

APES

ESS

Review

Notes

♡  
Mrs. A.

Important Chemistry

① Primary Pollutants → Secondary Pollutants  
p. 419

Primary

VOCs CO CO<sub>2</sub>  
SO<sub>2</sub> NO NO<sub>2</sub>  
most hydrocarbons  
most particulates

"oxidants"

→  
Sunlight  
Water  
Oxygen

SO<sub>3</sub> H<sub>2</sub>SO<sub>4</sub>  
HNO<sub>3</sub> O<sub>3</sub>  
H<sub>2</sub>O<sub>2</sub>  
NO<sub>3</sub><sup>-</sup> SO<sub>4</sub><sup>2-</sup>

(more rapidly, wet  
and during day)

p. 418 ② Formation of Ozone (troposphere)

prim



pollutant

2nd

Breakdown

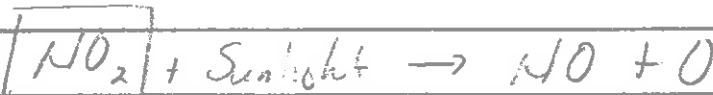


2nd

prim

Absence of sunlight

p. 418 ③ Formation of Smog



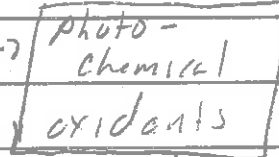
prim  
poll



2nd



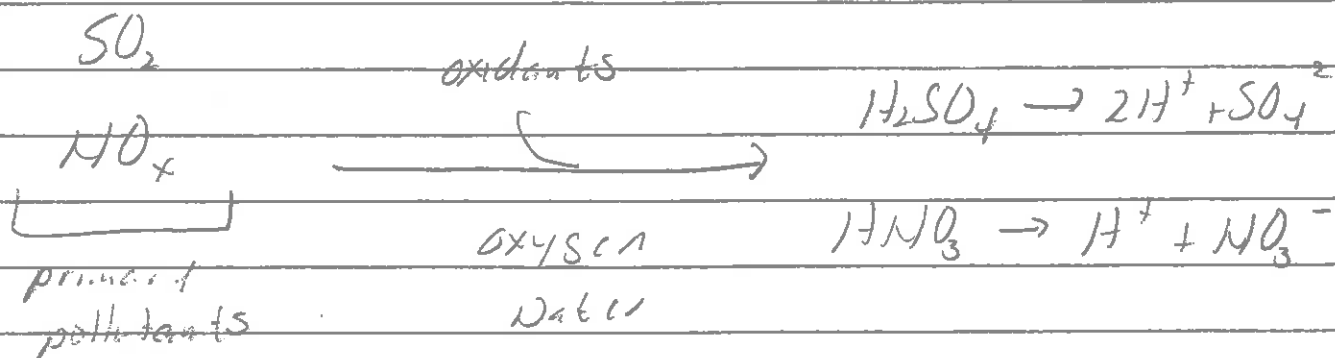
prim  
poll



2nd

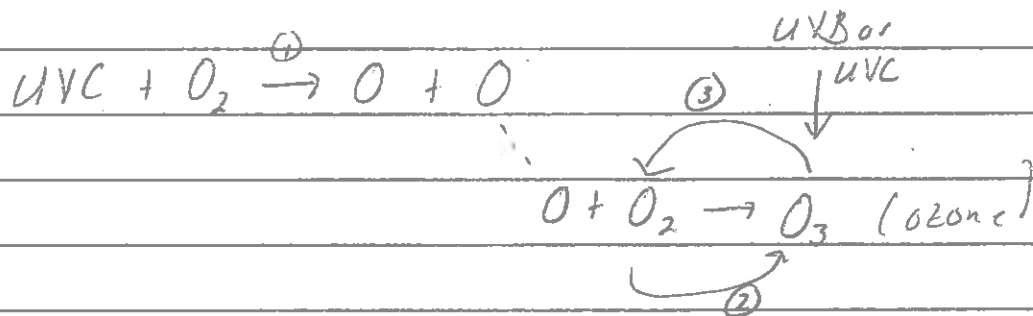
photo-chemical  
SMOG

p.419 ④ Formation of Acid Deposition

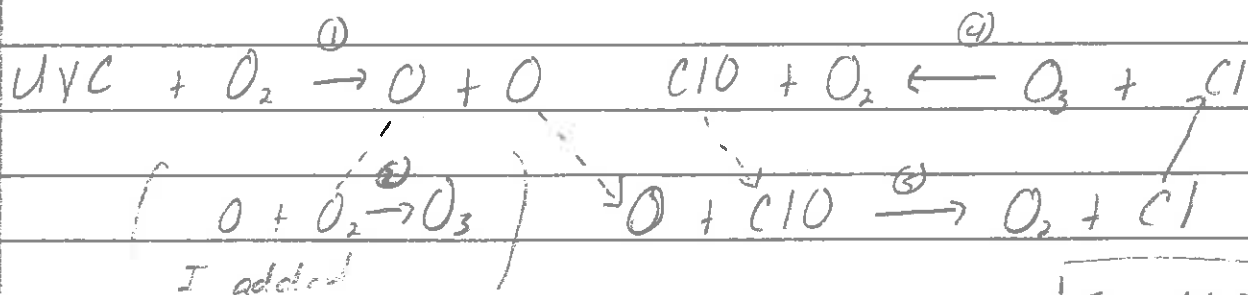


⑤ Formation and Breakdown of Stratospheric Ozone

(p.53)

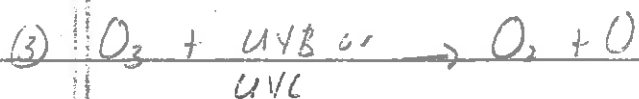


In the absence of stratospheric chlorine, the cycle continuously absorbs UV-B and UV-C radiation



Formation

Breakdown UV-C + UV → Cl



breakdown

less  $O_3$ : UV-B rays reach now reach earth's surface

pH ref. - p. 34 (Friedland)

Inorganic Compounds

- (a) Do not contain C
  - (b) Contain a C, but isn't bonded to H
- $NH_3, NaCl, H_2O, CO_2$

Organic Compounds

have C-C and C-H bonds



} basis of biological processes

Types of UV radiation

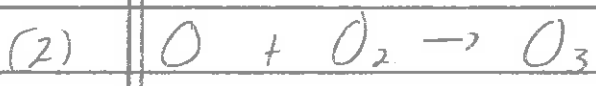
- UV-A 10.1) is U.V. radiation
- UV-B - inc. risks of skin cancer & suppresses immune system
- harmful to cells of plants & reduces ability to absorb sunlight to useable E

(and effect phytoplankton)

p. 55 Friedland



- only happens to O<sub>2</sub> in upper atmosphere



- natural cycle that cont. absorb UVB + UVC

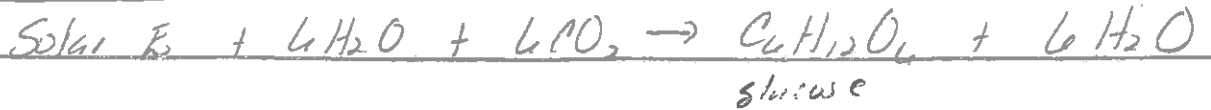


} A single chlorine molecule can break down 100,000 ozone molecules

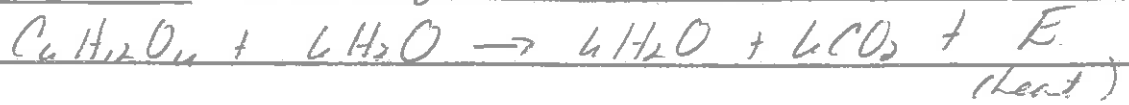


Plants, algae, some bacteria

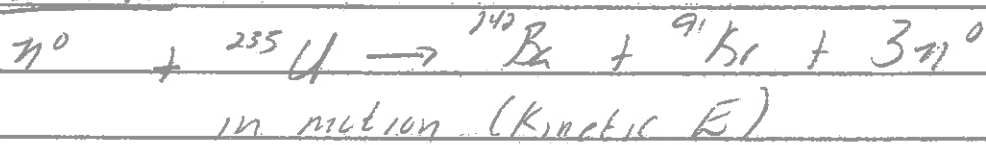
Photosynthesis



Respiration (all organisms)



Nuclear E



Radioactive Decay - You have 180g of radioactive substance. It has a half-life of 265 yrs. After 1,325 years, what mass remains?

	180g	Initial
	90g	1 decay
1325 - 5 decays	45g	2 decays
265	22.5	3 decays
	11.25	4 decays
	5.625	5 decays

Primary Pollutants

- SO<sub>2</sub> most hydrocarbons
- VOC most suspended
- NO particles + H<sub>2</sub>O
- NO<sub>2</sub> + O<sub>2</sub>
- CO
- CO<sub>2</sub> oxidant

Secondary Pollutants

- SO<sub>3</sub> Sulfur
- HNO<sub>3</sub> nitric acid
- H<sub>2</sub>SO<sub>4</sub> sulfuric acid
- O<sub>3</sub>
- H<sub>2</sub>O<sub>2</sub>
- Most NO<sub>3</sub><sup>-</sup> + SO<sub>4</sub><sup>2-</sup>

$\text{GHG}^-$

Water vapor

$\text{CO}_2$

$\text{CH}_4$

$\text{N}_2\text{O}$  (nitrous oxide)

CFCs

\* Soil Horizons (p. 220 / text) Ch. 12

- leaving  
accum. [ O - mostly organic - decomposing material dark  
A - mineral / organic (leaching) lighter  
E zone of leaching (so light colored) lightest  
B (clay & iron oxides) - "zone of accumulation"  
C partially weathered parent material (rock)  
D Rock  
R Unweathered parent material

\* Layers of Atmos. (p. 468 / text) Ch. 22 <sup>p. 50 / st</sup> study guide

- Troposphere (0-12 km) where weather happens  
temp. dec. with altitude
- Stratosphere (12-50 km) very little weather  
warms with inc. altitude  
ozone layer @ top of it
- Mesosphere (50-80 km) coldest layer (at night)  
meteors (shooting stars) burn up here
- Thermosphere - (80-120 km) temp. inc. with  
altitude (gamma / x-ray / UV radiation)

Atmospheric Ocean Interactions

- \* El-Niño - late Dec. / S. American coast  
Normal conditions of equatorial upwelling  
of deep ocean waters in the Eastern  
Pacific are disrupted

## E1-Nino-continued

Thus: reduce CO<sub>2</sub> outgassing & influence CO<sub>2</sub> cycle.  
(As Earth warms expected to be more variable)  
- may change patterns of troposphere

## Greenhouse Gases (Barrons - p.299-301)

When sunlight strikes Earth's surface, some of it is reflected back toward space & infrared radiation (heat) Greenhouse gases absorb & trap the heat

p. 525  
Friedland

Greenhouse Gas	Percentage	Source	Notes
CO <sub>2</sub>	182%	fossil fuel prod.	Iron + Steel, cement, man-made
CH <sub>4</sub> (methane)	9%	livestock digestion, landfills, waste, production of fire	CH <sub>4</sub>
Nitrous Oxide	5%	Agricultural soils, synthetic fertilizers, animal waste	-1/2 from crop
HFCs, PFCs, SF <sub>6</sub>	2%	refrigeration, electronics	aluminum

\* Inc. CO<sub>2</sub> lowers pH of sea water

\* Water vapor is the most abundant greenhouse gas in our atmosphere

Aerosols - microscopic droplets & particles  
can contribute to "global dimming"  
(volcanic activity)

\* Soil Components:  
45% mineral  
25% air  
25% water  
5% organic matter



Size: Clay - Silty - Sand - Gravel  
 Small Large

## \* Soil Types

Clay - <sup>very</sup> fine particles; clumps; waterlogged

Gravel - coarse particles or rock fragments

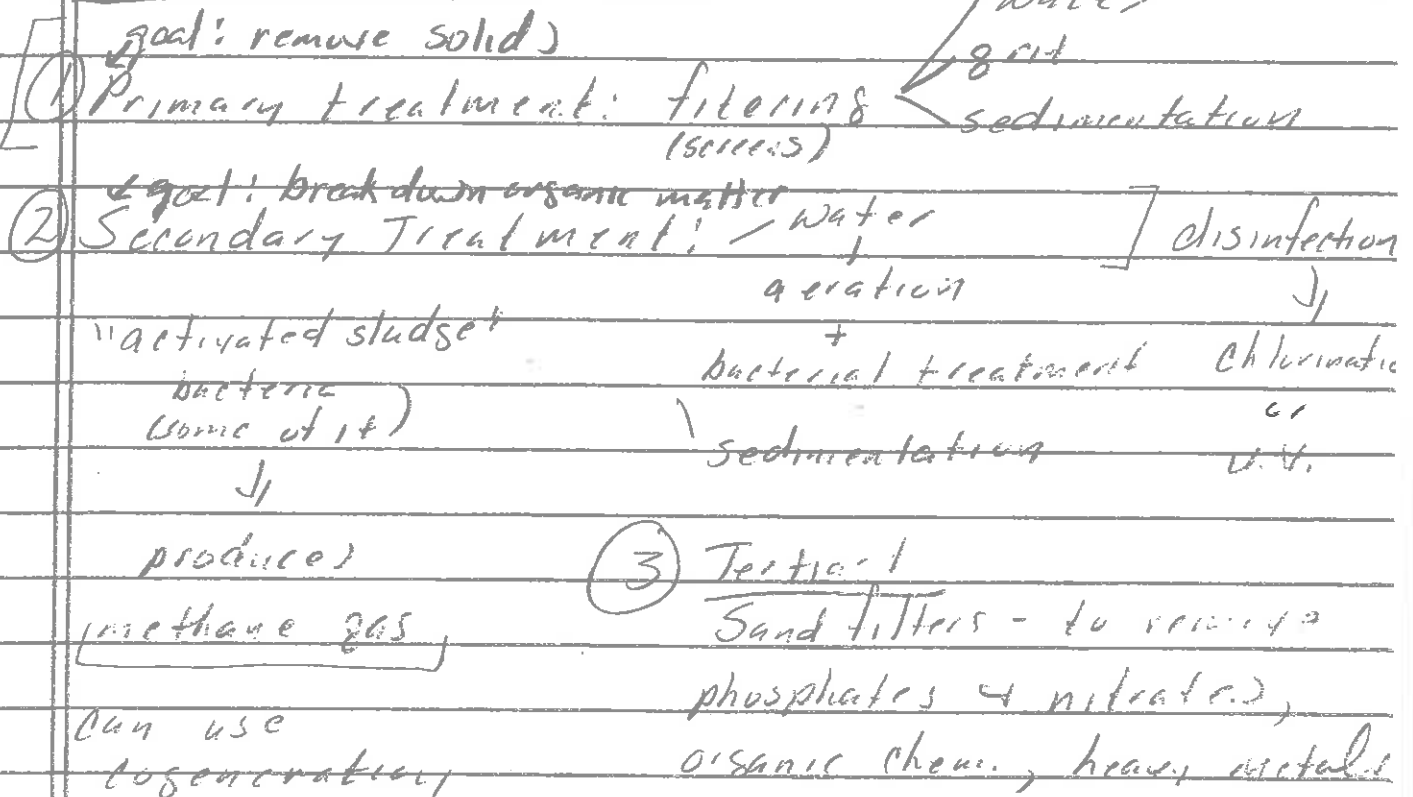
Sand - sedimentary material; coarser than silt; water flows through fast (only good for low water crops)

Silt - sedimentary material - fine particles (between sand & clay); easily transported by water

\* Loam - equal mixes of sand, silt, & humus, rich in nutrients / holds water

## Water Treatment Stages

Remove:  
35-40%  
BOD



# \* Nitrogen Cycle

Rhizobium (root nodules)  
lightning or bacteria can happen in soil or water

- (1) Nitrogen fixation:  $N_2 \rightarrow NH_3$  or  $NO_3^-$   
bacteria fix N to plants lightning
- (2) Nitrification:  $NH_3 \rightarrow NO_2^-$  and  $NO_3^-$   
forms must usable by plant
- (3) Assimilation: Nitrates taken up by plant roots (synthesize amino acids, oils nucleic acids)
- (4) Ammonification: organisms break down amino acids to produce  $NH_3$  (one way)
- (5) Denitrification:  $NO_3^- \rightarrow N_2$   
(anaerobic environment)  
 $NO_3^- \rightarrow N_2O \rightarrow N_2$   
powerful gas eventually

Coal Types	Energy	Sulfur
1. Anthracite	High	Low
2. Bituminous	Med	High
3. Subbituminous	Med	Low
4. lignite	low	low

Ranking

## D.O.

- tend to be highest in cold, turbulent waters
  - low BOD
  - tend to be lowest in warm, still waters with high BOD
  - Oxygen can be measured and reported as BOD.
  - Excessive organic matter and high decomp. rates may reduce D.O.
- ← eutrophication

or other photosynthetic  
plants

phytoremediation - using sunflowers to absorb  
radioactive waste

## Demographic Transition (Study Guide, p. 137)

Stage ① Pre-industrial - living conditions severe  
(Sub-Saharan Africa)  
- birth rates high (high infant mortality)  
- death rates also high (poor medical/science)  
overall: little pop. growth

Stage ② Transitional - std. of living improved  
(India, Mexico)  
- birth rate still high  
- death rate drops  
Overall: rapid growth in pop.

③ Industrial - urbanization dec. need for large families  
(China)  
so birth rate dec. } birth rate close  
- death rate same } death rate  
overall: pop. stabilizes

④ Post-Industrial - birth rates & death rates low  
(Russia, Japan, Europe)  
- std living high  
- birth rates may even fall  
below death rates

R-strategist (tawny owls, redwood trees)

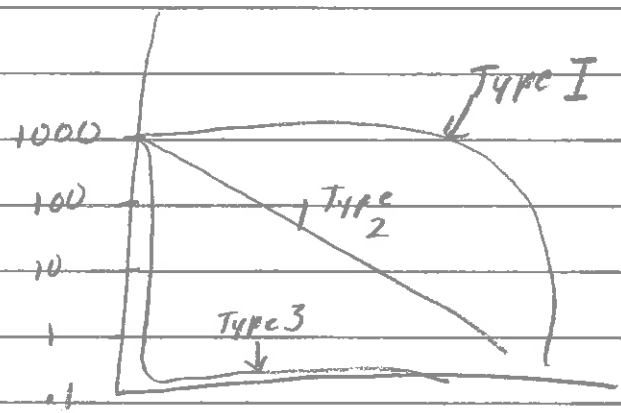
r-strategist (mosquitoes, weeds)

(live near carrying capacity)

- small # offspring
- long life span
- slow development
- parental care

- small body size
- early maturity
- short life-span
- large broods
- little/no parental care

p. 174  
R+B



Type 1: humans  
Type 2: lizards  
Type 3: fish

Survivorship Curves

The probability a given individual in a pop. will survive to a certain age.

\* Lake Chad holds 20% of the world's freshwater - and it is shrinking!

\* Largest old growth forest in U.S. is located in Alaska.

(#82) Pond Zones - pond no moving water

\* riparian - green ribbon of life alongside a stream (critical to health of all other zones)

(phytoplankton)

Littoral - shoreline areas that are completely submerged

limnetic - well-lit, open surface, far from shore

profundal - bottom below the region of light penetration (temp drops rapidly / lack light)

old term

benthic - lowest level of a body of water (bottom)

## Laws

### Goals of Ocean

#### RCRA (1976) Resource Conservation & Recovery Act

- protect the public from harm caused by waste disposal
  - encourage reduce, reuse, recycling
  - clean up spilled or improperly stored wastes
- "cradle to grave"

#### Endangered Species Act (1972)

- protect species and the ecosystems on which they depend

#### Comprehensive Environmental Response, (CERCLA) Compensation, & Liability Act (1980)

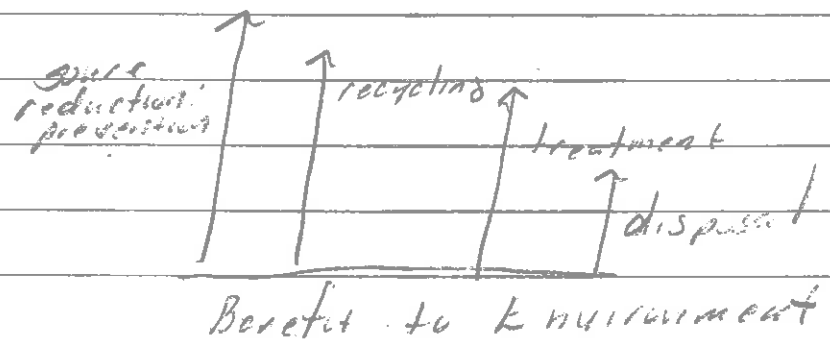
##### "Superfund"

- establish prohibitions & requirements concerning closed and abandoned hazardous waste sites
- provide liability of persons responsible for release of hazardous waste @ sites
- establish a trust fund to provide for clean-up when responsible party couldn't be identified
- National Priorities List

National Environmental Policy Act (NEPA) 1969

The focus of the law was to establish a U.S. national policy promoting the enhancement of the environment, but its most significant effect was to establish the requirement of environmental impact statements (EISs) for major U.S. federal government actions.

Pollution Prevention Act - (1990) Established the waste management hierarchy whereby wastes should be prevented or reduced at the source whenever feasible and safe disposal is the option of last resort.



hypoxia - a deficiency of oxygen

# Organic Agriculture "sustainable agriculture"

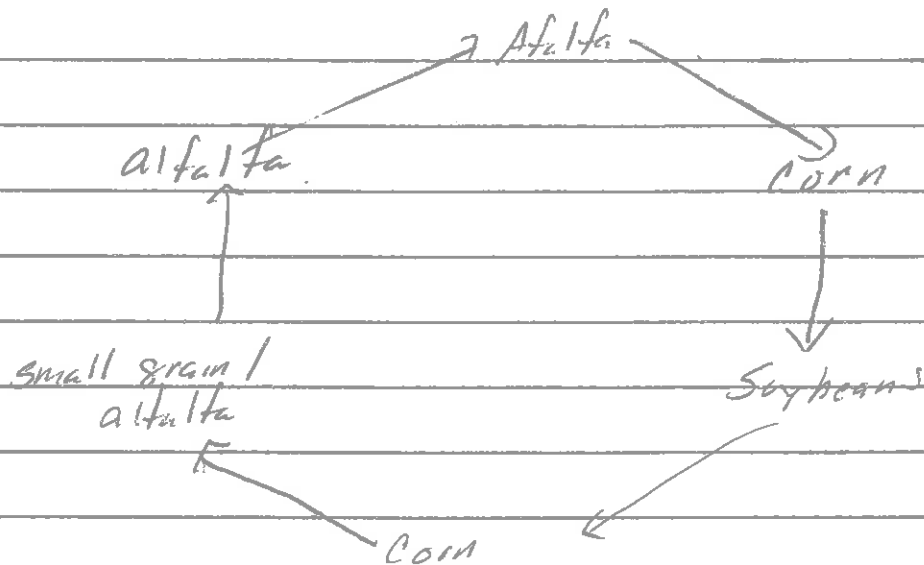
- (1) reduced soil erosion
- (2) lower fossil fuel consumption
- (3) less leaching of nitrate
- (4) greater carbon sequestration
- (5) little or no pesticide use

\* Legumes fix nitrogen in the soil

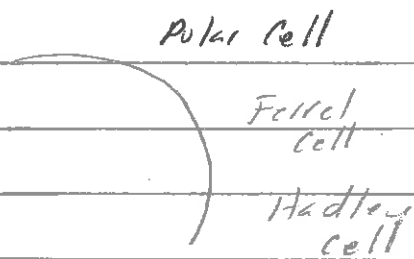
\* Corn is a heavy nitrogen consumer

\* livestock manure applied in advance of corn

## Organic Field Crop Rotation



albedo - a measure of reflectivity of sunlight from the surface



aeolian - sand-sized particles transported by wind action

option value - preserving the value of a resource for the future (value that people place on having the option to enjoy something in the future)

External Costs - the costs that are borne by people other than the producer of the good.

full-cost pricing - accounts for the cost of a good when its internal cost and its estimated short and long-term external costs are included in its market price.