Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

primary: released directly from a source, e.g. NO_x, CO, SO_2, particulates from vehicles; secondary: formed in the air by reactions of primary pollutants, e.g. tropospheric ozone

2.2

normally air cools with height, so warm polluted air rises and disperses; in an inversion a layer of warm air lies above cooler air near the ground; the cool, dense air cannot rise through it, so pollutants build up near the ground

2.3

vehicles release nitrogen oxides and volatile organic compounds; in strong sunlight these react together; they form secondary pollutants such as tropospheric ozone and PAN, which make a brown haze

3.1

(a) highest in winter (December–February), lowest in summer (June–August); winter values are about three times the summer values

(b) more burning of coal and wood for heating in winter; more temperature inversions and calm air in winter trap pollution / more summer rain washes particles out

3.2

(a) any two: asthma and other breathing problems; heart disease and stroke; lung cancer; early death; eye irritation

(b) strength: fewer old polluting vehicles in the centre, so less NO_x and particulates where most people are; limitation: poorer drivers and small businesses may pay most; traffic and pollution may move to roads outside the zone; judgement: effective when combined with better public transport and help to replace old vehicles

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