

Q1: Human origins expert Chris Stringer says that there are still questions about the early part of the human family tree. What is the important question he is asking?

Hint: Audio/slideshow: [Our family tree > Beginning the human line](#)

Answer: Which of these creatures might be the ancestors for the ones that come afterwards.

Q2: Geography question: name two continents where *Homo ergaster* and *Homo erectus* fossils have been found.

Hint: Audio/slideshow: [Our family tree > Much more human](#)

Answer: Africa and Asia.

Q3: What species does Chris Stringer believe is the most recent common ancestor of modern humans and Neandertals?

Hint: Audio/slideshow: [Our family tree > Ancient Europeans](#)

Answer: *Homo heidelbergensis*

Q4: What is another name for the members of early *Homo sapiens* that lived during the Ice Age?

Hint: Audio/slideshow: [Our family tree > Modern humans: a late arrival](#)

Answer: Cro-magnon

Q5: How long ago do scientists believe "The Missing Link" between modern humans and chimpanzees existed?

Hint: Text: [Comparisons > Bones > Looking at the bones of our living relatives](#)

Answer: Between five and eight million years ago.

Q6: What is a major difference between a human foot and a chimpanzee foot?

Hint: Animation: [Comparisons > Bones > Becoming bipedal: walking upright > Comparing humans and chimps](#)

Answer: Chimpanzees have an opposable big toe.

Q7: Where does the name Neandertal come from?

Hint: Text: Comparisons > Bones > Bones from an ancient human

Answer: They were named Neandertal because the first fossil of this species was found in the Neander Valley (Neander Tal) in Germany in 1856.

Q8: According to Chris Stringer, our line of evolution diverged from the Neandertals during the middle Pleistocene period. When was the middle Pleistocene period?

Hint: Video: Comparisons > Bones > Bones from an ancient human > How closely related

Answer: About 300,000-600,000 or 700,000 years ago.

Q9: Which four Neandertal fossil finds were mainly used in the first reconstruction of an adult Neandertal skeleton?

Hint: Text: Comparisons > Bones > Reconstructing the past

Answer: La Ferrassie (France), Kebara (Israel), Spy (Belgium), and Feldhofer (Germany).

Q10: Name three major differences between the Neandertal skull and the modern human skull.

Hint: Animation: Comparisons > Bones > Reconstructing the past > Comparing humans and Neandertals

Answer: A Neandertal skull is longer, brow-line more pronounced and nasal cavity is larger than a modern human's skull.

Q11: Compared with most other hominid species, the Neandertals were probably quite intelligent. How can scientists tell this?

Hint: Video: Comparisons > Bones > Reconstructing the past > The Neandertal head: Part 1

Answer: Skull size; their large skulls indicate that Neandertals were big-brained.

Q12: In the DNALC's first-ever reconstruction of a full Neandertal skeleton, the cast for the hyoid bone came from which fossil?

Hint: Slideshow: Comparisons > Bones > Reconstructing the past > Making of the Neandertal

Answer: Kebara skeleton, Israel.

Q13: To study thinking and language, geneticist Svante Paabo's group compares the genes of which two organisms?

Hint: Text: Comparisons > Behavior > Language and communication

Answer: Humans and chimpanzees.

Q14: What is the name of the first "language" gene found, where mutations in that gene affect language ability and speech?

Hint: Video: Comparisons > Behavior > Language and communication > Chimps, humans, and language

Answer: FOXP2

Q15: In which two countries have researchers found what they think are the two earliest *Homo sapiens* deliberate burial sites?

Hint: Video: Comparisons > Behavior > Burying the dead > Ancient human burials

Answer: South Africa and Israel.

Q16: Approximately how long ago did the Neandertals go extinct?

Hint: Text: Comparisons > Behavior > Surviving in a changing world

Answer: 30,000 years ago.

Q17: In 1967, Allan Wilson and Vince Sarich published their estimate of when the human lineage separated from the great apes. What was this estimate?

Hint: Text: Comparisons > DNA > Molecular comparisons

Answer: Five million years ago.

Q18: On average, how many differences are there between humans and chimps in a 379-nucleotide part of the mtDNA control region?

Hint: Animation: Comparisons > DNA > Molecular comparisons > Chimp and human (mtDNA)

Answer: 56

Q19: Which technique did Mary-Claire King use to infer that human and chimpanzee DNA differ by only one percent (1%)?

Hint: Text: Comparisons > DNA > Of apes and humans

Answer: DNA hybridization

Q20: When did Mary-Claire King compare the DNA of chimpanzees and humans?

Hint: Video: Comparisons > DNA > Of apes and humans > Shared genetic materials

Answer: The early 1970s: 1971-1973.

Q21: Under ideal conditions, how long can DNA remain intact?

Hint: Text: Comparisons > DNA > Ancient DNA

Answer: 50,000 years.

Q22: In 1997, German scientists were able to extract DNA from 30,000 year-old Neandertal fossils. From which part of the cell did this DNA come from?

Hint: Text: Comparisons > DNA > Of Neandertals and humans

Answer: The mitochondria.

Q23: On average, how many differences are there between two modern human beings in a 379-nucleotide part of the mtDNA control region?

Hint: Animation: Comparisons > DNA > Of Neandertals and humans > Human mtDNA variation

Answer: Seven.

Q24: What is the function of the mitochondria in the cell?

Hint: Text: Gene genealogy > Mitochondrial DNA > Looking at mitochondrial DNA (mtDNA)

Answer: To produce energy (cellular respiration).

Q25: How is the Y chromosome inherited?

Hint: Text: *Gene genealogy* > The Y chromosome

Answer: From father to son.

Q26: Name the two classes of markers found on the Y chromosome, that scientists use to trace genetic origins?

Hint: Video: *Gene genealogy* > The Y chromosome > Markers on the Y chromosome

Answer: Single nucleotide polymorphisms (SNPs); and microsatellites or short tandem repeats (STRs).

Q27: What does Kenneth Kidd's lab study that few other researchers currently research?

Hint: Video: *Gene genealogy* > Other genome regions > Integrating new information

Answer: The Kidd lab looks at large amounts of nuclear autosomal DNA variation in large numbers of populations.

Q28: Name two ways mutations can naturally occur in DNA.

Hint: 3D animation: *Gene genealogy* > A molecular clock > Mutations and the molecular clock > DNA mutations

Answer: Reactive chemicals and natural background radiation.

Q29: What are the two factors that Michael Hammer says control the amount of diversity in a population?

Hint: Video: *Gene genealogy* > A molecular clock > Mutations and the molecular clock > Measuring age by mutation

Answer: The size of the population and the amount of time that diversity has been allowed to accumulate.

Q30: In 1987, a Californian research team used mitochondrial DNA (mtDNA) to construct a human family tree. To where and when did these scientists trace the most recent common ancestor of all living human beings?

Hint: Text: *Gene genealogy* > Tracing Ancestries > Tracing our maternal lineage

Answer: The team traced the lineage of modern humans back to a common ancestor who lived in Africa about 200,000 years ago.

Q31: According to Jaume Bertranpetit, studies on which unique group of people in Europe can show a correlation between genes and language?

Hint: Video: [Gene genealogy](#) > [Tracing Ancestries](#) > [Some interesting histories](#)> [The Basques](#)

Answer: The Basques.

Q32: Why are the San, sometimes referred to as the African "Bushmen", interesting to geneticists?

Hint: Video: [Gene genealogy](#) > [Tracing Ancestries](#) > [Some interesting histories](#)> [An ancient lineage: the San](#)

Answer: They have very old haplotypes (they are descended from some of the earliest human lineages that existed in Africa).

Q33: Which chromosome did Michael Hammer study to confirm that the Jewish tradition of passing the priesthood from father to son, a cultural characteristic, has been carefully followed for thousands of years?

Hint: Video: [Gene genealogy](#) > [Tracing Ancestries](#) > [Some interesting histories](#)> [Genetics and culture: the Cohenim](#)

Answer: The Y chromosome.

Q34: Approximately how long did *Homo erectus* live on earth, and to how many continents did that species spread?

Hint: Animation and text: [Migrations](#) > [Follow the paths](#) > [Homo erectus](#) > [What's happening?](#)

Answer: More than 1.5 million years on three continents.

Q35: If the *Australopithecines* are quite ape-like, what is the major difference between these species and modern apes that makes scientists believe they may be early ancestors to modern humans?

Hint: Video: [Our Family Tree](#) > [Ape-like hominids that walked upright](#)

Answer: They walked upright.

Q36: Sometimes *Homo rudolfensis* and *Homo habilis* are called the earliest humans? Why?

Hint: Video: Our Family Tree > The earliest humans?

Answer: Relatively large brain size compared to the australopithecines.

Q37: What is it about the Chimp's skeletal structure that makes it difficult for them to walk around on two legs like human beings?

Hint: Animation: Comparisons > Bones > Becoming bipedal: walking upright > Comparing humans and chimps

Answer: The head and torso of a chimp are not balanced over the hips like a human's.

Q38: Name five ways Neandertal skulls differ from modern human skulls.

Hint: Videos: Comparisons > Bones > Reconstructing the past > The Neandertal head: Pt 1 and Pt 2

Answer: Neandertals : 1. lacked chin development; 2. had bigger front teeth; 3. had longer, lower skulls; 4. had different inner ear bones, 5. had differences in muscle insertions; 6. had pronounced brow-lines.

Q39: Scientists believe the common ancestor of chimps and modern humans may have been adapted for which environment?

Hint: Text: Comparisons > Bones > Becoming bipedal: walking upright

Answer: Living in trees.

Q40: How could you describe the shape of the Neandertal ribcage?

Hint: Animation: Comparisons > Bones > Reconstructing the past > Comparing humans and Neandertals

Answer: Bell Shaped.

Q41: To which type of environment were the Neandertals most likely adapted?

Hint: Video: Comparisons > Bones > Reconstructing the past > The Neandertal body

Answer: A cold environment. (see video 1 as well).

Q42: Name three of the behavioral differences that set modern humans apart from the other hominids 40,000 years ago.

Hint: Text: Comparisons > Behavior > Human behavior

Answer: Modern humans used materials other than stone to make a broad range of tools. They created symbolic sculptures and paintings; and they ceremonially buried their dead.

Q43: What does human origins expert Chris Stringer speculate may be the reason for the Neandertals' extinction?

Hint: Video: Comparisons > Behavior > Surviving in a changing world > Coping with rapid change

Answer: The Neandertals perhaps were just, that bit less good at coping with that rapid climate changes that were occurring in Europe about 30,000 years ago, than modern humans.

Q44: What does the ritual of ceremonial burial suggest about early human behavior?

Hint: Text: Comparisons > Behavior > Burying the Dead

Answer: That ancient humans developed an awareness of themselves and of death.

Q45: If humans and chimps are 99/98% the same genetically, why are they still classified in different taxa, or different animal families?

Hint: Video: Comparisons > DNA > Of apes and humans: Anatomy, behavior, and genes.

Answer: Differences in anatomy and differences in behavior.

Q46: King and Wilson suggested a reason for why a small amount of genetic difference could account for the major physical differences between humans and chimps. What was their theory?

Hint: Text: Comparisons > DNA > Looking directly at genes

Answer: They suggested the important evolutionary changes occurred in the pieces of DNA that control the activity of genes.

Q47: Svante Pääbo studied the activity of genes expressed in various tissues of chimps, humans and orangutans. Which tissue type was found to have gene activity, which is unique to the human line of evolution?

Hint: Video: Comparisons > DNA > Looking directly at genes > Comparing chimp and human genes

Answer: Brain.

Q48: Genetically, what accounts for the differences in the sense of smell between people?

Hint: Video: Comparisons > DNA > Looking directly at genes > Losing our sense of smell

Answer: The amount of pseudogenes, inactivated smell receptor genes, in an individual.

Q49: Why does Svante Pääbo believe that is probably impossible to isolate DNA from dinosaur fossils?

Hint: Video: Comparisons > DNA > Ancient DNA > Isolating ancient DNA

Answer: From observations about the chemical stability of DNA, in the presence of water or background radiation, there is no reason to expect that DNA will survive in fossils past 100,000 to 500,000 years.

Q50: Why does the DNA in bones and teeth stay preserved longer than the DNA in other tissues?

Hint: Video: Comparisons > DNA > Ancient DNA > Preservation of ancient DNA

Answer: Firstly, the teeth and bones are somewhat protected from the outside from water and microorganisms. Secondly, when the cells break up after death, and the DNA comes out, it can bind to a mineral, called hydroxyapatite, in the bone, and that also protects it from degradation by insects and from bacteria.

Q51: Approximately how many genes in the human genome are related to our sense of smell, and, of those, how many are inactive?

Hint: Video: Comparisons > DNA > Looking directly at genes > Human smell receptors

Answer: 1000 genes; more than half are inactive.

Q52: What is the name of the modern tool used to profile the activity of genes in a cell?

Hint: Text: *Comparisons > DNA > Looking directly at genes*

Answer: Microarrays

Q53: Does mtDNA have a higher or lower mutation rate than sites in the rest of the genome?

Hint: Text: *Gene Genealogy > Mitochondrial DNA (mtDNA) > Looking at mitochondrial DNA (mtDNA)*

Answer: mtDNA has a much higher mutation rate.

Q54: All living men today can trace their Y chromosome back to a single man. Does this mean this one man was the only man around at that time? Why or why not?

Hint: Video: *Gene Genealogy > The Y chromosome > The Y chromosome and ancestry*

Answer: No, there were other men, but some of those did not bear sons, and others whose lines had sons died out.

Q55: How does Douglas Wallace ensure that he is working with the correct population that represents the genetic lineage for a particular geographic region?

Hint: Video: *Gene Genealogy > Tracing ancestries > Some interesting histories > Studying indigenous populations*

Answer: His group does a complete genealogy of all the people that we're working with. And they only take the people in the genealogy that can trace their origins back to the original people in that area.

Q56: Why does author Steve Olson believe it's a very exciting time in using genetics to look at the history of human populations?

Hint: Video: *Gene Genealogy > Other genome regions > Using chromosomes 1-22 > A wealth of information*

Answer: Over the next ten years we are going to generate wealth of information about the history of human populations and the history of individuals from chromosomes other than the mitochondrial chromosome and the Y chromosome.

Q57: Why is the mtDNA inherited exclusively from the mother?

Hint: Video: *Gene Genealogy* > Mitochondrial DNA (mtDNA) > Looking at mitochondrial DNA (mtDNA) > Inheriting mtDNA

Answer: The mitochondria and their DNA are inherited exclusively from the mother because the egg has about 200,000 mitochondria whereas the sperm have just a few, and those that do enter the egg are actually destroyed.

Q58: Why does Michael Hammer say that there are many stories being told when we trace ancestry in the autosomal chromosomes?

Hint: Video: *Gene Genealogy* > Other genome regions > Using chromosomes 1-22 > Genes: a mosaic of histories

Answer: Because of recombination and the fact that each chromosome gets passed down independently of the other chromosomes, each part of the genome has got its own genealogical history that goes back to maybe different people.

Q59: How do researchers attach a time scale to the molecular clock?

Hint: Text: *Gene Genealogy* > A molecular clock? > How fast does the molecular clock tick?

Answer: Archeological data, linguistics data, and data from the fossil record. Researchers often use the divergence of chimps and humans, five or six million years ago, to set the mutation rate for different DNA sequences.

Q60: Why when scientists use the "molecular clock" to trace ancestry is the number of differences that we count an underestimate of the number of mutations that have actually occurred.

Hint: Video: *Gene Genealogy* > A molecular clock? > How fast does the molecular clock tick? > Counting DNA Mutations

Answer: Back mutation

Q61: How does the phylogenetic tree created by Mark Stoneking and other scientists using mtDNA comparisons from people around the world, suggest that modern humans evolved in Africa?

Hint: Video: *Gene Genealogy* > Tracing ancestries > Tracing our maternal lineage > Constructing our family tree

Answer: The earliest split in this tree has only African people on both of these early branches.

Q62: When scientists compare phylogenetic trees created using mtDNA data to trees created using Y-chromosome data, they find that the trees differ. How do scientists account for these differences, and what does it tell us about the movement of early human beings?

Hint: Video: *Gene Genealogy* > Tracing ancestries > Using genetic tools together > Male and female migration patterns

Answer: That men appeared to have stayed in one place and have children in the same region where they were born, while women appeared to have moved away from their birthplaces to have children.

Q63: According to human origins expert Chris Stringer, what's wrong with depicting human evolution as a straightforward progression from an apelike species to a modern human?

Hint: Video: *Our Family Tree* > Overview

Answer: Human evolution did not occur in a straight line, with an ultimate outcome. The hominid family tree branches, and there have been many dead ends.

Q64: In which direction is the human femur angled and how does this help us walk?

Hint: Animation: *Comparisons* > Bones > Becoming bipedal: walking upright > Comparing humans and chimps

Answer: It's angled inward and it places support directly under the ribcage and over the feet of an erect human.

Q65: Which of the following is most likely to have the smallest pelvis?

- a. Modern *Homo sapiens* female
- b. Neandertal male
- c. Modern *Homo sapiens* male.
- d. Neandertal female.

Hint: Animation: Comparisons > Bones > Becoming bipedal: walking upright > Comparing humans and chimps

Answer: c. Modern *Homo sapiens* male.

Q66: What did Svante Pääbo's group discover about the FOXP2 gene that may help us understand more about the evolution of human beings 200,000 years ago?

Hint: Video: Comparisons > Behavior > Language and communication > Chimps, humans, and language

Answer: There are two changes in the FOXP2 gene that we see only in humans and not in the mouse, chimpanzee, or other great apes.

Q67: There is debate in the scientific community over whether or not Neandertals buried their dead. Explain the major arguments on both sides of this debate.

Hint: Video: Comparisons > Behavior > Burying the dead > Neandertal Burials

Answer: Scientists argue that the large number of preserved Neanderthal skeletons support the idea that Neandertals buried their dead. Scientists opposed to the idea argue that other cave dwelling animals that clearly don't bury their dead also have a large number of preserved skeletons.

Q68: How do we know that Neandertals did not contribute any mitochondrial DNA to people living in Europe today?

Hint: Video: Comparisons > DNA > Of Neandertals and humans > Analyzing Neandertal DNA

Answer: The sequence of Neanderthal mtDNA branches off before the common ancestor of all the mitochondrial sequences of people living today, no matter if they live in Europe, in Asia, or in Africa.

Q69: Explain the concept of the molecular clock.

Hint: Text and video: *Gene Genealogy* > *A molecular clock?* > *Mutations and the molecular clock*

Answer: If populations separate, each group can accumulate their own unique set of DNA mutations. The molecular clock is used to measure genetic distance between two groups by comparing the sequences of a particular region of DNA. Assuming that mutations in a particular sequence of DNA occur at a constant rate, the number of accumulated mutations in that sequence will be proportional to the length of time that two groups have been separated.

Q70: Svante Pääbo hopes that in the next two years or so, scientists will be able to make a schedule or timeline of significant selective sweeps in the genes of evolving humans. How does he believe we will be able to do this?

Hint: Video: *Comparisons* > *DNA* > *Looking directly at genes* > *Future comparisons*

Answer: By comparing the whole genomes of humans and chimps and looking for specific genes, like FOXP2, where unique changes in the human line can be found.

Q71: Why does the use of red ochre indicate to scientists that an early human population may have exhibited symbolic behavior?

Hint: Video: *Comparisons* > *Behavior* > *Human behavior* > *Early humans*

Answer: We think the use of red ochre indicates symbolic behavior, because it can be used for making pigment, for making paint, painting the body or painting other objects, and really communicating about things other than simply day-to-day life.

Q72: What does Sally McBrearty mean when she says we should try not to be "ethnocentric" when studying the behavior of prehistoric people?

Hint: Video: *Comparisons* > *Behavior* > *Human behavior* > *What is human behavior?*

Answer: That we should try not to apply the same criteria that we apply to modern people living in the 21st century when studying prehistoric people's behavior.

Q73: Why do mitochondria have their own DNA separate from the rest of the DNA in the cell?

Hint: Video: *Gene genealogy* > Mitochondrial DNA (mtDNA) > Looking at mitochondrial DNA (mtDNA) > A closer look at mtDNA

Answer: They are believed to have once been ancient bacteria engulfed by the eukaryotic cell.

Q74: Why do researchers usually consider chromosomes 1-22 as a series of structural "haplotype blocks"?

Hint: Text: *Gene genealogy* > Other genome regions > Using chromosomes 1-22

Answer: Paired chromosomes 1-22 (unlike mitochondrial DNA or the Y chromosome) exchange segments during the formation of sex cells (meiosis). This exchange, or recombination, makes it difficult to track specific DNA sequences in populations.

Q75: How much faster does mitochondrial DNA mutate than nuclear DNA?

Hint: Text: *Gene genealogy* > A molecular clock? > How fast does the molecular clock tick?

Answer: Mitochondrial DNA mutates five to ten times faster than nuclear DNA.

Q76: Who was "Mitochondrial Eve"?

Hint: Video: *Gene genealogy* > Tracing ancestries > Tracing our maternal lineage > Mitochondrial Eve

Answer: The single woman to whom all living people can trace their mtDNA.