Assessment Schedule – 2008

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.

Q	2	4	6	8
1.	**1-2 clear points such as shown below:** • Proper disposal is essential to ensure health and safety of the public, and quality of the environment. • Radiation causes mutations in DNA. • Humans absorb radiation by ingestion, inhalation, absorption, or injection. • Radioactivity can be highly dangerous, eg α, highly ionising, most dangerous inside the body; β ionising, potential damage reduced by distance; γ highly energetic and penetrating, most dangerous from outside the body.	**3-4 clear points such as shown below:** • Proper disposal is essential to ensure health and safety of the public, and quality of the environment. • Radiation causes mutations in DNA. • Humans absorb radiation by ingestion, inhalation, absorption, or injection. • Radioactivity can be highly dangerous, eg α, highly ionising, most dangerous inside the body; β ionising, potential damage reduced by distance; γ highly energetic and penetrating, most dangerous from outside the body. • Shorter half-life – decays more quickly – store safely and wait for radioactivity to reduce to safe level then dispose of in landfills. • Shorter half-life – waste can be diluted so that the concentration of radioisotopes is harmless (levels of radiation being close to background radiation).	**5-6 clear points (or less but well developed) showing linking of ideas such as:** • Proper disposal is essential to ensure health and safety of the public, and quality of the environment. • Radiation causes mutations in DNA. • Humans absorb radiation by ingestion, inhalation, absorption, or injection. • Radioactivity can be highly dangerous, eg α, highly ionising, most dangerous inside the body; β ionising, potential damage reduced by distance; γ highly energetic and penetrating, most dangerous from outside the body. • Shorter half-life – decays more quickly – store safely and wait for radioactivity to reduce to safe level then dispose of in landfills. • Shorter half-life – waste can be diluted so that the concentration of radioisotopes is harmless (levels of radiation being close to background radiation). • Longer half-life – these wastes must be shielded or buried. • Longer half-life – buried wastes must be isolated from the living environment for thousands of years by sinking deeply into stable geological structures.	**7-8 clear points (or less but well developed) showing understanding such a:s** • Proper disposal is essential to ensure health and safety of the public, and quality of the environment. • Radiation causes mutations in DNA. • Humans absorb radiation by ingestion, inhalation, absorption, or injection. • Radioactivity can be highly dangerous, eg α, highly ionising, most dangerous inside the body; β ionising, potential damage reduced by distance; γ highly energetic and penetrating, most dangerous from outside the body. • Shorter half-life – decays more quickly – store safely and wait for radioactivity to reduce to safe level then dispose of in landfills. • Shorter half-life – waste can be diluted so that the concentration of radioisotopes is harmless (levels of radiation being close to background radiation). • Longer half-life – these wastes must be shielded or buried. • Longer half-life – buried wastes must be isolated from the living environment for thousands of years by sinking deeply into stable geological structures. • Shielding: barriers of lead, concrete or water give good

				protection from penetrating radiation such as gamma rays. • Solubility of the radioisotope determines how likely the substance is to spread into the environment • Leaking radioactive substances can directly contaminate life forms, or can enter the food chain. • Longer half-life – containment must be designed to withstand the heat that is produced by radioactive decay.
2	**1-2 clear points such as shown below:** • Greater abundance of solid particles or single-celled organisms, such as algae, will decrease depth of light penetration, because they scatter or absorb light. • The same person should be taking all readings, since sharpness of vision varies from person to person. • Take readings when the water is calm, because some incoming light is reflected off lake surface. If surface is calm and smooth, less light will be reflected and visa versa. • Measure by lowering the disc beyond point of disappearance, then raise and lower it slightly to get the Secchi depth. Do more than once and average.	**3-4 clear points such as shown below:** • Greater abundance of solid particles or single-celled organisms, such as algae, will decrease depth of light penetration, because they scatter or absorb light. • The same person should be taking all readings, since sharpness of vision varies from person to person. • Take readings when the water is calm, because some incoming light is reflected off lake surface. If surface is calm and smooth, less light will be reflected and visa versa. • Measure by lowering the disc beyond point of disappearance, then raise and lower it slightly to get the Secchi depth. Do more than once and average. • Take readings on fine days; a cloudy day will mean that less light will reflect off the disc which will	**5-6 clear points (or less but well developed) showing linking of ideas such as:** • Greater abundance of solid particles or single-celled organisms, such as algae, will decrease depth of light penetration, because they scatter or absorb light. • The same person should be taking all readings, since sharpness of vision varies from person to person. • Take readings when the water is calm, because some incoming light is reflected off lake surface. If surface is calm and smooth, less light will be reflected and visa versa. • Measure by lowering the disc beyond point of disappearance, then raise and lower it slightly to get the Secchi depth. Do more than once and average. • Take readings on fine days; a cloudy day will mean that less light will reflect off the disc which will add an error. • Take readings at same time because position of Sun in the sky alters light intensity. • The amount of light from the Sun will be affected by the season, with the Sun being lower in the sky and less intense in winter.	**7-8 clear points (or less but well developed) showing understanding such as:** • Greater abundance of solid particles or single-celled organisms, such as algae, will decrease depth of light penetration because they scatter or absorb light. • The same person should be taking all readings, since sharpness of vision varies from person to person. • Take readings when the water is calm, because some incoming light is reflected off lake surface. If surface is calm and smooth, less light will be reflected and visa versa. • Measure by lowering the disc beyond point of disappearance, then raise and lower it slightly to get the Secchi depth. Do more than once and average. • Take readings on fine days; a cloudy day will mean that less light will reflect off the disc which will add an error. • Take readings at same time because position of Sun in the sky alters light intensity. • The amount of light from the Sun will be affected by the season, with the Sun being lower in the sky and less intense in winter.

		add an error. • Take readings at same time, because position of Sun in the sky alters light intensity. • The amount of light from the Sun will be affected by the season, with the Sun being lower in the sky and less intense in winter.	• Ensure that the rope hangs vertically, so that the depth reading is a true measurement. • Rainy or stormy weather will alter the amount of sediments in the water, so take readings after a period of settled weather. • Measurements should be taken from the same place on the lake, using reference points from the shore. • Could be errors in the readings, because of Sun's glare (reflection) on the water so, for example, take the reading on the shady side of the boat, so that sun glare doesn't affect the result.	• Ensure that the rope hangs vertically, so that the depth reading is a true measurement. • Rainy or stormy weather will alter the amount of sediments in the water, so take readings after a period of settled weather. • Measurements should be taken from the same place on the lake, using reference points from the shore. • Could be errors in the readings, because of Sun's glare (reflection) on the water so, for example, take the reading on the shady side of the boat, so that sun glare doesn't affect the result. • Take readings at the same time of day because the angle of the Sun alters the ratio of reflected to refracted light, and therefore the intensity of light entering the water and hitting the disc. • The angle of the Sun affects the path length of light from the surface to the disc (and therefore its attenuation), due to the way that the angle of refraction changes with angle of incidence. • Observe the disc from directly above. As the angle of observation increases, total internal reflection will occur and the disc will no longer be visible.
3.	**1-2 clear points such as shown below:** • The gravitational pull of each planet on their moons causes flexing of their crusts. • The flexing would cause moonquakes on the Moon, cracking of ice on Europa, and volcanism on Io, causing vibrations and noise that could	**3-4 clear points such as shown below:** • The gravitational pull of each planet on their moons causes flexing of their crusts. • The flexing would cause moonquakes on the Moon, cracking of ice on Europa, and volcanism on Io, causing vibrations and noise that could be picked up by sound instruments.	**5-6 clear points (or less but well developed) showing linking of ideas such as:** • The gravitational pull of each planet on their moons causes flexing of their crusts. • The flexing would cause moonquakes on the Moon, cracking of ice on Europa, and volcanism on Io, causing vibrations and noise that could be picked up by sound instruments.	**7-8 clear points (or less but well developed) showing understanding such as:** • The gravitational pull of each planet on their moons causes flexing of their crusts. • The flexing would cause moonquakes on the Moon, cracking of ice on Europa, and volcanism on Io, causing vibrations and noise that could be picked up by sound instruments. • Moonquakes are caused by

	be picked up by sound instruments. • Moonquakes are caused by the effect of the Earth's gravity, and by the heating effect of the Sun.	• Moonquakes are caused by the effect of the Earth's gravity, and by the heating effect of the Sun. • Sounds on the Moon last a long time, because the dry, rigid structure of the crust transmits vibrations efficiently. • Speed of sound waves on the moons are dependent on density of the crust. • Sound reduces in amplitude and speed in a thin atmosphere and doesn't travel nearly so far. • Craters and cracks in the surface will distort and attenuate sound.	• Moonquakes are caused by the effect of the Earth's gravity, and by the heating effect of the Sun. • Sounds on the Moon last a long time, because the dry, rigid structure of the crust transmits vibrations efficiently. • Speed of sound waves on the moons are dependent on density of the crust. • Sound reduces in amplitude and speed in a thin atmosphere and doesn't travel nearly so far. • Craters and cracks in the surface will distort and reduce sound. • Instruments may also be able to tell if there is water under the ice by sonar. • The sonar would transmit a signal and then analyse the return echoes from subsurface boundaries to work out the ice and ocean depths. • Measuring the speed of waves provides information on the materials in the crusts of the moons. • Measuring the frequency of waves helps trace their source.	the effect of the Earth's gravity, and by the heating effect of the Sun. • Sounds on the Moon last a long time, because the dry, rigid structure of the crust transmits vibrations efficiently. • Speed of sound waves on the moons are dependent on density of the crust. • Sound reduces in amplitude and speed in a thin atmosphere and doesn't travel nearly so far. • Craters and cracks in the surface will distort and reduce sound. • Instruments may also be able to tell if there is water under the ice by sonar. • The sonar would transmit a signal and then analyse the return echoes from subsurface boundaries to work out the ice and ocean depths. • Measuring the speed of waves provides information on the materials in the crusts of the moons. • Measuring the frequency of waves helps trace their source. • Jupiter being much larger would cause greater flexing on Io and Europa, compared with Earth's effect on Moon. • Io and Europa orbiting much faster would also have greater flexing. • Therefore the Io and Europa sounds would have greater amplitude / energy / intensity compared with the Moon. • Magma is formed on Io by the friction of flexing and rapid orbiting. • Friction from tidal forces may also be heating the ice and forming water under the ice.

4.	**1-2 clear points such as shown below:** • The Pacific Plate (PP) and Australian Plate (AP) are both made up of oceanic crust. • The PP is denser and so subducts under the AP. • Magma is formed when plate has subducted to a certain depth. • PP possibly dips at a steep angle to form the deep trench • PP pushes up AP, or AP overrides PP to form the ridge • Sediment from subducting PP also helps build up the ridge	**3-4 clear points such as shown below:** • The Pacific Plate (PP) and Australian Plate (AP) are both made up of oceanic crust. • PP is denser than the AP and so subducts under the AP • PP possibly dips at a steep angle to form the deep trench • PP subducts under the AP dragging down part of the AP to form the deep trench. • The AP is also pushed up by the subducting PP to form the ridge. • Sediment is scraped off from the subducting PP and added to the ridge • Volcanoes formed by magma melting, formed by superheated water from subducted sediments. • The magma reaches the surface through cracks in the AP • Magma isn't formed until the PP has subducted to a certain depth, which is why all the volcanoes are in a line. • Earthquakes would show a pattern of shallow ones where subduction starts, getting deeper the further west you take readings.	**5-6 clear points (or less but well developed) showing linking of ideas such as:** • The Pacific Plate (PP) and Australian Plate (AP) are both made up of oceanic crust. • PP is denser than the AP and so subducts under the AP • The PP is denser because it is older and colder as it has travelled further (from the spreading zone or off the coast of Chile). • PP possibly dips at a steep angle to form the deep trench • The PP is very deep to begin with before it even starts to subduct. • PP subducts under the AP dragging down part of the AP to form the deep trench. • The trench is where PP subducts, the ridge is made up of AP. • The AP is also pushed up by the subducting PP to form the ridge. • Sediment is scraped off the subducting PP and added to the ridge • Volcanoes formed by magma melting, formed by superheated water from subducted sediments. • The super heated water breaks down rock, which becomes lighter or more buoyant and rises as magma • The magma reaches the surface through cracks in the AP • Magma isn't formed until the PP has subducted to a certain depth, which is why all the volcanoes are in a line. • Earthquakes would show a pattern of shallow ones where subduction starts, getting deeper the further west you take readings.	**7-8 clear points (or less but well developed) showing understanding such as:** • The Pacific Plate (PP) and Australian Plate (AP) are both made up of oceanic crust. • PP is denser than the AP and so subducts under the AP • PP possibly dips at a steep angle to form the deep trench • The PP is denser because it is older and colder as it has travelled further (from the spreading zone or off the coast of Chile). • The PP is very deep to begin with before it even starts to subduct. • PP subducts under the AP dragging down part of the AP to form the deep trench. • The trench is where PP subducts, the ridge is made up of AP. • The AP is also pushed up by the subducting PP to form the ridge. • Sediment from the subducting PP is scraped off and added to the ridge • Volcanoes formed by magma rising, formed by superheated water from subducted sediments. • The super heated water breaks down rock, which becomes lighter or more buoyant and rises as magma • The magma reaches the surface through cracks in the AP • Magma isn't formed until the PP has subducted to a certain depth, which is why all the volcanoes are in a line. • Earthquakes would show a pattern of shallow ones where subduction starts, getting deeper the further west you take readings. • Crust is relatively thin where Kermadec volcanoes erupt, because of back arcing

5.	**1-2 clear points such as shown below:** • Transfer of genes into rice genome may involve marker genes, such as antibiotic resistant genes. • Insertion of a foreign gene is a random process and could knock out an important gene. • Risk of introduced genes being passed on to related plants via pollination. • Risk of introduced genes being passed on via animals eating the seeds. • The protein made by the introduced genes may be allergenic or toxic to animals or humans that eat it. • The introduced genes or the protein made by them may affect soil organisms if parts of the plant rots in the soil. • Introduced genes could be transferred to soil bacteria. • The rice may compete with other rice plants. • Investigations needed to see if beta-carotene is absorbed by the human gut. • Very important that nutritional deficiencies in children is addressed – this is an effective way. • Investigations needed to see if beta-carotene is converted to Vitamin A efficiently by human body.	**3-4 clear points such as shown below:** • Transfer of genes into rice genome may involve marker genes, such as antibiotic resistant genes. • Antibiotic genes could be passed onto gut bacteria • Insertion of a foreign gene is a random process and could knock out an important gene. • Risk of introduced genes being passed on to related plants via pollination. • Risk of introduced genes being passed on via animals eating the seeds. • The protein made by the introduced genes may be allergenic or toxic to animals or humans that eat it. • The introduced genes or the protein made by them may affect soil organisms if parts of the plant rots in the soil. • Introduced genes could be transferred to soil bacteria. • The rice may compete with other rice plants. • Investigations needed to see if beta-carotene is absorbed by the human gut. • Very important that nutritional deficiencies in children is addressed – this is an effective way. • Investigations needed to see if beta-carotene is converted to Vitamin A efficiently by human body.	**5-6 clear points (or less but well developed) showing linking of ideas such as:** • Transfer of genes into rice genome may involve marker genes, such as antibiotic resistant genes. • Antibiotic genes could be passed onto gut bacteria (not actually true for plants, but candidates may not know this – use discretion). • Insertion of a foreign gene is a random process and could knock out an important gene. • Risk of introduced genes being passed on to related plants via pollination. • Risk of introduced genes being passed on via animals eating the seeds. • The protein made by the introduced genes may be allergenic or toxic to animals or humans that eat it. • The introduced genes or the protein made by them may affect soil organisms if parts of the plant rots in the soil. • Introduced genes could be transferred to soil bacteria. • The rice may compete with other rice plants. • Economically and/or socially better for a country if the children are happy. • Investigations needed to see if beta-carotene is absorbed by the human gut. • Very important that nutritional deficiencies in children is addressed – this is an effective way. • Providing rice with beta-carotene may mean that other plants that could provide it may not be grown. • Investigations needed to see if beta-carotene is converted to Vitamin A efficiently by	**7-8 clear points (or less but well developed) showing understanding such as:** • Transfer of genes into rice genome may involve marker genes, such as antibiotic resistant genes. • Antibiotic genes could be passed onto gut bacteria (not actually true for plants, but candidates may not know this – use discretion). • Insertion of a foreign gene is a random process and could knock out an important gene. • Risk of introduced genes being passed on to related plants via pollination. • Risk of introduced genes being passed on via animals eating the seeds. • The protein made by the introduced genes may be allergenic or toxic to animals or humans that eat it. • The introduced genes or the protein made by them may affect soil organisms if parts of the plant rots in the soil. • Introduced genes could be transferred to soil bacteria. • The rice may compete with other rice plants. • Economically and/or socially better for a country if the children are happy. • Investigations needed to see if beta-carotene is absorbed by the human gut. • Very important that nutritional deficiencies in children is addressed – this is an effective way. • Providing rice with beta-carotene may mean that other plants that could provide it may not be grown. • Investigations needed to see if beta-carotene is converted to Vitamin A efficiently by human body. • Investigations needed to see how much blindness is

	• Investigations needed to see how much beta-carotene is left after cooking. • It is against many cultural beliefs – must give specific reason, eg creates transgenic organisms or organism with genes from other species in them.	• Investigations needed to see how much blindness is reduced. • Investigations needed to see how much beta-carotene is left after cooking. • It is against many cultural beliefs – must give specific reason, eg creates transgenic organisms or organism with genes from other species in them. • The benefits to children at the moment probably outweigh any potential side effects.	human body. • Investigations needed to see how much blindness is reduced. • Investigations needed to see how much beta-carotene is left after cooking. • A cheap alternative to vitamin supplements or other food sources of vitamn A. • Opponents of GM food haven't yet proposed a viable solution to the problem of malnutrition. • Golden rice is a public exercise to soften up consumers for more GM food. • It is against many cultural beliefs – must give specific reason, eg creates transgenic organisms or organism with genes from other species in them. • The benefits to children at the moment probably outweigh any potential side effects.	reduced • Investigations needed to see how much beta-carotene is left after cooking. • A cheap alternative to vitamin supplements or other food sources of vitamn A. • Opponents of GM food haven't yet proposed a viable solution to the problem of malnutrition. • Golden rice is a public exercise to soften up consumers for more GM food. • It is against many cultural beliefs – must give specific reason, eg creates transgenic organisms or organism with genes from other species in them. • A good conclusion such as – There is a need to weigh up the risk – the benefits to children at the moment probably outweigh any potential side effects.

6	**1-2 clear points such as shown below:** a. – comparative flexibility between HDPE and LDPE, - comparative packing together of HDPE and LDPE polymer chains affecting strength and density - relative amount of weak intermolecular, (van-der-Waals or dipole-dipole) forces affecting strength and density between HDPE and LDPE (if not already mentioned). b. – HDPE chains must be highly unbranched, - the <u>longer</u> the HDPE chain the <u>more</u> opportunities for weak intermolecular, (van-der-Waals or dipole-dipole) forces and so greater strength and density 1 use related to properties e.g. - bullet proof vest must be able to absorb impact of bullet. c. possible marks: – <u>covalent bonds much stronger than weak intermolecular forces</u> therefore <u>more energy</u> needed to break the stronger covalent bonds so PEX has a higher melting point.	**3-4 clear points such as shown below:** a. - comparative flexibility between HDPE and LDPE, - comparative packing together of HDPE and LDPE polymer chains affecting strength and density - relative amount of weak intermolecular, (van-der-Waals or dipole-dipole) forces affecting strength and density between HDPE and LDPE (if not already mentioned). b. – HDPE chains must be highly unbranched, - the <u>longer</u> the HDPE chain the <u>more</u> opportunities for weak intermolecular, (van-der-Waals or dipole-dipole) forces and so greater strength and density 1 use related to properties e.g. - bullet proof vest must be able to absorb impact of bullet - friction and heat related to bullet impact must be dissipated. c. possible marks: – <u>covalent bonds much stronger than weak intermolecular forces</u> therefore <u>more energy</u> needed to break the stronger covalent bonds so PEX has a higher melting point - covalent bonds can cause elasticity because chains can stretch but also rebound back to the original shape because these bonds don't easily break.	**5-6 clear points (or less but well developed) such as shown below:** a. - comparative flexibility between HDPE and LDPE, - comparative packing together of HDPE and LDPE polymer chains affecting strength and density - relative amount of weak intermolecular, (van-der-Waals or dipole-dipole) forces affecting strength and density between HDPE and LDPE (if not already mentioned). b. – HDPE chains must be highly unbranched, - the <u>longer</u> the HDPE chain the <u>more</u> opportunities for weak intermolecular, (van-der-Waals or dipole-dipole) forces and so greater strength and density 1 use related to properties e.g. - bullet proof vest must be able to absorb impact of bullet - friction and heat related to bullet impact, wear on joint or blades on ice must be dissipated - Artificial ice must be able to withstand shape blades of skates - joint must be able to withstand wear and tear of use. c. possible marks: – <u>covalent bonds much stronger than weak intermolecular forces</u> therefore <u>more energy</u> needed to break the stronger covalent bonds so PEX has a higher melting point - covalent bonds can cause elasticity because chains can stretch but also rebound back to the original shape because these bonds don't easily break.	**7-8 clear points (or less but well developed) such as shown below showing understanding:** a. - comparative flexibility between HDPE and LDPE, - comparative packing together of HDPE and LDPE polymer chains affecting strength and density - relative amount of weak intermolecular, (van-der-Waals or dipole-dipole) forces affecting strength and density between HDPE and LDPE (if not already mentioned). b. – HDPE chains must be highly unbranched, - the <u>longer</u> the HDPE chain the <u>more</u> opportunities for weak intermolecular, (van-der-Waals or dipole-dipole) forces and so greater strength and density 1 use related to properties e.g. - bullet proof vest must be able to absorb impact / kinetic energy of bullet - friction and heat related to bullet impact, wear on joint or blades on ice must be dissipated - Artificial ice must be able to withstand shape blades of skates - joint must be able to withstand wear and tear of use. c. possible marks: – <u>covalent bonds much stronger than weak intermolecular forces</u> therefore <u>more energy</u> needed to break the stronger covalent bonds so PEX has a higher melting point - covalent bonds can cause elasticity because chains can stretch but also rebound back to the original shape because these bonds don't easily break.