

EVPP 110 Lecture
Exam #3 - Study Summary
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Physical Environments: Atmosphere Composition and Structure

- Do any other planets in our solar system have an atmosphere like earth's?
- In general, how does our atmosphere contribute to life as we know it?
- What three main roles of our atmosphere make it a central player in the physical geography of the earth?
- Are the major constituents of the atmosphere liquid, solid or gaseous?
- What two gases make up 99% of the total volume of the atmosphere?
- Do the relative percentages of nitrogen and oxygen gas in the atmosphere change with increases in altitude?
- How do water vapor concentrations in the atmosphere vary vertically and horizontally?
- What other gases make up the remaining 1% volume of the atmosphere?
- What are the four atmospheric characteristics that vary with changes in altitude?
- How is air density defined?
- In which part of the atmosphere is air density greatest?
- How is air pressure (or atmospheric pressure) defined?
- What is the average, or standard, atmospheric pressure at sea level in mb?
- If more air molecules were packed into a given column of air, would the air density and pressure in that column of air increase or decrease?
- Does the number of air molecules present in the atmosphere increase or decrease as altitude increases?
- Does air density increase or decrease with increased altitude?
- Does atmospheric pressure increase or decrease with increased altitude?
- Does air density and pressure decrease with altitude at a constant rate?
- From the surface of the earth up to an altitude of about 11km, does the temperature of the altitude normally increase or decrease?
- How is lapse rate defined?
- In the lower region of the atmosphere, what is the standard or average lapse rate?
- How is temperature inversion defined?
- Air temperature is the most common parameter used to define which four layers of the atmosphere?
- In which region of the atmosphere does "weather" occur?
- Place the names of the four layers of the atmosphere defined by temperature into order from the layer closest to the surface of the earth to the layer furthest from the earth's surface.
- How does air temperature vary with altitude in the troposphere?
- How does air temperature vary with altitude in the stratosphere?
- Does a temperature inversion routinely occur in part of the stratosphere?
- In which layer of the atmosphere does ozone typically reach its maximum concentrations?
- What role does ozone play in the temperature inversion present in the stratosphere?
- How does temperature vary with altitude in the mesosphere?
- How does temperature vary with altitude in the thermosphere?

- What role do variations in the activity level of the sun play in determining the temperature of the thermosphere?
- What is the exosphere?
- In which layer of the atmosphere do some of its atoms and molecules escape the earth's gravitational pull and shoot off into space?
- What are the names of the two layers of the atmosphere that are based gaseous composition of the atmosphere in terms of the relative percentages of nitrogen and oxygen gases?
- Does the gaseous composition of the atmosphere remain relatively constant in the homosphere or the heterosphere?
- What is the name of the electrified region of the atmosphere that goes from the surface to an altitude of ~60km?
- Why do atoms lose electrons and become positively charged in the ionosphere?
- By what process does heat exchange in the atmosphere occur?
- What is meant by the phrase "convective circulation"?
- When air is heated, does it expand or compress, rise or sink, become more dense or less dense?
- When air is cooled, does it expand or compress, rise or sink, become more dense or less dense?
- Describe convective circulation in terms of the vertical and horizontal movement of cooler and warmer air masses.
- What are "thermals"?
- What is a "thermal cell"?
- Describe the movement of a mass of air near the surface at the equator that heats up.
- What processes/principles interact to determine the manner in which moisture enters, move about in, and leaves the atmosphere?
- What are evaporation, transport and precipitation?
- What do we call the three phases of matter in which water can occur in the lower atmosphere?
- Can water change phases in the atmosphere?
- Define sublimation.
- Define evaporation.
- Define condensation.
- What are the three main factors that affect the rate of evaporation in the atmosphere?
- Why can evaporation serve as a cooling process?
- What is humidity?
- Distinguish between absolute and relative humidity.
- Define dew point.
- How does temperature affect the amount of water that a given volume of air can "hold"?
- If the temperature of a given mass of air were increased, would the ability of that air mass to hold water increase or decrease?
- How is water in the atmosphere transported?
- Is the amount of water that leaves the atmosphere equal to the amount of water that enters the atmosphere, on average?
- What three forms of precipitation represent the liquid, gas and solid phases of water?
- What are the four factors that govern the process by which water leaves the atmosphere as precipitation?

- What role do condensation nuclei play in the formation of precipitation?
- What aspects of the vertical structure of the atmosphere are combined in the concept of adiabatic processes?
- What is adiabatic cooling?
- Describe the mechanics of adiabatic cooling.
- What is the distinction between dry and moist adiabatic cooling?
- What is the dry adiabatic lapse rate?
- What is the moist adiabatic lapse rate?
- What is adiabatic heating?
- Describe the mechanics of adiabatic heating.

Physical Environments: Atmosphere and Oceans - Circulation Patterns

- What two key physical factors interact with physical geography to determine the distribution of biomes?
- What are some of the global ramifications of the interdependent relationship between the oceans and the atmosphere?
- What is meant by the term "global heat engine" ?
- What does the "global heat engine" do?
- What is solar radiation?
- Do all parts of the earth receive the same amount of solar radiation?
- What four factors affect the amount of solar radiation received at various points on the earth?
- Does the surface of the earth heat evenly as a result of solar radiation?
- What process drives the interrelated patterns of circulation of the oceans and atmosphere?
- What is meant by the term "global winds"?
- How are global winds produced?
- What causes the pressure difference between the poles and the equator that drives global winds?
- If the earth did not rotate, what would be the direction in which global winds would blow?
- Why don't the winds blow in straight lines from the equator to the poles?
- What is the Coriolis effect?
- The Coriolis effect causes winds to be deflected from their path of travel to what direction in the Northern Hemisphere and to what direction in the Southern Hemisphere?
- What are global wind belts?
- What type of air movement is occurring in calm areas?
- What type of air movement is occurring in the wind belts?
- What type of air movement is occurring in the doldrums and at what latitudes do the doldrums occur?
- What type of air movement is occurring in the horse latitudes and at what latitudes do the horse latitudes occur?
- What type of air movement is occurring in the wind belts called the "trade winds", what direction do the trade winds blow in the Northern versus the Southern Hemisphere, and at what latitudes do the horse latitudes occur?
- What type of air movement is occurring in the wind belts called the "prevailing westerlies", what direction do the prevailing westerlies blow in the Northern versus the Southern Hemisphere, and at what latitudes do the prevailing westerlies occur?

- What type of air movement is occurring in the wind belts called the "polar easterlies", what direction do the polar easterlies blow in the Northern versus the Southern Hemisphere, and at what latitudes do the polar easterlies occur?
- By what process was most of the early knowledge of ocean currents obtained?
- What are the two main types of circulation that exist in the ocean?
- Is surface circulation predominately a horizontal or vertical movement of water?
- Is thermohaline circulation predominantly a horizontal or vertical?
- What drives surface circulation?
- What drives thermohaline circulation?
- What are the four main factors that affect circulation patterns of oceans?
- How does wind affect the circulation patterns of the ocean?
- What type of circulation pattern would occur if the earth's surface was entirely water?
- What are gyres?
- What role do continental land masses play in setting up gyres?
- What three factors affect the density of water?
- What effect does water density have on thermohaline circulation?
- Describe the general movement of cold, dense waters originating in polar latitudes?
- Describe the general movement of warm, less dense waters originating in the tropics?
- What are the general characteristics of the principle ocean currents in terms of current strength on perimeters versus internally, and direction of movement of warm and cold water between poles and tropics?
- What are the four categories into which the principle ocean surface currents can be divided?
- What are the general characteristics of western boundary currents?
- Give an example of a western boundary current in the northern hemisphere and in the southern hemisphere?
- What are the general characteristics of eastern boundary currents?
- Give an example of a eastern boundary current in the northern hemisphere and in the southern hemisphere?
- What is the name of the type of vertical movement of water that is sometimes associated with eastern boundary currents?
- Describe the movement of water associated with upwelling?
- What is the significance of upwelling relative to ecosystems?
- What is the significance of upwelling relative to economies?
- What are the general characteristics of equatorial currents?
- Give an example of an equatorial current in the northern hemisphere and in the southern hemisphere?
- What are the general characteristics of polar currents?
- Give an example of a polar current in the northern hemisphere and in the southern hemisphere?
- The name "El Nino" was originally used to describe what process?
- The name "El Nino" is now used to describe what process?
- El Nino is now considered to be part of a phenomenon known as what?
- What series of events (in terms of pressure differences across the Pacific, rain patterns in the western Pacific, global climate patterns, sea level differences between western and eastern Pacific, upwelling, ecological effects) occurs when, under "normal" La Nina

conditions, the water of the Pacific Ocean is pushed away from the west coast of South America by constantly blowing east-to-west trade winds?

- What series of events (in terms of pressure differences across the Pacific, rain patterns in the western Pacific, global climate patterns, sea level differences between western and eastern Pacific, upwelling, ecological effects) occurs when, under El Niño conditions, the east-to-west trade winds slacken?
- Why are tides significant geomorphically and biologically?
- What is the definition of tides?
- What causes tides?
- In general, what roles do the sun and moon play in tides?
- Does the gravitational pull of the sun or of the moon have a more significant effect on tides?
- What factors affect the magnitude (height) of tides?
- Do high and low tides at a given point occur at the same times from day to day?

Physical Environment: Climate and Biomes

- What is the definition of an ecosystem?
- Do similar environments lead to the evolution of organisms that are similar in form and function?
- What is the "rule of climatic similarity"?
- What is a biome?
- What role, in general, does climate play in biomes?
- What is climate?
- How is climate different from weather?
- What two main factors determine a region's climate?
- Why are there variations in the earth's climate?
- Why do different parts of the earth receive different amounts of energy from the sun?
- Why are the tropics warmer?
- Why are the poles colder?
- Why is precipitation important to life and in determining distribution of biomes?
- What is the relationship between precipitation and productivity in ecosystems?
- What latitudes and other areas of the earth generally have low precipitation?
- Why is precipitation generally low near 30 degrees north and south latitude?
- Near what latitude to most major deserts of the world lie?
- What biome is found in areas of low precipitation?
- Why is precipitation generally low at the interiors of large continents?
- What latitudes of the earth generally have low precipitation?
- Why is precipitation generally high at the equator and, to a lesser extent, at 60 degrees north and south latitude?
- What biome is found in areas of high precipitation near the equator?
- What biome(s) are found near areas of higher precipitation at 60 degrees north and south latitude?
- What is the rain shadow effect?
- Why does the rain shadow effect occur?
- Where do rain shadow effects occur?
- What biome is found in areas of low precipitation?
- Why is temperature important to life and in determining distribution of biomes?

- What is the relationship between temperature and productivity in ecosystems?
- What two factors affect temperature?
- How does latitude affect temperature?
- What is the relationship between latitude and temperature?
- How does elevation affect temperature?
- How much does temperature decrease with an increase of 1000m in elevation, on average?
- Why does elevation affect temperature?
- What correlation can be made between the effect of latitude on temperature and the effect of elevation on temperature?
- In general, an increase in elevation will produce the same kind of change in temperature as would what kind of change in latitude?

Populations: Population Ecology

- What is the definition population?
- what is the relationship between a population and a species?
- are humans that lived 1000 years ago in Europe part of the same population of humans living in Fairfax County today?
- What are the major characteristics of populations?
- What is the definition of population size?
- Why is population size important to the survival of a population?
- what is the definition of population density?
- How can you determine population density?
- why are sampling techniques necessary for determining population density?
- what is the definition of a population's dispersion pattern?
- what are the three main dispersion patterns?
- what are some of the factors that lead to each of the three dispersion patterns?
- What is meant by population age distribution?
- In considering the age distribution of a population, why would it be important to know what portion of the population was of pre-reproductive, reproductive, or post-reproductive ages?
- What does it mean to say that populations are dynamic?
- What are the four variables that govern changes in population size?
- What factors affect the size of a population?
- What is biotic potential?
- What are some biotic and abiotic factors that affect biotic potential?
- What is environmental resistance?
- What are some biotic and abiotic factors that affect environmental resistance?
- What is carrying capacity?
- What roles do biotic potential and environmental resistance play in carrying capacity?
- what are the two main types of growth exhibited by populations?
- describe exponential growth
- what is the shape usually used to refer to the curve that illustrates exponential growth?
- what is meant by "intrinsic rate of increase"?
- is the intrinsic rate of increase the same for every species of organism?
- how can we obtain a rough estimate of the intrinsic rate of growth?

- what conditions, relative to the availability of resources, are necessary in order for exponential growth to occur?
- Are there always limits to population growth in nature?
- describe logistic growth
- what is the shape usually used to refer to the curve that illustrates logistic growth?
- what conditions, relative to the availability of resources, exist that result in logistic growth?
- how are the effects of population limiting factors representing in the equation for logistic growth?
- what is "carrying capacity"?
- is carrying capacity the same for all populations? All environments?
- Compare the effects of a large K versus a small K on population growth
- what are the two general types of factors that limit population growth?
- describe how density-dependent factors limit population growth
- describe how density-independent factors limit population growth
- what are the four general types of population fluctuations?
- Describe a stable population fluctuation
- Describe an irruptive population fluctuation
- Describe an irregular population fluctuation
- Describe a cyclic population fluctuation
- what is a predator-prey cycle?
- What are the two hypotheses used to explain predator-prey cycles?
- How does the top-down control hypothesis explain predator-prey cycles?
- How does the bottom-up control hypothesis explain predator-prey cycles?
- describe the snowshoe hare-lynx cycle
- what is meant by the term "survivorship"?
- what is a life table and what kind of information does it contain?
- what do we call the graphs that result when life table data is plotted?
- do all species exhibit the same type of survivorship curve?
- why is a percentage of maximum life span used on the horizontal axis instead of actual age categories?
- what are the 3 types of survivorship curves?
- what are the general characteristics of a population that exhibits a Type I survivorship curve?
- what are the general characteristics of a population that exhibits a Type II survivorship curve?
- what are the general characteristics of a population that exhibits a Type III survivorship curve?
- what type of survivorship curve is exhibited by humans?
- what does the life history of an organism entail?
- what are some of the important life history traits that influence the growth rate of a population?
- what are the two main types of life history strategies?
- what are the characteristics of organisms and populations that exhibits an opportunistic (r-selected) life history strategy?

- what are the characteristics of organisms and populations that exhibits an equilibrial (K-selected) life history strategy?

Populations: Evolution and Natural Selection

- how did Darwin's life and experiences lead him to develop his theory of evolution?
- Who conceived of a theory identical to Darwin's?
- What phrase did Darwin use originally, instead of the term "evolution" and what did they phrase mean?
- What are fossils?
- What is the fossil record?
- What are the five main categories of evidence for evolution?
- What is biogeography?
- What is comparative anatomy?
- What is comparative embryology?
- What is molecular biology?
- What three key observations that halped give rise to Darwin's theory?
- What did Darwin propose as the mechanism for evolution?
- What is natural selection?
- What is meant by "differential or unequal success in reproduction"?
- What is artificial selection?
- What is overproduction of offspring?
- What is the definition of a population ?
- What is a sexual species?
- What is the smallest unit that can evolve?
- What is the gene pool?
- What is Hardy-Weinberg equilibrium?
- What is microevolution?
- What five conditions are necessary for Hardy-Weinberg equilibrium to be maintained?
- What are the five agents of microevlution?
- What is the relationship between the five conditions necessary for maintaining Hardy-Weinberg equilibrium and the five agents of microevolution?
- What is genetic drift?
- What are the two subtypes of genetic drift?
- What is the bottleneck effect?
- What is the founder effect?
- What is gene flow?
- What is mutation?
- What is nonrandom mating?
- What are the three main modes of natural selection?
- What is stabilizing selection?
- What is directional selection?
- What is diversifying selection?
- What is the neutral variation hypothesis?
- How is resistance to pesticides and drugs related to mutation and natural selection?
- In evolutionary terms, how is the fitness of an organisms determined?

- What is the significance of homologous structures in organisms in terms of their possible shared ancestry?
- What was Darwin's original phrase for evolution?
- Changes in the relative frequencies of alleles in a population is called what?