

**Final Exam Concepts and “Things to Know”**

**These concepts will be used to prepare the Multiple Choice and Short Answer Questions**

**Week 9: Air Masses, Fronts and Cyclonic Storms (Lectures 15 & 16)**

- 1) Be able to identify each type of air mass by name, two letter symbol, and be able to describe the weather conditions you would expect within each.
- 2) Be able to identify each type of front by their symbol and explain the type of weather you expect and the front and how it changes from one side to the other.
- 3) Be able to define what an air mass is and the requirements for forming one.
- 4) Be able to define what happens, in general, at a frontal passage.
- 5) Know the difference between a warm-type occluded front and a cold-type occluded front.
- 6) Know which travels faster, a warm front or a cold front.
- 7) Know what a Kona Storm or Kona Low is and how it affects the Hawaiian Islands.
- 8) Know the three general stages of a mid-latitude cyclone and be able to describe its life-cycle
- 9) Know how the rotation of highs and lows are related to convergence and divergence.

**Week 10: Thunderstorms and Tornadoes (Lectures 17 & 18)**

- 1) Be able to describe the critical ingredients for a thunderstorm to form.
- 2) Be able to explain how lightning forms and be able to define the different aspects of a lightning strike including a leader, step-leader, dart-leader, and return stroke.
- 3) Be able to explain how thunder is formed and what the general rule of thumb is for using thunder as a way to determine your distance from a lightning strike.
- 4) Be able to describe the difference between an Air Mass Thunderstorm and a Severe Thunderstorm.
- 5) Be able to list the requirements for a thunderstorm to be classified as “severe.”
- 6) Be able to describe the life cycle of an Air Mass Thunderstorm including descriptions of how the air is moving, if there is precipitation, etc., for each stage (cumulus, mature, dissipating).
- 7) Be able to identify components of a supercell thunderstorm on a diagram including the updraft, downdraft, anvil, overshooting top, gust front, wall cloud, and funnel cloud or tornado.
- 8) Know what different types of lightning are possible.
- 9) Know what a mesocyclone is, how it forms and its role in tornado formation.
- 10) Know the difference between a funnel cloud and a tornado.
- 11) Know the difference between the Fujita Scale and the Enhanced Fujita Scale.

**Week 11: Hurricanes (Lectures 19 & 20)**

- 1) What are the three different names used to identify tropical cyclones? What areas of the earth are each of the names used. Be able to identify them on a map.
- 2) Be able to describe the formation of a hurricane from a tropical disturbance to a Category 1 Hurricane. Be able to put the terms needed to do this in the correct order.
- 3) Know the difference between a Hurricane Warning and a Hurricane Watch.
- 4) Know what three conditions/factors need to occur for a hurricane to form and how they relate, individually, to hurricane formation.

- 5) Know the minimum wind speed for a storm to be considered a Tropical Storm and a Hurricane.
- 6) Be able to describe and draw a sketch of a cross section of a hurricane and be able to label the eye, eyewall, low pressure, high pressure, and how the wind is flowing in different areas.
- 7) Know the name of the damage scale associated with hurricanes (tropical cyclones).
- 8) Be able to describe the three types of damage associated with a hurricane.
- 9) Know which side of the storm is most affected by the storm surge and why. Be able to identify this region on a diagram.
- 10) Know the three things that can cause a hurricane to intensify.
- 11) Know the four situations that can cause a hurricane to weaken.
- 12) Know how many hurricanes have hit the Hawaiian Islands and how many were considered major hurricanes.
- 13) Know why the Hawaiian Islands are typically spared major hurricane landfalls.
- 14) Know which countries were effected by and/or devastated by Super Typhoon Haiyan/Yolanda.
- 15) Know which country was devastated by Tropical Cyclone Pam.

### **Week 12: Air Pollution (Lectures 21 & 22)**

- 1) Be able to describe the difference between primary and secondary pollutants.
- 2) Give examples (list) of primary pollutants. Give examples (list) of secondary pollutants.
- 3) Know the effects of PM<sub>2.5</sub> and if it is a primary or secondary pollutant.
- 4) Be able to describe the “Six Cities Study” and how it is related to air pollution and health.
- 5) Know the main sources for Sulfur Dioxide (SO<sub>2</sub>), its climate, weather, and health effects.
- 6) Know how NO<sub>2</sub> is formed, its main sources, and its environmental effects.
- 7) Know what Vog is, where it comes from, and its health effects.
- 8) Know what VOCs are, their main sources, and if they are primary or secondary pollutants.
- 9) Be able to describe the differences between “Good Ozone” and “Bad Ozone”
- 10) Know the main sources of Carbon Monoxide (CO) and its health effects.
- 11) Know what SMOG is, if it is a primary or secondary pollutant and its health effects
- 12) Know the difference between industrial smog and photochemical smog
- 13) Describe the process and the pollutants involved in “Acid Rain” formation and the main effects.
- 14) Describe the role of weather, specifically temperature inversions, in pollution events.
- 15) List the main indoor air pollution hazards and their major health effects including lead, radon, environmental tobacco smoke, mold, bacteria, formaldehyde, carbon monoxide, VOCs, Animal dander, Chloroform, asbestos, particulate matter, and nitrogen oxides.
- 16) Know the names of the vents that Vog is emitted from on the Big Island.
- 17) Know the story of Pele and her sisters Na-maka-o-Kaha’I and Poliahu.
- 18) Know which Pacific Island was the site of a major nuclear test that resulted in nuclear fallout on its people and the year that this event occurred.

### **Week 13: Atmospheric Optical Phenomena (Lectures 23 & 24)**

- 1) Know why the sky is blue, sunsets are red, and hazy days are white.
- 2) Know what refraction, reflection, diffraction, dispersion, and scattering are.
- 3) Be able to explain how inferior and superior mirages form.
- 4) Know what type of phenomena a “Fata Morgana” is and why it is special.
- 5) Describe how a Glory and a Corona form.
- 6) Be able to draw and describe how a single rainbow forms (i.e. what happens in a single rain drop).

- 7) Be able to draw and describe how a double rainbow forms.
- 8) Know what time of day is best for seeing rainbows and why.
- 9) Know how Halos (22 degree and 46 degree) form.
- 10) Know why Halos are white and not rainbow colored.
- 11) Be able to describe how Sun Dogs form.
- 12) Be able to describe how Sun Pillars form.
- 13) For Rainbows, Halos, Sun Dogs, and Sun Pillars identify if they form due to ice or liquid drops.

#### **Week 14: Nature and Music (Lecture 25)**

- 1) Be able to describe how nature is related to Hawaiian music.
- 2) Be able to describe the influence of western culture on Hawaiian music.
- 3) Be able to identify, by name, key individuals in the development and evolution of Hawaiian music.
- 4) Be able to describe what triggered a dramatic change in the use of the Hawaiian language on the islands.
- 5) Be able to describe the poetic style of Queen Lili'uokalani and the topics she typically wrote about.

#### **Week 15: Climate Vulnerability and Agriculture (Lecture 26 & 27)**

- 1) Be able to explain how the "Greenhouse Effect" keeps the Earth warm.
- 2) Be able to name and describe three main climate change impacts that affect the Pacific Islands.
- 3) Be able to name and describe the six ways global warming can affect Agriculture
- 4) Be able to list and describe the four ways changes to agriculture, due to climate change, can be dealt with.
- 5) Be able to identify and describe the difference between mitigation and adaptation.
- 6) Be able to summarize regional climate impacts on the Pacific Islands.
- 7) Be able to explain how changes in climate are affecting disease transmission.
- 8) Be able to explain the importance of coral reefs to Pacific Island ecosystems.
- 9) Be able to identify what impact of climate change will directly affect coral reef ecosystems.
- 10) Be able to describe the differences between the Maori and traditional Polynesian methods for cultivating Kumara (sweet potato) and how this is related to climate.
- 11) Be able to define ecosystem-based adaptation.
- 12) Be able to define REDD+ and what its main goals are.

#### **Week 16: Sea-Level Rise – Impacts and Mitigation (Lecture 28)**

- 1) Know the difference between first order and a second order changes in sea level.
- 2) Know why rising sea levels are a significant hazard for the Pacific Islands.
- 3) Be able to discuss the challenges behind identifying climate impacts in the Pacific Islands.
- 4) Identify what affects sea level on short time scales (e.g. months or days).
- 5) Be able to describe a "king tide" and the general impacts of one hitting a small Pacific Island.
- 6) Know how many inches sea level has risen in the last 100 years on Oahu, specifically in Honolulu.
- 7) Be able to identify the three basic approaches to sea-level rise adaptation.
- 8) Be able to identify the obstacles to implementing long term sea-level rise adaptations.