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**MLS 512 ASSIGNMENT**

**1A)**

CLASSIFICATION OF POISONOUS SUBSTANCES INCLUDE:

**Classification based on origin**

Poisons are of microbial, plant, animal, or synthetic origin. Microbial poisons are produced by microscopic organisms such as [bacteria](https://www.britannica.com/science/bacteria) and fungi. Botulinus toxin, for example, is produced by the bacterium *Clostridium botulinum* and is capable of inducing weakness and paralysis when present in underprocessed, nonacidic canned foods or in other foods containing the spores. An example of a plant toxin is the [belladonna](https://www.britannica.com/plant/belladonna) alkaloid hyoscyamine, which is found in belladonna (*Atropa belladonna*) and jimsonweed (*Datura stramonium*).

Animal poisons are usually transferred through the bites and stings of venomous terrestrial or marine animals, the former group including poisonous snakes, scorpions, spiders etc. Synthetic toxins are responsible for most poisonings. “Synthetic” refers to chemicals manufactured by chemists, such as drugs and pesticides, as well as chemicals purified from natural sources, such as metals from ores and solvents from petroleum. Synthetic toxins include pesticides, household cleaners, cosmetics, pharmaceuticals, and hydrocarbons

**Classification based on physical form**

The physical form of a chemical—solid, liquid, gas, vapour, or aerosol—influences the exposure and absorbability.

Because [solids](https://www.britannica.com/science/solid-state-of-matter) are generally not well absorbed into the blood, they must be dissolved in the aqueous liquid lining the intestinal tract if ingested or the [respiratory tract](https://www.britannica.com/science/respiratory-system) if inhaled. Solids dissolve at different rates in fluids, however. For example, compared with lead sulphate granules, granules of lead are practically nontoxic when ingested, because elemental lead is essentially insoluble in water, while lead sulphate is slightly soluble and absorbable. Even different-sized granules of the same chemical can vary in their relative toxicities because of the differences in dissolution rates. For example, arsenic trioxide is more toxic in the form of smaller granules than is the same mass of larger granules because the smaller granules dissolve faster.

A poison in a [liquid](https://www.britannica.com/science/liquid-state-of-matter) form can be absorbed by ingestion or by inhalation or through the skin. Poisons that are gases at room temperature (*e.g.,* carbon monoxide) are absorbed mainly by inhalation, as are vapours, which are the gas phase of substances that are liquids at room temperature and [atmospheric pressure](https://www.britannica.com/science/atmospheric-pressure) (*e.g.,* benzene). Because organic liquids are more volatile than inorganic liquids, inhalation of organic vapours is more common. Although vapours are generally absorbed in the lungs, some vapours that are highly soluble in lipids (*e.g.,* furfural) are also absorbed through the skin.

[Aerosols](https://www.britannica.com/science/aerosol) are solid or liquid particles small enough to remain suspended in air for a few minutes. Fibres and dust are solid aerosols. Aerosol exposures occur when aerosols are deposited on the skin or inhaled. Aerosol toxicity is usually higher in the lungs than on the skin. An example of a toxic fibre is asbestos, which can cause a rare form of [lung cancer](https://www.britannica.com/science/lung-cancer) ([mesothelioma](https://www.britannica.com/science/mesothelioma)).

Many liquid poisons can exist as liquid aerosols, although highly volatile liquids, such as benzene, seldom exist as aerosols. A moderately volatile liquid poison can exist as both an aerosol and as a vapour. Airborne liquid chemicals of low volatility exist only as aerosols.

**Classification based on chemical nature**

Poisons can be classified according to whether the chemical is metallic versus nonmetallic, organic versus inorganic, or acidic versus alkaline. [Metallic](https://www.britannica.com/science/organometallic-compound) poisons are often eliminated from the body slowly and accumulate to a greater extent than nonmetallic poisons and thus are more likely to cause toxicity during chronic exposure. [Organic](https://www.britannica.com/science/organic-compound) chemicals are more soluble in [lipids](https://www.britannica.com/science/lipid) and therefore can usually pass through the lipid-rich cell membranes more readily than can inorganic chemicals. As a result, organic chemicals are generally absorbed more extensively than inorganic chemicals. Classification based on acidity is useful because, while both acids and alkalis are corrosive to the eyes, skin, and intestinal tract, alkalis generally penetrate the tissue more deeply than acids and tend to cause more severe tissue damage.

**Classification based on chemical activity**

[Electrophilic](https://www.britannica.com/science/electrophile) (electron-loving) chemicals attack the nucleophilic (nucleus-loving) sites of the cells’ macromolecules, such as [deoxyribonucleic acid](https://www.britannica.com/science/DNA) (DNA), producing mutations, cancers, and malformations. Poisons also may be grouped according to their ability to mimic the structure of certain important molecules in the cell. They substitute for the cells’ molecules in chemical reactions, disrupting important cellular functions. [Methotrexate](https://www.britannica.com/science/methotrexate), for example, disrupts the synthesis of DNA and [ribonucleic acid](https://www.britannica.com/science/RNA) (RNA).

2) When a drug is taken in orally, it moves from the mouth, to the gastrointestinal, then into the blood stream.

the rate at which drugs diffuse through membranes is directly related to their relative degree of lipid solubility. Thus, lipid soluble agents(hydrophobic agents)usually pass readily through membranes,

B) and more water-soluble drugs do so more slowly, if at all. As a result, hydrophobic substances tend to be absorbed more readily than hydrophilic substances

**3A)**

| **Agent** | **Indication** |
| --- | --- |
| [Antimuscarinic](https://en.wikipedia.org/wiki/Antimuscarinic) drugs (e.g. [Atropine](https://en.wikipedia.org/wiki/Atropine)) | [Organophosphate](https://en.wikipedia.org/wiki/Organophosphate) and [carbamate](https://en.wikipedia.org/wiki/Carbamate) insecticides, [nerve agents](https://en.wikipedia.org/wiki/Nerve_agent), some [poison mushrooms](https://en.wikipedia.org/wiki/Mushroom_poisoning) |
| [Calcium chloride](https://en.wikipedia.org/wiki/Calcium_chloride)[[5]](https://en.wikipedia.org/wiki/Antidote#cite_note-Calcium_channel_blocker_poisoning-5) | [Calcium channel blocker toxicity](https://en.wikipedia.org/wiki/Calcium_channel_blocker_toxicity),[[5]](https://en.wikipedia.org/wiki/Antidote#cite_note-Calcium_channel_blocker_poisoning-5) [black widow spider](https://en.wikipedia.org/wiki/Latrodectus) bites |
| [Calcium gluconate](https://en.wikipedia.org/wiki/Calcium_gluconate) [[5]](https://en.wikipedia.org/wiki/Antidote#cite_note-Calcium_channel_blocker_poisoning-5) | [Calcium channel blocker toxicity](https://en.wikipedia.org/wiki/Calcium_channel_blocker_toxicity),[[5]](https://en.wikipedia.org/wiki/Antidote#cite_note-Calcium_channel_blocker_poisoning-5) [hydrofluoric acid](https://en.wikipedia.org/wiki/Hydrofluoric_acid) burns |
| [Chelators](https://en.wikipedia.org/wiki/Chelator) such as [EDTA](https://en.wikipedia.org/wiki/EDTA), [dimercaprol](https://en.wikipedia.org/wiki/Dimercaprol) (BAL), [penicillamine](https://en.wikipedia.org/wiki/Penicillamine), and 2,3-[dimercaptosuccinic acid](https://en.wikipedia.org/wiki/Dimercaptosuccinic_acid) (DMSA, succimer) | [Heavy metal poisoning](https://en.wikipedia.org/wiki/Toxic_heavy_metal) |
| [Cyanide](https://en.wikipedia.org/wiki/Cyanide) antidotes ([hydroxocobalamin](https://en.wikipedia.org/wiki/Hydroxocobalamin), [amyl nitrite](https://en.wikipedia.org/wiki/Amyl_nitrite), [sodium nitrite](https://en.wikipedia.org/wiki/Sodium_nitrite), or [thiosulfate](https://en.wikipedia.org/wiki/Thiosulfate)) | [Cyanide poisoning](https://en.wikipedia.org/wiki/Cyanide_poisoning) |
| [Deferoxamine](https://en.wikipedia.org/wiki/Deferoxamine) mesylate | [Iron poisoning](https://en.wikipedia.org/wiki/Iron_poisoning) |
| 100% [Ethanol](https://en.wikipedia.org/wiki/Ethanol) or [fomepizole](https://en.wikipedia.org/wiki/Fomepizole) | [Ethylene glycol poisoning](https://en.wikipedia.org/wiki/Ethylene_glycol_poisoning) and [methanol poisoning](https://en.wikipedia.org/wiki/Methanol_toxicity) |
| [Flumazenil](https://en.wikipedia.org/wiki/Flumazenil) | [Benzodiazepine overdose](https://en.wikipedia.org/wiki/Benzodiazepine_overdose) |
| 100% [oxygen](https://en.wikipedia.org/wiki/Oxygen) or [hyperbaric oxygen therapy](https://en.wikipedia.org/wiki/Hyperbaric_oxygen_therapy) (HBOT) | [Carbon monoxide poisoning](https://en.wikipedia.org/wiki/Carbon_monoxide_poisoning) and [cyanide poisoning](https://en.wikipedia.org/wiki/Cyanide_poisoning) |
| [Leucovorin](https://en.wikipedia.org/wiki/Leucovorin) | [Methotrexate](https://en.wikipedia.org/wiki/Methotrexate), [trimethoprim](https://en.wikipedia.org/wiki/Trimethoprim) and [pyrimethamine](https://en.wikipedia.org/wiki/Pyrimethamine) overdose |
| [Intralipid](https://en.wikipedia.org/wiki/Intralipid) | [Local Anesthetic](https://en.wikipedia.org/wiki/Local_anesthetic#Treatment_of_overdose:_%22Lipid_rescue%22) toxicity |
| [Naloxone hydrochloride](https://en.wikipedia.org/wiki/Naloxone_hydrochloride) | [Opioid overdose](https://en.wikipedia.org/wiki/Opioid_overdose) |
| [N-acetylcysteine](https://en.wikipedia.org/wiki/N-acetylcysteine) | [Paracetamol](https://en.wikipedia.org/wiki/Paracetamol_toxicity) (acetaminophen) poisoning |
| [Protamine sulfate](https://en.wikipedia.org/wiki/Protamine_sulfate) | [Heparin](https://en.wikipedia.org/wiki/Heparin) poisoning |
| [Prussian blue](https://en.wikipedia.org/wiki/Prussian_blue) | [Thallium poisoning](https://en.wikipedia.org/wiki/Thallium_poisoning) |
| [Physostigmine](https://en.wikipedia.org/wiki/Physostigmine) sulfate | [Anticholinergic](https://en.wikipedia.org/wiki/Anticholinergic) poisoning |
| [Pyridoxine](https://en.wikipedia.org/wiki/Pyridoxine) | [Isoniazid](https://en.wikipedia.org/wiki/Isoniazid) poisoning, ethylene glycol, accidental hydrazine exposure (E.G from [Gyromitra](https://en.wikipedia.org/wiki/Gyromitra) mushrooms) |
| [Phytomenadione](https://en.wikipedia.org/wiki/Phytomenadione) (vitamin K) and [fresh frozen plasma](https://en.wikipedia.org/wiki/Fresh_frozen_plasma) | [Warfarin](https://en.wikipedia.org/wiki/Warfarin) overdose and some (but not all) rodenticides |
| [Succimer](https://en.wikipedia.org/wiki/Succimer), chemical name Dimercaptosuccinic acid (DMSA) | [Lead poisoning](https://en.wikipedia.org/wiki/Lead_poisoning) |