Assessment Schedule – 2005

Scholarship Science (93104)

A nine point marking scale (0-8) was used to assess each question.

Evidence Statement

Q	Evidence for 8 marks	Evidence for 6 marks	Evidence for 4 marks
1(a)	A **comprehensive discussion** considering MANY of the following points: Intermolecular forces / van der Waal forces between the chains affected by chain length. Shorter chains means less forces, also branching means less forces so the fat would be flexible and less dense. Flexible fat would deform so as to form an acoustic lens, a solid fat wouldn't be able to do this. A flexible lens such as in the eye (that can adjust to light) can adjust to sound. The fats may be unsaturated which will also add to flexibility. Fat must be able to be distorted – so density / flexibility must make this possible. The density of the fats should be close to the density of water (similar acoustic impedance) so energy of sound wave depends on the density of the medium it is travelling through. The densities may change so as to focus the wave. (The melon will act as a converging lens.) Had to realise that dolphins and whales are warm blooded.	ONE of the following points needed to be **well developed** or BOTH mentioned. Shorter chains means a lower melting point : molecules / fats / fatty acids cannot stack together as well / less intermolecular forces / chains or molecules slide past eachother, hence greater flexibility / fats aren't so solid / less dense. Less dense fats means unsaturated fats : fatty acids with more space between the molecules / because of a kink in the molecules. Shorter chains means less intermolecular forces and a lower melting point and hence greater flexibility / fats aren't so solid. A solid fat (which is normally found in animals) wouldn't be flexible. Fat must be able to be distorted – so density / flexibility must make this possible. If it was mentioned that fat could be liquid this had to be qualified to gain 6.	One of the following points **developed** or TWO or more mentioned: • Shorter chains means a lower melting point / density. • Shorter chains means greater flexibility / fats aren't so solid / less dense / softer / more liquid. • Unsaturated fats / fatty acids means that there is more space between the molecules / because of a kink in the molecules. • Fat needs be soft / semi-liquid for flexibility. • Shorter chains or unsaturated fatty acids / fats means that there are less intermolecular / van der Waal forces between the fatty acid chains / chains can slide past each other. • If a fat is too dense there is no or little flexibility. Lots of candidates did not realise that dolphins and whales are mammals are therefore warm blooded.

Q	Evidence for 8 marks	Evidence for 6 marks	Evidence for 4 marks
1(b)	FIVE points fully **discussed** from: Low frequency – distance – 1. Far away objects are located by low frequencies as the sound waves travel further – 2. High frequency – close – 1. Close objects are located by high frequencies and the smaller wavelengths enable the animal to distinguish fine features – 2. Interference from external sources – 1 Interference of returning signal with out going signal is avoided by the sound being sent out in clicks so the echo can return before the next click goes out – 2. Large objects stronger echoes – 1. The differences between objects of similar size are determined by the difference in density of the objects – 1. The softer the body, the more absorption of sound. (Dolphins can determine the difference between a golf ball and a ping-pong ball based solely on density) – 2.	THREE points fully **discussed**.	FOUR points **mentioned** or TWO points fully **discussed**.
1(c)	• A summary of the issues with full consideration of different sides, eg is the whales hearing impaired or has the whale panicked? Are whales' own signals interfered with? • Dolphins and whales cannot be captured in the wild to study, so the data is reliant on studying stranded whales directly, or by studying their behaviour and patterns such as migration so to detect any abnormal changes. So it is very difficult to gain enough reliable and valid data. • Noise levels set for sound and sonar, or only used in certain areas or at certain times, establish standards such as not increasing the amount of human noise already produced until reasonable data obtained. Shipping lanes may be altered, or reduced sonar, avoiding migration and breeding times. A comprehensive discussion of all THREE points, especially the last TWO bullet points.	• A good summary of the issues with some consideration of different sides. • Need a lot of dolphins or whales to study for valid data, this is hard to get because of size, hard to catch from the passages (any valid reason). • Noise levels set for sound and sonar, or only used in certain areas, err on the side of caution just in case damage is being done, backed up with evidence from the passages. The THREE bullet points briefly considered or TWO well discussed.	• A summary of the issues in the candidate's own words, eg low frequency noises may affect detection and orientation, and finding a mate, intense sonar location and detection of objects. • Need a lot of dolphins or whales to study for valid data. Should dicuss collection of data especially sufficiency and validity. Not enough data to gain valid conclusions. • Noise levels set for sound and sonar, err on the side of caution just in case damage is being done. The THREE bullet points considered or ONE well discussed.

Q	Evidence for 8 marks	Evidence for 6 marks	Evidence for 4 marks
2(a)	Well expressed argument – 1. As in (6) column, **plus** TWO more points such as: Po-210 for much more recent deaths – up to 3 years. Pb-210 – up to 150 years. Pb-210 would be the best to use as it has stayed at stable levels in the environment. C-14 – up to 50 000 years. C-14 could be used to cross check. Starting point less in a younger person as they don't have as much accumulated.	Well expressed argument – 1. As in (4) column, **plus** TWO more points such as in (8) column.	C-14 half-life too long for 75 years Pb-210 just right Po-210 for much more recent deaths.
2(b)	Make measurements on several different people to establish a valid benchmark – 2. Effects on measurements of age of person as Pb-210 accumulates in the body – 3. Well expressed argument – eg compare the amount left in bones of dead humans of known age (as determined by other means) with the levels present in a living human of the same age – 1. Effects on measurements of factors such as diet / place of residence / size / gender – 1–2. Could be checked against known deaths, eg from graveyards (with permission!). Check the variability of Pb-210 within the body.	Make measurements on several different people to establish a valid benchmark – 2. Effects on measurements of age of person as Pb-210 accumulates in the body – 3. Well expressed argument – eg compare the amount left in bones of dead humans of known age (as determined by other means) with the levels present in a living human of the same age – 1.	Compare the amount left in bones of a dead human with the levels present in a living human – 1. Make measurements on several different people to establish a valid benchmark – 2. Effects on measurements of factors such as diet / place of residence / size / gender – 1–3.

Q	Evidence for 8 marks	Evidence for 6 marks	Evidence for 4 marks
2(c) (8)	A good discussion of the problems such as mentioned below, but weighing them up with the advantages of catching more criminals, especially of vicious crimes. • If the suspect won't give a sample it is easy to ask a family member. Is this against human rights? Does this make nonsense of consent? • Will the above lead to family problems? A sense of betrayal? Do family members want to implicate a family member? Families may be under suspicion or tainted even though they are not guilty. • You can either extend or narrow down the range of suspects. This could be a good way of eliminating innocent people. • May show up unknown adoptions or children with different fathers. • Mitochondrial DNA can be used for females. • What about twins? • Does the relative's DNA go on file? Should it stay on file? Is it fair for someone who has committed no crime to be DNA tested just because a relative's DNA is on file? • It brings with it the indirect lifetime surveillance of citizens simply because they are related to someone whose DNA profile is on record. • DNA profiles are very personal data which must be safeguarded. • Raises the question of whether all the population should have DNA profiles on record. • What is the chance of accidental matches? • Should DNA collected for one purpose be used for another purpose? • Innocent individuals should be given the reasons that their DNA is being required. • A good way of reducing the number of suspects, then other forensic techniques could be used.	Discussion of MORE than one problem as shown in left hand column, or ONE problem discussed and the advantages of catching more criminals weighed.	Mention of at least TWO of the points mentioned in the (8) column, or good discussion of ONE point.

Q	Evidence for 8 marks	Evidence for 6 marks	Evidence for 4 marks
3(a)	• The Pacific Plate in the South Island is made of the lighter / less dense / high silica continental crust which cannot subduct under the Australian Plate as both crusts are light, so collision means that the land is uplifted to form the Southern Alps. The Pacific Plate is overriding the Australian Plate as the former plate is being formed in the Pacific Ocean / off the coast of Chile and is moving towards NZ. • The oceanic crust changes to continental crust round about Kaikoura : the Pacific Plate stops subducting and starts sliding / New Zealand is being twisted as a result of this and the subduction of the Australian Plate under the Pacific in Fiordland. BOTH bullet points well developed.	• The Pacific Plate in the South Island is made of the lighter / less dense / high silica continental crust which cannot subduct under the Australian Plate as both crusts are light, so collision means that the land is uplifted to form the Southern Alps. The Pacific Plate is overriding the Australian Plate as the former plate is being formed in the Pacific Ocean / off the coast of Chile and is moving towards NZ. • The oceanic crust changes to continental crust : the Pacific Plate stops subducting and starts sliding / New Zealand is being twisted as a result of this and the subduction of the Australian Plate under the Pacific in Fiordland. ONE bullet point well developed, the other commented on.	ONE bullet point developed, or BOTH bullet points commented on.
3(b) (i) 5 / 8	Any valid linking of an observation with a measurement such as seismograph readings showing evidence of Marsquake waves, P and S waves, fault lines showing movement which could be measured, eg taking TWO rock outcrops as reference points and seeing how the outcrops moved relative to each other, volcanoes / lava flows / volcanic dust with valid measurement. Measurements could involve instruments on the surface or space probe measurements ~~or GPS~~ etc. For observations only – 1 mark. To gain more marks candidates had to link the observation with how the observation could be measured. For each valid observation with a valid measurement – 2 marks. Things that could be observed and measured are: • plate boundaries • evidence of seas • mountain chains • movement in hot spot volcanoes • marsquakes – P + S waves • active volcanoes • SO_2 in atmosphere • temperature variations • soil sampling.	See (8) answer.	See (8) answer.

Q	Evidence for 8 marks	Evidence for 6 marks	Evidence for 4 marks
3(b) (ii) 3 / 8	Heart from core, – 1. Causes convection currents in the mantle (or a frozen core means no convection currents) – 1. Moves crust as tectonic plates / fractures of the crust causing tectonic plates – 1. Anything insightful added – 1 per comment up to total of 8 for the whole of question 3.	See (8) answer.	See (8) answer.
Note **An answer well expressed, argued or discussed was rewarded with one extra mark, as this showed an ability to present a coherent answer.**			

Judgement Statement

An aggregate mark of 64 from three questions was used in Science.
In 2005, candidates who achieved 49 marks or better were awarded outstanding scholarship and candidates who achieved 41-48 marks were awarded scholarship.