

### Self-study Problems #9: Neanderthals and *Homo sapiens*

1. Fossils from Sima de los Huesos indicate that Neanderthals evolved from

*Homo heidelbergensis*

2. In what region(s) did Neanderthals live?

*only in Europe (extending a little further east and south than what we usually call Europe today)*

3. Describe some body (post-cranial) features that made Neanderthals different from other members of *Homo*.

*stocky, robust, muscular; large knee and hip joints; thick-walled leg bones; barrel chest; short extremities, especially lower leg and forearm*

4. How did the size of Neanderthal brains compare to those of modern *Homo sapiens*, and what can we conclude from this?

*Neanderthal brains were in the same range of variation as modern *H. sapiens* (1000-2000 cc), but averaged slightly larger (1520 cc vs. 1400 cc). Since *H. sapiens* intelligence is similar across our whole range of variation, brain size does not tell us much about relative intelligence in these species.*

5. Explain why some Neanderthal facial characteristics are thought to have evolved.

*The large nose may have warmed cold incoming air, conserving heat in the upper body and reducing cooling of the brain. The heavy, pulled-forward face and hollow browridges may also have insulated the brain from cold air. The large browridges may have strengthened the face against the heavy use of the front teeth for holding and scraping actions that the wear on the incisors suggests.*

6. What has been suggested about Neanderthal hunting and other behavior based on the health conditions of many Neanderthal fossils?

*The pattern of injuries among Neanderthals resembles that of rodeo performers, suggesting that they hunted with weapons that required them to get close to large animals.*

*Since some Neanderthals apparently lived a long time after serious injuries, tooth loss, partial paralysis, etc., some people suggest that Neanderthals may have cared for the sick, injured, and old. Others point out that chimps and other primates may survive such conditions without help, however.*

7. What evidence suggests that Neanderthals may have had human-like ideas about death or the supernatural?

*They intentionally buried their dead. Some burials included flower pollen, goat horns, or other items that might indicate that they placed things with the dead intentionally, suggesting ideas about death, the afterlife, or other supernatural concepts. However, all the evidence of things placed in the burials is debatable; all could be due to accidents or natural processes.*

8. What happened among hominins in Africa as Neanderthals were evolving?

*Initially, *Homo heidelbergensis* continued, without evolving Neanderthal traits, then began to evolve into *Homo sapiens*.*

9. About when and where did *Homo sapiens* first appear?

*From about 200,000 to 100,000 years ago, in Africa.*

10. What physical features make *Homo sapiens* different from earlier hominins?

*smaller, more lightly built face, pulled in and below the braincase; greatly reduced browridges; rounder, higher cranium with more vertical forehead; slightly larger cranial capacity than H. heidelbergensis, but maybe not significantly larger; longer, more lightly built limbs, hands, and fingers; generally lack the odd incisor wear of Neanderthals.*

11. Describe the “human revolution” theory and what it is supposed to explain.

*This is the idea that *Homo sapiens* made a rapid shift to modern behavior, including mode 4 stone tools, cave art, ritual burials, figurines, long-distance procurement of materials, etc., around 50,000 years ago. It suggests that a probably small population of *H. sapiens* in Africa experienced either strong selection pressures or some mutations that led to a rapid increase in cognitive abilities.*

12. What other hominins might *Homo sapiens* have encountered, where, and what happened?

*H. sapiens shared the Middle East and Europe with the Neanderthals. In Asia, H. sapiens could have encountered H. erectus, and possibly H. heidelbergensis (or a similar hominin that evolved in Asia from H. erectus). We don't know if the species actually met. Genetic studies suggest that they did not interbreed. They may have competed for the same resources. Neanderthals in one cave in France might have picked up some H. sapiens cultural practices, making bone awls and wearing bone and animal tooth ornaments. In the end, all the others went extinct, leaving only H. sapiens.*

13. Name and describe the new mode of stone tools that cognitively modern *Homo sapiens* made.

*Mode 4 stone tools, based on blades (long, narrow flakes). Mode 4 blades are made by breaking long, narrow flakes from the edge of a cylindrical or conical core in such a way that the next blade can be removed without having to reshape the core. Blades are removed in a spiral pattern around the outside of the core, reducing its diameter until it is too small to continue. The blade may be used as-is or used as a blank from which to make the desired tool.*

14. What was new about the behavior of cognitively modern *Homo sapiens* in the Upper Paleolithic?

*They made mode 4 tools based on blades; used many new materials such as bone, antler, ivory, etc.; made many new types of tools, such as spear throwers (atl-atls), awls, and needles; procured specific materials for specific tools from hundreds of kilometers away, either making special trips or trading; they developed local cultures in different places, which changed much more rapidly than before, like modern cultures or ethnicities; they mastered a wider range of environments, from arctic to coastal; they built shelters; they buried their dead with goods, suggesting beliefs about the afterlife or the supernatural; they made cave art, figurines, decorated tools, and personal ornaments*

15. Compare the rate of change of tool styles among different species of the genus *Homo*. What does this suggest about their cognitive abilities?

**Homo ergaster* and early *H. heidelbergensis* made Acheulean tools in the same way for over a million years. Later *H. heidelbergensis*, Neanderthals, and early *H. sapiens* made mode 3 tools in similar ways for about 100,000 years. Cognitively modern *H. sapiens* made many different styles of mode 4 tools that initially lasted thousands of years, and changed faster and faster over time. This suggests that the earlier species had thought processes more limited and less flexible than ours. Perhaps they differed from us in the way they learned or solved problems.*

16. How might the lifespan of cognitively modern *Homo sapiens* have affected their cultural behavior?

*Cognitively modern H. sapiens would have had more old, experienced people around than did previous hominins. This might have increased their ability to accumulate experience and knowledge, and for younger individuals to learn from older ones, encouraging varied local cultures and more rapid cultural change.*

17. What genetic evidence supports the claim that all humans descended from a small group in Africa?

*Humans are very genetically uniform compared to other species. Calculations suggest that this is due to our descending from a small group (maybe only a few thousand) only recently, which fits the theory. Also, there is much more genetic variability across African populations than across all humans in the rest of the world. This fits the theory in that all humans outside of Africa would have descended from the subset of Africans that migrated out of Africa, so they would be relatively similar to each other, compared to other groups within Africa that had been evolving differences for much longer. Specialized studies of mitochondrial DNA and Y chromosomes suggest this same pattern of branching: all non-African populations are fairly closely related, while some African populations split from each other much earlier.*