

Question	Answer	Marks
1(a)	any 2 from: carbon dioxide; nitrogen; any named noble gas;	2
1(b)	any 6 from:  carbon monoxide; from incomplete combustion (of carbon-containing fuel);  sulfur dioxide; from burning fossil fuels /roasting ores which contain sulphur/volcanoes;  oxides of nitrogen; nitrogen reacting with oxygen in car engines/lightning;  methane; from anaerobic decomposition/anaerobic decay;	6

Question	Answer	Marks
2(a)(i)	more than enough to react (with all the hydrocarbon); <b>OR</b> (some) oxygen remaining;	1
a)(ii)	cm <sup>3</sup> ;	1
(a)(iii)	2 : 15 : 10;	1
(a)(iv)	2 : 15 : 10 : 10; C <sub>5</sub> H <sub>10</sub> ;	2 1 1
(b)(i)	<sub>7</sub> H <sub>16</sub> ;	1
(b)(ii)	contains a double bond/triple bond/multiple bond; <b>OR</b> not all bonds are single bonds;	1
(b)(iii)	test: aqueous bromine/bromine (water)/Br <sub>2</sub> ; result: (orange/yellow/brown) to colourless/decolourised/colour disappears;	2 1 1
2(c)(i)	add	1
(c)(ii)	(kg);	1
(c)(iii)	propene: CH <sub>2</sub> ; polypropene: CH <sub>2</sub> ;	2 1 1

Question	Answer	Marks
3(a)(i)	com / burning of a motor vehicle fuel or a named fuel which can act as a motor vehicle fuel; incomplete combustion would produce CO; complete combustion would produce CO <sub>2</sub> ;	3
(a)(ii)	<i>carbon dioxide</i> : climate change / global warming / greenhouse effect; <i>carbon monoxide</i> : poisonous / toxic;	2
(a)(iii)	nitrogen and oxygen react or combine; at high temperatures or in presence of spark;	2
(a)(iv)	it reacts or combines with oxygen / $\text{NO} + \frac{1}{2}\text{O}_2 \rightarrow \text{NO}_2$ ;	1
(b)	any two from: <ul style="list-style-type: none"> <li>acid rain is formed;</li> <li>lowers pH or acidifies lakes / rivers or kills fish / aquatic animals;</li> <li>changes composition of soils or reduces fertility of soil or reduces crop yields / deforestation or kills crops or trees or plants or leaves / lowers pH of soil or increases acidity of soil;</li> <li>attacks (limestone) buildings or statues;</li> <li>attacks metal (structures) / bridges;</li> </ul>	2
Question	Answer	Marks
(c)	use of a catalytic converter; $2\text{NO} + 2\text{CO} \rightarrow 2\text{CO}_2 + \text{N}_2$ species; balancing;	3

- 4 (a) nitrogen and oxygen react at high temperatures (in engine) [1]  
[1]
- (b) M1 carbon monoxide (converted to) carbon dioxide **or**  $2\text{CO} + \text{O}_2 \rightarrow 2\text{CO}_2$  [1]
- M2 (by) oxides of nitrogen (which are reduced to) nitrogen  
**or**  $2\text{NO} \rightarrow \text{N}_2 + \text{O}_2$  **or**  $2\text{NO}_2 \rightarrow \text{N}_2 + 2\text{O}_2$  [1]
- M3 hydrocarbons (burn) making water [1]
- M4 products: any **two** from:  
carbon dioxide, water, nitrogen [1]
- (c) lead compounds are toxic **or** brain damage **or** reduce IQ or nausea or kidney failure **or** anaemia [1]

[Total: 7]

- 5 (a) (i) named noble gas [1]  
**accept:** any noble gas  
**accept:** symbol
- (ii)  $H_2O / CO_2$  [1]  
**not:** names **not:** equations
- (b) oxygen and nitrogen (in air) (react) [1]  
at high temperature [1]  
**accept:** in engines / lightning **not:** in exhausts
- (ii) fossil fuels / fuels which contain sulfur [1]  
**accept:** named fossil fuel such as coal / oil / natural gas  
burn / combust [1]
- (iii) any two from:  
damage buildings / soil acidification / leaching from soil / soil nutrients become  
unavailable / kill microbes / acidify lakes / kill fish / damage trees / reduction in plant  
growth / crop loss [2]
- (c) oxygen reacts with copper [1]  
to form copper oxide (which is black) [1]
- (ii) measure volume at room temperature / gas has different volumes at different  
temperatures / volume of gas depends on temperature / hot gas has higher volume /  
heat causes expansion (of gases) / ORA [1]
- (iii) no oxygen left **or** all the oxygen has reacted (with copper) [1]
- (iv)  $39-40\text{ cm}^3$  **note:** units required [1]
- 6 (a) (i) manufacture of plastics / (solvents for) dry cleaning / metal degreasing / textiles  
/ agrochemicals / pharmaceuticals / insecticides / dyestuffs / household cleaning  
products / bleach / water treatment / swimming pools / kill bacteria or germs or  
microorganisms or pathogens / sterilisation / disinfectants; [1]
- (ii) electric light bulbs / fluorescent tubes / (inert gas shield for) arc welding /  
production of titanium / inert atmosphere / car headlights / food packaging; [1]
- (iii) (manufacture of) polyethene / polyvinyl chloride (PVC) / making polymers / (to  
prepare) epoxyethane (which is used in the manufacture of detergents / (to  
make) ethylene glycol (which is used to prepare Terylene) / (to make) anti-  
freeze / or making ethanol (accept making alcohol) / ripening fruits; [1]
- (iv) (making) steel / (oxy-acetylene) welding / cutting of metals / medical or diving or  
(oxygen tanks in) hospitals / astronauts / (deep sea) diving / fire fighters; [1]
- (b) liquid air; [1]  
fractional distillation; [1]

[Total: 6]