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| Alien 4  Due Wednesday, Nov 12, Midnight  |  | | --- | | Facts about Genomes.  * There are 100 trillion (1012) cells in your body. Each cell contains DNA double helix totalling three billion (3 x 109) base pairs. * If unwound and linked together, the strands of DNA in one cell would stretch almost six feet but would be only 50 trillionths of an inch wide. * It would take about 9.5 years to read out loud (without stopping) the 3 billion bases in a person's genome sequence, if you read at a rate of 10 bases per second. * If all the DNA in your body was put end to end, it would reach to the sun and back over 600 times (100 trillion times six feet divided by 92 million miles). * Human DNA is 98 percent identical to chimpanzee DNA. Human DNA is 30% identical to E. coli DNA. * The average amount of genetic difference between any two humans is 0.2 %, or one in 500 bases. Chimpanzees differ by 0.8 %.   Useful Sites   * [NCBI](http://www.ncbi.nlm.nih.gov/) (National Center for Biotechnology Information) * [OMIM](http://www.ncbi.nlm.nih.gov/sites/entrez?db=omim) (Online Mendelian Inheritance in Man) * [BLAST](http://www.ncbi.nlm.nih.gov/BLAST/Blast.cgi?CMD=Web&LAYOUT=TwoWindows&AUTO_FORMAT=Semiauto&ALIGNMENTS=50&ALIGNMENT_VIEW=Pairwise&CLIENT=web&DATABASE=nr&DESCRIPTIONS=100&ENTREZ_QUERY=%28none%29&EXPECT=10&FILTER=L&FORMAT_OBJECT=Alignment&FORMAT_TYPE=HTML&NCBI_GI=on&PAGE=Nucleotides&PROGRAM=blastn&SERVICE=plain&SET_DEFAULTS.x=34&SET_DEFAULTS.y=8&SHOW_OVERVIEW=on&END_OF_HTTPGET=Yes&SHOW_LINKOUT=yes&GET_SEQUENCE=yes) DNA-DNA comparison * [Webcutter](http://rna.lundberg.gu.se/cutter2/) Restriction enzyme mapping * [Human Genome](http://www.ncbi.nlm.nih.gov/genome/guide/human/) |   **1. (15 pts) In Florida, cryptozoologists track the** [**Skunk Ape**](http://en.wikipedia.org/wiki/Skunk_ape)**.**  A. Suppose trackers of the Skunk Ape find a swath of orange hair which they sample for DNA. What technique can they use to analyze the DNA? What kind of small sequence(s) do the geneticists need to guess first, and why?  B. Suppose the Skunk Ape genome differs from the NCBI human genome by 12 million base pairs. Do you think the creature is human? On what basis do you decide?  C. Suppose you capture a Swamp Ape covered in orange fur. Is the creature human?  Now how do you decide?  **2. (15 pts) You are a doctor assessing the condition of a deformed newborn. The newborn genome has a gene that includes this sequence:** aatgttattagtcttttttcccctgtctaattggtgggggcctgatggaa gagggagtttggaggaaggtggagaactcctaaagaccaaaaaagtgaac ttaagaagtgtgcctgggagacgttgtattctagctctggctgtgctcca catagtttcatacttttgaccttaagagaactggaagagaaagaagtgaa aagagtgctttgaaatacagctttatttagtagc A. Use the appropriate program to determine what human gene this is.  B. Based on comparison with a "normal" human genome: What possible defect do you see?  C. What genetic disease might be exhibited by the deformed newborn? What are the likely symptoms?  **3. (10 pts) Suppose the baby above is number II.1 in the family shown below.**  A. Explain the banding pattern in the electrophoretic gel, for DNA cut with a restriction enzyme.  B. Which members of the family carry the recessive gene, though they don't show the disease? Explain.    **4. (10 pts) The chart below shows the population dynamics of an alien life form.**  A. Sketch the profile of growth rate (rate of change of population size, at a given time) as a function of time.  B. Invent a story to explain the life history of these organisms. |