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Gr. 12 Life Sciences

Preliminary exam Paper 1 2024

Marking guidelines

1.1 K J N H D A G M S L (10)

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6	1.2.7	1.2.8	1.2.9	1.2.10
C	D	B	C	C	A	A	D	C	A

1.3.1 They all have a similar structure showing that they come from a common ancestor✓, but have become adapted differently✓ for different forms of movement in different habitats/ different forms of movement✓.

1.3.2 F✓

1.3.3 Toes are much shorter (smaller) ✓ and big toe lies parallel✓ to the other toes

1.3.4 Stand up✓ higher to spot danger or reach food easier✓

Hands are freed✓ for handling of tools or weapons or taking care of young✓

Less of the body surface is exposed to the sun✓ important for temperature regulation✓

Saves energy✓ which is then used for other activities✓ (and 3 facts with reasons)

1.4.1 A – B: Sympatric✓ – not separated physically✓

B – C – Allopatric✓ – separated geographically✓

1.4.2 Coastal – blends in with the sand✓ and inland blends in between the trees✓ – camouflaged to escape predators✓.

1.5.1 X – Prophase I

Y – metaphase II

1.5.2 For gametes to have only half a set of chromosomes each✓ to fuse with the half set of chromosomes from another gamete ✓to form a diploid✓ combination of chromosomes in the zygote. (Any 2✓)

1.5.3 Diagram of cell containing 2 chromosomes✓✓ drawn as chromatids✓ with correct shading✓

- 1.6.1 Sample✓ of cat hair is collected and DNA is isolated✓ from the cat hair
DNA is put through PCR✓ to create a larger sample✓
Gel-electrophoresis ✓is done on the DNA sample – current is passed through the gel✓ to separate the DNA molecule✓ according to size
A DNA profile✓ is formed consisting of a banded pattern (formed by STRs) which can be compared ✓to other DNA samples of cat hair (any 8✓)
- 1.6.2 Blood, cheek cells, semen (not hair) (any 2✓)
- 1.6.3 Identifying casualties✓
Paternity testing ✓
- 1.6.4 a) 2✓ – bands match✓
b) To compare✓ it and make sure it didn't come from any other cats✓ – to have a larger degree of genetic diversity✓ for comparison✓.(any 2✓)
- 1.6.5 a) DNA found in the mitochondria (extra-nuclear DNA) ✓✓
b) Easy to compare (high mutation rate) ✓ and found in large amounts✓
c) YES / NO – students opinion with TWO good logical reasons(4)
- 1.7.1 A – C
B – D
C – B
- 1.7.2 a) Able to bring down larger prey✓ – more food ✓
b) Blends in with grass better✓ – protected from predators✓
- 1.7.3 a) Found more attractive by females – finding a mate (courtship) (accept any logical answer)
b) Scar – bb
Mufasa – Bb
- 2.1.1 Organism which hunts and kills✓ prey to eat✓
- 2.1.2 Killer whale✓ – it is not killed by any other predators✓
- 2.1.3 Massive jaws with sharp teeth✓ – kill prey✓
Grey – spotted coloration✓ – blend in and prevent prey from seeing them✓
- 2.1.4 Interspecific✓ – different species✓ both eating same fish✓
- 2.2.1 Safety by numbers✓ – surrounding and protecting young
Dilution effect✓ – colours blend making it difficult for predators to spot and hunt individual penguins✓
- 2.2.2 Zebra✓ – stands in a herd✓ stripes blend in with grass✓

- 2.2.3 a) Too many huddled together – difficult to catch and allow marked ones to mingle effectively
b) Too close together to count individual quadrats (accept any two logical problems which could be experienced)

2.2.4 Taking areal photographs and enlarging them to spot individual penguins

2.3.1 Factors decreasing ✓ population size when carrying capacity is reached ✓

2.3.2 No ✓ – it is caused by humans and not by the size of the fish population ✓

2.3.3 a) they will decrease ✓ – less food available ✓

b) increase ✓ - more food due to less competition with the silverfish ✓

2.3.4 Caused by humans ✓ It happens regardless ✓ of the population density of the fish populations ✓

2.3.5 They would increase as less would be harvested

2.3.6 Students' own logical opinion

3.1.1 alleles ✓

3.1.2 gene – section / sequence of DNA nucleotides ✓ coding for a specific protein ✓

Genome – genetic make-up ✓ of an organism found in the DNA of the nucleus of the cell ✓

3.1.3 It has more than one ✓ gene coding for it ✓

3.1.4 Research conducted at the University College of London ✓

3.1.5 a) Substitution (accept point mutation) ✓ a nucleotide base is replaced with a different one ✓

b) Codon – AUG

Anti-codon UAC

c) The enzyme helicase ✓ causes DNA to unwind ✓ forming 2 separate strands

Loose, complementary nucleotide bases are paired ✓ to exposed bases on the DNA (RNA polymerase)

mRNA forms and comes loose from the DNA and leaves through a nuclear pore ✓

DNA rewinds ✓

mRNA is read in groups of 3 called codons ✓ by the ribosomes ✓

tRNA complementary to the codons form anticodons ✓ which pick up amino acids ✓

Amino acids are brought to the ribosome✓ and forms peptide bonds to form a polypeptide ✓ (any 6✓)

3.1.6 Cell growth and development could become dependent on the drugs

3.2.1 Carried on chromosome 1✓ and not on a sex-chromosome✓ (23)

3.2.2 Parent genotypes:

Man: Hh ✓ Woman: hh ✓

Gametes:

Man: H and h Woman: h✓

	H	h
h	Hh	hh
h	Hh	hh

Punnet square✓✓

(Correct crossing)

50% chance of having curly hair ✓

3.3.1 Plant that has had its DNA✓ genetically altered✓

3.3.2 Gall/ tumour producing gene is isolated✓

Gene is removed using restriction enzymes (modified to no longer cause tumours)

Plasmid is taken from bacteria✓ and cut with restriction enzymes✓

Good gene is added✓ to plasmid using ligase✓

Plasmid with good gene is placed back in plant✓ (any 5 ✓)

(given as a flow diagram -1 if not flow diagram)

3.3.3 Students own motivation – must refer to fruit not developing crown gall tumour✓✓

Refer to financial benefit✓✓ of not losing fruit and importance of fruit orchards✓ in the Cape in terms of income – wine, juices and exports.

4.1.1 Sterkfontein caves✓

4.1.2 Takes time finding all the fossils and removing them from the ground (slow, delicate process) ✓

Dating the fossil to determine age and doing DNA testing to determine its relationship to other hominids✓ (ensure results are reliable)

4.1.3 Humans – bipedal (toes parallel and hips smaller and rounder; more rounded cranium)

Apes – larger jaw and protruding snout; longer arms and wider rib cage

4.1.4 *Homo naledi* had made use of the caves as burial site✓ showing that they to dispose of their dead showing that they could think about situation✓s and that they lived as a functional community✓

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- 4.1.5 a) Better protection from predators✓, better food preparation✓, formed communities✓ that lead to the development of language. ✓
b) Better communication✓ which lead to strategic planning✓ and formation of communities✓ standing together for protection✓ and better survival✓
- 4.1.6 It mostly walked on 2 legs✓ but could climb trees to escape predators✓
- 4.1.7 a) Has both human✓ as well as ape characteristics✓ linking it to both
b) Compare DNA✓ from both✓
- 4.1.8 Many more scientists✓ visit SA – Sterkfontein is a natural heritage site leading to more tourism and income due to tourism. ✓
- 4.2.1 107 – 110✓
- 4.2.2 Graph A – shows effectiveness decreasing✓ and B shows deaths increasing✓
- 4.2.3 There was variation✓ in the Plasmodium population with some Plasmodium being resistant to the drug✓. Those who were not resistant died✓ and those who were resistant survived✓ the drug and passed this gene to their offspring✓
- 4.2.4 a) Sexual reproduction – needs to organisms which form haploid gametes and two haploid gametes fuse to form a diploid cell✓
Asexual – only one organism makes a genetically identical copy of itself✓
b) Sexual✓ – leads to more variation✓