**Plant Anatomy & Physiology: Exam 4 Review Guide**

Phytohormones

Define hormones and their general functions. How do plant hormones and animal hormones differ?

Know where **each** hormone synthesis can primarily occur in a plant and the distinguishing functions of **each** hormone.

What is the tryptophan-dependent pathway in auxin synthesis?

What are some ways auxins are regulated/stored in a plant?

Explain how auxin influences apical dominance and phototropism.

How does auxin concentration influence cellular differentiation in vascular tissue formation?

What pathways are involved in iso-pentenyl pyrophosphate (IPP) synthesis? Where does each occur in the cell?

Where does gibberellin synthesis occur in the cell? What compounds is the precursor to all gibberellins?

What are some ways gibberellins are regulated/stored in a plant?

Explain how gibberellins influence dwarf/rosette plants and seed germination.

What are some commercial uses for auxins and gibberellins?

What are the two building blocks of cytokinins? The reaction is controlled by what enzyme?

What are some ways cytokinins are regulated/stored in a plant?

Describe the relationship between auxins and cytokinins, and how they influence each other with respect to root formation and axillary bud growth.

What compound is ethylene synthesized from? What three enzymes are involved?

What is the Yang Cycle? What is its purpose and why is it important in ethylene synthesis?

Describe the relationship between auxins and ethylene, and how they influence each other with respect to fruit ripening and senescence.

Be able to summarize ABA synthesis, including where it begins and ends a cell and the three enzymes involved. What form is required to allow transport from one component in a cell to another?

How is ABA regulated/stored in a cell?

Describe the relationship between ABA and gibberillins during seed development.

Explain how ABA assists a plant during drought stress.

What are brassinosteroids? What compound are they derived from that comes from what pathway?

What are the two precursors for most brassinosteroids (needed to make brassinolide)?

Photoperiodism, Flowering, & Plant Movements

What are photoreceptor proteins? What are the three classes discussed in class? Know the differences and general roles of each class.

Why is phytochromes characterized by photoreversibility? Be able to explain how it works with red and far-red light.

What is etiolation? What photoreceptor proteins control it?

What is shade avoidance and how may plants achieve this?

Define photoperiodism and what controls it. What do plants measure and how to they perceive the signal?

What are the three general plant photoperiodic groupings and how do they differ?

Describe the three stages of the flowering process. What genes are involved and what signal/protein is required to induce flower development?

What is the floral meristem and what does it produce? Where did it originate?

What is the ABC model for floral organ specification? Be able to interpret a diagram using the ABC model.

Describe the five phases of fruit development. What hormones are involved for each phase?

What is meant by fruit set?

Define biological clock, endogenous rhythm, and circadian rhythm.

What are the three criteria for distinguishing a biological clock? Which phytochrome is involved?

Explain the basic model for plant circadian clocks using the three components.

Why is photoperiodism so important for plants?

What is thermoperiodism? How does it influence plant functions?

What are the two principal categories of plant movement and how do they differ?

Define phototropism and gravitropism. How are they regulated in a plant?

What is nastic movement? What typically controls it?

What are pulvini and heliotropism? How does each it work? How does each benefit some plants?

Plants & Environmental Stress

Why is studying plant stress responses so important? Define homeostasis and environmental stress.

What is the difference between susceptible, stress avoidance, and stress resistance?

Explain the difference between acclimation and adaptation and their relations to stress responses.

If plants require light for photosynthesis, explain why plants can be exposed to too much light.

How do low light conditions affect carbon assimilation and photosynthetic rates? What is limiting photosynthetic rates? Why?

How do light saturated conditions affect carbon assimilation and photosynthetic rates? What is limiting photosynthetic rates? Why?

What happens when light conditions exceed even light saturated conditions?

What is photoinhibition? What does it do to photosynthetic reactions? Why is this a problem?

What is the role of the D1 repair cycle?

What are some plant physical symptoms to chilling stress? What are some plant metabolic effects for chilling and high temperature stress?

Describe how plants may be injured metabolically by water stress. How does it impact photosynthesis?

What is the difference between drought stress and desiccation stress? How do they relate with each other?

How does stomatal closure come about in response to water stress? What is the difference between hydropassive closure and hydroactive closure for stomata?

Explain the differences between short-term acclimation responses and long-term acclimation responses. Be able to provide examples of the short-term acclimation and long-term acclimation responses discussed in class.

How does the PQ pool of photosynthetic electron transport aid in balancing energy distribution?

What is the role of the xanthophyll cycle in response to stress?

Review AQ and ACi curves and be able to interpret/use them in relations to environmental stress.

What are obligate shade plants? What features do they generally have?

What are some key C4 pathway features? Why are they important for this pathway?

What components does the C4 pathway have that the C3 pathway doesn’t have? What advantage and disadvantages does the C4 pathway compared to the C3 pathway?

How does CAM photosynthesis differ from C4 and C3 pathways? Advantages? Disadvantages?

Under what conditions would C3 plants outcompete C4 and CAM plants? Why is this so?

What is the difference between constitutive defenses and inducible defenses? Be able to provide some examples of each.

Define resin ducts and laticifers. What is resin and latex composed of and what is its function? Why is this so important in plant defenses?

What is hypersensitive response? What are some plant examples? How does this compare with systemic acquired resistance?

What are the roles of salicylic acid and jasmonates in a plant’s response to biotic stress?

What are HIPVs in plant defense and how do they influence insect herbivores and their predators?

Define disease. What can it result from? What must a plant rely on without having an immune system?

Explain the plant disease triangle. Define resistance and susceptibility.

What are pith flecks and galls? How are they formed?

Describe the three potential means of pathogen penetration.

What is compartmentalization and why is it the principal anatomical response to injury or disease?

What is the compartmentalization process (4 general steps)? What is a callus?

Define abscission and describe the abscission process (3 general steps). Why is this a useful defense against disease?

Explain how vascular tissues and the vascular cambium tissues are regenerated following an injury/disease.

What are the structures studied for potential increase in plant resistance? Why are these of importance?

Define laticifers and tyloses. Why are these good forms of resistance? How does heartwood formation influence plant resistance?

How are plant viruses transmitted? Why do the plant anatomical effects vary among viruses? What are two possible means of viral transport within a plant?

Describe some of the possible viral plant symptoms. What are the general steps in plant response to viruses?

What are some possible means of viral plant management agriculturalists can use?

**Note: This is only a review guide and only contains the exam content. Remember the final exam questions may or may not be worded the same as those in the review guide.**