

**ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2019
EXAMINATION CATEGORY: TECHNICAL**

PAPER III: SUBJECT SPECIALISATION PAPER FOR HORTICULTURE

Date	: October 13, 2019
Total Marks	: 100
Writing Time	: 150 minutes (2.5 hours)
Reading Time	: 15 minutes (prior to writing time)

GENERAL INSTRUCTIONS:

1. Write your Registration Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is to check the number of pages of Question Paper, printing errors, clarify doubts and to read the instructions. You are NOT permitted to write during this time.
3. This paper consists of **TWO SECTIONS**, namely SECTION A & SECTION B:
 - **SECTION A** has two parts: Part I - 30 Multiple Choice Questions
Part II - 4 Short Answer Questions
All questions under SECTION A are COMPULSORY.
 - **SECTION B** consists of two Case Studies. Choose only **ONE** case study and answer the questions of your choice.
4. All answers should be written on the Answer Booklet provided to you. Candidates are not allowed to write anything on the question paper. If required, ask for additional Answer Booklet.
5. All answers should be written with correct numbering of Section, Part and Question Number in the Answer Booklet provided to you. Note that any answer written without indicating the Section, Part and Question Number will NOT be evaluated and no marks will be awarded.
6. Begin each Section and Part in a fresh page of the Answer Booklet.
7. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
8. Use of any other paper including paper for rough work is not permitted.
9. **You are required to hand over the Answer Booklet to the Invigilator before leaving the examination hall.**
10. This paper has **8 printed pages**, including this instruction page.

GOOD LUCK

SECTION A

PART I: Multiple Choice Questions (30 marks)

Choose the correct answer and write down the letter of your chosen answer in the Answer Booklet against the question number e.g. 31 (d). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

1. Three mechanisms in Operation in the Soil-Water-Plant System are
 - i. The contact exchange and root Inception
 - ii. Mass flow or convection
 - iii. Osmosis
 - iv. Diffusion
 - a) I, III and IV
 - b) IV, III and II
 - c) III, II and I
 - d) I, II and IV

2. The major disease of cut flower after the harvest is
 - a) Wilting
 - b) Fungal
 - c) Botrytis
 - d) Molasse

3. Ethylene exposure causes aging of the cut flowers. To avoid ethylene exposure, the cut flowers need to be treated with
 - a) Zinc thiosulphate
 - b) Copper thiosulphate
 - c) Sugar thiosulphate
 - d) Silver thiosulphate

4. TSS content is one of the most important maturity indices in horticultural crops. Which equipment is used for measuring TSS content?
 - a) Refractometer
 - b) Penetrometer
 - c) TSS meter
 - d) PH Meter

5. The berry producing horticultural plants are known as
 - a) Berryferous plants
 - b) Mulberryferous plants
 - c) Bacciferous plants
 - d) Bulberrous plants

6. Self-pollination in plants can be avoided through the removal of anthers of a flower. Which term best describes the above method?
 - a) Vasectomy
 - b) Emasculation
 - c) Demasculation
 - d) Floral basculation

7. The ancient art of training and clipping hedges and trees into fancy shapes are known as
 - a) Traditional arts
 - b) Bonsai
 - c) Topiary
 - d) Shaping art

8. According to past records and history, George Boggle, a representative of the East India Company, planted _____ crop in every place he stopped on his journey to Bhutan and Tibet in 1774-75. Which crop are we talking about?
 - a) Chilli
 - b) Maize
 - c) Potato
 - d) Apple

9. Which of the following horticultural crop is NOT a CAM Plant?
 - a) Pineapple
 - b) Banana
 - c) Orchids
 - d) Jade plant

10. In bisexual flowers, Gynoecium and Androecium matures at different times. When Gynoecium matures earlier than Androecium, it is called
 - a) Protogamy
 - b) Heterogamy
 - c) Autogamy
 - d) Protandry

11. Which of the following is highly specialized vegetable gardening?
 - a) Vegetable Truck Gardening
 - b) Vegetable Floating Garden
 - c) Vegetable Forcing
 - d) Vegetable Market Gardening

12. Which of the following chemical is used in de-greening of fruits and is not advised to use in cold stores?
 - a) Ethylene
 - b) Ammonia
 - c) Carbide
 - d) Sulphur

13. Based on photoperiodism, plants are classified as Short-day Plants, Long-day Plants and Day-neutral Plants. Which of the following horticultural crop is day neutral crop?
- Pisum sativum
 - Lactuca sativa
 - Cucumis sativus
 - None of the above.
14. Flower business is increasingly gaining popularity in Bhutan because of yearly Royal Bhutan Flower Exhibition and we see lots of scopes for up-scaling flower production in the country for air-freight markets. Where do you think you will find the largest flower market in the world?
- Amsterdam, Netherlands
 - Aalsmeer, Netherlands
 - Washington DC, USA
 - Florida, USA
15. Prevalence of major disease in horticultural crop has huge economic losses. A mango farmer needs to judiciously carryout disease management practices to control the following diseases EXCEPT
- Colletotrichum gloeosporioides
 - Lasiodyplodia theobromae
 - Oidium mangiferae
 - Drosophila melanogaster
16. What is the seed rate for chilli in Bhutanese condition?
- 0-0.5 Kg/Acre
 - 1-2 Kg/Acre
 - 0.5 to 1.5 Kg/Acre
 - None of the above.
17. Who wrote the book on WEEDS OF BHUTAN?
- Dr. C.T Dorji
 - Father Mackey
 - Chris Parker
 - Pema Dorji
18. In which Dzongkhag was the 5th Royal Bhutan Flower Exhibition held?
- Paro
 - Punakha
 - Samdrupjongkhar
 - Thimphu
19. Which of the following is edible wild mushroom?
- Amanita rubrovolvata*
 - Russula emetica*
 - Cantharellus cibarius*
 - Russula fragrantissima*

20. _____ is responsible for transmitting citrus greening virus.
- Nematodes
 - Psyllid
 - Citrus whitefly
 - Bees
21. Which of the following chemicals should NOT be used in Organic Agriculture?
- Neem oil
 - Sulphur sprays
 - Dolomite sprays
 - Lead sprays
22. The term hydroponics was derived by _____.
- Boyle
 - Lincoln
 - Setchell
 - Mackey
23. Which of the following crop is known as queen of the spices?
- Ginger
 - Black pepper
 - Turmeric
 - Cardamom
24. Blossom end rot is caused due to the deficiency of which nutrient?
- Cu
 - Ca
 - Na
 - Zn
25. The pungency in onion is due to the presence of compound with chemical formula:
- $C_3H_5S_2C_3H_7$
 - $C_3H_5S_2C_3H_8$
 - $C_3H_5S_2C_3H_9$
 - $C_3H_5S_2C_3H_{10}$
26. Which of the following variety is used as a pollinizer variety in commercial production of *Malus domestica* in Bhutan?
- Golden delicious
 - Red delicious
 - Royal delicious
 - None of the above.

27. The progeny of crosses between different varieties of plant species usually exhibit greater biomass and fertility than either parent. This phenomenon is called _____.
- Mutation
 - Superiority
 - Heterosis
 - Hybridization
28. Researchers have identified 15 vulnerable medical plant species of high-altitude fragile ecosystems of the Himalayas. Which of the following medical plants are identified as vulnerable?
- Meconopsis simplicifolia*
 - Fritillaria delavayi* F.
 - Nardostachys grandiflora*
 - All of the above.
29. Which of the following is correctly matched?
- Mango - Pome fruit
 - Tomato - *Lycopersicon tuberosum*
 - Banana - Monoecious
 - Chilli - Coppices
30. The Chromosome number in *Tagetes erecta* is _____.
- $2n=24$
 - $4n=48$
 - $2n=36$
 - $4n=24$

PART II – Short Answer Questions (20 marks)

This part has 4 Short Answer Questions. Answer ALL the questions. Each question carries 5 marks.

- What is Relay Cropping? Define two different types of relay cropping in horticulture. Write two advantages of relay cropping.
- Classify fruits based on climatic requirement and also based on ripening behavior. Give one example each for classification based on ripening behavior.
- What is cryo-preservation? What is the most common temperature maintained in cryo-preservation process? Which gas liquid is used? Give two advantages of cryo-preservation.
- What is unfruitfulness in fruit trees? Describe four different causes of unfruitfulness.

SECTION B: Case Study (50 marks)

Choose either CASE I or CASE II from this section. Each case study carries 50 marks. Mark for each sub-question is indicated in the brackets.

CASE I

“Bhutan’s economy is largely dependent on hydropower and tourism industry. The need for economic diversification is increasingly seen as being important to generate revenue and create employment opportunities. Diversifying economy in any country is touted as a standard prescription to cure problems of development ailments such as sustainability issues and joblessness in the country. The Enterprise Development in horticulture is seen as one of the potential sectors which can be taken up for economic diversification”. In connection to the above case, answer the following questions:

1. Identify three temperate fruit crops which can be taken up as a part of horticultural enterprise development program in Bhutan. Write five reasons/basis for choosing those horticultural crops for enterprise development/commercialization? Name two value added products each for your selected horticultural commodities. (10 marks)
2. Write how your proposed enterprise will create employment opportunities and contribute towards import substitution in the country? (10 marks)
3. Describe five climate challenges in enterprise development in horticulture or horticulture commercialization in the country? Describe in brief, five means/ways to either adapt or mitigate climate change issues. (10 marks)
4. Write down production technology for one of your selected horticultural crops in respect to:
(20 marks)
 - a) Climate
 - b) Elevation
 - c) Planting distance
 - d) Planting system
 - e) Varieties
 - f) Soil pH requirements
 - g) Nutrient Management
 - h) Major diseases
 - i) Maturity Indices
 - j) Post-harvest management

CASE II

A Citrus farmer, Mr. Singye from Tsirang is planning to diversify his cropping system and he is genuinely interested to venture into organic kiwi cultivation. He has approached you for your advice on developing a concept note for his project. He is also interested to follow the principles of Good Agricultural Practices in his farm and requires technical advice from a horticulturist.

1. Develop a brief concept note for his organic kiwi farming project. Your project concept note structure should consist of a good outline to attract any funding agencies. (20 marks)
2. What is crop diversification? Write four advantages of crop diversification. (5 marks)
3. Describe training system in kiwi fruit orchard in organic kiwi cultivation. Describe in details the principles of organic agriculture and three principles of Good Agricultural Practices. (19 marks)
4. Root rot is one of the major diseases in kiwi fruit. This disease can be controlled using Bordeaux mixture. Describe how 1% Bordeaux mixture is prepared. (6 marks)

TASHI DELEK