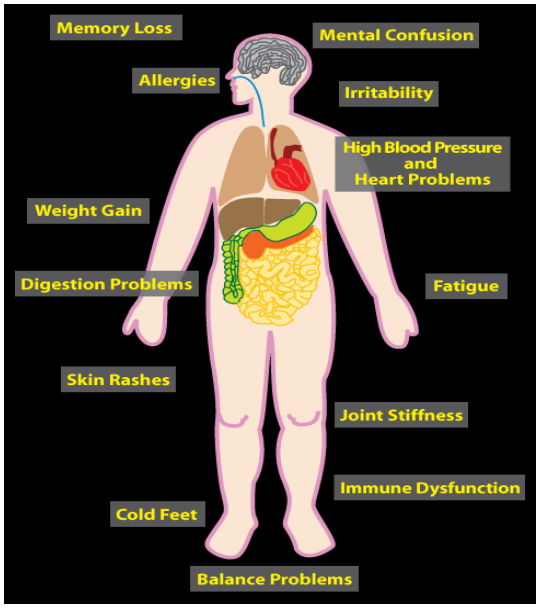
POISONED BY MERCURY

UPSC's new found love for Environment and biodiversity is evident from its 22 EnB MCQS in CSAT 2013.In that 22 MCQs, 3 questions are pollution related. Also G.S (mains) syllabus includes Environment and Biodiversity topics(current issues attracts UPSC).Hence this article is written to analyze and answer the MCQs and to draft a brief essay of 200 words.

1.WHAT IS MERCURY POLLUTION (OR POISONING)?

- Mercury poisoning is a disease caused **by exposure to mercury** or its compounds.
- Also known as hydrargyria or mercurialism.
- Mercury (chemical symbol Hg) is a heavy metal occurring in several forms, all of which can produce toxic effects in high enough doses.
- **Various states**:

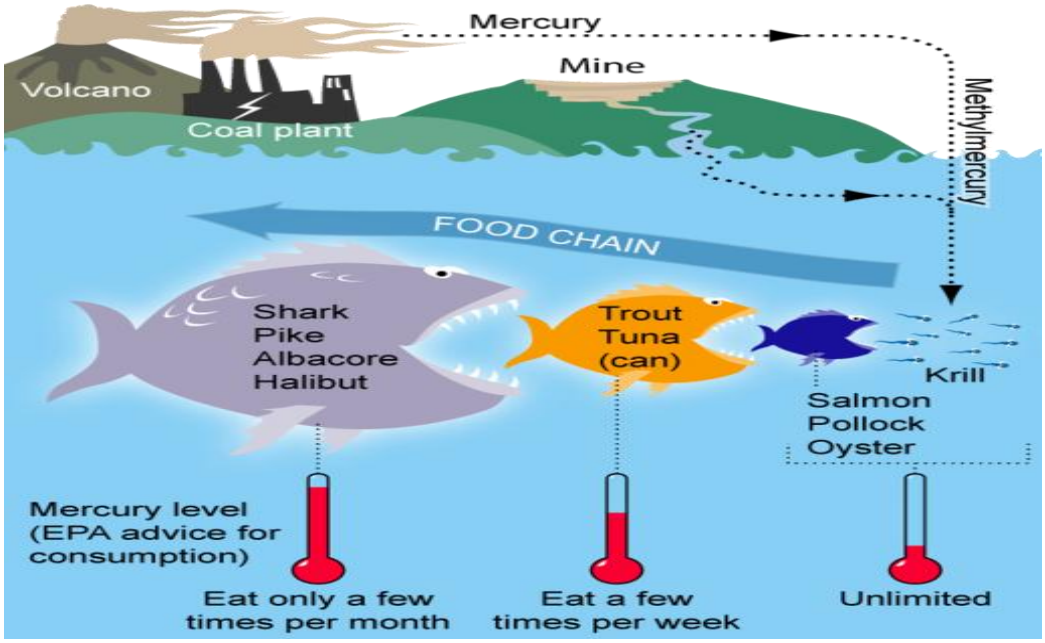
  1.zero oxidation state: Hg^0 (exists as vapor or as liquid metal).
  2.Mercurous state: Hg_2^{2+} exists as inorganic salts.
  3.Mercuricstate: Hg^{2+} may form either inorganic salts or organo-mercury compounds.



- Toxic effects include **damage to the brain, kidney, and lungs**. Mercury poisoning can result in several diseases, including acrodynia (pink disease), Hunter-Russell syndrome and Minamata disease.

2.Various Anthropogenic (manmade) sources for Mercury pollution:

Mercury is emitted to the air by power plants, cement plants, certain chemical manufacturers and other industrial facilities.



- **Coal burning**, and to a lesser extent the use of other fossil fuels, is one of the most significant anthropogenic source of mercury emissions to the atmosphere.
- In addition, over the years, many companies have used mercury to manufacture a range of products including **thermometers, thermostats and automotive light switches**. These products can release mercury, particularly at the end of their useful life during waste handling and disposal.
- **Mining, smelting**, and production of iron and non-ferrous metals are also a large source of global mercury emissions to air, and also a very important sector with regard to releases to water. Among intentional-use sectors, Artisanal and smallscale gold mining is a major source.
- **Oil refining** emits and releases mercury, as oil deposits are known to contain mercury, generally at low concentrations.

The **consumption of fish** is by far the most significant source of ingestion-related mercury exposure in humans and animals. Fish and shellfish concentrate mercury in their bodies, often in the form of methyl mercury, a highly toxic organic compound of mercury. Fish products have been shown to contain varying amounts of heavy metals, particularly mercury and fat-soluble pollutants from water pollution.

3.Mechanism affecting humans:

Mercury and methylmercury is present in only very small concentrations in seawater. However, it is absorbed, usually as methylmercury, by algae at the start of the food chain. This algae is then eaten by fish and other organisms higher in the food chain through **Biomagnification**.

Once in the human body, mercury acts as a **neurotoxin**, interfering with the brain and nervous system. Exposure to mercury can be particularly **hazardous for pregnant women** and small children. In adults, mercury poisoning can adversely affect fertility and blood pressure regulation and can cause memory loss, tremors, vision loss and numbness of the fingers and toes.

4.Minamanta disease:

- **Minamata disease** sometimes referred to as Chisso-Minamata disease , is aneurological syndrome caused by severe mercury poisoning.
- **Symptoms** include ataxia, numbness in the hands and feet, general muscle weakness, narrowing of the field of vision, and damage to hearing and speech. In extreme cases, insanity, paralysis, coma, and death follow within weeks of the onset of symptoms. Acongenital form of the disease can also affect foetuses in the womb.
- Minamata disease was first discovered in ***Minamata city in Kumamoto prefecture***, Japan, in 1956. It was caused by the release of methylmercury in the industrialwastewater from the Chisso Corporation's chemical factory, which continued from 1932 to 1968. This highly toxic chemical ***bioaccumulated*** in shellfish and fish inMinamata Bay and the Shiranui Sea, which, when eaten by the local populace, resulted in mercury poisoning. While cat, dog, pig, and human deaths continued for 36 years, the government and company did little to prevent the pollution. The animal effects were severe enough in cats that they came to be called ***dancing cat fever***.

5.MINAMANTA CONVENTION (ON MERCURY):

The Minamata Convention on Mercury, usually known as the Minamata Convention, is a global treaty that was designed to prevent emissions and releases of mercury. It aims at controls and reductions in a range of products, processes and industries where mercury is used, released or emitted and also requires governments to devise national plans to reduce the use of mercury in artisanal and small-scale gold mining operations. The treaty was **adopted by 147 governments on January 19, 2013 in Geneva** and the text of the Convention was open for signature at the Diplomatic Conference to be held from 7 to 11 October 2013 in Japan.(India ~absent)

The treaty was named after the Japanese seaside city of Minamata where serious health problems occurred as a result of mercury pollution in the mid-1950s.

Products:

Production, export and import of these mercury-containing products will be banned by 2020:

- Batteries, except for 'button cell' batteries used in implantable medical devices
- Switches and relays
- Certain types of compact fluorescent lamps (CFLs)
- Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps
- Soaps and cosmetics
- Certain kinds of non-electronic medical devices such as thermometers and blood pressure devices
- The treaty also controls mercury emissions and releases from various large industrial facilities ranging from coal-fired power stations and industrial boilers

Exceptions:

- Governments approved exceptions for some large measuring devices where currently there are no mercury-free alternatives.
- Vaccines where mercury is used as a preservative.
- Products used in religious or traditional activities.
- Dental fillings using mercury amalgam (phase-down).

6.Mercury pollution in India:

Mercury, a very toxic and dangerous substance, has severely contaminated land, water, air and the food chain throughout India.

At a **conference** recently organised by the **Centre for Science and Environment (CSE)** on mercury pollution in the country, **Dr R C Srivastava**, co-chairperson of the United Nations Environment Programme's (UNEP) Chemicals Working Group, said that mercury contamination in India is reaching alarming levels largely due to the discharge of **mercury-bearing industrial effluents** ranging from 0.058 to 0.268 milligram/litre (mg/l). This is several times more than the prescribed Indian and ***WHO standards of 0.001 mg/l (for drinking water) and 0.01 mg/l (for industrial effluents).***

Affected areas in India : High levels of mercury in fish stocks have been found, mainly in coastal areas. ***Mumbai, Kolkata, Karwar (in Karnataka) and North Koel (in Bihar)*** are some of the severely affected areas.

In ***Mumbai***, mercury levels in fish were 0.03-0.82 mg total Hg/kg dry weight (dw); crabs had 1.42-4.94 mg total Hg/kg dw mercury compared to the permissible limit of 0.5 mg/kg.Mercury levels in oysters in Karwar ranged from 0.18-0.54 mg/kg dw.

The ***North Koel river*** showed mercury concentrations almost 600-700 times above the limits.

Ground water contamination: Mercury in ground water and surface water was detected from across the country: Delhi, Mumbai, Vadodara, Vapi, Ankleshwar, Bhopal, Panipat, Singhrauli, Ganjam, Dhanbad, Durgapur, Howrah, Meda,the list stretched on endlessly.Levels higher than the permissible limits were found near ***chlor-alkali, cement and chemical units and thermal power plants.***

The ***chlor-alkali sector***, the biggest known consumer of mercury in India, released about 79 tonnes of the toxin into the atmosphere between 1997-2000. According to Dr Srivastava, **chlor-alkali industries** located on river basins in eastern India have released ***60-320 times more mercury than the permissible limit into the rivers.***

INDIA'S RELUCTANCE TO SIGN MERCURY TREATY UNJUSTIFIED:

The government's inexplicable decision to skip such a historic convention has lost the country an opportunity to take global leadership in phasing out mercury.

It is undeniable that India's regulation on waste discharge from chemical industries is notoriously lax. There ***is no justification, therefore, for India's reluctance to sign such a convention***. New Delhi dragging its feet on such a convention is all the more inexplicable as it amounts to a political and moral coup by China over India.

- ***China has signed the treaty :***

  China is one of the biggest emitters of mercury in Asia. In addition to Cinnabar mines from where ore of mercury is extracted, it has several coal power plants, which also emit large amounts of mercury into the atmosphere. It also has small and artisanal gold mining, which contributes to the majority of emissions in the world. Yet, ***China has signed the treaty*** and committed to phasing out existing technologies.

- ***India`s stand:***

  India, on the other hand, is promoting several coal power plants which emit mercury, severely affecting the health of people living next to them. The ***country has no policy to regulate and control mercury emissions.***

REFERENCES:

1) http://civilsprep.in/category/environment/

2)http://www.newindianexpress.com/opinion/Indias-reluctance-to-sign-mercury-treaty-unjustified/2013/11/10/article1881734.ece

3) http://en.wikipedia.org/wiki/Minamata_disease

4) http://www.medicinenet.com/mercury_poisoning/page2.htm

5) http://www.cseindia.org/node/439

6) http://en.wikipedia.org/wiki/Minamata_Convention_on_Mercury

7) Economic & Political Weekly, ISSUE:November 16, 2013.

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