For questions 1-10, circle the word(s) or phrases(s) that correspond or are related to the toxic agent. None, one or more of the selections may be correct. Don’t guess—incorrect responses will be deducted from your score (5 each).

1. **Sulfur dioxide:**
   - reducing agent
   - soluble –mainly lower lung
   - insoluble – mainly upper lung
   - soluble
   - coal burning

2. **Nitrogen dioxide:**
   - automobile exhaust
   - role in ozone formation
   - soluble – mainly lower lung
   - cigarette smoke
   - oxidizing agent

3. **Hydrogen sulfide:**
   - good warning properties
   - NaNO₂ to treat
   - binds to hemoglobin only
   - volcanoes
   - automobile exhaust

4. **Cyanide:**
   - laetrile
   - apple seeds
   - inhibits glutathione transferase
   - Hitler suicide
   - vapors poorly absorbed

5. **Arsenic:**
   - toxic potency: As⁺⁵ > As⁺³
   - “Paris Green”
   - hemolysis
   - Britsh Anti Lewisite
   - Catherine de Medici

6. **Lead:**
   - more in smoker’s blood
   - inhibits heme synthesis
   - > 50% absorbed from GI
   - Roman era sweetening agent
   - Burton’s Line

7. **Mercury:**
   - Minamata bay
   - mercaptan
   - paper mill effluent
   - swordfish
   - seed treatment
8. **aldehydes:**
   - cholinergic stimulation
   - cigarette smoke
   - “sick building” link
   - formaldehyde human carcinogen
   - irritation: formaldehyde > acrolein

9. **urban particulate matter:**
   - deep lung: PM$_{10}$ > PM$_{2.5}$
   - simple composition
   - increased Wasatch Front mortality
   - cause: transportation > industry
   - airborne t$_{1/2}$: PM$_{2.5}$ > PM$_{10}$

10. **benzene:**
   - “shift-to-right”
   - gasoline
   - activated by CYP
   - narcotic effects
   - stimulates maturation of blood cells

11. Briefly describe each of these diseases, and identify their causative agent. (10)

   Hatter’s Disease

   *Itai-Itai* Disease

   Painter’s colic

   Shaver’s Disease

   Farmer’s Lung
11. Each year, several people are fatally poisoned by carbon monoxide (CO) in their own homes. 
a) How does this happen? b) describe three precautions to prevent poisoning in the home c) 
Why is CO poisoning insidious? d) what is the mechanism of action of CO? e) using the 
Haldane equation, show the percentage of atmospheric CO is needed to achieve 50% saturation 
of binding sites in the body, assuming atmosphere 20% O₂ (15).
13. Mercury’s toxicity has been recognized since antiquity. However, not all forms of mercury have the same toxicologic characteristics. a) identify the three major forms of mercury and in detail, compare their toxicologic characteristics (absorption, distribution, etc.); b) what is the principal target organ, and the usual symptoms of mercury poisoning; c) describe the molecular mechanism of mercury poisoning and how this relates to its target organ toxicity; d) describe occupational mercury poisoning cases that occurred in i) Poultney, VT and ii) Danbury, CT; e) what is the origin of mercury’s chemical symbol (Hg)? (15)
15. Briefly (1-2 sentences) explain these toxicological phenomena (10)

sodium nitrite alone not sufficient CN⁻ therapy

Airborne dust in older homes often contains more lead than that from newer dwellings

Chromium’s renal toxicity may be manifest as an increase or decrease in urine osmolarity from the nominal setpoint of ~310mOsm.

16. Super bonus question: These “records” were placed at the top of Rolling Stone Magazine’s “All-Time Top 500 Albums” list. Name each of and the artists (6 total):