What pollutes every breath we take

Air pollution is a phenomenon by which solid or liquid particles and gases contaminate the environment resulting in health effects on the population, damage to materials, agricultural damage and even climate change.

Not all pollutants are a result of human activity. Natural pollutants are those that are found in nature or are emitted from natural sources. Anthropogenic pollutants are those that are produced by humans.

Air pollutants also are classified as primary or secondary. Primary pollutants are those that are emitted directly into the atmosphere from an identifiable source. Secondary pollutants are those that are produced in the atmosphere by chemical and physical processes from primary pollutants and natural constituents.

Particulate matter (PM) – solid or liquid particles that are airborne and dispersed – originates from a variety of anthropogenic sources, including diesel trucks, power plants, wood stoves and industrial processes. 'Fine' particles are especially detrimental to human health because they can penetrate deep into the lungs.

Carbon monoxide (CO) is a fairly unreactive colourless, odourless and poisonous gas. It is formed when carbon in fuels is not burned completely. The major sources of CO are motor vehicle exhausts, industrial processes, fuel combustion and natural sources such as wildfires.

Sulphur dioxide (SO_2) is colourless, non-flammable, non-explosive gas which is one of the precursors of acid rain. Most anthropogenic SO_2 emissions are the result of fossil fuel combustion in power plants. A natural source of sulphur oxides is volcanic activities. Exposure to SO_2 irritates the human respiratory tract.

Nitrogen dioxide (NO_2) is a reddish-brown gas which is a lung irritant. Anthropogenic emissions of NO_x come from combustion processes such as those occurring in automobiles and power plants. Natural sources of NO_2 are lightning and various biological processes in soil.

Ozone (O_3) is a secondary pollutant and is formed in the atmosphere by the reaction of molecular oxygen ($O_{2)}$ and atomic oxygen (O) which comes from the photochemical decomposition of NO_2. Volatile organic compounds (VOCs) must also be present if O_3 is to accumulate in the atmosphere. O_3 occurs naturally in the stratosphere and provides a protective layer from the sun's ultraviolet rays high above the earth. However, at ground level, O_3 is a lung and eye irritant and can cause asthma attacks. O_3, being a powerful oxidant, also attacks materials.

Lead (Pb) is a toxic metal and can accumulate in the blood, bones and soft tissues.

Hazardous air pollutants (HAPs), commonly referred to as air toxics or toxic air pollutants, are pollutants known to cause serious human health effects or damage to the ecosystem. Potential human health effects of HAPs include headache, dizziness, nausea, birth defects and cancer.

Primary pollutants may be controlled at the source. For example, SO_2 is controlled by the use of scrubbers, which are industrial devices that remove SO_2 from the exhaust gases from power plants. SO_2 emissions are also reduced by the use of low-sulphur coal or other fuels, such as natural gas, that contain lower amounts of sulphur. NO_2 from industrial sources also may be minimized by scrubbing. NO_2 from cars, as well as CO, are controlled by the use of catalytic converters, engine design modifications, and the use of cleaner burning grades of gasoline. Lead emissions have been reduced significantly since the introduction of lead-free gasoline.

Ozone and particulate matter are two of the most difficult pollutants to control. Reduction of oxides of nitrogen emissions, together with a reduction of VOC emissions is the primary control strategy for minimizing ozone concentrations.

1 *Answer these questions about* What pollutes every breath we take.

a. What is air pollution? • **b.** What are the main damages it causes? • **c.** What is the difference between natural and anthropogenic pollutants? • **d.** What is the difference between primary and secondary pollutants? • **e.** What is particulate matter? • **f.** Where does particulate matter originate from? • **g.** What is carbon monoxide? • **h.** What are the main sources of carbon monoxide in the air? • **i.** What is sulphur dioxide? • **j.** What are the health effects of sulphur dioxide? • **k.** What is nitrogen dioxide? • **l.** What do emissions of nitrogen dioxide derive from? • **m.** How is ozone formed in the atmosphere? • **n.** What is the function of stratospheric ozone? • **o.** What are the effects of ozone at ground level? • **p.** Where does lead accumulate in the body? • **q.** What are HAPs? • **r.** How can the amount of sulphur dioxide in the air be diminished? • **s.** How can the amount of nitrogen dioxide in the air be decreased? • **t.** What has reduced lead emissions? • **u.** How can ozone concentration be minimized?

2 *Complete these definitions choosing among the words underlined in* What pollutes every breath we take. *Tip: copy the definitions in your indexed book.*

a. ..... are uncontrolled fires in areas of combustible vegetation in the countryside or in the wilderness.

b. A ..... is a discharge of atmospheric electricity.

c. An ..... is a community of plants, animals and smaller organisms that live, feed, reproduce and interact in the same environment.

d. The ..... is the complex set of physical, geographic, biological, social, cultural and political conditions that surround an individual or organism.

e. The ..... is the layer of gases which surround the Earth.

f. The ..... is the second layer of the Earth's atmosphere.

3 *Combine words* a-h *with words* 1-8 *into meaningful pairs which complete the definitions below. Tip: copy the definitions in your indexed book.*

a.	acid	☐	**1.** activity
b.	birth	☐	**2.** converter
c.	catalytic	☐	**3.** defect
d.	fossil	☐	**4.** exhaust
e.	power	☐	**5.** fuel
f.	ultraviolet	☐	**6.** plant
g.	vehicle	☐	**7.** rain
h.	volcanic	☐	**8.** ray

a. ..... is an electromagnetic radiation emitted by the sun.

b. ..... is a health problem that happens while a baby is developing in the mother's womb.

c. ..... is a vehicle emissions control device.

d. ..... is an eruption which may release noxious gases in the lower atmosphere.

e. ..... is an hydrocarbon formed from the remains of dead plants and animals.

f. ..... is an industrial facility for the generation of electric power.

g. ..... is rain made acidic by pollutants.

h. ..... is the emission created by the mixture burning inside an internal combustion engine.