Hazard Classification and the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

The GHS classifies chemicals according to the type of hazard and the severity of the effect. GHS contains classification criteria that can be applied on pure substances as well as on mixtures of substances.

1 Hazard classes

The hazard class describes the type of hazard. The classes are grouped into **physical hazards, health hazards** and **environmental hazards.** GHS defines 17 physical hazard classes, 10 health hazard classes, and 2 environmental hazard classes.

1.1 The **physical hazard classes** consider effects such as explosivity, flammability, oxidizing potential, metal corrosion, and chemicals under pressure. The criteria for physical hazard classification are aligned with the UN recommendations on the Transport of Dangerous Goods.

1.2 The **health hazard classes** consider the ability of a chemical to cause harm (toxicity) in humans. The effects may occur after short-term (acute) or long-term (chronic) exposure.

- *Acute toxicity* is generally characterised by a single or short-term exposure at a high dose causing clinical symptoms of effects which hopefully can be treated and help the affected person to recover. One example is methanol intoxication. Allergic reactions are other type of effects that may occur after single or short-term exposure.

- *Chronic toxicity* refers to effects that may not cause any obvious immediate symptoms but where harm becomes evident over time, such as cancer and effects on reproduction or development. By the time symptoms develop and are recognised, treatment may not always be possible. One example is lung cancer due to asbestos exposure.

1.3 Two types of **environmental hazards** are considered by the GHS.

- *Hazardous to the aquatic environment* means the ability of a chemical to cause harm to water-living organisms. The hazard class covers both acute (short-term) and chronic (long-term) exposure.

- *Hazardous to the ozone layer* covers the controlled substances listed in Annexes to the Montreal Protocol.

2 Hazard categories

Each hazard class is divided into hazard categories that differentiate the hazard according to:

- the severity of the effect or;
- weight of the evidence.

For health hazards, data on effects in exposed human populations carry a higher weight than experimental animal studies, thus positive data from human populations motivates classification in a higher health hazard category than when solely animal data is available. However, lack of observations in exposed human populations do not rule out positive animal test data.

Chemicals with the most severe effect within a hazard class are generally placed in Category 1, with subsequent categories indicating decreasing severity. Some physical hazard classes are differentiated according to severity using an alternative to the numbering system.

3 Classification of substances

Substances are classified based on available data obtained by internationally validated and accepted test methods, such as the OECD Guidelines for Testing of Chemicals. Classification of chemicals for effects on humans can also be based on epidemiological (disease) data or human experience, but human testing for the purpose of classification is not acceptable. Other information, such as molecular structural information, may assist in classification.

Test data is required for physical hazard classification and the criteria have been adopted from the UN Manual on Test and Criteria.

4 Classification of mixtures

The **classification of mixtures** generally requires knowledge of the ingredient substances, their concentration, and individual classifications.

Classification of mixtures for **physical hazards** requires testing of the mixtures. A mixture of two substances with two different hazardous properties may result in a mixture with a third hazardous property. For example, it could be that combining a flammable substance with an oxidising substance may form an explosive mixture.

The **health hazard classification** of mixtures is generally based on data on the ingredient substances. For acute toxicity, a calculation method is applied on numerical indices of acute toxicity for each classified ingredient and their percentage in the mixture. For other hazard classes, a cut-off value/concentration limit approach is applied.

The approach can be either additive, considering the sum of concentration of all ingredients classified for a certain hazard, or non-additive where a single substance above the cut-off value/concentration limit justifies classification.

For **environmental hazard,** a summation method is applied in the case of mixtures containing substances classified as hazardous to the aquatic environment, while the cut-off value/concentration limit approach is used for mixtures containing substances classified as hazardous to the ozone layer.

For more information, please contact UNITAR

The Global Partnership to Implement the GHS | UNITAR

https://unitar.org/sustainable-development-goals/planet/our-portfolio/globally-harmonized-system-classification-and-labelling-chemicals/global-partnership-implement-ghs

or visit the GHS website

https://unece.org/about-ghs

This leaflet is part of a series of leaflets and presentations on the GHS with the following topics:
1) What is the GHS? 2) Hazard classification 3) Hazard communication 4) Implementing GHS and available data on substance classification.