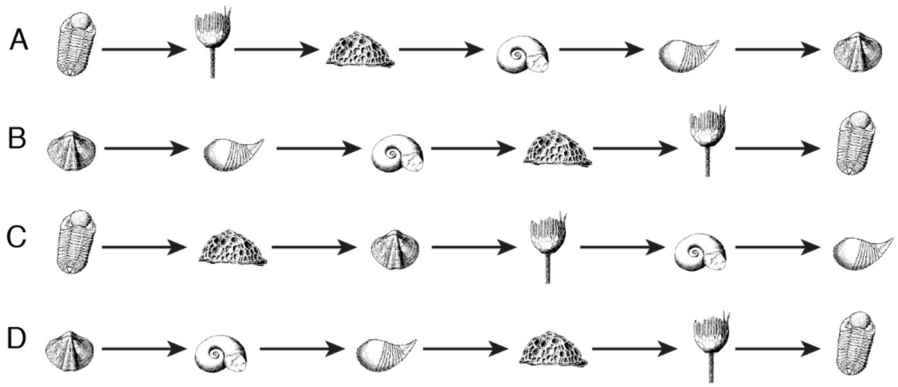
Evidence: _____

_____

The sequence of rock layers below show evidence of six different life forms, now fossils, that existed during a specific time period in Earth's history.



4 Which sequence of fossils shows the correct chronological order of fossil appearance from oldest to youngest?



5 Which claim is best supported by the evidence shown in the sequence of rock layers?

A Rock layer 4 shows evidence of diversity in one period of Earth's history.
B Three organisms became extinct before rock layer 6 formed.
C All six organisms currently exist on Earth.
D There has been no change in life forms throughout Earth's history.

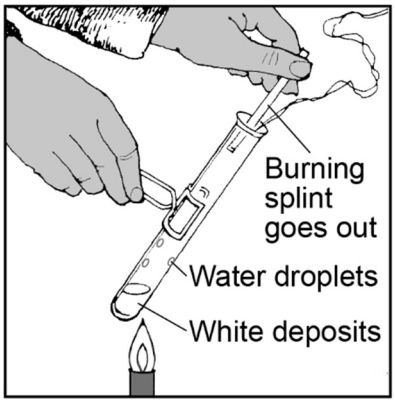
Base your answers to questions 1 through 5 on the information below and on your knowledge of science.

Investigating Chemical Reactions

During an investigation involving chemical reactions, a student used appropriate safety equipment and followed all safety procedures. The student placed a small amount of baking soda ($NaHCO_3$) in a test tube and heated the test tube carefully over a Bunsen burner. The student observed that the powdered baking soda appeared to move within the test tube. The flame of a burning wood splint was placed into the mouth of the test tube and went out, indicating the presence of carbon dioxide gas (CO_2). White deposits were visible on the bottom of the test tube, and water (H_2O) droplets formed on the inside of the test tube.

Test Tube Being Heated

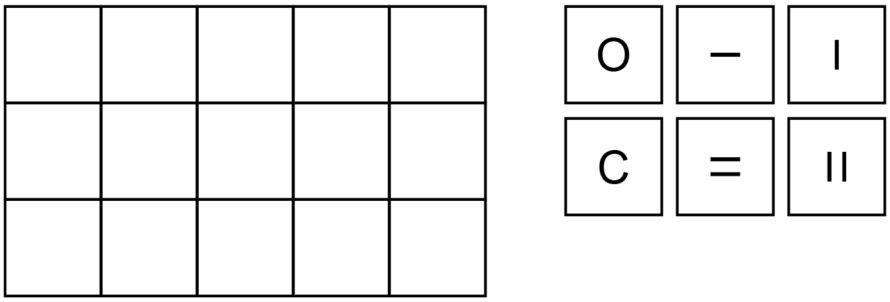
Results of Test Tube Being Heated



1 Which observation made by the student is evidence that a chemical reaction occurred as the baking soda was heated?

A The Bunsen burner was used to heat the baking soda.
B The baking soda in the test tube was exposed to air as it was heated.
C Droplets of water formed inside the test tube as it was heated.
D The temperature of the clamp increased as the test tube was heated.

2 The student created a model of the carbon dioxide molecule produced by this chemical reaction. Develop the model that the student correctly created to represent the molecular structure of **one** carbon dioxide molecule by placing the correct symbols (chemicals and bonds) into the grid. Symbols may be used more than once. [1]



The student performed another investigation during which powdered baking soda was placed on a plate and baked in an oven at 400°F for 15 minutes. After this time, only a solid substance remained on the plate.

The reaction of the baking soda being heated can be modeled using the equation below.

$$2NaHCO_3 \xrightarrow{Heat} Na_2CO_3 + CO_2 + H_2O$$

(baking soda) (sodium carbonate) (carbon dioxide) (water)

3 The student claimed that the total mass of the substance on the plate would not change while the substance was heated in the oven. Write the correct terms from the options below to complete the paragraph to ***refute*** the student's claim. [1]

Options for Terms

A	B	C
less	solid and two gases	the substance and the plate are not a closed system
the same	solid, liquid, and a gas	the substance and the plate are a closed system

A Compared to the total number of atoms in baking soda, the total number of atoms in all the products of the reaction is _____.

B However, during the reaction, the baking soda would change to a _____.

C As a result, the total mass of the substance on the plate would change because _____ _____.

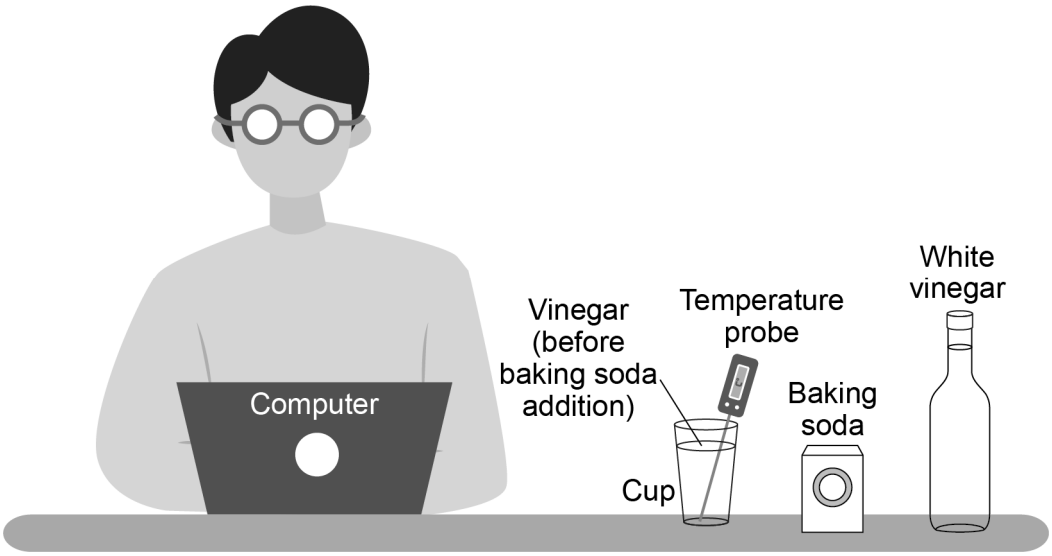
The same student decided to investigate what would happen if baking soda was mixed with vinegar. They wanted to see if a gas was produced and if thermal energy was absorbed or released in the reaction.

The student obtained the following materials:

– safety goggles
– a temperature probe connected to a computer
– a plastic cup (400 ml)
– white vinegar (25 ml)
– baking soda (6 g)
– plastic spoon

The diagram of the setup is shown below.

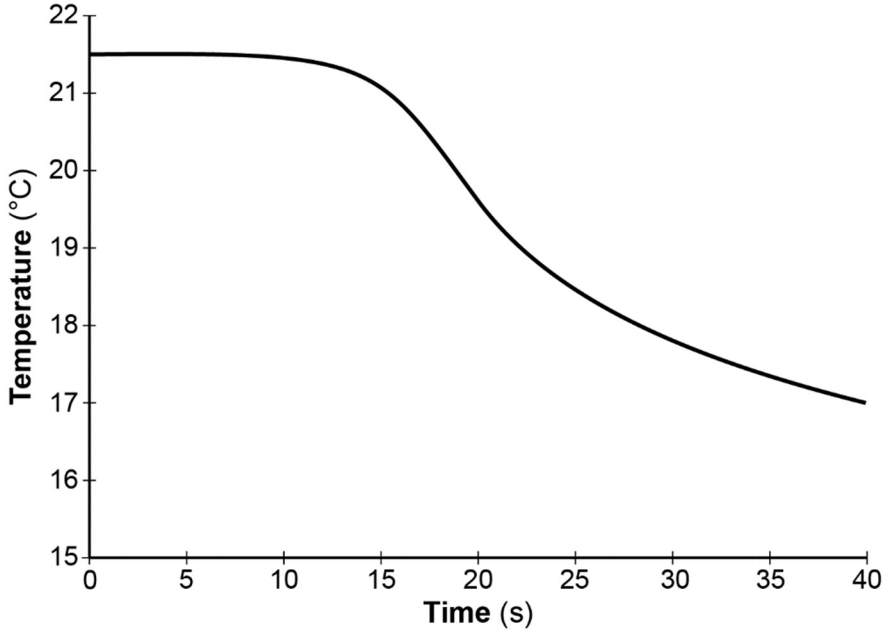
Baking Soda–Vinegar Investigation Setup



The student used appropriate safety equipment and followed all safety procedures to perform the steps listed below.

1. Pour 20 ml of vinegar into the plastic cup.
2. Place the temperature probe into the cup.
3. Allow probe to record the temperature of the white vinegar for 10 seconds.
4. Carefully add 6 grams of baking soda to the vinegar in the cup. Stir with a spoon for 30 seconds.
5. Observe and record any changes to the appearance of the baking soda-vinegar mixture.
6. Analyze graph of data from temperature probe.

Relationship Between Time and Temperature for a Baking Soda–Vinegar Mixture



Observations of Baking Soda – Vinegar Mixture
• Liquid rises in cup. • Bubbles form in mixture and pop on surface.

4 What is the *most* accurate statement about the atoms in this reaction?

A The baking soda molecules broke apart and the atoms formed new substances.
B Atoms in the air combined with atoms in baking soda to form new substances.
C Some atoms were destroyed as a result of mixing the baking soda with the vinegar.
D New atoms were created as a result of stirring the baking soda with the vinegar.

5 Based on the results of the investigation, which table includes data that supports the claim that thermal energy was absorbed and a gas was produced when baking soda was mixed with vinegar?

A

Observation	Graph
Bubbles formed.	Temperature stayed the same from 10 to 30 seconds.

C

Observation	Graph
Level of liquid rose in cup.	Temperature decreased from 0 to 10 seconds.

B

Observation	Graph
Bubbles formed.	Temperature decreased from 10 to 30 seconds.

D

Observation	Graph
Level of liquid rose in cup.	Temperature stayed the same from 0 to 10 seconds.