Assessment Schedule – 2007

Scholarship Science (93104)

Evidence Statement

Note: One or more accurate points very well developed, a discussion coherently presented or particular insights can also be rewarded.

Question	2	4	6	8
1	**2 clear points such as shown below** • All three are producing human insulin which can be tolerated by diabetics. • Inserted gene may knock out a good gene, effect may not be immediately apparent. • Only need to make a few transgenic yeast, they then rapidly multiply producing a large population. • Yeast can be contained in vats which could be in the middle of cities, don't take up much space. • Very little danger of gene from yeast spreading into the environment. • Safflower: containment harder – could be inside but more probably grown outside where conditions can't be as controlled. • Plants only produce seeds at certain times of the year, so not a continuous supply. • Seeds or pollen may be accidentally spread releasing gene into the wild. • Objections to human genes being put into animals e.g. Maori, Hindu, vegetarians (must mention one of these or similar). • disposal of any of the 3 when production finished may be a	**4 clear points such as shown below** • All three are producing human insulin which can be tolerated by diabetics. • Inserted gene may knock out a good gene, effect may not be immediately apparent. • Only need to make a few transgenic yeast, they then rapidly multiply producing a large population. • Yeast can be contained in vats which could be in the middle of cities, don't take up much space. • Vat conditions can be highly controlled for maximum insulin production meaning that insulin can be produced all year long. • Production could be linked to temperature regulation, lower temperature, gene not switched on. • Very little danger of gene spreading into the environment. • Very little ethical issues as single celled organism, grown in labs under controlled conditions is more ethically acceptable. • Safflower: containment harder – could be inside but more probably	**6 clear points (or less but well developed) such as shown below** • All three are producing human insulin which can be tolerated by diabetics. • Inserted gene may knock out a good gene, effect may not be immediately apparent. • Yeast can be contained in vats which could be in the middle of cities, don't take up much space. • Vat conditions can be highly controlled for maximum insulin production meaning that insulin can be produced all year long. • Very little danger of gene spreading into the environment. • Very little ethical issues as single celled organism, grown in labs under controlled conditions is more ethically acceptable. • Safflower: containment harder – could be inside but more probably grown outside where conditions can't be as controlled. • Plants only produce seeds at certain times of the year, so not a continuous supply. • Seeds or pollen may be accidentally spread releasing gene into the wild. • Birds or insects eating the seeds may be affected by the insulin. • Cows – can be kept contained in paddocks with secure fences so	**8 clear points (or less but well developed) such as shown below coherently developed** • All three are producing human insulin which can be tolerated by diabetics. • Inserted gene may knock out a good gene, effect may not be immediately apparent. • Only need to make a few transgenic yeast, they then rapidly multiply producing a large population. • Yeast can be contained in vats which could be in the middle of cities, don't take up much space. • Vat conditions can be highly controlled for maximum insulin production meaning that insulin can be produced all year long. • Production could be linked to temperature regulation, eg lower temperature, gene not switched on. • Very little danger of gene spreading into the environment. • Very little ethical issues as single celled organism, grown in labs under controlled conditions is more ethically acceptable. • Safflower: containment harder – could be inside but more probably grown outside where conditions can't be as controlled. • Plants only produce seeds at certain times of the year, so not a continuous supply, even if seeds planted at different times. • Seeds or pollen may be accidentally spread releasing gene into the wild. • Plants could be made sterile to prevent pollen from spreading gene.

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	problem. **Note: confusion between bacteria and yeast generally accepted for all levels if statements were accurate**	grown outside where conditions can't be as controlled. • Plants only produce seeds at certain times of the year, so not a continuous supply. • Seeds or pollen may be accidentally spread releasing gene into the wild. • Cows – can be kept contained in paddocks with secure fences so the spreading of the gene not such a problem. • Cows are not destroyed, only milked, to get the insulin; therefore the cows are not harmed. • Objections to human genes being put into animals e.g. Maori, Hindu, vegetarians (must mention one of these or similar). • disposal of any of the 3 when production finished may be a problem.	the spreading of the gene not such a problem. • Cows are not destroyed, only milked, to get the insulin; therefore the cows are not harmed. • Animal waste may spread the gene • Milk only produced at breeding time. • To produce milk cow must have a calf, what happens to the calf? • Both the plants and animals take up land which could be used for food production. • Disposal of any of the 3 when production finished may be a problem • Yeast multiply quickly and plants can be tissue cultured to ensure continuity of supply. • Objections to human genes being put into animals e.g. Maori, Hindu, vegetarians (must mention one of these or similar) OR that some unspecified groups object to human gene being put into other organisms; but this is weighed up against the need for an increasing number of diabetics to have a ready source of insulin.	• Birds or insects eating the seeds may be affected by the insulin • Cows – can be kept contained in paddocks with secure fences so the spreading of the gene not such a problem. • Cows are not destroyed, only milked, to get the insulin; therefore the cows are not harmed. • Animal waste may spread the gene. • Only females produce milk and only at breeding time. • To produce milk cow must have a calf, what happens to the calf, calves may drink the insulin laden milk. • Both the plants and animals take up land which could be used for food production. • Disposal of any of the 3 organisms when production finished may be a problem. • Yeast multiply quickly and plants can be tissue cultured to ensure continuity of supply, harder for animals although they live longer. • Objections to human genes being put into animals, eg Maori, Hindu, vegetarians (must mention one of these or similar) OR that some unspecified groups object to human gene being put into other organisms; but this is weighed up against the need for an increasing number of diabetics to have a ready source of insulin.
2	**One point developed from either AVC or TVC or one point from both:** • In the AVZ low viscosity basaltic magma is very hot. The eruptions are gentle. Shield shaped volcanoes are formed. • The magma is at a lower temperature in the TVC. The magma is viscous.	**One point developed from both AVC or TVC or two points from both:** • In the AVZ low viscosity, low silica basaltic magma is very hot. The eruptions have very little gas or water and are gentle. Shield shaped volcanoes are formed because the hot magma flows a	**Points developed for both areas to level as indicated below** • In the AVZ low viscosity basaltic magma is very hot and reaches the surface through weaknesses in the crust. The eruptions have very little gas or water and are gentle. Shield shaped volcanoes are formed because the hot magma flows a long way before cooling because it is	**As for "6" plus perceptive comments or development of key ideas such as:** • In the AVC because the magma from the mantle is very hot and rises quickly very little silica rich continental crust is melted and therefore the magma is low in silica and viscosity. • The basaltic magma of the AVC is dry because there is no source of water because there is no subducting plate bringing down wet sediment. Therefore there is very little

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	The eruptions are generally violent or extremely violent producing cone or caldera volcanoes.	long way before cooling. • The TVZ magma is viscous andesite or very viscous rhyolitic magma with relatively high or high silica content. The eruptions are generally violent or extremely violent, producing cone or caldera volcanoes, or dome volcanoes if the rhyolite magma is degassed. The violent eruptions are caused by dissolved gases and water.	fluid and very hot. • The TVZ magma is mainly a mixture of melted mantle and some continental crust forming viscous andesite or rhyolitic magma. The eruptions are generally violent or extremely violent, producing cone or caldera volcanoes. The violent eruptions are caused by dissolved gases and water coming out of solution as the magma rises. This puts pressure on the ground above, which shatters after the pressure is released in a rhyolitic eruption. • The magma melts at a lower T in the TVC because the water from the subducted sediments on top of the oceanic crust lowers the mp of the surrounding rock. The less dense magma rises, melting the continental crust above. **Or one or more of the bullet points for "8" in less detail as part of the answer.**	steam in this magma which is why the eruptions are gentle in the TYC. • The subducting plate gets warmer as it descends into the mantle. The water from the subducting sediments plus any contained in the oceanic (basalt) crust heats up and turns to vapour. • The magma melts at a lower T in the TVC because the water from the subducted sediments on top of the oceanic crust lowers the mp of the surrounding rock. A partial melt results and the less dense melted magma rises to the surface, melting the continental crust of the Australian plate as it rises. • The TVZ magma is mainly a mixture of melted mantle / oceanic crust (basalt) and some continental crust (rhyolite) forming viscous andesite or (if greater proportion of rhyolite) very viscous rhyolitic magma. • The violent eruptions are caused by dissolved gases and water coming out of solution as the magma rises – because the pressure gets less the nearer the surface the magma is. This increases the volume of the magma as it nears the surface, forming a foamy gas and magma mixture. • This puts pressure on the ground above, which shatters after the pressure is released in a rhyolitic eruption. • The giant reservoir under the TVC is also a giant heat reservoir which melts the crust above producing rhyolitic magma.
3	**Two points from:** • The glycerol is denser so will sink to the bottom. • Methanol and/or NaOH are soluble in water, and will be removed with washing. • NaOH acts as a	**Four points from:** • The glycerol is denser so will sink to the bottom. • Methanol and NaOH are soluble in water and will be removed with washing, biodiesel is not.	**Six points (no more than five from either (a) or (b)) from:** • Triglycerides initially heated to drive off any water. • Equilibrium tipped towards making biodiesel by the extra methanol.	**Eight points (no more than five from either (a) or (b)) from:** • Triglycerides initially heated to drive off any water. • Equilibrium tipped towards making biodiesel by the extra methanol. • Equilibrium tipped towards making biodiesel the

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	catalyst • The higher the degree of unsaturation OR the shorter the fatty acid chain of the biodiesel, the more liquid the biodiesel (or the converse).	• NaOH acts as a catalyst • The higher the degree of unsaturation OR the shorter the fatty acid chain, the more liquid the biodiesel (or the converse). • Colder climates, biodiesel used should be made from more unsaturated oils (or the converse).	• Equilibrium tipped towards making biodiesel the removal of glycerol • NaOH acts as a catalyst • Mixture heated at optimum temperature for several hours for reaction to occur – forward reaction is endothermic so this favours that. • Methanol, glycerol and/or NaOH are soluble in water and will be removed with washing, biodiesel is not. • The glycerol is denser and will sink to the bottom – easier to remove. • Drying ensures water is removed to further purify the biodiesel. • The higher the degree of unsaturation the more liquid the biodiesel and converse. • The shorter the HC chain, the more liquid the biodiesel and converse. • In colder climates, biodiesel used should be made from more unsaturated oils because melting point lower and therefore won't solidify easily. • In warmer climates biodiesel could be made from more saturated fats so that they are less volatile and don't evaporate at higher temperatures.	removal of glycerol. • Any water in the methanol will promote saponification and inhibit transesterification. • Triglycerides are cooled again so that the methanol doesn't evaporate when added. • NaOH acts as a catalyst • Mixture heated at optimum temperature for several hours for reaction to occur – forward reaction is endothermic so this favours that. • Methanol, glycerol and NaOH and any soap are soluble in water and will be removed with washing, biodiesel is not. • The glycerol is denser and will sink to the bottom – easier to remove and tips equilibrium towards making biodiesel. • Drying ensures water is removed to further purify the biodiesel. • The higher the degree of unsaturation the more liquid the biodiesel and converse. • The shorter the HC chain, the more liquid the biodiesel and converse. • In colder climates, biodiesel used should be made from more unsaturated oils because melting point lower and therefore wont solidify easily. • In warmer climates biodiesel could be made from more saturated fats so that they are less volatile and don't evaporate at higher temperatures.
4	**One developed or two points from:** • The different densities of air and rocks contribute to different wave velocities in the two media. • Distance can be determined from the different arrival	**Four (or less but better developed) points from:** • The different densities of air and rocks contribute to different wave velocities / wave attenuation in the two media. • Distance can be	**Six points (or less but well developed) from:** • The different densities of air and rocks contribute to different wave velocities / wave attenuation in the two media. • Distance can be determined from the different arrival times	**Eight points (or less but well developed) from:** • The different densities of air and rocks contribute to different wave velocities and wave attenuation in the two media. • Distance can be determined from the different arrival times of the sound and seismic waves (answers

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	times of the sound and seismic waves (answers based on echo times were also rewarded). • Elephants can also tell the direction from which the waves came, depending on which foot feels it first.	determined from the different arrival times of the sound and seismic waves (answers based on echo times were also rewarded). • Elephants can also tell the direction from which the waves came, depending on which foot feels it first. • Both air and seismic signals can be affected by other sources of sound or vibrations, eg wind, thunderstorms, other animals or human generated such as generators. • Seismic waves are reflected and refracted by changes in rock density.	of the sound and seismic waves (answers based on echo times were also rewarded). • Elephants can also tell the direction from which the waves came, depending on which foot feels it first. • Both air and seismic signals can be affected by other sources of sound or vibrations, eg wind, thunderstorms, other animals or human generated such as generators. • Seismic waves are reflected and refracted by changes in rock density. • Low frequency sound waves travel further than high frequency waves.	based on echo times were also rewarded). • Elephants can tell the direction from which the waves came, depending on which foot feels it first. • Both air and seismic signals can be affected by other sources of sound or vibrations, eg wind, thunderstorms, other animals or human generated such as generators. • Seismic waves are reflected and refracted by changes in rock density. • Low frequency sound waves travel further than high frequency waves. • Low frequency sound waves with their large wavelengths (~20 m) diffract readily around large obstacles. • Sound through air may give greater sensitivity as variation can be put into sound; seismic waves give crude information as the signal gives duration and frequency only and cannot be modified. The details are garbled and distorted.
5	**One developed or two points from:** • Mercury is closer to the Sun than Venus and, for this reason, should be hotter. • The surface of Mercury will be hottest on the side facing the Sun.	**Four (or less but better developed) points from:** • Mercury is closer to the Sun than Venus and, for this reason, should be hotter. • The surface of Mercury will be hottest on the side facing the Sun. • Both planets will radiate heat. • The atmosphere of Venus will trap heat.	**First three points and fourth well developed:** • Mercury is closer to the Sun than Venus and, for this reason, should be hotter. • The surface of Mercury will be hottest on the side facing the Sun. • Both planets will radiate heat. • The atmosphere of Venus will absorb the outgoing, infrared radiation, causing a greenhouse effect that warms the planet, making it hotter than Mercury.	**First four points and fifth well developed:** • Mercury is closer to the Sun than Venus and, for this reason, should be hotter. • The surface of Mercury will be hottest on the side facing the Sun. • Both planets will radiate heat. • The atmosphere of Venus will absorb the outgoing, infrared radiation, causing a greenhouse effect that warms the planet, making it hotter than Mercury. • The atmosphere of Venus will cause an even temperature over the whole surface of the planet. Winds may spread the heat around despite Venus rotating so slowly, or the heat may be internally reflected around by the cloud cover.

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6	**One developed or two points from:** • The half-life must be long enough to diagnose or treat conditions. • The half-life must be short enough to minimise the radiation dose to the patient.	**Four (or less but better developed) points from:** • The half-life must be long enough to diagnose or treat conditions. • The half-life must be short enough to minimise the radiation dose to the patient. • A radioisotope used for diagnosis must emit gamma rays • Gamma rays are highly-penetrating rays that can escape from the body and be detected.	**First three points and forth and fifth points well developed:** • The half-life must be long enough to diagnose or treat conditions. • The half-life must be short enough to minimise the radiation dose to the patient. • A radioisotope used for diagnosis must emit gamma rays. • Gamma rays are highly-penetrating, non-ionising rays that can escape from the body and be detected. • A radioisotope used for treatment must emit alpha or beta particles.	**First two points and third, forth and fifth points well developed:** • The half-life must be long enough to diagnose or treat conditions. • The half-life must be short enough to minimise the radiation dose to the patient. • A radioisotope used for diagnosis must emit gamma rays, which are highly-penetrating, non-ionising rays that can escape from the body and be detected. • A radioisotope used for treatment must emit alpha or beta particles, as these are ionising radiation that can damage nearby cells. • Radiation causes mutations in the DNA that can have a wide range of metabolic effects.