

Greenhouse Crop Production Career Development Event

PURPOSE

To stimulate interest in greenhouse production and management of major greenhouse plants through the career - technical agriscience curriculum.

OBJECTIVES

1. To apply principles of plant science to the planning and management of a commercial greenhouse and production of floricultural plants.
2. Identify annual and perennial bedding plants, flowering and foliage potted plants, and cut flowers produced in greenhouses and sold in the U.S.
3. Identify plant problems due to pest, nutritional, mechanical, or chemical injury. Understand the source of problems and controls.
4. Understand the principles, and develop skills, in propagation and culture of commercial greenhouse crops.

CONTEST RULES AND PROCEDURES

1. The contest has four phases each worth 100 points: general knowledge exam, plant identification exam, problem identification and solving, and greenhouse crop production practicum. All answers will be provided on a scantron sheet.
2. No contestant is permitted to touch or handle plant material during the contest, except in the practicum.
3. Observers are not permitted in the contest area while that contest is in progress.
4. No contestant is permitted to communicate to another contestant while competing, or receive assistance from any other source.
5. Contestants are assigned to group leaders who will escort them to various contest staging sites. Stay with your group leader throughout the contest.
6. Contestants are assigned to groups and given an identification number. Write this number on the score sheet for each phase of the contest.

SCORING THE CONTEST:

Individual scores will be the sum of the scores on the 4 phases of the contest, each of which is worth 100 points. Team awards will also be determined, based on total points acquired by team members.

PHASE 1A - GENERAL KNOWLEDGE EXAM (80 POINTS)

Forty multiple choice questions will cover the area of the greenhouse industry reflected in the contest objectives. The exam will test the student's knowledge and understanding of basic plant science, the greenhouse structure and environment, the plant root zone, and basic principles of producing bedding plants, flowering and foliage potted plants, hydroponics vegetable and herb production. A question bank is available in a separate file.

PHASE 1B - GREENHOUSE TOOL AND EQUIPMENT IDENTIFICATION (20 POINTS)

Contestants will have to be able to identify 10 tools from the attached list.

Thirty minutes will be allowed for this phase of the contest.

PHASE 2 - IDENTIFICATION OF PLANT MATERIAL (100 POINTS)

Specimens from a list of plant species will be displayed for contestants to identify by scientific and common name. A master list will be provided so the students can match the correct scientific and common name to the specimen. For each of the 25 specimens contestants will have to place on the scoresheet both the common and scientific name. Thirty minutes will be allowed for this phase of the contest.

PHASE 3 - GREENHOUSE PROBLEM SOLVING (100 POINTS)

Each contestant will identify problems related to the various aspects of the greenhouse/plant production industry. The student must identify the problem and the best solution to the problem from a list provided. Students will have thirty minutes to complete this part of the contest.

PHASE 4 - GREENHOUSE CROP PRODUCTION PRACTICUM (100 POINTS)

Contestants will demonstrate basic skills in typical greenhouse production techniques. Possible activities might include: sowing seeds, vegetative propagation, or planting of major greenhouse crops. Study information is provided. Five (5) multiple choice questions will be asked regarding this practicum. Students will have thirty minutes to complete this practicum.

REFERENCES

References and Textbooks (Library SB 414 to SB 416)

Primary Recommended Student Textbook

An Introduction to Greenhouse Production. 1992. Robert W. McMahon. Ohio Agricultural Education Curriculum Materials Service. ISBN 1-56502-002-2

Recommended for Instructors and as References

Introductory level, include both greenhouse management and crop production information.

The Commercial Greenhouse Handbook. 1981. James W. Boodley, Litton Educational Publishing, Inc., 135 W. 50th Street, New York, NY 10020 (SB 415.B66) (Currently being updated by the author.)

Ball Red Book (15th edition). 1991. George J. Ball, Inc., PO Box 335, W. Chicago, IL 61085 (SB 405, B25) ****New Edition****

Upper level or for Instructors (These two are used as texts at MSU.)

*Greenhouse Operation and Management (4th Edition). 1991. Paul V. Nelson, Reston Publishing Co., Inc., Reston VA 22090 (SB 415.N44)

Introduction to Floriculture (2nd edition). 1992. Roy A. Larson, Editor. Academic Press, Inc., San Diego, CA 92101 (SB 405.I55) ****New Edition****

Periodicals

Greenhouse Manager. Branch-Smith Publishing, 120 St. Louis Avenue, Fort Worth TX 76104, (SB 414.67). Phone 800-433-5612, Fax 817-877-1862

Greenhouse Grower. Meister Publishing Company, 37733 Euclid Avenue, Willoughby, OH 44094, (SB 415.A1). Phone 216-942-2000, Fax 216-942-0662

Grower Talks. PO Box 532, 1 North River Lane, Suite 206, Geneva, IL 60134. Phone 708-208-9080, Fax 708-208-9350

MSU Extension Bulletins

E 1382	Poinsettia Production
E 2069	Chrysanthemum Pot Plant Production
NCR 340	Diagnosis Greenhouse Plant Diseases II: Botrytis/Spp/Powdery Mildew
NCR 341	Diagnosis Greenhouse Plant Diseases III: Phys Dis, Leafspots & Viruses

PHASE 1A - GENERAL KNOWLEDGE EXAM (80 POINTS)

Forty multiple choice questions will cover the area of the greenhouse industry reflected in the contest objectives. The exam will test the student's knowledge and understanding of basic plant science, the greenhouse structure and environment, the plant root zone, and basic principles of producing bedding plants, flowering and foliage potted plants, hydroponics vegetable and herb production. A question bank is available in a separate file.

PHASE 1B - GREENHOUSE TOOL AND EQUIPMENT IDENTIFICATION (20 POINTS)

Contestants will have to be able to identify 10 tools from the attached list.

Thirty minutes will be allowed for this phase of the contest.

Tool & Equipment List

1. hoop house/high tunnel
2. gutter connected
3. polycarbonate
4. polyethylene film
5. exhaust fan
6. circulation fan
7. thermostat
8. 3/4" hose
9. watering wand
10. LED light
11. roof vent
12. shade cloth
13. solar panel
14. 6" pot
15. 4" pot
16. gallon pot
17. hanging basket
18. 1204 flat
19. 1020 flat
20. plug tray
21. fiber pot
22. rockwool
23. net pots
24. heat mat
25. dome lid
26. peat
27. vermiculite
28. perlite
29. polyethylene tubing
30. drip tube
31. fertilizer injector
32. irrigation controller
33. ebb and flow irrigation
34. float system
35. NFT system
36. reservoir tank
37. flood tables
38. cart/wagon
39. water pump
40. pruners
41. shuttle tray
42. pesticide sprayer
43. wasp
44. green lacewing
45. lady bugs
46. pheromone trap
47. yellow sticky board
48. tags

PHASE 2 - Identification of Plant Material

Twenty-five (25) whole plant, flower or leaf specimens, or pictures of plants from a list of plant species will be displayed for contestants to identify by common name and scientific name. A list of all botanical names and common names will be provided so the student has only to match the correct scientific and common name to the specimen.

<u>Genus species</u>	<u>Common name</u>
osteospermum	African daisy
Saintpaulia ionantha	African violet
Ageratum houstonianum	Ageratum
Aglaonema nitidum 'Silver Queen'	Aglaonema
Eruca sativa	Arugula
Aster species	aster
Astilbe hybrid	Astilbe/False goats beard
Bacopa monnieri	Bacopa/Water hyssop
Ocimum basilicum	Basil
Capsicum annuum	Bell Peppers
Ficus benjamina	Benjamin fig
Rudbeckia fulgida	Black-eyed susan
Nephrolepis exalt	Boston fern
Brassica oleracea var. italic	Broccoli
Phaseolus vulgaris	bush beans
Calibrachoa species	calibrachoa
Allium schoenoprasum	Chives
Coriandrum sativum	Cilantro
Cleome hassleriana	Cleome
Celosia argentea plumosa	Cockcombs
Coleus X hybridus	Coleus
Aquilegia x hybrida	Columbine
Heuchera x hybrida	Coral bells
Dracaena fragrans "Massangeana"	Corn plant dracaena
Cosmos bipinnatus	Cosmos
Cyclamen persicum	Cyclamen
Narcissus pseudonarcissus	Daffodil
Dahlia species	dahlia
Hemerocallis spp.	Daylily
Delphinium x cultorum	Delphinium
Dianthus species	dianthus
Diascia hybrid	diascia
Lilium longiflorum	Easter lily
Echeveria species	echeveria
Solanum melongena	Eggplant
Hedera helix	English Ivy
Iris x germanica florentina cv.	Flag (bearded) Iris

Chrysanthemum x moriflorum cv.	Florists Chrysanthemum
Fuchsia magellanica	Fuschia
Gaura oenothera	Gaura
Gerbera jamesonii	Gerbera daisy
Gladiolus species	gladiola
Epipremnum aureum	Golden pothos
Schlumbergera truncata	Holiday cactus
Lilium x hybridum cv.	Hybrid Lily
Rosa spp. Class Hybrid Tea	Hybrid tea rose
Hyacinthus orientalis	Hyacinth
Impatiens hybrid	Impatiens
Pelargonium peltatum	Ivy geranium
Crassula argentea	Jade plant
Kalanchoe blossfeldiana	Kalanchoe
Brassica oleracea var. sabellica	Kale
Cyperus papyrus	King tut cyperus
Lavandula angustifolia	Lavender
Liatris spicata	Liatris
Helichrysum species	Licorice vine
Tagetes spp.	Marigold
Salvia nemorosa	Meadow sage
Mentha	Mint
Liriope muscari	Monkey Grass
Araucaria heterophylla	Norfolk Island Pine
Origanum vulgare	Oregano
Viola wittrockiana	Pansy
Petroselinum crispum	Parsley
Spathiphyllum floribundum	Peace lily
Paeonia sp.	Peony
Strobilanthes atropurpureus	Persian shield
Petunia X hybrida	Petunia
Phalaenopsis	Phalaenopsis
Hosta x hybrida	Plantain Lily
Euphorbia pulcherrima	Poinsettia
Maranta leuconeura var. kerchoviana	Prayer Plant
Echinacea purpurea	Purple coneflower
Pennisetum setaceum 'Rubrum'	Purple fountain grass
Rosmarinus officinalis	Rosemary
Perovskia atriplicifolia	Russian Sage
Heptapleurum arboricola	Schefflera
Sedum species	sedum

Oxalis articulata	Shamrock plant
Leucanthemum superbum	Shasta daisy
Artemisia schmidtiana	Silver Mound
Antirrhinum majus	Snapdragon
Spinacia oleracea	Spinach
Dieffenbachia maculata	Spotted dumb cane
Asparagus densiflorus 'Sprengeri'	Sprengeri "fern"
Fragaria x ananassa	Strawberry
Dracaena deremensis 'Warneckii'	Striped dracaena
Helianthus annuus	sunflower
Lobularia maritima	Sweet alyssum
Ipomea batatas	Sweet potato vine
Thymus vulgaris	Thyme
Coreopsis grandiflora	Tickseed
Solanum lycopersicum	Tomatoes
Begonia x tuberhybrida cv.	Tuberous Begonia
Tulipa spp.	Tulip
Verbena stricta	Verbena
Vinca minor	Vinca
Tradescantia zebrina	Wandering dude/ inch plant
Begonia X semperflorens-cultorum	Wax begonia
Achillea millefolium	Yarrow
Miscanthus sinensis	Zebra Grass
Zinnia elegans	Zinnia
Pelargonium X hortorum	Zonal geranium

Mark both common and scientific names for each of the 25 specimens on the scoresheet.

PHASE 3 -GREENHOUSE PROBLEMS LIST

Students will identify the problem from the following list of pests, diseases and cultural disorders and record on a scantron.

Students will also identify a possible solution from the list provided and record on a scantron.

Identification of each problem and control recommendations will be worth 10 points for each plant (if 10 plants given).

Insect and Pest Infestations

two-spotted spider mites
aphids
mealybugs
white flies
thrips
fungus gnats
scale

Fungus and Disease Infections

Botrytis gray mold
Rhizoctonia/Pythium/Thielaviopsis root rot/damping-off
Fungal leaf spot
Powdery mildew
Downy mildew
Tomato spotted wilt virus
Rust
Bacterial wilt

Cultural or Physiological Problems

Over watering
Under Watering
Over fertilization
Iron Deficiency
Manganese Deficiency
Phosphorous Deficiency
Blossom Rot
Nitrogen deficiency
Pesticide Toxicity
Low Temperature Injury
Excessive light intensity
Inadequate light intensity

Possible Solutions or Corrective Actions

beneficial insect
fungicide application
alter watering practices
discard all infected plants
increase fertilization
decrease fertilization
increase relative humidity
decrease relative humidity
increase air temperature
adjust pH
adjust lighting

PHASE 4 - GREENHOUSE PRACTICUM STUDY SHEET

Contestants will demonstrate common greenhouse crop production skills and techniques. Possible activities are listed below. A standardized scoring sheet would be developed and used for each practicum.

- A. Asexual Propagation
 - 1. Given a vegetative stock plant and various types of rooting media, demonstrate how to take cuttings, treat them with rooting hormone and place them in the rooting media.
 - 2. Outline the Key cultural conditions for rapid rooting of the cutting including how long it should take for the cutting to root.
 - 3. Know the difference between direct stick, layering, budding, grafting, runner, leaf section, soft wood and hardwood, stem tip and stem section methods and rooting for later transplanting this may be from photographs or live plant material.
- B. Sowing and Germination of Seed
 - 1. Given necessary supplies and equipment demonstrate how to sow seeds in an open flat.
 - 2. Outline the key cultural conditions for rapid germination including how long it should take. Discuss the advantages and disadvantages of sowing seeds in plug trays vs. open flats.
 - 3. What are the 4 phases of seed germination commonly referred to in plug production.
 - 4. Be able to quickly distinguish between a 128, 288, 338, 406, 512, and 800 cell plug tray.
 - 5. Timing for planting to ensure that plants are marketable on the appropriate date.
- C. Potting, Planting, or Transplanting of Major Crops.
 - 1. Demonstrate or identify the correct planting techniques for a five cuttings per six-inch diameter pot of plants. May be for rooted or unrooted cuttings.
 - 2. Demonstrate or Identify proper planting for plants. Some examples might be rooted plugs, bare root or cuttings.
- D. Pinching, Pruning and Shearing of plants for Lateral Branching
 - 1. Given one or more pots of plants, demonstrate or identify the difference between a hard pinch, soft pinch, thinning, disbudding, deadheading and heading cuts.
 - 2. Demonstrate, identify or explain how a predetermined number of lateral branches can be obtained using correct pinching methods.
 - 3. Demonstrate identify or explain how variability in initial plant size can be corrected using proper pinching methods.
- E. Plant grading
 - 1. Students will rank plant material on a scale of 1-4, with one being the best representation of an industry standard of that plant. Students will evaluate the following types of plants: herbaceous annual, vegetable/herb, perennial, house plant. Plant material can be photos or living materials.

Tie Breakers:

- 1. General Knowledge Exam
- 2. Identification of Plant Material

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