

Marking scheme for Core Worksheet – Option E

- 1 a** short wavelength/higher energy radiation from the Sun passes through the atmosphere [1]
the Earth radiates longer wavelength IR radiation [1]
greenhouse gases absorb IR radiation [1]
IR radiation is re-radiated back to the Earth [1]
- b** methane is more effective at absorbing IR radiation [1]
but carbon dioxide is present in greater abundance in the atmosphere/more CO₂ is produced each year [1]
- 2 a** $\text{O}_2 \xrightarrow{\text{UV light}} 2\text{O}\bullet$ [1]
 $\text{O}\bullet + \text{O}_2 \rightarrow \text{O}_3$ [1]
- b i** dichlorodifluoromethane [1]
ii 1,1,1-trichloro-2,2,2-trifluoroethane [1]
- c** hydrocarbons are flammable [1]
- 3 a** A PCB/polychlorinated biphenyl [1]
B dioxin [1]
- b i** air/oxygen pumped into aeration tank [1]
water mixed with sludge containing a high concentration of bacteria able to break down organic matter [1]
water passed to secondary settling tank where sludge settles out [1]
- ii** $\text{Al}^{3+}(\text{aq}) + \text{PO}_4^{3-}(\text{aq}) \rightarrow \text{AlPO}_4(\text{s})$ [1]
- iii** heavy metals/nitrates/ammonia/organic nitrogen compounds [1]

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[4]

	Disadvantages	Advantages
Landfill	<ul style="list-style-type: none"> unsightly, smelly and noisy may attract vermin takes up large areas of land gives off methane and carbon dioxide (greenhouse gases) when biodegradable waste is decomposed anaerobically may contaminate land 	<ul style="list-style-type: none"> efficient for large volumes of waste cheap the only method of disposing of some waste (e.g. ash from incineration) methane gas can be used as an energy source landfill sites may be redeveloped for use by wildlife or for leisure activities
Incineration	<ul style="list-style-type: none"> expensive (high capital costs and running costs) can create pollutants (especially dioxins) bottom ash must still be disposed of in landfill sites fly ash must be disposed of as hazardous waste 	<ul style="list-style-type: none"> requires little space significantly reduces the physical volume of waste bottom ash may be used as construction aggregate can produce energy and/or heating

1 mark for each advantage and disadvantage

- 5 **a** any process in which acidic substances (particles, gases and precipitation) leave the atmosphere [1]
- b** **i** $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{NO}(\text{g})$ [1]
- ii** in a catalytic converter [1]
- $2\text{CO} + 2\text{NO} \rightarrow 2\text{CO}_2 + \text{N}_2$ [1]
- iii** $2\text{NO}(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{NO}_2(\text{g})$ [1]
- $\text{NO}_2(\text{g}) + \text{HO}(\text{g}) \rightarrow \text{HNO}_3(\text{g})$ [1]
- or $4\text{NO}_2(\text{g}) + \text{O}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow 4\text{HNO}_3(\text{aq})$
- or $2\text{NO}_2(\text{g}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{HNO}_2(\text{aq}) + \text{HNO}_3(\text{aq})$