A palaeontologist finds a fossilised bone from an extinct hominid and is able to extract a tiny amount of DNA. Describe in detail the process that would be used to make a large number of copies of this DNA in order for it to be sequenced.

* The process used is Polymerase Chain Reaction (PCR) (1)
* A reaction mixture is set up with contains:
  + The DNA section to be copied (1)
  + Primers as a starting point for nucleotide attachment (1)
  + Free nucleotides to attach during copying (1)
  + Taq *(Thermus aquaticus)* polymerase to bind nucleotides to template strand (1)
* A single cycle contains the following:

1: Denaturation (1) : The strand to be copied is heated to 96 C (1) which separates the DNA strand into two template strands (1)

2: Annealing (1) : The reaction is cooled to 55-65 C (1) so that primers can bind to the start of the template strands (1)

3: Extension (1): The reaction temperature is raised to 72 C (1) allowing Taq polymerase to extend the copying by adding free bases to the template strands. (1)

* After this cycle the initial DNA strand has now become two identical strands (1)
* The cycle is repeated multiple times (1) each time doubling the number of copies of the DNA sequence present (1)
* This is able to happen because Taq polymerase is heat stable (1) so it does not denature during the cycles of heating and cooling (1).
* Taq polymerase is heat stable because it is sourced from the bacterium *Thermus aquaticus* (1) which lives in high temperature environments (1) and has therefore adapted to have to have heat stable polymerase (1).

(Any 15 of the above for 15 marks)