

# Comparing Anatomy

Name \_\_\_\_\_

Suppose you are given the task of designing and building the forelimb (arm, front leg, wing, and fin) of four different clay animals. One of them must fly. One of them must swim under water. One must be able to run fast on four legs. And the last one must be able to grasp objects.

You are given four sets of 27 “bones” made of modeling clay. These pieces came from another clay animal that someone else constructed earlier. You are to build your four clay animals from four sets of these bones. Here are the rules:

1. You must use all 27 bones in some way for EACH of your organisms.
2. You can stretch, compress, trim, and shape each clay bone any way you need in order for it to fit your design.
3. You may stick two or more pieces of the clay bones together to make a single, stronger piece.
4. You may not add any new pieces of clay.

## QUESTIONS:

1. Would it be safe to say that your four clay animals are somehow related to each other? \_\_\_\_\_ Explain.
2. Suppose you were asked to build the forelimbs of four clay animals but were not given any starting pieces except one big glob of clay. Your job is to build one animal that can run on four legs, one that can fly, one that can swim under water, and one that can grasp things. How would you build it?
  - a. Count a certain number of pieces of clay for each animal and use the same number of pieces to build the limbs of each animal.
  - b. Design each animal out of however many pieces of clay it took to do the job best, even if that number is different for each animal.
3. Explain why you picked the answer you did in #2.
3. How many bones are in the wing of a butterfly, a moth, and a wasp? \_\_\_\_\_
4. Since insects do not have bones in their wings but birds and bats do, would it be safe to say that butterflies, moths, and wasps are more closely related to each other than they are to birds and bats? \_\_\_\_\_
5. What does the term homologous structure mean?
6. What does the term analogous structure mean?

7. Are the wings of a butterfly and the wings of a bird homologous or analogous?  
\_\_\_\_\_

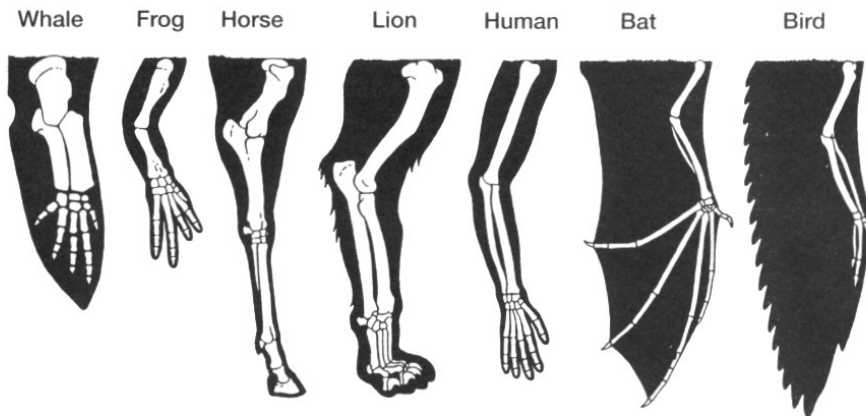
8. Are the wings of a bat and the arms of a human analogous or homologous?  
\_\_\_\_\_

9. In horses, some of the toes are very tiny and hidden under the skin. They are not used for anything, yet they are still present. These are called vestigial structures. What is the definition of vestigial?

10. In the example above where you are asked to design four clay animals from scratch using however many “bones” you needed, would you design any of them with useless or vestigial bones? \_\_\_\_\_ Why or why not?

11. If you had to design a limb using a certain number of bones from another organism, but if you didn’t really need all the pieces of clay, would you make them very small so they wouldn’t get in the way of the other, useful bone pieces? \_\_\_\_\_

12. Here are pictures of the forelimbs of seven organisms: a bird wing, a bat wing, a human arm and hand, a lion’s front leg, a frog’s front leg, a horse’s front leg, and a whale’s fin. They are all made of the same number of bones connected in the same way, but some of the bones are very tiny and useless in birds and horses.



CONCLUSION: Is it logical to conclude that birds, bats, horses, frogs, lions, whales, and humans share a common ancestor? \_\_\_\_\_ How can you tell?