Directions: To complete this lesson you will need the Tyrannosaurus Rex, Stegosaurus and Triceratops models plus the T-Rex tooth and raptor casts. You will find that many of the questions ask for interpretations of features on the models; questions for which answers are not provided in the text. This is similar to the work performed by paleontologists both in the field and in the laboratory.

Tyrannosaurus Rex is reputed to have been one of the most awesome killing machines ever to walk our planet. During this lesson you will explore many features of this magnificent creature to discover what made T-Rex such an incredibly efficient hunter.

Let's begin with the head. **[1]** How are the eyes and nostrils positioned to provide maximum efficiency for hunting?

Compare the positioning of T-Rex's eyes with those of Stegosaurus and Triceratops. **[2]** How do they differ? **[3]** What advantage does the eyes being placed on the sides of their heads provide for Stegosaurus and Triceratops?

Position the T-Rex model so you are able to stare directly into its eyes. **[4]** Is the positioning of T-Rex's eyes similar to that of your own?

Paleontologists often compare creatures known only from fossils with animals that are presently alive. **[5]** Do your eyes move in unison, or do they move independently? **[6]** Might it be reasonable to assume that T-Rex's eyes also moved in unison?

Living creatures having eyes positioned close together possess the ability to focus upon distant points or objects. This is referred to as having binocular vision. **[7]** How might binocular vision contribute to T-Rex's efficiency as a hunter?

Because most soft tissues, such as eyes, have not been preserved, we can never be absolutely certain that T-Rex had the ability to focus clearly upon distant objects, but the positions of the eye sockets in the skull seem to indicate this as a strong possibility.

[8] What adjectives might be used to describe T-Rex's neck?

[9] How might a flexible neck assist T-Rex in locating and consuming its prey?

[10] Describe T-Rex's teeth, jaws and mouth. **[11]** How might its teeth, mouth and jaws have contributed to T-Rex's reputation as an efficient killer? The model T-Rex jaw measures a little more than one inch and its open mouth measures approximately one inch. The scale of this model is 1:40 meaning that each inch equals 40 inches, or just over three feet Can you imagine a T-Rex heading straight toward you with its three-foot gaping mouth full of sharp, curving teeth open wider than three feet?

Examine the cast of a T-Rex tooth. **[12]** In what way does this tooth resemble the sharp knives in your parents' kitchen? **[13]** Does this tooth appear to be as razor sharp as you may have imagined before actually seeing the tooth?

Position the tooth near the mouth of the T-Rex model with the curved side faced inward toward the throat. **[14]** How might such a set of inward-pointing teeth be an advantage to T-Rex?

Although difficult to determine through observations of the model, the size of the T-Rex skull indicates that it quite likely had a very large brain capable of sophisticated thought. **[15]** How might intelligence have contributed to its efficiency as a hunter?

Thus far no mention has been made of a possible sense of hearing. **[16]** What clues, if any, does the model provide that may indicate whether T-Rex possessed a sense of hearing?

Very little appears in literature addressing whether T-Rex may have had a sense of hearing. **[17]** Why, do you suppose, the sense of hearing is largely ignored in literature?

[18] Describe T-Rex's forearms.

The arms of the model are about one inch in length. The scale of the T-Rex model is 1:40. **[19]** According to this, what is the approximate length of the forearm in feet?

T-Rex's two small fingers each ended with a sharp claw. **[20]** Would T-Rex have used its arms to bring food to its mouth? Why or why not?

Before continuing our discussion of T-Rex's body features, it must be noted that – although muscular tissue is soft and readily decomposes – skeletal bones reveal the exact location where muscles had been previously attached and exactly how large that area of attachment actually was. Careful study reveals that extremely large and powerful muscles were attached to all the large bones T-Rex used in locomotion and feeding. What an incredibly powerful and ferocious beast T-Rex must have been!

As you may have observed at your school's track meets, athletes rhythmically move their arms back and forth as they run. **[21]** What benefit do runners gain from this arm movement?

T-Rex's forearms were so relatively small that they provided little additional balance even if it had swung its arms back and forth. However, T-Rex did possess a outstandingly efficient device for counterbalance. **[22]** What do you suppose that device may have been?

Study the positioning and size of T-Rex's head, tail, legs and feet. Might the balancing act required of T-Rex possibly explain the comparatively puny size of its forearms? Scientists often devise hypotheses to explain the unknown. **[23]** Give the "balancing act" question some thought and attempt to develop a hypothesis of your own to explain why T-Rex's forearms evolved into such small size.

One other impressive feature is the extremely muscular legs of T-rex. Most other features that rendered T-Rex such an outstanding hunter would have served little purpose had it not evolved such strong, powerful hind limbs. Note the long toes. **[24]** How might these have been positioned while running to further increase T-Rex's speed? **[25]** What trace evidence may eventually be found to prove or disprove your hypothesis?

At the end of each of T-Rex's long toes was a very sharp claw similar to the cast of the raptor claw. **[26]** Describe how T-Rex may have used this claw in its role as a predator.

T-Rex, The Tyrant Lizard King **Answer Key**

Please note: The complete set of twelve model dinosaurs plus the casts of the T-Rex tooth and raptor claw referenced in this lesson are available for purchase from Other Worlds Educational Enterprises. Visit http://www.otherworlds-edu.com for details.

1. Eyes appear to look straight ahead and the openings of the nostrils are pointed directly forward.
2. The eyes of the Stegosaurus and Triceratops are on the sides of their heads whereas the eyes of T-Rex look directly forward.
3. This positioning increases their chances of detecting possible predators more quickly thereby providing a clue to cease any possible motion that might attract a predator's attention.
4. Yes
5. They move in unison.
6. Yes
7. T-Rex would have the ability to estimate how far his prey is away so that he could adjust his running speed accordingly.
8. Flexible, long, slender – answers may vary
9. It could swivel its head quickly to follow movements in the distance. Once its prey had been captured, T-Rex could grasp it and swivel its head in rapid succession to hasten its prey's death, thus decreasing the possibility of injury to itself.
10. Numerous inward curving teeth; large mouth; probably very muscular jaws
11. Large mouth capable of opening very wide; muscular jaws capable of clamping down very hard, inward curving teeth to prevent captured prey from escaping.
12. Serrated edges
13. Answers will vary.
14. It's much more difficult for prey to escape once it has been captured.
15. T-Rex may have had enough intelligence to interpret information that its senses had gathered.
16. If ears are present, they are not very obvious. There appears to be no typical ear-shaped receptacles on the exterior of the head to direct sound inward.
17. Hypothesis: Only large bones have been well preserved. Since ear bones are relatively small and the external portions of the ears are generally composed of cartilage, there may be little evidence of their existence.
18. Very small when compared to the rest of the T-Rex features.
19. 3.3 feet
20. No. Its forearms were not long enough to reach its mouth.
21. Balance
22. Its tail
23. Hypothesis: If the arms had been much larger and heavier, T-Rex may not have been able to balance its body. It may literally have caused him to fall on his face!
24. T-Rex may have run on the tips of his toes.
25. T-Rex trackways
26. Possibly grasping and holding down its prey to prevent its escaping or causing T-Rex physical harm until its prey had succumbed to its final fate.