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WORKSHEET

Life Science 12

Week 14

Once your work has been uploaded, I will choose a few questions at random, and it will be for marks.

Lesson 1-4

Question 1 [5]

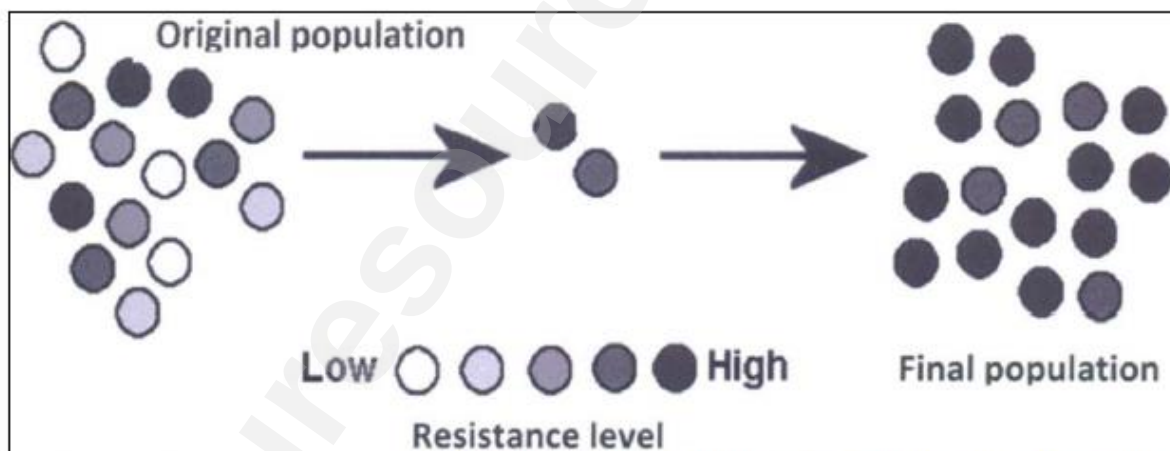
{Adapted from: IEB Paper 1, 2015}

The following text appeared in an issue of *New Scientist Magazine* on 11 March 2013:

Antibiotic resistance poses an 'apocalyptic' threat to human health. We are facing 'nightmare bacteria' and a 'war' against them – which we are losing. Such language, in statements from the top United Kingdom and United States medical authorities – normally a very cautious bunch – reflects the enormity of the situation they feel we are now in.

[Adapted from: <www.newscientist.com/article/dn23259>]

Antibiotic-resistant bacteria evolve when antibiotics are prescribed or administered incorrectly. The following diagram illustrates this process.



[Source: <<http://staff.jccc.net/pdecell/bio122/resistance.gif>>]

1. By means of a flow diagram, explain how colonies of antibiotic-resistant bacteria establish themselves when the antibiotics are not properly administered.

(5)

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Question 2 [16]

{Adapted from: IEB Paper 1, 2016}

Study the following text and graphs about drug resistance in *Plasmodium*:

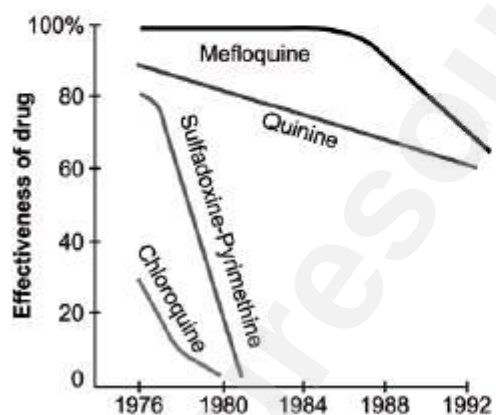
Malaria continues to be a disease which causes an enormous number of deaths in Africa. Human malaria is caused by a parasite belonging to the genus *Plasmodium*. The life cycle of *Plasmodium* involves sexual and asexual reproductive stages.

The discovery of Chloroquine (CQ) in the 1930s revolutionised malaria treatments. CQ was the most widely-used drug from the early 1950s until the 1980s. During that time, the *Plasmodium* parasite developed resistance to CQ. While some parasites remained sensitive to CQ, it seemed that the resistant types had developed an ability to excrete the CQ from their systems at a very rapid rate, preventing the drug from affecting them.

Scientists thus had to develop new drugs to treat malaria, as CQ is not always effective.

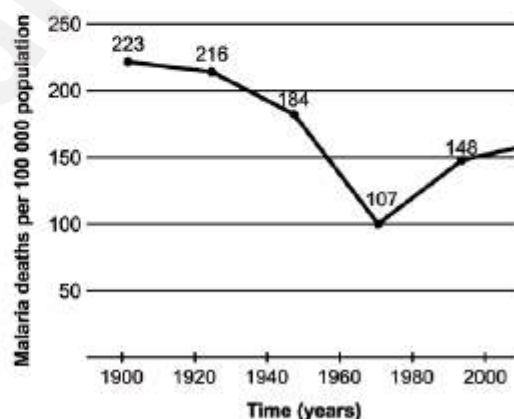
[Adapted from: <<http://www.nature.com/scitable/knowledge>>]

GRAPH A: Declining response to antimalarial drugs



[Adapted from: *The Southeast Journal of Tropical Medicine and Public Health, Mekong Malaria, Volume 30, Supplement 4, page 68, 1999*]

GRAPH B: Malaria mortality rate in Africa over time



[Adapted from: <<https://s3.amazonaws.com>>]

1. According to Graph B, how many malaria deaths were there in 1970? (2)
2. Provide TWO pieces of evidence from the graphs above indicating that by 1980 the drug Chloroquine was no longer effective in treating malaria. (4)
3. According to Darwin's theory of Evolution by Natural Selection, explain how *Plasmodium* developed resistance to Chloroquine. (6)
4. (a) The article explains that *Plasmodium* undergoes both asexual and sexual reproduction. Explain the difference between these two terms. (2)
- (b) Which of the two types of reproduction mentioned in (a) above would most likely contribute to the evolution of drug-resistant *Plasmodium*? Explain your answer. (2)

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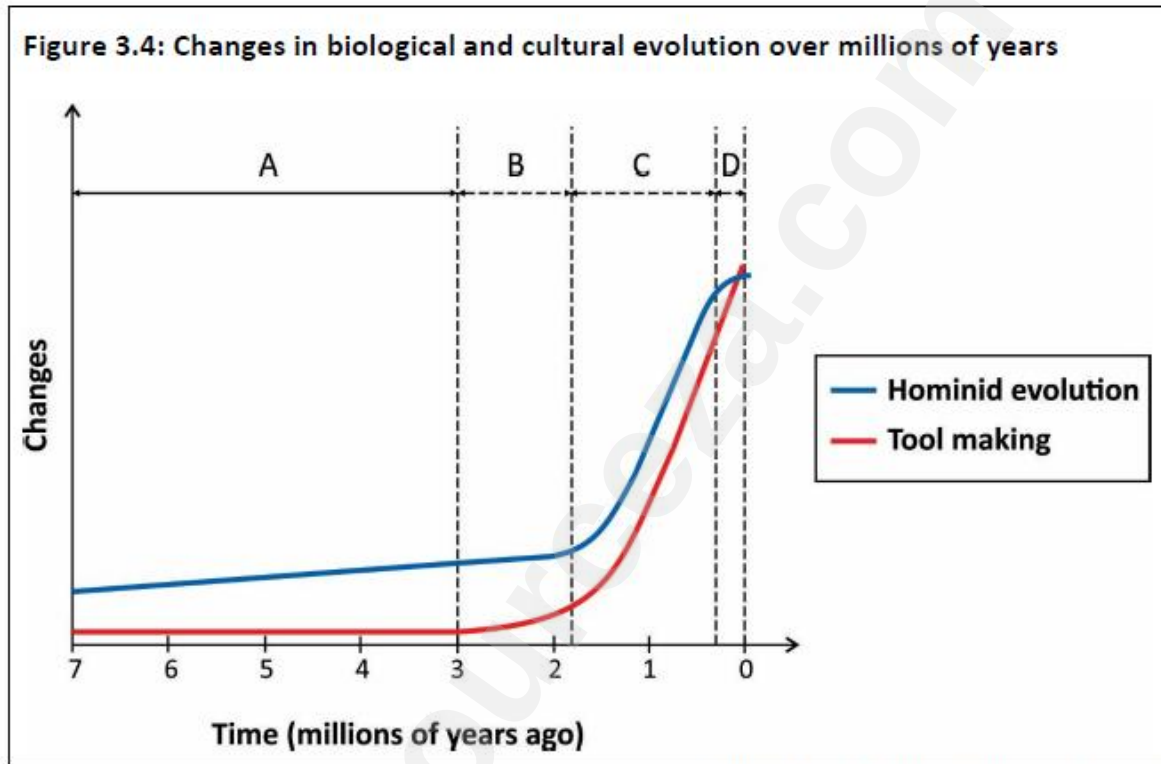
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Question 3 [6]

{Adapted from: IEB Paper 1, 2021}

Study Figure 3.4 below and answer the questions that follow.



[Adapted: <<https://blog.waikato.ac.nz>>]

1. Explain the relationship between hominid evolution and practices such as tool making. (2)
2. Discuss TWO ways in which an increase in brain size in hominids impacted cultural practices. (4)

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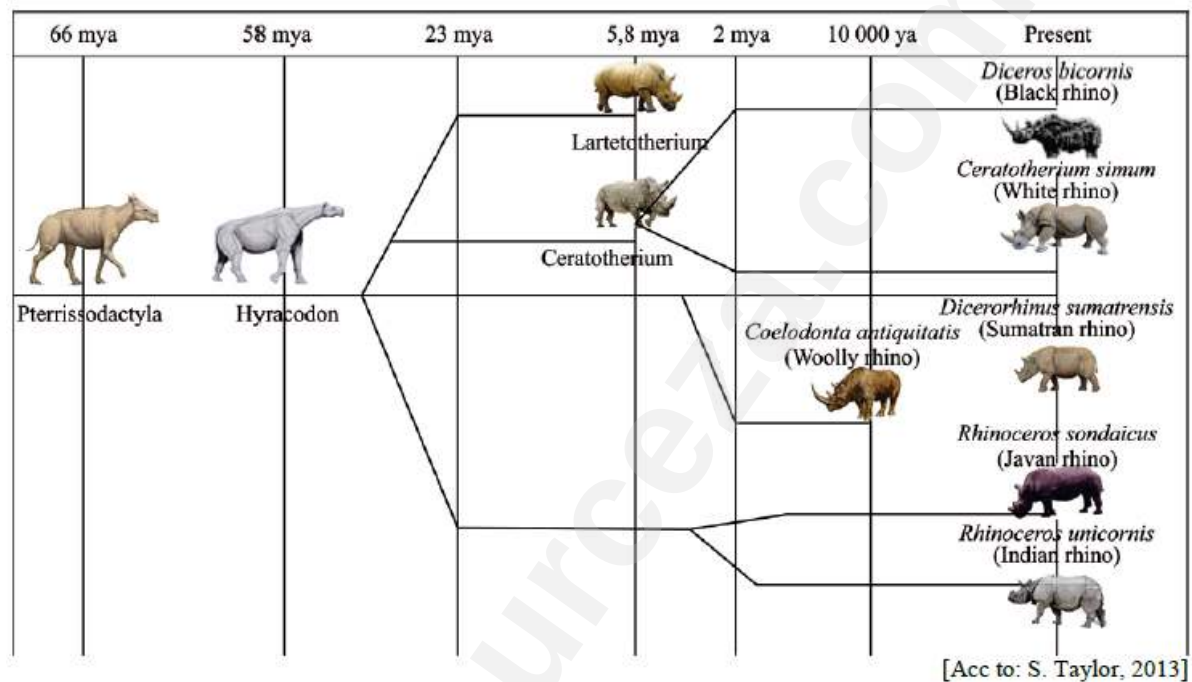
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Question 4 [9]

{Adapted from: IEB Paper 1, 2013}

Use the diagram of the phylogenetic tree below which illustrates the evolution of the modern rhinoceros/rhino family to assist you in answering the following questions.



1. Name ONE rhino that is still living today? (1)
2. According to the diagram, how long ago did the direct ancestor of all the rhinos evolve? (1)
3. Name the most recent common ancestor of the African rhinos living today. (1)
4. Explain how the following scientists would have described the evolution of the modern rhino's horn:
 - (a) Charles Darwin (2)
 - (b) Jean-Baptiste de Lamarck (2)
5. (a) Draw a circle around the living rhino which is most closely related to the extinct woolly rhino? (1)
- (b) Give a reason for choosing this rhino. (1)

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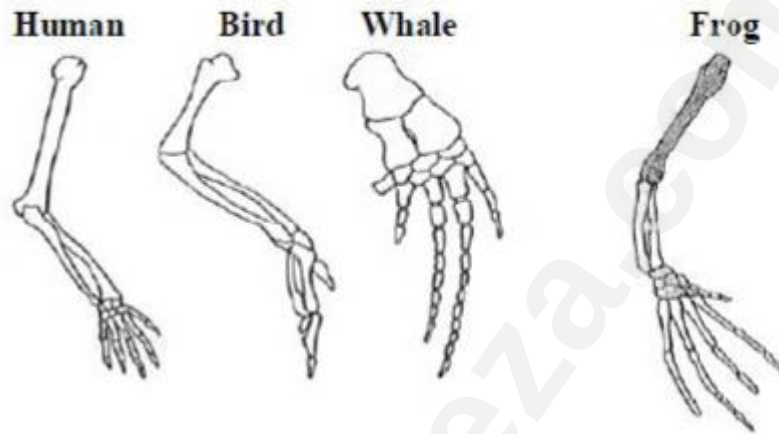
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Question 5 [17]

{Adapted from: ACEIT!}

Study the diagrams below and answer the questions that follow:



1. What term is used to describe the arrangement of bones in vertebrate forelimbs? (1)
2. How is convergent evolution shown in the forelimb of a human, bird, whale and frog? (5)
3. Explain the following terms:
 - a) Homologous structures (2)
 - b) Descent with modification (3)
 - c) Adaptive radiation (3)
 - d) Vestigial structures (2)
 - e) Pentadactyl limb (1)

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Question 6 [12]*{Adapted from: ACEIT!}*

In an investigation to establish the resistance of mosquitoes to DDT, scientists captured a sample of mosquitoes from the environment. They then applied a standard dose of DDT (4% DDT for 1 hour) in the laboratory and counted how many mosquitoes were killed. The scientists repeated this procedure every two months over a period of 16 months. The results are indicated in the table below

Table showing percentage mortality of mosquitoes after applying DDT

Time (in months)	Mortality of mosquitoes (%)
0	95
2	87
4	80
6	69
8	60
10	54
12	35
14	27
16	22

1. Identify the:
 - a) Independent variable (1)
 - b) Dependent variable (1)
2. State TWO ways in which the scientists could improve the reliability of their results. (2)
3. Explain, in terms of natural selection, how mosquitoes may develop resistance to DDT. (8)

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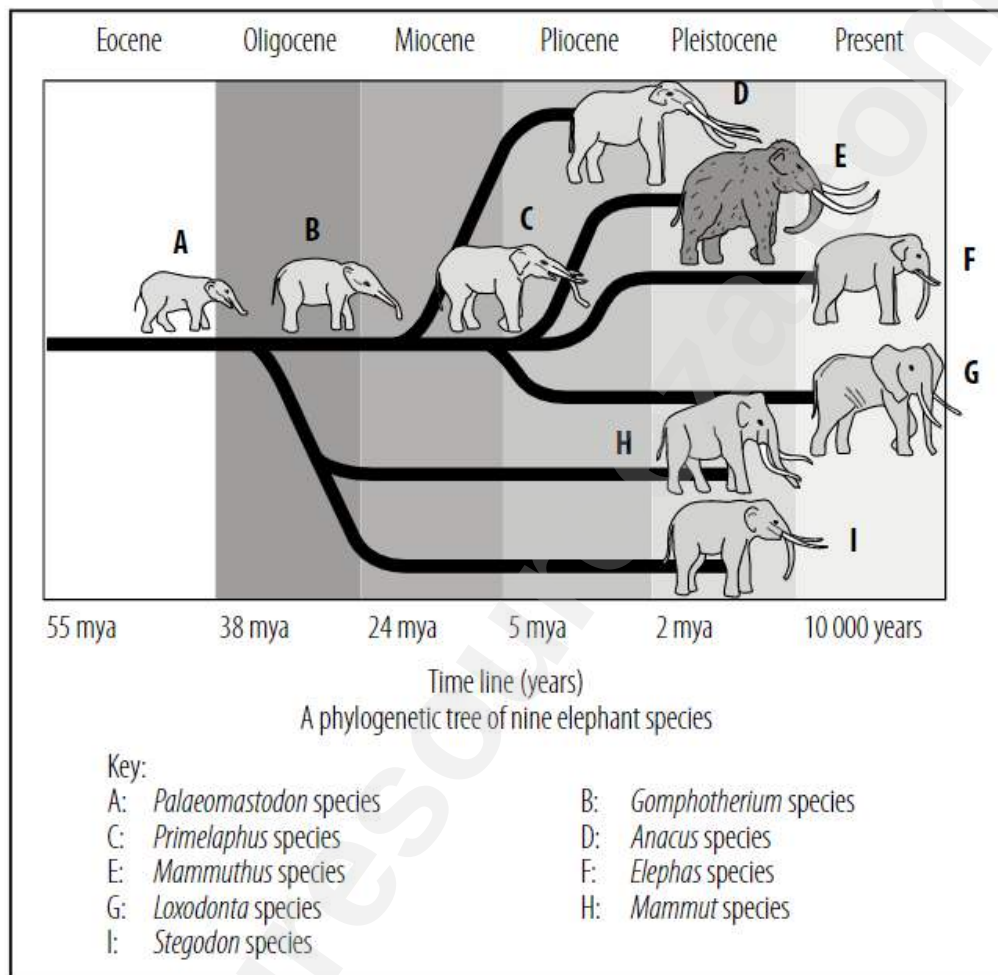
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Question 7 [6]

{Adapted from: ACEIT!}

Study the phylogenetic tree of nine elephant species over six geologic time periods from 55 million years ago (mya) to the present and answer the questions below.



1. According to the phylogenetic tree above, which is the ancestral species of ALL the named species? (1)
2. Name the TWO species of elephants that exist today. (2)
3. Name the immediate ancestor of the two species mentioned in Question 2. (1)
4. In which period did:
 - a) The Anacus species first appear (1)
 - b) The Stegodon species become extinct (1)

[Total: 71 Marks]