FAQ's

What is ozone? Why does it get depleted?

Ozone or **trioxygen**, is an inorganic molecule with the chemical formula **O_3**. It is a pale blue gas with a distinctively pungent smell. It is an allotrope of oxygen that is much less stable than the diatomic allotrope O_2, breaking down in the lower atmosphere to normal dioxygen. Ozone is formed from dioxygen by the action of ultraviolet light and also atmospheric electrical discharges, and is present in low concentrations throughout the Earth's atmosphere (stratosphere). In total, ozone makes up only 0.6 ppm of the atmosphere.Ozone is a powerful oxidant (far more so than dioxygen) and has many industrial and consumer applications related to oxidation. This same high oxidising potential, however, causes ozone to damage mucous and respiratory tissues in animals, and also tissues in plants, above concentrations of about 100 ppb. This makes ozone a potent respiratory hazard and pollutant near ground level. However, the ozone layer(a portion of the stratosphere with a bigger concentration of ozone, from two to eight ppm) is beneficial, preventing damaging ultraviolet light from reaching the Earth's surface, to the benefit of both plants and animals.

Discussthe effects of ultraviolet radiation.

Harmful Effects of Ultraviolet Radiation

The harmful effects from exposure to ultraviolet (UV) radiation can be classified as acute or chronic. The acute effects of UV-A and UV-B exposure are both short-lived and reversible. These effects include mainly sunburn (or erythema) and tanning (or pigment darkening). The chronic effects of UV exposure can be much more serious, even life threatening, and include premature aging of the skin, suppression of the immune system, damage to the eyes, and skin cancer

Typical Effects:

Sunburn (Erythema)
Tanning
Premature Aging of the Skin
Suppression of the Immune System
Eye Damage
Skin Cancer

Suppression of the Immune System

Suppression of the immune system resulting from exposure to UV radiation is believed to be an important contributor to the development of nonmelanoma skin cancers. Put simply, UV radiation induces a state of relative immunosuppression that prevents tumor rejection. This is mainly accomplished by interfering with the normal surveillance function of antigen-presenting Langerhans cells in the epidermis, which are responsible for T-lymphocyte activation in response to foreign antigens (2). The number of Langerhans cells and their characteristics are altered from exposure to UV radiation while similar cells that are responsible for the selective induction of suppressor lymphocyte pathways are resistant to UV damage. This creates an imbalance in the local T-cell function and a shift from helper to suppressor pathways, which ultimately favors tumorigenesis and progression. Grossman and Leffell conclude that the immunosuppressive effects of UV may be as important as the carcinogenic effects of UV radiation in the establishment and progressive growth of UV-induced skin tumors.

Skin Cancer

Skin cancers are the most commonly occurring cancers in terms of incidence in the world. There are different types of skin cancer including the nonmelanoma skin cancers, basal cell carcinoma (BCC) and squamous cell carcinoma (SCC), and melanoma. Exposure to UV radiation is thought to be an important factor in each of these cancers as it induces DNA damage, however the types of exposure necessary to cause

the different types of skin cancer may vary. For the nonmelanoma skin cancers, cumulative sun exposure is believed to be important, whereas for melanoma the intermittent exposure hypothesis has been postulated. This hypothesis proposes that infrequent intense exposure of unacclimatized skin to sunlight is related to the increasing incidence of melanoma and is more important than chronic sun exposure. The incidence of all types of skin cancer is increasing.

How is water distributed on earth?

The **water distribution on earth** shows that most water in the Earth's atmosphere and crust comes from the world ocean's saline seawater, while freshwater accounts for only 2.5% of the total. Because the oceans that cover roughly 71% of the area of the Earth reflect blue light, the Earth appears blue from space, and is often referred to as the *blue planet* and the *Pale Blue Dot*. An estimated 1.5 to 11 times the amount of water in the oceans may be found hundreds of miles deep within the Earth's interior, although not in liquid form.

The oceanic crust is young, thin and dense, with none of the rocks within it dating from any older than the breakup of Pangaea. Because water is much denser than any gas, this means that water will flow into the "depressions" formed as a result of the high density of oceanic crust. (On a planet like Venus, with no water, the depressions appear to form a vast plain above which rise plateaux). Since the low density rocks of the continental crust contain large quantities of easily eroded salts of the alkali and alkaline earth metals, salt has, over billions of years, accumulated in the oceans as a result of evaporation returning the fresh water to land as rain and snow.

As a result, the vast bulk of the water on Earth is regarded as *saline* or *salt water*, with an average salinity of 35‰ (or 3.5%, roughly equivalent to 34 grams of salts in 1 kg of seawater), though this varies slightly according

to the amount of runoff received from surrounding land. In all, water from oceans and marginal seas, saline groundwater and water from saline closed lakes amount to over 97% of the water on Earth, though no closed lake stores a globally significant amount of water. *Saline* groundwater is seldom considered except when evaluating water quality in arid regions.

The remainder of the Earth's water constitutes the planet's *fresh water* resource. Typically, fresh water is defined as water with a salinity of *less than 1 percent that of the oceans* - i.e. below around 0.35‰. Water with a salinity between this level and 1‰ is typically referred to as *marginal water* because it is marginal for many uses by humans and animals. The ratio of salt water to fresh water on Earth is around 40 to 1.

What is water pollution? Discuss.

Water pollution is the contamination of water bodies (e.g. lakes, rivers, oceans, aquifers and groundwater). This form of environmental degradation occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds. Water pollution affects the entire biosphere – plants and organisms living in these bodies of water. In almost all cases the effect is damaging not only to individual species and population, but also to the natural biological communities.

Although interrelated, surface water and groundwater have often been studied and managed as separate resources. Surface water seeps through the soil and becomes groundwater. Conversely, groundwater can also feed surface water sources. Sources of surface water pollution are generally grouped into two categories based on their origin.

Point sources

Point source water pollution refers to contaminants that enter a waterway from a single, identifiable source, such

as a pipe or ditch. Examples of sources in this category include discharges from a sewage treatment plant, a factory, or a city storm drain. The U.S. Clean Water Act (CWA) defines point source for regulatory enforcement purposes. The CWA definition of point source was amended in 1987 to include municipal storm sewer systems, as well as industrial storm water, such as from construction sites.

Non-point sources

Nonpoint source pollution refers to diffuse contamination that does not originate from a single discrete source. NPS pollution is often the cumulative effect of small amounts of contaminants gathered from a large area. A common example is the leaching out of nitrogen compounds from fertilized agricultural lands. Nutrient runoff in storm water from "sheet flow" over an agricultural field or a forest are also cited as examples of NPS pollution.

Contaminated storm water washed off of parking lots, roads and highways, called urban runoff, is sometimes included under the category of NPS pollution. However, because this runoff is typically channeled into storm drain systems and discharged through pipes to local surface waters, it becomes a point source.

The specific contaminants leading to pollution in water include a wide spectrum of chemicals, pathogens, and physical changes such as elevated temperature and discoloration. While many of the chemicals and substances that are regulated may be naturally occurring (calcium, sodium, iron, manganese, etc.) the concentration is often the key in determining what is a natural component of water and what is a contaminant. High concentrations of naturally occurring substances can have negative impacts on aquatic flora and fauna.

Oxygen-depleting substances may be natural materials such as plant matter (e.g. leaves and grass) as well as man-made chemicals. Other natural and anthropogenic

substances may cause turbidity (cloudiness) which blocks light and disrupts plant growth, and clogs the gills of some fish species.

Many of the chemical substances are toxic. Pathogens can produce waterborne diseases in either human or animal hosts. Alteration of water's physical chemistry includes acidity (change in pH), electrical conductivity, temperature, and eutrophication. Eutrophication is an increase in the concentration of chemical nutrients in an ecosystem to an extent that increases in the primary productivity of the ecosystem. Depending on the degree of eutrophication, subsequent negative environmental effects such as anoxia (oxygen depletion) and severe reductions in water quality may occur, affecting fish and other animal populations.