ENVR E-101 FALL 2004 FINAL EXAM REVIEW NOTES

Format
1. 100 multiple choice questions
2. 2 hours allotted
3. Most coverage from lectures
4. Some questions from book (Chapters 22 and 23 mostly)
5. Emerson Hall Room 105 for on-campus and distance students in New England

Earth’s Atmosphere & Anthropogenic Contamination
- Primary energy source is the sun
- Know electromagnetic spectrum
- Visible range of light
- Know relative amount of energy absorbed, reflected by the atmosphere, short wave and long waves
- Know atmospheric makeup (principal gases)
- Atmospheric window, role of water vapor and energy absorption
- Rise in CO2 concentrations
  - Sawtooth pattern caused by seasonal changes in vegetation
  - 360 ppm now
- GHGs include water vapor, methane, CO2
- Arctic warming observations and trends
- Sea level rise
- Ozone sources, causes of ozone depletion
- Role of ozone in upper atmosphere
- Atmospheric redistribution of energy
- Weather patterns, global circulation
- All weather and most pollutants exist in Troposphere
- Causes of ozone depletion
- Residence times of chemicals can be very long
- Coriolis force
- Freezing heights
- Effect of coastal mountain ranges on weather, pollutant dispersion
- Coastal circulation effects
- Principle gases present in air
- Amount of moisture held in warm vs. cold air
- Thermal structure of atmosphere, mixing heights, boundary levels, effects on pollution
- Thermal inversions, Denora, PA and London smog events
- Long term transport of pollutants in atmosphere
- Effects on local vs. regional pollution and stack heights
- Impact on temperature, wind, weather caused by cities and urban landscapes, roughness factor, heat island effects
- Temporal changes in global CO2 levels, temperature
- Acid rain, SO2 emissions, power plants
Climate Change
- Global CO₂ measurements and trends
- Ice core record of CO₂
- Global temperature trends
- Negative effects of climate change
- Precipitation, sea level rise, temperature
- Climate change effects, winners and losers
- Climate patterns, changes in the Gulf Stream
- IPCC predictions in 2050, extreme impacts on Amazon tropical rainforest
- Montreal Protocol, history of international agreements

Air Pollution Sources and Human Health Effects
- Over 3000 substances in air, few regulated
- Know NAAQS, their sources, and effects
- Progress of CAA, pollutant trends
- Persistent Organic Pollutants (POPs)
- Difference between ground level ozone and stratospheric ozone
- Natural vs. manmade pollutant sources
- SO₂ from burning coal
- Nitrogen oxide sources
- CO sources, automobiles, etc.
- Ozone/brown smog formation and hydrocarbons, ozone non-attainment zones
- Diurnal smog pattern – exam question!!
- PM sources, fate and transport, deposition
- Know how particle size and shape relates to health effects, deposition in lungs, body defenses
- Acid deposition, impact on buffering capacity
- Pollution and visibility impairment
- Know pollutants released by the internal combustion engine/automobiles
- Pollution from individual cars way down, but pollution from cars as a whole has gone up because of the increase in the number of cars on the road
- 300 lb. CO₂ for each lb. of gas burned in an automobile
- Air to fuel ratio and impacts on power and emissions
- Only 60% auto pollution is emitted from tailpipe
- Hot soak emissions
- Vapor recovery at gas stations
- Basic structure and function of respiratory system, defenses such as macrophages
- Entrance of pollutants into the bloodstream
- Hemoglobin and affinity for CO
- Surface area of lungs
- Lung function and age, smoking
- Asthma trends
- Asbestos in the lungs
- CO sources in the home
- Health effects pyramid
- Power plant deaths
National and International Environmental Legislation
- Air pollution definition
- Milestones of the environmental movement
- Major environmental acts such as CAA, Superfund, SARA
- 1990 significant revisions to the CAA
- Toxic Release Inventory
- Major features of CAA Amendments
- NAAQS, NESHAPS
- Non-attainment areas
- Lead sources
- Stationary vs. mobile sources
- Motor vehicles, inspection and maintenance, emission control technologies
- Source control techniques, traditional vs. innovative approaches such as emissions trading, tax incentives
- Total vehicle miles up

Ambient Particles
- Particle sources
- Types of sources
- Natural vs. anthropogenic
- Mobile vs. stationary sources
- Most time spent indoors, highest exposures, typically
- Biological (e.g., pollen)
- Secondary pollutants (sulfate, nitrate)
- Fate and transport
- Wet vs. dry deposition
- Particle sizes and composition
- Particulate trends
- Collection and measurement of particles
- Toxicity, health effects
- Particle size distribution
  - PM10, PM2.5, ultra-fine
- Respiratory system
- Mortality and health effects studies
- Chronic effects, morbidity (emergency room visits, medications dispersed, etc.)
- Visibility as an issue
- Bronchitis, asthma, vascular disease
- 20% particulate matter gets indoors global CO₂ emissions
- History of particle regulation
- London smog episode in 1952