APPENDIX-I

TOPIC: RELATIVE EFFECTIVENESS OF SELECTED EXTENSION TEACHING METHODS IN IMPARTING KNOWLEDGE ABOUT HYBRID SEED PRODUCTION TECHNOLOGY IN SUNFLOWER TO THE AGRICULTURAL DEVELOPMENT OFFICERS OF PUNJAB STATE

SCHEDULE

Sr.No.  Date of filling: _____

**PART-I: BIO-DATA**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Details</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Name</td>
<td>___________________________________________</td>
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<tr>
<td>2.</td>
<td>Designation</td>
<td>___________________________________________</td>
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<td>3.</td>
<td>Age (years)</td>
<td>___________________________________________</td>
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<tr>
<td>4.</td>
<td>Educational qualifications</td>
<td>___________________________________________</td>
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<td>5.</td>
<td>Area of specialization</td>
<td>___________________________________________</td>
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<td>6.</td>
<td>Place of posting</td>
<td>___________________________________________</td>
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<td>7.</td>
<td>Professional experience</td>
<td>___________________________________________</td>
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<tr>
<td></td>
<td>Designation</td>
<td>From</td>
</tr>
<tr>
<td></td>
<td>(a)</td>
<td>_______</td>
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<td></td>
<td>(b)</td>
<td>_______</td>
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<td></td>
<td>(c)</td>
<td>_______</td>
</tr>
<tr>
<td></td>
<td>(d)</td>
<td>_______</td>
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8. Do you belong to:
   (a) Rural area ____________________________________________
   (b) Urban area ____________________________________________
9. Marital status

Married
Unmarried
Widowed
Divorced

10. How often do you expose yourself to the following mass media in order to improve your farm knowledge?

<table>
<thead>
<tr>
<th>Exposure frequency</th>
<th>Regularly</th>
<th>Sometimes</th>
<th>Never</th>
</tr>
</thead>
</table>

(a) Farm radio broadcast
i) ________  ________  ________  ________
ii) ________  ________  ________  ________
iii) ________  ________  ________  ________

(b) Farm telecast
i) ________  ________  ________  ________
ii) ________  ________  ________  ________

(c) With what frequency do you read the following
i) Package of practices for rabi and kharif crops
   ________  ________  ________  ________

ii) Agriculture related magazines (please specify)
   ________  ________  ________  ________
### PART-II

**KNOWLEDGE TEST OF HYBRID SEED PRODUCTION OF SUNFLOWER**

I. Hybridization of Sunflower

Following are the general statements of hybridization of sunflower. State whether the statements are true or false. Please put (T) if the statement is true and (F) if the statement is false.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Statement</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Sunflower is a self-pollinated crop</td>
<td></td>
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<tr>
<td>b)</td>
<td>Hybrids are produced in $F_1$ generation after crossing</td>
<td></td>
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<tr>
<td>c)</td>
<td>Hybrids have more production stability</td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>Homozygosity is maximum in $F_1$ generation</td>
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<tr>
<td>e)</td>
<td>Hybrids are superior in their seed filling ability</td>
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<tr>
<td>f)</td>
<td>Hybrids are comparatively less self-fertile</td>
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<td>g)</td>
<td>The crop stand and harvested produce is uneven in case of hybrids</td>
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<td>h)</td>
<td>Hybrids are more tolerant to diseases and pests</td>
<td></td>
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<tr>
<td>i)</td>
<td>Hybrids can withstand drought much better than open-pollinated varieties</td>
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<tr>
<td>j)</td>
<td>Hybrids are well suited for input-intensive agriculture</td>
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</tbody>
</table>

II. Development of Inbred Lines

In each of the following statements, alternatives are given. Tick (√) the correct one.

a) The development of inbred lines involves selection of individual plants from:

   i) Open-pollinated cultivars  
   ii) Gene-pools  
   iii) Planned crosses  
   iv) All the three
b) The plants which are selfed at the time of flowering are phenotypically:
   i) Same
   ii) Superior
   iii) Inferior

c) The selection of plants for diseases resistance and other agronomic characters is made at the time:
   i) Within 15 days of sowing
   ii) Flowering stage
   iii) Seed-setting stage
   iv) Harvesting stage

d) The number of generations of inbreeding required before testing the lines for combining ability are:
   i) 5-6
   ii) 7-8
   iii) 8-10
   iv) 11-12

III. Evaluation and Conversion of Inbred Lines

Fill in the blanks:

a) In sunflower breeding _______ test has been used for evaluating inbred lines.

b) The inbred lines which have _______ combining ability are converted into CMS (cytoplasmic male sterile) and restorer lines.

c) _______ method is used to develop cytoplasmic male sterile lines.

d) Fertility restorer lines incorporate _______ restorer gene in the plants.

e) A third line which is grown to maintain the fertility of the CMS line is known as _______ line.
IV. Procedure for hybrid seed production

1. The sowing season for hybrid seed production of sunflower is:
   
   Khartff crop
   
   Rabi crop

2. A space isolation of about ___ metres must be maintained.

3. A spacing of ___ cm between the rows and ___ cm between plants should be provided.

4. About ___ kg of CMS (female) line and ___ kg of restorer (male) line should be used ___ per acre.

5. The proportion of female : male ratio should be kept as _____.

6. The pollination of sunflower crop is mainly carried out by _______.

7. To avoid the contamination of foreign pollens the following heads are ___.

8. To ensure one healthy seedling per hill ____ seeds are dibbled per hill and thinning is done after 100-15 days.

   In case of following statements, alternatives are given. Tick (✓) the correct one.

V. Crossing Techniques

1. Emasculation is the process of removing:
   a) Female parts of a flower
   b) Male parts of a flower
   c) Both male and female parts
   d) Neither male nor female parts

2. Emasculation is carried out at the time of:
   a) Morning
   b) Noon
   c) Evening
   d) Night
3. The flowers which are not emasculated:
   a) are removed from head before fertilization.
   b) are removed from head after fertilization
   c) are retained on head till fertilization
   d) are not removed from head even after fertilization
4. Which of the following techniques is used for making crosses in sunflower:
   a) Hand-emasculcation
   b) Making cross without emasculation
   c) Chemical induction of male sterility
   d) All the three
5. The chemical used for inducing male sterility is:
   a) Abscisic acid (ABA)
   b) Cytokinins
   c) Gibberellic acid (GA)
   d) Auxins
6. What is the concentration of chemical used for inducing male sterility:
   a) 50 ppm
   b) 80 ppm
   c) 100 ppm
   d) 120 ppm
7. To avoid the contamination in pollination, the hands must be wiped after each cross with:
   a) Alcohol
   b) Water
   c) Acetone
   d) Sodium bicarbonate