ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2023
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALISATION PAPER FOR AGRICULTURE

Date	: October 7, 2023
Total Marks	: 100
Writing Time	: 150 minutes (2.5 hours)
Reading Time	: 15 Minutes (prior to examination time)

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GENERAL INSTRUCTIONS:

1. Write your Registration Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is being provided to check the number of pages of the 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 - 2 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 correct 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. Push-pull technology is a sustainable pest management strategy used to control pests and improve crop yields. Which of the following best describes the strategy?
   a) A method of using chemical repellents to push pests away from the main crop.
   b) A strategy of intercropping plants to pull nutrients from the soil and push them to the main crop.
   c) An approach involving the use of trap crops to attract and concentrate pests away from the main crop.
   d) A process of physically pushing pests off the leaves of the main crop to prevent damage.

2. Which soil ameliorants are used in sodic soil reclamation which is cheaper and easily available?
   a) Lime
   b) Gypsum
   c) Ammonium Nitrate
   d) Ammonium Sulphate

3. Which of the following is a micronutrient essential for chlorophyll synthesis in plants?
   a) Iron (Fe)
   b) Magnesium (Mg)
   c) Phosphorus (P)
   d) Sulfur (S)

4. Which of the following taxonomic levels in the correct hierarchical order, starting from the broadest category to the most specific?
   a) Genus, Family, Order, Class, Kingdom, Phylum, Species, Domain
   b) Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species
   c) Species, Family, Order, Class, Kingdom, Genus, Phylum, Domain
   d) Domain, Phylum, Kingdom, Order, Genus, Family, Class, Species

5. The process when a plant is propagated using small tissue or part of plant is termed as:
   a) Sexual Propagation
   b) Micro Propagation
   c) Hybridization
   d) Somatic hybridization

6. In which of the following seed storage conditions, the longevity of the seeds would be maximum?
   a) Normal ambient storage
   b) Moisture proof storage
   c) Dehumidified with low temperature (5 - 8°C) storage
   d) Dehumidified storage only

7. Rice inflorescence has got _____ number of stamens?
   a) Three (3)
   b) Four (4)
   c) Five (5)
   d) Six (6)

8. Which of the following agency is mandated to provide third-party certification for organic agriculture in Bhutan?
   a) Bhutan Agriculture and Food Regulatory Authority
   b) National Plant Protection Centre
   c) National Centre for Organic Agriculture
   d) National Soil Service Centre

9. One molecule of glucose contains _____ of energy.
   a) 686 K cal
   b) 343 K cal
   c) 40 K cal
   d) 12 K cal

10. Which one of the following is the correct sequence of stages of mitosis in the cell cycle?
    a) Interphase, Prophase and Metaphase
    b) Interphase, Prophase and Anaphase
    c) Prophase, Telophase and Anaphase II
    d) Prophase I, Metaphase I and Telophase II

11. What does FSAPP stand for?
    a) Food Sufficiency and Agriculture Production Project
    b) Food Security and Agriculture Productivity Project
    c) Food Self-sufficiency and Agriculture Production Project
    d) Food Self-reliant and Agricultural Productivity Project

12. Interveinal chlorosis and whitening of leaves are the characteristic features of:
    a) Nitrogen deficiency
    b) Zinc deficiency
    c) Iron deficiency
    d) Phosphorous deficiency

13. Which of the following is not under the Ministry of Agriculture and Livestock?
    a) Department of Agricultural Marketing and Cooperatives
    b) National Biodiversity Centre
    c) Department of Forest
    d) Department of Livestock

14. During the 25th Variety Release Committee (VRC) meeting, the Department of Agriculture released a variety of Black pepper in the name of _____.
    a) SamtenlingMarij -1
    b) Samtenling Na-le-sham 1
    c) SamtenlingYungwaMaap
    d) Samtenling pepper 1

15. Which of the following agricultural practices is aimed at increasing carbon sequestration in the soil and vegetation to mitigate climate change?
    a) Intensive tillage for better soil aeration
    b) Frequent crop residue burning after harvest
    c) Planting cover crops during fallow periods
    d) Applying excessive synthetic fertilizers for higher yields

16. If a linear relation exists between the variable X and Y, then the coefficient of correlation between them will be:
    a) Infinite
    b) Zero
    c) One
    d) Two

17. ELISA can be used to measure the concentration of important nutrients in the soil, such as nitrogen, phosphorus, and potassium. What is the full form of ELISA?
    a) Enzyme-Linked Immunosorbent Assay
    b) Enzyme-Linked Immunodeficiency Syndrome Assay
    c) Electrochemical Laboratory In Situ Analysis
    d) Enzymatic Long-term Immunity Screening Approach

18. In agricultural research, what does the p-value represent in hypothesis testing?
    a) The strength of the relationship between two test variables
    b) The validity of the null hypothesis for the agricultural experiment
    c) The effect size of the agricultural intervention or treatment
    d) The variability of data points in the dataset

19. As per the Cost of Production (CoP) for Field and Horticulture Crops in Bhutan 2020, the CoP of Mid-altitude paddy is _____.
    a) 38
    b) 39
    c) 40
    d) 41

20. The enzyme secreted by embryo of seeds which induces germination process is:
    a) Auxin
    b) Gibberellin
    c) Cytokinin
    d) Ethylene

21. What does "Absolute Advantage" refer to in agricultural economics?
    a) The ability of a country to produce a specific agricultural product more efficiently and at a lower cost than another country.
    b) The willingness of a country to engage in international trade for agricultural products.
    c) The overall self-sufficiency of a country in agricultural production.
    d) The total agricultural output of a country compared to its neighboring countries.

22. Which classes of pesticides are permitted for use in Bhutan, according to the World Health Organization (WHO) Hazard classification system?
    a) Class I only
    b) Class II only
    c) Class III only
    d) Class II and III

23. The 17th nutrient added to the list of essential elements is:
    a) Nickel
    b) Molybdenum
    c) Chlorine
    d) Boron

24. What is the optimum temperature for tuberization in potato?
    a) < 20 °C
    b) 20-25 °C
    c) 25-30 °C
    d) 30-35 °C

25. Close Breeding and Line Breeding are the type of which one of the following?
    a) Grading up
    b) Remote breeding
    c) Inbreeding
    d) Out Breeding

26. Bhutan is one of the members of ICIMOD? What does the acronym "ICIMOD" stand for?
    a) International Centre for Irrigation Management and Organizational Development
    b) Integrated Crop Improvement and Mountain Observational Database
    c) International Coalition for Indigenous Mountain Outreach and Development
    d) International Centre for Integrated Mountain Development

27. Based on the consensus of the 9th National Climate Outlook Forum (NCOF), the rainfall forecasted for the monsoon JJAS 2023 in Bhutan is:
    a) Normal
    b) Slightly above normal
    c) Slightly below normal
    d) Cannot forecast

28. What is the primary purpose of training grapevines in a vineyard?
    a) To reduce the height of the grapevines for easy harvesting.
    b) To create a well-organized and balanced vine canopy.
    c) To prevent the spread of diseases in the vineyard.
    d) To increase the number of lateral shoots on the grapevines.

29. Plant-based protein alternatives have gained popularity due to
    a) lower cost compared to animal-based proteins.
    b) their ability to be stored for long periods without refrigeration.
    c) increased demand for sustainable and healthier food choices.

d) their ability to provide a wider range of essential amino acids than animal-based proteins.

30. Aflatoxin contamination in stored maize is a major issue. Which fungus is primarily responsible for producing aflatoxins?
    a) *Penicillium chrysogenum*
    b) *Rhizopusstolonifer*
    c) *Aspergillus flavus*
    d) *Fusarium oxysporum*

PART II – Short Answer Questions [20 marks]

This part has 2 Short Answer Questions. Answer ALL the questions. Each question carries 10 marks. Mark for each sub-question is indicated in the brackets.

1. Define remote sensing? What does GIS and GPS stand for? Explain the application of remote sensing and GIS in agriculture? **(2+2+6 marks)**

2. Define regenerative agriculture and conservation agriculture? Explain their key principles and benefits, focusing on soil health, environmental sustainability, and climate change mitigation. Provide an example of practices from both systems that promote long-term agricultural productivity while minimizing environmental impacts. **(3+5+2 marks)**

SECTION B: CASE STUDY [50 marks]

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

CASE I

Gender inequality has long been a prevalent issue in agriculture, rooted in patriarchal norms. However, over the years, various policies, and international frameworks have recognized the importance of addressing gender differences in agriculture. The United Nations' Sustainable Development Goals (SDGs), particularly Goal 5 (Gender Equality) and Goal 2 (Zero Hunger), emphasize the need to promote gender equality in the agricultural sector to achieve food security and sustainable development.

1. Define gender equality in agriculture and what are the challenges faced by woman in participation and advancement in the agriculture sector? **(5+10 marks)**

2. What are the key challenges in promoting gender equality in Bhutan's agriculture sector? **(15 marks)**

3. What are the key initiatives to address gender equality in Bhutan's agriculture sector? **(20 marks)**

CASE II

The agricultural sector is particularly vulnerable to the impacts of climate change. As climate change continues, it poses significant challenges to agriculture, threatening food security, livelihoods, and overall sustainability.

1. What is the climate change in the context of agriculture, and what are the key factors of climate change that directly impact crop production? **(15 marks)**

2. How can the agricultural sector adapt to and mitigate the impacts of climate change while ensuring sustainable food production and resilience for farming communities? **(15 marks)**

3. How does climate change influence the distribution, behaviour, and prevalence of pests in agricultural and natural ecosystems, and what implications does this have for pest management strategies and crop protection? **(20 marks)**

TASHI DELEK