ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2022
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALISATION PAPER FOR AGRICULTURE

Date	: October 9, 2022
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 on 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 must hand over the Answer Booklet to the Invigilator before leaving the examination hall.**
10. This paper has **7 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. Wind velocity at any given point in time is measured by:
   a) Barometer
   b) Altimeter
   c) Anemometer
   d) Odometer

2. Which one of the following is **NOT** an agronomic erosion prevention method?
   a) Contour Bunding
   b) Tillage
   c) Contour Cultivation
   d) Mulching

3. A market phenomenon where a small change in the price of a commodity leads to considerable extension/contraction of demand is known as
   a) relatively elastic demand.
   b) perfectly inelastic demand.
   c) unitary elastic demand.
   d) relatively inelastic demand.

4. Which is the progeny of nucleus seed of a variety and is produced by the originating breeder?
   a) Foundation seed
   b) Certified seed
   c) Nucleus Seed
   d) Breeders Seed

5. Which one of the following is not mineral plant nutrient?
   a) Nitrogen
   b) Carbon
   c) Potash
   d) Phosphorus

6. Dragon fruit is released as_____ in Bhutan?
   a) Zhimpeykotong Sep
   b) Gewaringpa 1
   c) Soekham Drukchu
   d) Zhimpeykotong Phosing

7. The new potato variety released in 2022 from NCOA- Yusipang is _____.
   a) Yusi Maap 2
   b) Desiree
   c) Nasephey Kewa Kaap
   d) Yusi Maap

8. Which agency in Bhutan is designated as the National Plant Protection Organization by International Plant Protection Convention (IPPC)?
   a) National Plant Protection Centre (NPPC)
   b) National Seed Centre (NSC)
   c) Bhutan Agriculture and Food Regulatory Authority (BAFRA)
   d) National Biodiversity Centre (NBC)

9. As per the National Plant Protection Centre (NPPC), _____of agricultural land was brought under electric fencing in the financial year 2020-2021.
   a) 580.64 km
   b) 4251.30 km
   c) 2566.00 km
   d) 620.70 km

10. Who is the current Secretary of Ministry of Agriculture & Forests?
   a) Dasho Rinzin Dorji
   b) Dasho Thinley Namgyel
   c) Dasho Sherub Gyaltshen
   d) Dasho Tenzin Dhendup

11. Inbreeding in cross pollinated crops increases due to_____.
   a) population mean
   b) homozygosity
   c) heterozygosity
   d) polyploidy

12. The degree to which a chemical is poisonous to the insect/pathogen is its
   a) lethal dose
   b) toxicity
   c) hazard rating
   d) kill value

13. What is the largest plant cell?
   a) Prenchyma cells
   b) Sieve tube cells
   c) Sclerenchyma fibres
   d) Xylem vessel cell

14. The fruit which develops only from the ovary after fertilization are called
   a) parthenocarpic fruits.
   b) apomictic fruits.
   c) true fruits.
   d) false fruits.

15. Match the following research centers and their location correctly.

A. National Citrus Repository	I. Chungdudingkha, Paro
B. National Soil Service Centre	II. Bondey, Paro
C. National Post Harvest Centre	III. Menchuna, Tsirang
D. Agriculture Machinery Training Centre	IV. Semtokha, Thimphu

a) (A-II), (B-IV), (C-III), (D-I)
b) (A-III), (B-IV), (C-II), (D-I)
c) (A-I), (B-III), (C-II), (D-the)
d) (A-IV), (B-II), (C-IV), (D-I)

16. The Bhutanese Journal of Agriculture (BJA) Volume 1 Issue I was first published in _____.
a) 2016
b) 2017
c) 2018
d) 2019

17. Bordeaux mixture was discovered by:
a) E.J. Butler
b) P.M.A. Millardet
c) M.Tillet
d) H.A. deBary

18. If equilibrium population level of a crop damaging insect is above the economic injury level, it is a _____.
a) potential pest
b) not a pest
c) sporadic pest
d) regular pest

19. The Aroma in the ripe fruit of apple is due to
a) Ethyl-2-methyl butyrate.
b) Eugenol.
c) Hexanol.
d) Isopentanol.

20. Which of the following organism is used in the preparation of vermicompost?
a) actinomycetes
b) azotobacter
c) eisenia foetida
d) rhizobium sps.

21. As per the Population and Housing Census of Bhutan (PHCB) 2017 _____ of Bhutanese households reported to have experienced food insufficiency during the 12 months prior to the census.
    a) 12.6%
    b) 8.1%
    c) 6.2%
    d) 2.9%

22. How many ATP are **consumed/used** in glycolysis to produce 4 ATP and 2 NADH molecules?
    a) 1 ATP
    b) 2 ATP
    c) 3 ATP
    d) None of the above

23. What is the optimum N:P: K ratio for balanced fertilizer use in most of the crops?
    a) 6:4:2
    b) 6:2:1
    c) 4:4:2
    d) 4:2:1

24. Bacterial wilt of Solaneceous crop is caused by:
    a) Ralstonia solanacearum
    b) Pectobacterium atrosepticum
    c) Erwinia carotovora
    d) Xanthomonas campertris pv. Campetris

25. The botanical form of kiwi fruit is_____.
    a) Drupe
    b) Berry
    c) Pome
    d) Nut

26. Synapsis between homologous chromosome occurring during the _____stage of the prophase of meiosis.
    a) Diplotene
    b) Leptotene
    c) Zygotene
    d) Pachytene

27. Potato tuber is scientifically called as
    a) underground stem.
    b) rhizome.
    c) root.
    d) seed.

28. A breeding method in self-pollinated crops where many desirable plants of similar phenotypes are selected, and their seeds are mixed to constitute new variety is known as
    a) pure line selection.
    b) mass selection.
    c) pedigree selection.
    d) backcross selection.

29. Based on the Poverty Analysis Report (PAR) 2017, using the updated poverty line, an estimate of _____ _____of the Bhutanese population are found to be poor?
    a) 12%
    b) 11.9%
    c) 8.2%
    d) 2.8%

30. The farm equipment that completes both harvesting and threshing in one pass is called
    a) reaper.
    b) combiner.
    c) harvester.
    d) mower.

PART II – Short Answer Questions [20 marks]

This part has 3 short answer questions. Answer ALL the questions. Marks against each question is indicated in the bracket.

1. What is food and nutritional security? What are the four dimensions of food and nutritional security? In your opinion, what is the current status of food and nutritional security in Bhutan and how can Bhutan achieve food and nutritional security? **(2+2+3 Marks)**

2. What causes citrus greening in Bhutan? Explain the problem, casual organism (biology), symptoms, and management practices? **(6 Marks)**

3. What is protected agriculture and why it is important for horticulture development in Bhutan? Define hydroponic, aeroponics and list down some of the major differences? **(3+4 Marks)**

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

Agroecological principles can contribute to creating a more sustainable, socially just, and secure global food system. Agroecological concepts and principles embrace a wide range of practices and have broad scope for implementation. This means that they have considerable resonance with other concepts, principles, and practices in the field of sustainable agriculture that also offer alternative structures to the mainstream paradigm of industrial agriculture.

1. What do you understand by agroecology and explain the five major properties of agroecology? **(15 Marks)**

2. What do you understand by organic agriculture and explain how is the concepts of organic agriculture different or similar to the principles of agroecology? **(15 Marks)**

3. The agriculture sector in Bhutan is under immense pressure to make Bhutan food secure, hence considering this explain how is the concepts of agroecology considered in the current system of Bhutanese agriculture and will it help Bhutan to enhance its food security? **(20 Marks)**

CASE II

Global agriculture system has been changing drastically since the early domestication of plants and animals about 10000 years ago. This change has been consistent with parallel development in other sectors leading to various innovation and advancement within the sector. Similarly, the agricultural system in Bhutan has been changing since time unknown and further catalysed by planned agriculture development after 1960s. In this context answer the following questions:

1. Identify six major drivers of change that brings about the paradigm shift in agriculture sector in Bhutan. Explain in detail including challenges and opportunities. **(30 Marks)**

2. To address challenges of agriculture development, the global agricultural communities have come up with many innovations and interventions such as precision farming. Identify and detail at least four major innovations in modern agriculture and explain its implementations in Bhutan? **(20 Marks)**

TASHI DELEK