Assessment Schedule – 2006

Scholarship Science (93104)

Evidence Statement

Question	2	4	6	8
1	At least three named out of: • UV • gamma • x-rays • alpha and beta particles. One discussed of • penetration discussed • ingestion increases ionisation effects.	At least three named out of: • UV • gamma • x-rays • alpha and beta particles. Discussion of two: • nature of radiation discussed (structure or interaction strength) • penetration • ingestion increases ionisation effects • EMR will cause ionisation if high energy, short wavelength, high frequency.	At least four named out of: • UV • gamma • x-rays • alpha and beta particles. Discussion of: • nature of radiation discussed (structure / interaction strength) • penetration. • ingestion increases ionisation effects • EMR will cause ionisation if high energy, short wavelength, high frequency • effect on DNA – breaking of covalent bonds, removal of electrons.	At least four named out of: • UV • gamma • x-rays • alpha and beta particles. Thorough discussion of: • nature of radiation discussed (structure or interaction strength) • penetration • Ingestion increases ionisation effects • EMR will cause ionisation if high energy, short wavelength, high frequency • effect on DNA – breaking of covalent bonds, removal of electrons.

Question	2	4	6	8
2	Interpretation of diagram only with no extra understanding or a list of the different types of point mutations.	Interpretation of diagram showing some understanding of point mutations.	As for 8, but briefer discussion of substitutions and frameshifts, or in-depth discussion of one, briefer discussion of the other. May have diagrams explaining this.	• Link between sequence of bases and arrangement of amino acids along protein chain and that a mutation changes this accurate arrangement. • Amino acids must be in the correct sequence, so that protein can fold correctly, otherwise it cannot function properly. • The active site must have the precise arrangement of amino acids. • Substitution – one base is exchanged for another – a range of changes depending on where in the gene this occurs. • Amino acid coded for won't change if base change in wobble position. • Amino acid will change if base change in different position in codon. Then position of changed amino acid in protein will be critical. • If amino acid changed is in unimportant part of polypeptide or protein, then gene will still function. If in crucial part, protein will have reduced, or no function. If amino acid changes to a stop codon, then protein will only be made up to that point. • Deletions or insertions will result in frame shifts which means a completely changed aa from point of deletion or substitution, which is unlikely to be serious if happens at end of protein chain, but will be serious anywhere else. If codon becomes a stop codon protein, production will be stopped, otherwise a completely new protein will be made, leading to serious symptoms. • All cause severe changes if a stop codon is coded for. • Severe effect if change active site. Answers may have diagrams explaining this. Answers must discuss what happens plus the implications.

Question	2	4	6	8
3	• Could be another mutation. • There are enough samples for sufficient and reliable data.	• Could be another mutation and make test better. • There are enough samples for sufficient and reliable data. • Police might use it to solve crimes.	• Could be another mutation causing CF : benchmarking to make the test better or to check family histories. • Massive amount of data to look for population genetic trends. • Could be used by courts to determine paternity, or police for DNA profiling or familial searching.	• Samples retested to find another mutation causing the CF. • Use the samples for benchmarking to make the test better. • If missed in the initial testing, when the mutation is the common one, is there a liability issue? • To check family histories if there is an inherited mutation or gene. • Massive amount of data to look for population genetic trends. • A large data base gives a great cross section of NZ society. • Some research, such as studies of the prevalence of a particular disease or the identification of a disease gene, requires tissue samples from a large number of individuals. • Can be used for profiling to determine genetic relationships between individuals for any valid reason. • Could be used by courts to determine paternity. • Advantage - Used by police for DNA profiling or familial searching to help solve crimes. • Disadvantage – could breach people's privacy. • Small chance innocent people could be implicated, especially among family groups or genetically isolated communities, such as small islands.

Question	2	4	6	8
4	Cold dense oceanic crust sinks under the North Island. In the beginning it is brittle and will not slide easily under the Australian plate. As it sinks further, plate warms and softens.	Cold dense oceanic crust sinks under the North Island. In the beginning it is brittle and will not slide easily under the Australian plate, forming the "stuck plate interface zone". As it sinks further, plate warms and partially softens producing "slow-slip zone", and then softens further under it; forms the "steady creeping zone".	Cold dense oceanic crust sinks under the North Island. In the beginning it is brittle and will not slide easily under the Australian plate, forming the "stuck plate interface zone". As it sinks further, plate warms and partially softens producing "slow-slip zone", and then softens further under it; forms the "steady creeping zone". Water that is part of the sediments that subduct with the plate provides the lubrication. Slow earthquakes are probably releasing tension, and so will help prevent more severe earthquakes.	• Dense oceanic crust subducts. • The further the plate sinks the more it softens. • In the beginning it is brittle and will not slide easily under the Australian plate, forming the "stuck plate interface zone". As it sinks further, plate warms and partially softens producing "slow-slip zone", and then softens further under it; forms the "steady creeping zone". • Slow slip earthquakes on land above locked and slow slip zone. • As oceanic subducts continental pushed upwards or along. • Water is part of the sediments that subduct with the plate. • Water provides the lubrication. • Magma can also act as a lubricant. • The stress caused by the brittle plate going under is being released by the slow-slip earthquakes. • This is probably releasing tension, and so will help prevent more severe earthquakes. • Can move to East as land pushed one way then has to move other way to correct.

Question	2	4	6	8
5	2 marks from either (a), (b), or (c) or 1 mark each from 2 parts. ***(see "8" column for possible answers)***	4 marks from (a), (b), and (c). Can be from 2 parts only. ***(see "8" column for possible answers)***	6 marks from (a), (b), and (c). ***(see "8" column for possible answers)***	(a) Methane and ethane non-polar, so methane can dissolve in ethane because formation of weak van der Waal forces. Water is polar, forms hydrogen bonds with other water or polar compounds, but not with methane, which cannot form hydrogen bonds. **3 marks** (b) Forms 4 covalent bonds with carbon and other atoms such as O, H, N to form large complex molecules, which are the basis of life or organic matter. **2 marks** (c) Life may become • Based on methane as a solvent, which means a non-polar solvent instead of a polar one. • Because methane is non-polar, it wouldn't be a solvent for the same reactions as water. • Cells mostly methane instead of water. • All metabolic pathways would be based around non-polar molecules. • There aren't as many non-polar compounds which may limit potential life forms. • Life forms would have to be able to withstand high pressure, eg special molecules, cell walls, high pressure inside cells. • Would life be carbon based? – likely as hydrocarbons abundant. • What would be the effect of the extreme temperature? • Ice would be solid, so cannot act as a solvent so easily. **3 marks**

Question	2	4	6	8
6	• Source of noise is of constant intensity. • Noise reduction is measured by decibel meter.	***Brief discussion of the following, or more in-depth discussion of 2.*** • Source of noise is of constant intensity. • Noise reduction is measured by decibel meter. • Position of decibel meter minimises the detection off sound reflected from walls. • Discussion of materials that absorb or reflect sound • Discussion of the effects of materials that vary in thickness or density.	***Discussion of the following, or more in-depth discussion of 2–3.*** • Source of noise is of constant intensity. • Noise reduction is measured by decibel meter. • Position of decibel meter minimises the detection off sound reflected from walls. • Discussion of absorptive and reflective materials that vary in thickness and density or layering.	***In-depth discussion of the following points.*** • Source of noise is of constant intensity. • Noise reduction is measured by decibel meter. • Position of decibel meter minimises the detection off sound reflected from walls. • Discussion of absorptive and reflective sound barrier materials that vary in thickness and density / layering. • Frequency effects in the properties of the sound barrier materials. • Effects of structural defects in experimental room / background noise / atmospheric conditions (pressure, temperature, humidity).