

GUIDELINES FOR EXAMINATION I

I. COMPOSITION

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| 1. Essay questions (8 questions, 5 points each)..... | 40 points |
| 2. Short answers, matching or fill-in type (14 questions, various points)..... | 30 points |
| 3. Multiple choice and true/false (10 questions, 2 points each)..... | 20 points |
| <i>Total</i> | <i>100 points</i> |

II. SUGGESTED AREAS OF STUDY

A. Introduction (Chapter 1, lecture notes)

1. Definition of “plant propagation.”
2. Contrast sexual and asexual propagation.
3. What is meant by apomictic seed?
4. Examples of plants that are propagated by: cuttings, grafting, budding, layering, runners, division, micropagation.
5. Know plants that produce underground organs: bulbs, corms, rhizomes, offsets, tubers, tuberous roots.
6. What is meant by differentiation and organogenesis in micropropagation?
7. Know four professional organizations involved in the study of plant propagation.

B. Biology of Propagation (Chapter 2, lecture notes)

1. Know what is meant by genotype, phenotype, ploidy, x number, or n number.
2. Give examples of heterozygous and homozygous conditions in genotype.
3. Know the meaning of euploidy, aneuploidy.
4. Know terms: monosomic, trisomic, double trisomic.
5. What is meant by double fertilization?
6. Know difference between meiosis and mitosis, including site of occurrence, chromosome numbers in divided cells and genetic consequences.
7. Nomenclature for a cultivated plant, including genus, species and cultivar.
8. What is meant by line, hybrid, and clone?
9. Four general requirements that constitute a cultivar.
10. Know how 3 different types of hybrids are made: single cross, double cross, and 3-way cross.

C. Environmental Facility for Plant Propagation (Chapter 3, lecture notes)

1. Know 4 most important environmental factors that must be controlled for a plant propagation facility.
2. Uses of coldframes and hotbeds in plant propagation.
3. Variations in greenhouse structure (free-standing, lean-to, ridge and furrow, quonset, etc.).
4. Give examples of heating systems: centralized and localized.
5. List kinds of heating fuels used in propagation greenhouses.
6. Know the principle of the pad-and-fan system in greenhouse cooling.
7. Examples of flexible and rigid plastics used as greenhouse covers.
8. Know properties of various soil amendments used in plant propagation: soil, peat moss, sand, vermiculite, perlite, pumice, rockwool, bark.
9. Contrast the U.C. mix and the Cornell peat-lite mix for their composition and uses.
10. List chemicals commonly used as base fertilizers in the preparation of growing media.
11. Advantages and disadvantages of steam vs. chemical sterilization of growing media.

12. Reasons why ammonium toxicity may develop in soil media following steam sterilization.
13. Know chemicals commonly used to raise or lower growing media pH.

D. **The Development of Seeds** (Chapter 4, lecture notes)

1. Know the life cycle of annuals, biennial and perennials for vegetative and reproductive growth.
2. Draw a cross section of a woody plant stem and label pith, year rings, phloem, xylem, cambium, and bark.
3. What is meant by 'phase change' in plant life cycle?
4. What is meant by vernalization?
5. Describe the process of 'double fertilization' in angiosperm.
6. The N number (chromosome number) in zygote and endosperm following double fertilization.
7. Know the names of the seed and fruit parts which originate from pericarp, ovule, endosperm, zygote, integument, funiculus and nucellus.
8. Illustrate various stages of embryo development from a zygote to a mature seed.
9. Contrast the endospermic and non-endospermic types of seed with examples.
10. What is meant by 'somatoplastic sterility' and how does it occur? How can this be overcome?
11. What are the three most abundant chemical groups found in seed storage tissues?
12. When does an embryo change from a desiccation-sensitive state to a desiccation-resistant state?
13. What is vivipary? Give examples of fruits in which vivipary is found.
14. Name a chemical that prevents vivipary in maturing fruits.
15. What are the three major components of a seed?
16. Define 'polyembryony' and indicate crops that are propagated by polyembryonic seeds.
17. Define apomixis and distinguish 'obligate apomicts' from 'facultative apomicts.'
18. Know adventitious apomixis, recurrent apomixis and non-recurrent apomixis.

E. **Principles and Practices of Seed Selection** (Chapter 5, lecture notes)

1. List 3 general purposes of using seeds in propagation.
2. Give examples of self-pollinated and cross-pollinated crops.
3. Genetic consequences of inbreeding in self-pollinated crops and cross-pollinated crops?
4. Define dioecy, monoecy, andromonoecy, gynomonoecy and polygamous flowering of plants.
5. What are the advantages and disadvantages of using hybrid seeds in propagation?
6. Outline seed production procedures for herbaceous cultivars.
7. Illustrate steps involved in seed distribution from a breeding program to commercial sales.
8. Why do seeds provide more genetic variation than cuttings when used in woody plant propagation?
9. Define the terms provenance, ecotypes and clines as they are used in the seed propagation of woody plants?
10. Discuss a difference between phenotypic selection and genotypic selection in the seed propagation of woody plants.
11. Why are rootstocks used in grafting often grown from seeds?

F. **Seed Production and Handling** (Chapter 6, lecture notes)

1. What determines the location of commercial seed production and why are the coastal lines of California so popular as seed growing areas?
2. Define, with examples, the type 1, type 2 and type 3 seeds used in commercial propagation.
3. Discuss procedures for harvesting and handling seeds for each of the seed types above.
4. Explain the advantage of using the fermentation method of seed extraction for certain crops.
5. Describe procedures for harvesting and handling seeds from gymnosperm plants.
6. What is meant by recalcitrant seed?
7. List plants that produce recalcitrant seeds.
8. Classification of plants by their seed longevity.

G. Principles of Propagation by Seed (Chapter 7, lecture notes)

1. Discuss the processes involved in each of the three stages of seed germination.
2. Reasons why the synthesis of enzymes must precede the germination of seed.
3. Illustrate the morphology of a germinating seed showing cotyledons, endosperm tissues, embryo axis, plumule and radicle.
4. Contrast hypocotyl and epicotyl.
5. Explain the difference between epigeous germination and hypogeous germination with examples.
6. Know the difference between viability, germinability and vigor as they relate to seed propagation.
7. Contrast dormancy vs. quiescence.
8. Explain 3 different types of seed dormancy: ecdormancy, paradormancy and endodormancy.
9. Contrast primary seed dormancy and secondary seed dormancy.
10. Explain the two different types of seed coat dormancy: physical and mechanical.
11. What is meant by chemical dormancy and morphological dormancy?
12. Contrast physiological dormancy and embryo dormancy (physiological deep dormancy).
13. What is meant by stratification and how is it used to overcome embryo dormancy?
14. What is meant by epicotyl dormancy?
15. Briefly outline the function of GA₃ during the germination of a corn seed.
16. Discuss the function of abscisic acid (ABA) in the onset of primary dormancy.
17. List crops that are cool-temperature requiring and warm-temperature requiring during seed germination.
18. Why is aeration required by germinating seeds?