

BOARD OF STUDIES  
NEW SOUTH WALES

319 (i) Hominid fossil 'Lucy' (*A. afarensis*)

(ii) ~~opposable~~ thumb - this is an important primate feature, as it allows for various ~~tool~~ tool usage, and ~~handling~~ handling of objects such as trees and branches. In hominids it is essential for various grips such as the 'power' & 'precision' grip

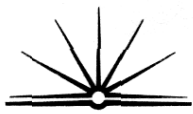
The presence of 4 different kinds of teeth → incisors, canines, molars and premolars. These are important features as it also determines the relative diet of the hominid.

(iii) The opposable thumb is an important human feature. In apes, both the big toe and the thumb are opposable (in that it consists of a ball & socket joint) this is indicative of their arboreal & ground

dwelling existence. The opposable digits allows the Apes to move freely from tree to tree using all limbs. This is contrasted to humans, where the thumb is only opposable. This is important as it allows humans to have a greater manipulation of tools, the forward facing <sup>big</sup> toe also suggests that humans have a bipedal ~~stance~~ stance and reflects their ground dwelling habitats thus it is ~~clear~~ <sup>evident</sup> that with evolution the ~~opposable~~ <sup>big toe</sup> ~~thumb~~ has been selected against in humans, due to the more favourable forward facing digits to support weight. While the opposable thumb has been an adaptive advantage for both humans & Apes.



- b) (i) Donald Johanson was the leader of the Hadar Expedition in Ethiopia in 1974. In this expedition he discovered the skeletal remains of a hominid fossil called 'Lucy'. He named it "*Australopithecus Afarensis*". This ~~was~~ discovery was important as it was the 1st hominid fossil to be in an almost complete form. It was 100m tall, it had a ~~small~~ a small skull (400cc) and ~~was~~ it was ape like above the waist and possessed human like features below the waist. Although it was ~~first~~ considered to be the remains of a chimpanzee by some due to the physical features, the position of the foramen magnum indicated a bipedal gait, thus it was considered <sup>a</sup> hominid ancestor.



(11) Prior to the discovery of 'Lucy', paleoanthropologists only had fragmented bits of fossil evidence to research the human evolutionary story. However the discovery of this fossil ~~remains~~ ~~of its~~ ~~of its~~ which had a 40% complete skeletal structure intact provided the scientific world with some startling insights. Not only did it possess both ape like and human features, its skull size also indicated a small cranial & brain capacity. ~~It~~ it was generally believed that hominids who had a large ~~cranial~~ cranial capacity and hence large brain evolved ~~to~~ a bipedal ~~gait~~ gait in order to free up their hands. However the size of 'Lucy's' brain together with the evidence of an upright stance suggested that bipedal evolution occurred before the development of brain size. Thus indicating that



bipedalism: occurred for other reasons.  
Donald Johansen's ~~discovery~~ discovery ~~was~~  
was believed to be the ancestor of all  
hominid species. Thus its discovery  
has been of monumental importance  
in understanding the line of descent  
and how & possibly why humans  
have evolved.

c)(i)

(ii) 40% of radioactivity

corresponds to 7500 yrs (from graph.)

(iii) Radiometric dating is used to estimate  
the ~~parent~~ age of a fossil. For a fossil  
to be measured with  $C^{14}$ , there must be  
adequate amounts of carbon present.

The fossil must also not be disturbed. After the fossil remains have been subject to degradation in a way which may alter its chemical structure, thus making it difficult for an accurate ~~to~~ measurement.

- Carbon 14 has a half life of approx. 5000 years, this makes it extremely difficult to date hominid fossils which have believed to be older than this. (Hominids have roamed the earth for approximately ~~4~~ 4myrs!) Thus carbon dating is inadequate for tracing full evolutionary history.



d) Cultural development refers to the evolution of organisms through the transfer of knowledge. Culture is the way in which traditions and beliefs shape the way we live. Humans have an extremely complex cultural development of all primates, and this can be seen by observing ~~the~~.

- The case of young, the group bonding & social organisation, the use of tools and communication systems. This is often attributed to greater brain size as they have a greater <sup>expectation</sup> of life.

In ~~primates~~ <sup>human</sup> there is a long gestation period, ~~and~~ while in early primates, gestation lasts for a few weeks, humans have an extended gestation period and ~~the~~ length of juvenile care. This can be attributed to the fact that humans ~~are~~ are born quite prematurely ( $\frac{1}{4}$  of their adult size) and thus remain with their mother. ~~then~~ During this stage of childhood, many things are taught and learnt which will enable them to.



evolve with significant aspects of culture.

In most primate groups, <sup>sexual</sup> maturity is prolonged - this is due to the reduction in sexual competitiveness amongst families.

Thus this ~~of~~ care of young enables many parts of culture to be passed onto ~~the~~ future generations. The organisation of

social groups is also indicative of a complex cultural development. While

~~many~~ early primates are 'loners' and live in either pairs or individually, humans

have an extremely complex social structure, this is also reflected in other primates

such as chimpanzees. This social structure enables much information to be passed

amongst friends and families. In addition the social groups also enable the human

species to function as a coherent community.

While there is often a hierarchy in

apes with a dominant male gorilla,

the human organisation can range.



from a distinct set of social classes and orders, making humans the most specialised in their societal systems. Communication is also important in humans. While many other primates such as chimps and Apes communicate through facial expression and vocal sounds (such as howler monkey) humans have an extremely sophisticated communication system ~~that is~~ along with developed vocal chords to turn sounds into codes (words) and form these into understandable sequences (sentences.) Thus the human's ability to speak is a great method to pass on cultural knowledge and understanding. Communication is also important for hunting in groups however humans have found new ways to communicate through recording information.



Thus the ~~act~~<sup>method</sup> of writing, ~~and~~ painting and artwork are a means by which information is recorded and passed onto future generations. In addition the use of tools has become increasingly sophisticated over ~~the~~<sup>the</sup> evolutionary period. ~~Chimps~~ Chimps may use simple sticks to probe for food but humans have taken such simple tools to create great systems of technology. The use of computers and internet has allowed culture to be sustained as information now flows more freely. Thus together, these elements enable humans to form a complex cultural development compared to primates.

2002 HIGHER SCHOOL CERTIFICATE EXAMINATION

Biology

This page is to be detached, completed and attached to the inside front cover of your writing booklet for the option question you have attempted.

Radioactive decay of Carbon 14 over time

