pAssessment Schedule – 2012

Scholarship Science (93104)

Evidence Statement

Q	Evidence	1–4	5–6	7–8
1.	**Key points** • Viruses can be easily genetically engineered by removing disease causing genes of viruses and replacing with transgenes. • Using viruses would ensure that the transgenes are transmitted relatively quickly throughout the whole population. • Viral mode of reproduction in possum means that large numbers of viruses containing the transgenes will be produced. • The virus chosen must be highly specific, but can't harm the possums too much, otherwise the possums Will not produce lots of virus that can then be spread to more possums. • Some possums may develop immunity to the virus reducing effective spread of the virus. • Use of such a virus may be successful initially but as population density of possums declines the virus may not spread as well. • Once the virus is released it would be impossible to contain or destroy. If the virus mutates or stops being effective, it would be impossible to remove from the environment. • Plant tissue may be genetically engineered and then multiple (identical) plants grown by tissue culture. • Plant must be highly edible and favoured by possums. • The proteins would have to survive the possum digestive system. • Insertion of transgenes may disable important plant gene or mutations of transgenes in plants could bring about unintended harm to the plants. • Transgenes may be spread to other plants via pollen or seeds, although sterile plants only could be used, except that sterile plants would not naturally spread. • Possum proteins could harm other animals if eaten by them causing allergic reactions (NOT reproductive problems unless qualified, e.g. similar reproductive proteins, similar species). • Proteins from transgenes could have a cumulative effect in the environment, or affect micro-organisms and/or invertebrates. • Use of plants as baits would make the delivery more under human control, so that where and when to apply the bait could be more accurately targeted. If adverse effects occur, delivery can be stopped. • Bait delivery systems are expensive, labour-intensive and time-consuming. Repeat applications of the toxin or vaccine are needed to ensure all the possums in a population are treated. **Note – the following were not relevant to answering this question** • Specific techniques for the insertion of transgenes. • Ethical concerns about killing possums. • Evolutionary concepts.	Shows some understanding of the underlying science. Some accurate use of scientific language. Some relevant detail in answer.	Good understanding of the underlying science. Accurate use of scientific language. Occasional insight.	Thorough understanding of the underlying science. Confident use of relevant scientific language. Perceptive response to question. Communication of insightful understanding. Extensive relevant detail in answer.

Q	Evidence	1–4	5–6	7–8
2.	**Key points – could be found in either (a) or (b).** (a) • When the climate is warmer, more photosynthesis occurs so there will be more C-12 and less C-13 in plants. This means there will be proportionally more C-13 in atmosphere. (Ratio of C12 to C13 important here – NOT the overall amount of carbon dioxide). • When the climate is colder the converse applies. When platelets are fossilised they maintain the ratio of C12-C13 as was in the ocean at the time which is the same as the ratio in the atmosphere. • Pollen grains will reflect isotope ratio of plants at that time. Can be used to cross check with the ratio in platelets for the same time period. • Sediment at top of a sediment core will always be the youngest and on the bottom the oldest. This gives a time sequence. (b) Geological processes and features such as: • Rapid uplift and erosion of Southern Alps forming rubble and sediment. • Land sediment flows down rivers to the ocean and is swept north by currents • Sediment accumulates on the walls of the Kaikoura canyon, then periodically collapses and is swept up the east coast of NI and deposited as far away as Kermadec trench. • This produces thick, continuous sedimentary sequences – especially off NI eastern coast. • Marine sediment added – calcareous remains of plankton – forming limestone. • The land and marine sediment is subducted and contributes to the violence of eruptions in the TVZ because of the addition of extra silica (from the land sediment) and gas (from melted marine caronates) • Taupo ash can be dated using C-14 or K / Ar dating, also ash unique to each eruption event. Cross correlated with what is found out on land. • Sediment may contain different minerals which can be used for dating, eg proportion of silica	Some application of geological and chemical knowledge to unique context. Shows some understanding of the underlying science. Some accurate use of scientific language. Some relevant detail in answer.	Good application of geological and chemical knowledge to unique context. Good understanding of the underlying science. Accurate use of scientific language. Occasional insight.	Excellent application of geological and chemical knowledge to unique context. Thorough understanding of the underlying science. Confident use of relevant scientific language. Perceptive response to question. Communication of insightful understanding.

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3.	• Less incoming energy with increased distance from the Sun. • Carbon dioxide is a greenhouse gas that traps heat, and its effect increases with its concentration and with atmospheric thickness. • Venus and Earth are more massive and so have stronger gravitational fields and hold onto an atmosphere better. • The length of the day has no direct effect on the average surface temperature. • Albedo measures the fraction of sunlight reflected back into space. • Clouds reflect incoming sunlight. • Liquid water mostly absorbs sunlight whereas ice mostly reflects sunlight. • Water is an important greenhouse gas for Earth. • The presence of water on Earth dissolves CO_2, reducing its concentration in the atmosphere. • Water regulates temperature variation on Earth. • Water lubricates tectonic activity. • Volcanic activity on Venus and Earth pumps CO_2 into the atmosphere. • Mars has a cold core and no volcanic activity. • Radioactivity is a source of heat within planets.	Superficial discussion of the table, including the effect of relative distances from the Sun. The greenhouse effect and the role of carbon dioxide. Shows some understanding of the underlying science. Some accurate use of scientific language. Some relevant detail in answer.	Some development of key ideas such as the greenhouse effect, the role of water, and the role of volcanic activity in aiding or not the amount of CO_2 in atmosphere. Most of the table discussed and some integration of ideas. Good understanding of the underlying science. Accurate use of scientific language. Occasional insight.	Good development of key ideas such as the greenhouse effect, the role of water in, for example, dissolving CO_2 and aiding subduction, and the role of volcanic activity in aiding or not the amount of CO_2 in atmosphere. The table discussed and integrated. Confident use of relevant scientific language. Perceptive response to question. Communication of insightful understanding.

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4.	• Sonar is strongly reflected off the gas-filled organs because the speed of sound in gas and sea water is very different, so a boundary that will strongly reflect is formed. • The layer above the submarine must have contained many millions of the same animal so that sonar was all reflected. • The different shapes and sizes of the swim bladders cause sound to reflect differently from each swim bladder, causing differences in the return echo. • Additional information, such as preferred depth of habitation, can aid in identification of species. • Each swim bladder has a natural frequency and when the sonar is at that same frequency the swim bladder resonates and the sound is scattered and amplified. • Higher frequency sound provides better resolution. • Lower frequency sound travels further. • The time for the echo to return gives the depth. • The return signal weakens with increased depth, due to spreading out and scattering. • Increasing depth changes the wave velocity, causing refraction of the wave.	Some application of sound knowledge to unique context. Shows some understanding of the underlying science. Some accurate use of scientific language. Some relevant detail in answer.	Good application of sound knowledge to unique context. Good understanding of the underlying science. Accurate use of scientific language. Occasional insight.	Excellent application of sound knowledge to unique context. Thorough understanding of the underlying science. Confident use of relevant scientific language. Perceptive response to question. Communication of insightful understanding. Extensive relevant detail in answer.