Assessment Schedule – 2010

Scholarship Science (93104)

Evidence Statement

Q	2	4	6	8
ONE	Points from: • mtDNA passed through maternal line, Y chromosome transferred from father to son only. Using mtDNA: • can be compared with living maternal relatives • relationship link between first grave and second grave confirmed. Using nuclear DNA: • determines sex • determines relationship of children to parents and between siblings • blood stains can confirm male body in first grave. Using Y markers (2 points): • relates male of first grave with male in second grave.	Well developed points from: • mtDNA passed through maternal line, Y chromosome transferred from father to son only • nuclear DNA inherited from both parents, genes are rearranged during meiosis / recombination. Using mtDNA: • can be compared with living maternal relatives • relationship link between first grave and second grave confirmed. Using nuclear DNA: • determines sex • determines relationship of children to parents and between siblings • blood stains on shirt provided a standard sample of nuclear DNA. • blood stains can confirm male body in first grave. Using Y markers (2 points): • relates male of first grave with male in second grave • can compare with other male descendants. Additional points : • multiple labs provide reliability checks – justified.	Well developed points from: • mtDNA passed through maternal line, Y chromosome transferred from father to son only • mtDNA or Y chromosome doesn't change or mutate from parent to offspring in the time scales here • nuclear DNA inherited from both parents, genes are rearranged during meiosis / recombination. Using mtDNA: • can be compared with living maternal relatives • relationship link between first grave and second grave confirmed. Using nuclear DNA: • determines sex • determines relationship of children to parents and between siblings • blood stains on shirt provided a standard sample of nuclear DNA • blood stains can confirm male body in first grave . Using Y markers (2 points): • relates male of first grave with male in second grave • can compare with other male descendants • allows bone fragments of second grave to be sorted into male / female. Additional points :	Well developed points from: • mtDNA passed through maternal line, Y chromosome transferred from father to son only • mtDNA or Y chromosome doesn't change or mutate from parent to offspring in the time scales here • nuclear DNA inherited from both parents, genes are rearranged during meiosis / recombination. Using mtDNA: • can be compared with living maternal relatives • relationship link between first grave and second grave confirmed. Using nuclear DNA: • determines sex • determines relationship of children to parents and between siblings • blood stains on shirt provided a standard sample of nuclear DNA • blood stains can confirm male body in first grave Using Y markers (2 points): • relates male of first grave with male in second grave • can compare with other male descendants • allows bone fragments of second grave to be sorted into male / female. Additional points :

			• multiple labs provide reliability checks – justified • results from one method, eg nuclear DNA can be cross checked against mtDNA or Y marker results.	• multiple labs provide reliability checks – justified • results from one method, eg nuclear DNA can be cross checked against mtDNA or Y marker results • crosschecked results: All identified through maternal line – mtDNA, Y – confirmed. Blood stains used to confirm Czar, and his son. mtDNA used on original bodies and then compared with the 2 extra. • mtDNA is not unique to an individual, in that the testing proves only relationship, not necessarily identity. No nuclear DNA sample preserved from either of those girls when they were alive to compare to the nuclear DNA found in the bones.
TWO	Developed points from: Tectonic plate interaction: • North of Kaikoura dense oceanic crust of the Pacific plate (PP) is subducting under the more buoyant continental crust of the Australian Plate (AP). Tectonic conditions at Kaikoura: • Major earthquakes along the fault lines in the area destabilise the debris in the Kaikoura Canyon, contributing towards submarine avalanches. Violent eruptions: • The sediment is subducted with the PP along with a lot of water. • The higher the amount of silica the more viscous the magma, (andesite and rhyolite magma is formed) and more gas is trapped.	Developed points from: Tectonic plate interaction: • North of Kaikoura dense oceanic crust of the Pacific plate (PP) is subducting under the more buoyant continental crust of the Australian Plate (AP). Tectonic conditions at Kaikoura: • Major earthquakes along the fault lines in the area destabilise the debris in the Kaikoura Canyon, contributing towards submarine avalanches. Violent eruptions: • The sediment is subducted with the PP along with a lot of water. • The higher the amount of silica the more viscous the magma, (andesite and rhyolite magma is formed) and more gas is trapped. • As the PP subducts the water from the sediment becomes super heated, and lowers the melting point of the rock,	Well developed points from: Tectonic plate interaction: • North of Kaikoura dense oceanic crust of the Pacific plate (PP) is subducting under the more buoyant continental crust of the Australian Plate (AP). • Near Kaikoura the tectonic movements change from subduction to continental crust of the PP colliding with continental crust of the AP and lateral movement along the tectonic plate boundary / Alpine Fault. Tectonic conditions at Kaikoura: • The tectonic changes (mentioned above) near Kaikoura cause stresses and strains / twisting, which have resulted in major faults. • Major earthquakes along the fault lines in the area destabilise the debris in the Kaikoura Canyon, contributing towards submarine avalanches.	Well developed points from: Tectonic plate interaction: • North of Kaikoura dense oceanic crust of the Pacific plate (PP) is subducting under the more buoyant continental crust of the Australian Plate (AP). • Near Kaikoura the tectonic movements change from subduction to continental crust of the PP colliding with continental crust of the AP and lateral movement along the tectonic plate boundary / Alpine Fault. Tectonic conditions at Kaikoura: • The tectonic changes (mentioned above) near Kaikoura cause stresses and strains / twisting, which have resulted in major faults. • Major earthquakes along the fault lines in the area destabilise the debris in the Kaikoura Canyon, contributing towards submarine avalanches.

		forming magma. • As magma rises gas comes out of solution and expands in magma, violent eruptions occur.	Violent eruptions: • The sediment is subducted with the PP along with a lot of water. • The higher the amount of silica the more viscous the magma, (andesite and rhyolite magma is formed) and more gas is trapped. • As the PP subducts the water from the sediment becomes super heated, and lowers the melting point of the rock forming magma. • As magma rises gas comes out of solution and expands in magma, violent eruptions occur.	• Effect of gravity on unstable slopes if point well developed Violent eruptions: • The sediment that has come from the Southern Alps is rich in silica / came from continental crust. • The sediment is subducted with the PP along with a lot of water. • The higher the amount of silica the more viscous the magma, (andesite and rhyolite magma is formed) and more gas is trapped. • As the PP subducts the water from the sediment becomes super heated, and lowers the melting point of the rock forming magma. • As magma rises gas comes out of solution and expands in magma, violent eruptions occur.
THREE	Well developed points from: Effect of evaporation – must relate directly to chain length: • Shorter chain HC will evaporate off easily / first because they don't have strong temporarily dipole-dipole bonds OR natural evaporation of longer chains will take longer or never happen because they have stronger dipole-dipole bonds. Effect of burning: • Burning gets rid of a lot of oil rapidly • CO_2, CO and C as products of complete and incomplete combustion, either in words or equations Effect of detergents: • Detergent anion has a hydrophobic end which combines with alkane / crude oil and a hydrophilic end with combines	Well developed points from: Effect of evaporation – must relate directly to chain length: • Shorter chain HC will evaporate off easily / first because they don't have strong temporarily dipole-dipole bonds and therefore are gases or are volatile OR natural evaporation of longer chains will take longer or never happen because they have stronger dipole-dipole bonds. • Evaporation can take a long time so oil in environment longer. Effect of burning: • Burning gets rid of a lot of oil rapidly. • CO_2, CO and C as products of complete and incomplete combustion, either in words or relevant equations. Effect of detergents:	Well developed points from: Effect of evaporation – must relate directly to chain length: • Shorter chain HC will evaporate off easily / first because they don't have strong temporarily dipole-dipole bonds and therefore are gases or are volatile OR natural evaporation of longer chains will take longer or never happen because they have stronger dipole-dipole bonds. • Evaporation can take a long time so oil in environment longer. Effect of burning: • Because oil floats on top of water / less dense than water, it can be burned • Burning gets rid of a lot of oil rapidly. • CO_2, CO and C as products of complete and incomplete combustion, either in	Well developed points from: Effect of evaporation – must relate directly to chain length: • Shorter chain HC will evaporate off easily / first because they don't have strong temporarily dipole-dipole bonds and therefore are gases or are volatile OR natural evaporation of longer chains will take longer or never happen because they have stronger dipole-dipole bonds. • Natural evaporation will only get rid of a small amount because longer chains will take longer to evaporate or may never happen because they have stronger dipole-dipole bonds. • Evaporation can take a long time so oil in environment longer. Effect of burning:

	with water.	• Detergent anion has a hydrophobic end which combines with alkane / crude oil and a hydrophilic end with combines with water. • Anion plus crude oil emulsifies the oil by forming a micelle which disperses the oil by suspending in the water. Valid comparisons not mentioned elsewhere, eg: • Natural evaporation for shorter chains because less dipole-dipole bonds, burning for longer chains.	words or relevant equations. Effect of detergents: • Detergent anion has a hydrophobic end which combines with alkane / crude oil and a hydrophilic end with combines with water. • Anion plus crude oil emulsifies the oil by forming a micelle which disperses the oil by suspending in the water. • Micelles distribute oil all through the water column so the oil never leaves the water. Valid comparisons not mentioned elsewhere, eg: • natural evaporation for shorter chains because less dipole-dipole bonds, burning for longer chains. • Burning may break up longer molecules to shorter ones which can then evaporate.	• Because oil floats on top of water / less dense than water it can be burned. • Burning gets rid of a lot of oil rapidly • CO_2, CO and C as products of complete and incomplete combustion, either in words or relevant equations. • Long chains alkanes burn less efficiently and create more unsightly pollution. Effect of detergents: • Detergent anion has a hydrophobic end which combines with alkane / crude oil and a hydrophilic end with combines with water. • Anion plus crude oil emulsifies the oil by forming a micelle which disperses the oil by suspending in the water. • Micelles distribute oil all through the water column so the oil never leaves the water. Valid comparisons not mentioned elsewhere, eg: • natural evaporation for shorter chains because less dipole-dipole bonds, burning for longer chains. • Burning may break up longer molecules to shorter ones which can then evaporate. • Carbon products / CO_2 released by combustion similar amount as if the oil was used as fuels.
FOUR	Points from: Exposure to radiation: • External exposure to alpha radiation is a minor concern because alpha particles travel only a few cm in air and can be stopped by a layer of skin.	Developed points from: Exposure to radiation: • External exposure to alpha radiation is a minor concern because alpha particles travel only a few cm in air and can be stopped by a layer of skin.	Well developed points from: Exposure to radiation: • External exposure to alpha radiation is a minor concern because alpha particles travel only a few cm in air and can be stopped by a layer of skin.	Well developed points from: Exposure to radiation: • External exposure to alpha radiation is a minor concern because alpha particles travel only a few cm in air and can be stopped by a layer of skin.

	• Alpha radiation is more hazardous when the radioactive dust enters the body through inhalation or ingestion.	• Alpha radiation is more hazardous when the radioactive dust enters the body through inhalation or ingestion. Depleted radiation dust: • Dust of depleted uranium can be dispersed widely by the wind and the half-life is so long that it will be a radiation hazard forever, essentially. • Once an atom of uranium-238 has decayed to release an alpha particle, the relatively short half-lives of thorium-234 and protactinium-234 mean that two beta particles will be released soon after. • Radiation from depleted uranium dust can cause chromosomal damage, leading to cancer.	• Alpha radiation is more hazardous when the radioactive dust enters the body through inhalation or ingestion. Depleted radiation dust: • Dust of depleted uranium can be dispersed widely by the wind and the half-life is so long that it will be a radiation hazard forever, essentially. • Once an atom of uranium-238 has decayed to release an alpha particle, the relatively short half-lives of thorium-234 and protactinium-234 mean that two beta particles will be released soon after. • Radiation from depleted uranium dust can cause chromosomal damage, leading to cancer. Hazardous effects of depleted radiation dust and how to prove it: • Ionising radiation can cause mutations in DNA, which may alter the product of a gene or prevent the gene from functioning or, if within a germ cell, cause disease in offspring. • Experiments to determine whether depleted uranium dust is hazardous should compare a population exposed to the dust with a control population that is not exposed to the dust but is otherwise similar.	• Alpha radiation is more hazardous when the radioactive dust enters the body through inhalation or ingestion. Depleted radiation dust: • Dust of depleted uranium can be dispersed widely by the wind and the half-life is so long that it will be a radiation hazard forever, essentially. • Once an atom of uranium-238 has decayed to release an alpha particle, the relatively short half-lives of thorium-234 and protactinium-234 mean that two beta particles will be released soon after. • Radiation from depleted uranium dust can cause chromosomal damage, leading to cancer. Hazardous effects of depleted radiation dust and how to prove it: • Ionising radiation can cause mutations in DNA, which may alter the product of a gene or prevent the gene from functioning or, if within a germ cell, cause disease in offspring. • Experiments to determine whether depleted uranium dust is hazardous should compare a population exposed to the dust with a control population that is not exposed to the dust but is otherwise similar. Collecting data to test for the effects of depleted uranium dust: • Data should be collected on people exposed to depleted uranium dust from war zones in which depleted uranium weapons have been used. • For a reliable measurement, a large number of data points is required.

FIVE	Points from: Reflection of sound: • When sound hits a boundary part of the energy is reflected, part absorbed by the next layer and part transmitted through the next layer. • The more similar in density and sound velocity (acoustic impedance) the two media are, the less reflection and the more transmission that occurs. • Rock, such as found at the bottom of sediment layers, reflects sound strongly. • Waterlogged sediments reflect sound only weakly and absorb strongly.	Developed points from: Reflection of sound: • When sound hits a boundary part of the energy is reflected, part absorbed by the next layer and part transmitted through the next layer. • The more similar in density and sound velocity (acoustic impedance) the two media are, the less reflection and the more transmission that occurs. • Rock, such as found at the bottom of sediment layers, reflects sound strongly. • Waterlogged sediments reflect sound only weakly and absorb strongly. The depth of layers: • The times taken by the returning signals help to determine the depth of the boundaries between the sediment layers. • The amplitudes of the reflected waves, when combined with their return times and the materials properties of the sedimentary layers (acoustic impedance and absorption) can determine the thickness of the layers.	Well developed points from: Reflection of sound: • When sound hits a boundary part of the energy is reflected, part absorbed by the next layer and part transmitted through the next layer. • The more similar in density and sound velocity (acoustic impedance) the two media are, the less reflection and the more transmission that occurs. • Rock, such as found at the bottom of sediment layers, reflects sound strongly. • Waterlogged sediments reflect sound only weakly and absorb strongly. The depth of layers: • The times taken by the returning signals help to determine the depth of the boundaries between the sediment layers. • The amplitudes of the reflected waves, when combined with their return times and the materials properties of the sedimentary layers (acoustic impedance and absorption) can determine the thickness of the layers. The sound source: • High intensity means that the sound has more energy and can travel further. • Low frequency sound will travel much further because less energy is absorbed by the medium. • Low frequency sound has long wavelength and will diffract around large objects in the water, but it will provide lower resolution in timing. • The sound is pulsed so that reflected sound is not confused with outgoing sound.	Well developed points from: Reflection of sound: • When sound hits a boundary part of the energy is reflected, part absorbed by the next layer and part transmitted through the next layer. • The more similar in density and sound velocity (acoustic impedance) the two media are, the less reflection and the more transmission that occurs. • Rock, such as found at the bottom of sediment layers, reflects sound strongly. • Waterlogged sediments reflect sound only weakly and absorb strongly. The depth of layers: • The times taken by the returning signals help to determine the depth of the boundaries between the sediment layers. • The amplitudes of the reflected waves, when combined with their return times and the materials properties of the sedimentary layers (acoustic impedance and absorption) can determine the thickness of the layers. The sound source: • High intensity means that the sound has more energy and can travel further. • Low frequency sound will travel much further because less energy is absorbed by the medium. • Low frequency sound has long wavelength and will diffract around large objects in the water, but it will provide lower resolution in timing. • The sound is pulsed so that reflected sound is not confused with outgoing sound.

				The measurement: • Sound intensity in water decreases because of scattering and absorption. • Many hydrophones are used to pick up waves reflected at various angles due to the uneven slope of the layers or to pick up waves that have been refracted and reflected, providing a stronger, more accurate signal. • The measurements can be tested on layers of known depth, as determined from sediment cores or by other methods of measurement.