Lesson 6 Test Bank – Water and Atmospheric Moisture

Multiple Choice Questions

1. What type of energy is required to break the hydrogen bonds in ice to become liquid water?
2. Latent heat of vaporization
3. Sensible heat
4. Latent heat of fusion
5. Ground heat flux

Correct Answer: C

1. Which phase of water has the highest molecular kinetic energy?
2. Solid
3. Liquid
4. Gas
5. Ice

Correct Answer: C

1. Out of all the water present in Earth's systems, how much is stored in the atmosphere?
   1. Less than 0.03%
   2. Approximately 2%
   3. About 15%
   4. Around 3% at the equator and 1% at the poles

Correct Answer: A

1. What process converts liquid water to vapor?
   1. Condensation
   2. Melting
   3. Evaporation
   4. Sublimation

Correct Answer: C

1. Which of the following phase changes of water is incorrectly matched?
   1. Deposition – gas to solid
   2. Vaporization – solid to gas
   3. Melting – solid to liquid
   4. Condensation – gas to liquid

Correct Answer: B

1. What are the three requirements for evaporation to occur?
   1. Heat, air movement, and salinity
   2. Energy, water, and vertical moisture gradient
   3. Water, gravity, and wind
   4. Sunlight, cold surface, and fog

Correct Answer: B

1. What happens to latent heat during condensation?
   1. It is absorbed by water vapor
   2. It is lost to the surface
   3. It becomes sensible heat
   4. It is radiated to space

Correct Answer: C

1. Which process moves water from plant leaves to the atmosphere?
   1. Infiltration
   2. Precipitation
   3. Condensation
   4. Transpiration

Correct Answer: D

1. Which of the following is an example of deposition?
2. Water freezing to ice
3. Ice melting into water
4. Water vapor condensing into liquid
5. Water vapor freezing directly into ice

Correct Answer: D

1. The movement of water through the atmosphere, hydrosphere, lithosphere, and biosphere is known as the:
2. Biogeochemical cycle
3. Hydroflux
4. Hydrologic cycle
5. Water flow

Correct Answer: C

1. What is the amount of heat energy required to raise the temperature of 1 gram of water at 15°C by 1 degree Celsius called?
   1. Adhesion
   2. A calorie
   3. Cohesion
   4. Capillary action

Correct Answer: B

1. When water condenses, it \_\_\_\_\_\_\_\_ heat energy and \_\_\_\_\_\_\_\_ the surrounding air.
   1. Absorbs; cools
   2. Releases; heats
   3. Absorbs; heats
   4. Releases; cools

Correct Answer: B

1. When water evaporates, it \_\_\_\_\_\_\_\_ heat energy and \_\_\_\_\_\_\_\_ the surrounding air.
   1. Absorbs; cools
   2. Releases; cools
   3. Absorbs; heats
   4. Releases; heats

Correct Answer: A

1. What is water vapor in the atmosphere commonly called?
   1. Transpiration
   2. Sublimation
   3. Humidity
   4. Condensation

Correct Answer: C

1. Which humidity measure is most commonly used in meteorology?
   1. Absolute humidity
   2. Specific humidity
   3. Relative humidity
   4. Dew point

Correct Answer: B

1. What does 100% relative humidity mean?
   1. The air contains no moisture
   2. It is raining
   3. The air is saturated
   4. The air is completely dry

Correct Answer: C

1. Relative humidity is:
   1. The amount of water vapor in the air compared to the average amount
   2. The amount of moisture in the air relative to human perception
   3. The amount of water vapor in the air relative to the air’s capacity to hold water vapor
   4. The amount of water in the air per unit volume

Correct Answer: C

1. What happens to the air’s capacity to hold water vapor as temperature increases?
   1. Increases
   2. Decreases
   3. Stays the same
   4. Varies randomly

Correct Answer: A

1. Assuming a Northern Hemisphere location, in which month is relative humidity likely to be highest?
   1. January
   2. March
   3. July
   4. September

Correct Answer: A

1. Dew point is defined as:
   1. The temperature when ice forms
   2. The point at which water freezes
   3. The temperature at which air becomes saturated
   4. The temperature when fog forms

Correct Answer: C

1. When the air is saturated, adding more water vapor or lowering the temperature will result in:
   1. Condensation
   2. Evaporation
   3. Freezing
   4. Sublimation

Correct Answer: A

1. What is true of specific humidity?
   1. It changes with temperature
   2. It depends on volume
   3. It is stable regardless of temperature or pressure
   4. It decreases as air rises

Correct Answer: C

1. What is required for condensation to occur?
   1. High pressure
   2. Cold air above warm water
   3. Saturation or near-saturation
   4. Low relative humidity

Correct Answer: C

1. Condensation nuclei help water droplets to:
   1. Freeze
   2. Evaporate
   3. Grow by reducing surface tension
   4. Sublimate

Correct Answer: C

1. What type of cooling occurs when warm air touches a cold surface?
   1. Adiabatic cooling
   2. Uplift cooling
   3. Contact cooling
   4. Evaporative cooling

Correct Answer: C

1. What type of uplift is caused by surface heating?
   1. Convergent uplift
   2. Frontal uplift
   3. Convective uplift
   4. Orographic uplift

Correct Answer: C

1. What term describes the tendency of a parcel of air to remain in place or to move?
   1. Adiabatic
   2. Stability
   3. Conditional instability
   4. Buoyancy

Correct Answer: B

1. An air parcel is considered unstable when it:
   1. Either remains as it is, or changes its initial position
   2. Continues to rise until it reaches an altitude where the surrounding air has a similar temperature
   3. Resists being lifted
   4. Stops moving vertically

Correct Answer: B

1. What happens to a rising parcel of air in the atmosphere?
   1. It compresses and warms
   2. It expands and cools
   3. It becomes more dense
   4. It condenses immediately

Correct Answer: B

1. Unsaturated air will cool or warm at what rate as it rises or descends?
   1. 10°C per 1000 m (5.5°F per 1000 ft)
   2. 6°C per 1000 m (3.3°F per 1000 ft)
   3. 6.4°C per 1000 m (3.5°F per 1000 ft)
   4. 4.5°C per 1000 m (2.5°F per 1000 ft)

Correct Answer: A

1. What accounts for the difference between the dry and moist adiabatic lapse rates?
   1. The latent heat of condensation
   2. Lower atmospheric pressure
   3. Altitudinal temperature variations
   4. The specific heat of water

Correct Answer: A

1. The condensation level is the altitude where:
   1. Rain begins to fall
   2. Dew point is reached and condensation starts
   3. Wind speeds are highest
   4. Temperature stops decreasing

Correct Answer: B

1. What is the saturated adiabatic rate?
   1. 10°C/1000 m
   2. 6°C/1000 m
   3. 3°C/1000 m
   4. 8°C/1000 m

Correct Answer: B

1. What condition creates the strongest likelihood of rainfall in the tropics?
   1. Clear skies and high pressure
   2. Convective uplift only
   3. Convergent uplift at ITCZ combined with convection
   4. Radiation fog

Correct Answer: C

1. A change in temperature without a physical exchange of heat is called:
2. Diabatic temperature change
3. Radiative cooling
4. Adiabatic temperature change
5. Latent heat transfer

Correct Answer: C

1. The heat used in the phase change of water is
   * 1. ground heat.
     2. latent heat.
     3. sensible heat.
     4. potential phase change heat.

Correct Answer: B

1. What does the environmental lapse rate refer to?
   1. The average rate at which the Earth cools
   2. How a rising parcel cools
   3. Actual observed temperature change with altitude
   4. The normal average cooling rate of 6.4°C/1000 m

Correct Answer: C

1. Adiabatic cooling occurs due to:
   1. Radiation loss
   2. Direct contact with cold surfaces
   3. Expansion without heat loss
   4. Moisture content

Correct Answer: C

1. Why is the saturated adiabatic rate lower than the dry rate?
   1. It occurs at night
   2. Latent heat is released during condensation
   3. Water vapor absorbs sunlight
   4. It only happens in deserts

Correct Answer: B

1. Stable air conditions occur when:
   1. The air is rising quickly
   2. The environmental lapse rate is greater than the dry adiabatic rate
   3. A lifted parcel is cooler and denser than surrounding air
   4. Dew point is below 0°C

Correct Answer: C

1. Unstable air is most likely to:
   1. Remain near the surface
   2. Resists rising
   3. Lead to condensation and storm formation
   4. Increase surface pressure

Correct Answer: C

1. The average rate of decrease in temperature with an increase in elevation is
   * 1. the normal lapse rate of temperature.
     2. the environmental lapse rate of temperature.
     3. the latitudinal temperature gradient.
     4. none of the above.

Correct Answer: A

1. The greatest amount of latent heat transfer into the air for a year
   * 1. occurs over the midlatitude deserts.
     2. occurs near the Arctic ocean.
     3. occurs off the west coast of midlatitude continents.
     4. tropical oceans.

Correct Answer: D

1. The highest relative humidity for the day
   * 1. is usually around sunrise when the air temperature is coolest.
     2. is usually later in the afternoon when the air temperature is the warmest.
     3. is right at noon
     4. is at midnight

Correct Answer: A

1. If the temperature of the air increases without additional water vapor being added to the air the relative humidity will likely
   * 1. increase
     2. decrease
     3. stay the same
     4. temperature has no impact on relative humidity

Correct Answer: B

1. On a day in mid-June a parcel of air and the air that surrounds it at ground level are found to have the same temperature. You also find that the ELR is greater than the DAR on that day. If the parcel is given an upward push
   * 1. the air would be stable
     2. the air would be unstable
     3. the parcel and surrounding air will still have the same temperature
     4. none of the above

Correct Answer: B

1. A fog that forms when warm, moist air comes in contact with a cool surface is called
   * 1. a steam fog
     2. an upslope fog
     3. a radiation fog
     4. an advection fog

Correct Answer: D

1. The ice crystal growth model
   * 1. applies to cold clouds
     2. applies to mid and high latitude situations
     3. requires the presence of super-cooled water
     4. all the above

Correct Answer: D

1. The weight of water vapor per unit weight of dry air is
   * 1. the mixing ratio
     2. the relative humidity
     3. the absolute humidity
     4. the vapor pressure

Correct Answer: A

1. Thin, wispy high clouds composed of ice crystals are
   * 1. cumulus clouds
     2. cirrus clouds
     3. stratus clouds
     4. cumulonimbus clouds

Correct Answer: B

1. Latent heat
   * 1. is stored in water molecules when condensation occurs
     2. is converted to sensible heat when water vapor condenses
     3. is used to raise the temperature of the water
     4. relates to none of the above

Correct Answer: B

1. Radiation fog
   * 1. is more likely to form during the day
     2. is more likely to form at night
     3. forms when it is windy
     4. none of the above

Correct Answer: B

1. What force initiates the upward motion of warmer, less dense air?
   1. Friction
   2. Buoyant force
   3. Gravity
   4. Wind shear

Correct Answer: B

1. What cloud type is typically associated with thunderstorms?
   1. Cirrus
   2. Nimbostratus
   3. Cumulonimbus
   4. Altocumulus

Correct Answer: C

1. What is true of stratus clouds?
   1. Wispy and high in altitude
   2. Vertically developed and storm-producing
   3. Thick and low, often covering the sky in gray layers
   4. Composed entirely of ice crystals

Correct Answer: C

1. What are condensation nuclei examples?
   1. Water vapor and carbon dioxide
   2. Sea salt, dust, and sulfates
   3. Oxygen and nitrogen
   4. Pollen and grass

Correct Answer: B

1. Which cooling process most commonly triggers cloud formation?
   1. Radiation cooling
   2. Contact cooling
   3. Cooling due to air uplift
   4. Horizontal cooling

Correct Answer: C

1. Fog is essentially:
   1. Rain that hasn't yet fallen
   2. A ground-level cloud
   3. Dust in the air
   4. Frozen precipitation

Correct Answer: B

1. What type of fog forms from radiative cooling of the surface overnight?
   1. Steam fog
   2. Advection fog
   3. Radiation fog
   4. Upslope fog

Correct Answer: C

1. Which fog type is most likely to form along coastlines?
   1. Radiation fog
   2. Advection fog
   3. Steam fog
   4. Valley fog

Correct Answer: B

1. Steam fog typically forms when:
   1. Warm air passes over a cold surface
   2. Cold air passes over warm water
   3. Moist air rises along a slope
   4. It rains during a cold snap

Correct Answer: B

1. What is the primary difference between sleet and freezing rain?
   1. Sleet forms at higher altitudes
   2. Sleet refreezes before hitting the ground
   3. Freezing rain is lighter
   4. Freezing rain originates in cold clouds

Correct Answer: B

1. What causes hail to grow larger within a thunderstorm?
   1. Falling into cooler air
   2. Sublimation
   3. Updrafts that keep it suspended
   4. Melting and refreezing cycles

Correct Answer: C

1. Which precipitation process dominates in tropical, warm clouds?
   1. Bergeron process
   2. Sublimation
   3. Collision-coalescence
   4. Evaporative cycling

Correct Answer: C

1. What does the Bergeron process rely on?
   1. Only water droplets
   2. Ice crystals and supercooled water
   3. Hot, rising air
   4. Fog formation

Correct Answer: B

1. Supercooled water is:
   1. Water below freezing but still liquid
   2. Vapor that becomes fog
   3. Ice crystals forming into hail
   4. Frozen water on the ground

Correct Answer: A

1. Rain that falls through a cold layer and freezes on contact is:
   1. Sleet
   2. Snow
   3. Freezing rain
   4. Glaze rain

Correct Answer: C

1. What process begins most precipitation in cold clouds?
   1. Rain condensation
   2. Ice crystal growth
   3. Fog uplift
   4. Sublimation

Correct Answer: B

1. What cloud type is typically thin, high-altitude, and wispy?
   1. Cumulus
   2. Nimbostratus
   3. Cirrus
   4. Stratocumulus

Correct Answer: C

1. Where is the ITCZ associated with frequent cloud and rainfall formation?
   1. Poles
   2. Mid-latitudes
   3. Equator
   4. 30° latitudes

Correct Answer: C

1. Cloudy nights are usually:
   1. Colder than clear nights
   2. Warmer due to trapped heat
   3. Windier
   4. Lower in humidity

Correct Answer: B

1. What happens when a parcel of air reaches its dew point during ascent?
   1. It stops rising
   2. It begins to warm
   3. Condensation begins
   4. It evaporates

Correct Answer: C

1. The process that forms dew on a cold glass of water is:
   1. Evaporation
   2. Conduction
   3. Radiation
   4. Condensation

Correct Answer: D

1. What cloud type is composed mainly of ice crystals?
   1. Nimbostratus
   2. Altocumulus
   3. Cirrocumulus
   4. Stratocumulus

Correct Answer: C

1. What factor determines whether precipitation reaches the ground as rain or snow?
   1. Cloud type
   2. Wind speed
   3. Temperature profile below the cloud
   4. Altitude of cloud formation

Correct Answer: C

1. Which type of fog forms when humid air is pushed uphill by wind?
   1. Radiation fog
   2. Steam fog
   3. Upslope fog
   4. Valley fog

Correct Answer: C

1. Why do stratus clouds rarely produce heavy rainfall?
   1. They lack vertical development
   2. They are too high in the atmosphere
   3. They are composed of ice
   4. They form over dry regions

Correct Answer: A

1. Frost is a product of
   * 1. evaporation
     2. condensation
     3. sublimation
     4. deposition

Correct Answer: D

Written Response Questions

1. What is latent heat and why is it important during phase changes?

Correct Answer: Latent heat is stored energy during phase changes. It's absorbed during melting and evaporation, and released during condensation and freezing.

1. Differentiate between specific and relative humidity.

Correct Answer: Specific humidity is the mass of water vapor per mass of air (g/kg), while relative humidity is the percent of water vapor relative to the air’s capacity at a given temperature.

1. What is dew point and how does it relate to condensation?

Correct Answer: Dew point is the temperature at which air becomes saturated. When air cools to this point, condensation occurs.

1. Describe the adiabatic cooling process.

Correct Answer: Air rises, expands due to lower pressure, and cools without heat loss to surroundings.

1. What is the difference between dry and saturated adiabatic lapse rates?

Correct Answer: Dry rate is 10°C/1000m for unsaturated air; saturated is about 6°C/1000m due to latent heat release.

1. What causes convective uplift and how does it relate to cloud formation?

Correct Answer: Surface heating causes air to rise; if it cools to its dew point, condensation begins and clouds form.

1. How do condensation nuclei aid in cloud formation?

Correct Answer: They provide surfaces for water vapor to condense on, facilitating droplet formation.

1. Explain the process that forms radiation fog.

Correct Answer: Occurs at night when the ground cools by radiation, chilling air below its dew point near the surface.

1. Compare and contrast radiation fog and advection fog.

Correct Answer: Radiation fog forms from surface cooling; advection fog forms when moist air moves over a cooler surface.

1. Describe upslope fog and its conditions for formation.

Correct Answer: Forms when humid air is forced up a slope, cooling adiabatically and condensing into fog.

1. What is the Bergeron process and where does it occur?

Correct Answer: It involves ice crystals growing at the expense of supercooled water; common in cold clouds.

1. How does hail form in a thunderstorm?

Correct Answer: Updrafts lift ice pellets, allowing layers of ice to form around them until heavy enough to fall.

1. Describe how transpiration contributes to atmospheric moisture.

Correct Answer: Plants release water vapor through leaves, which adds to atmospheric humidity.

1. Explain why specific humidity is preferred in meteorology.

Correct Answer: It remains constant with altitude and temperature, making it more reliable for analysis.

1. What conditions lead to unstable air and storm formation?

Correct Answer: Environmental lapse rate exceeds adiabatic rate, making rising air warmer and less dense.

1. Why do cloudy nights stay warmer than clear nights?

Correct Answer: Clouds trap terrestrial radiation, reducing surface cooling.

1. What cloud types are associated with steady rain?

Correct Answer: Nimbostratus clouds—low, thick, and moisture-laden.

1. What’s the role of buoyancy in vertical air motion?

Correct Answer: Lighter (warmer) air is pushed upward by denser surrounding air.

1. What weather conditions are typical with cumulus clouds?

Correct Answer: Fair weather initially, but they can grow into cumulonimbus clouds leading to storms.

1. Describe how fog affects transportation safety.

Correct Answer: Reduced visibility from fog can impair navigation for vehicles, ships, and aircraft.

1. Explain the global pattern of precipitation around the equator.

Correct Answer: High precipitation due to converging trade winds and convective uplift at the ITCZ.

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