

ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2015
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALIZATION PAPER for *Agriculture*

Date	: 11 October 2015
Total Marks	: 100
Examination Time	: 150 minutes (2.5 hours)
Reading Time	: 15 Minutes (prior to examination time)

GENERAL INSTRUCTIONS:

1. Write your Roll Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is being provided 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 and 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 under your choice.
4. 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 any or correct Section, Part and Question Number will NOT be evaluated and no marks would be awarded.
5. Begin each Section and Part in a fresh page of the Answer Booklet.
6. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
7. Use of any other paper including paper for rough work is not permitted.
8. You are required to hand over the Answer Booklet to the Invigilator before leaving the examination hall.
9. This paper has **08** printed pages in all, 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 the correct answer chosen in the Answer Booklet against the question number. E.g. 31 (c). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

1. The industrial process by which ammonia (for fertilizer production) is made from nitrogen is called:
 - A. Linde-Hampson process
 - B. Haber-Bosch process
 - C. KM-CDR process
 - D. Castner-Kellner process
2. Glyphosate is a common herbicide used all over the world, including Bhutan, as an effective control of weeds. It is marketed under the trade name of:
 - A. Avenge
 - B. Checkmate
 - C. Dacthal
 - D. Roundup
3. Growing of plants in water in combination with animals such as fish, snails, etc, is called:
 - A. Hydroponics
 - B. Aquaculture
 - C. Aquaponics
 - D. Aquanomics
4. In order to hasten the artificial ripening of mango fruits, some bad traders are known to apply a chemical on the fruits. This chemical is:
 - A. Calcium carbide
 - B. Calcium carbonate
 - C. Boric acid
 - D. Zinc sulphate
5. Golden rice, although a GMO crop, has earned much fame for its ability to biosynthesize:
 - A. Folic acid
 - B. Beta-carotene
 - C. Vitamin C
 - D. Vitamin D

6. Millets are drought tolerant crops and hardy plants. As a diet from health perspective they are even known to be better than rice or wheat although people consume relatively less of this amazing cereal. The most widely grown species is:
 - A. Foxtail millet
 - B. Finger millet
 - C. Pearl millet
 - D. Proso millet

7. EM (Effective Microorganism) technology, which has now become popular worldwide as an alternative to chemical fertilizers and pesticides, was developed by a scientist from:
 - A. Thailand
 - B. Japan
 - C. India
 - D. China

8. Chilli peppers are native to which continent:
 - A. Asia
 - B. Africa
 - C. South America
 - D. Europe

9. Which of the following is not in the same genus as the other three:
 - A. Potato
 - B. Tomato
 - C. Chilli
 - D. Eggplant

10. The bulk density (dry mass per unit volume) of typical agricultural soils is near:
 - A. 1300 kg/m³
 - B. 2000 kg/m³
 - C. 3000 kg/m³
 - D. 3500 kg/m³

11. The Headquarter of FAO (Food and Agriculture Organisation) is in:
 - A. Brussels
 - B. Geneva
 - C. Rome
 - D. Paris

12. Hornblende is a kind of:
 - A. Whiskey made from barley
 - B. Vodka made from wheat
 - C. Primary soil mineral

- D. Blending technique
13. Soil texture relates to its:
- A. Profile
 - B. Particle size
 - C. Colour
 - D. Mineral content
14. Which of the following has the smallest particle size:
- A. Silt
 - B. Fine sand
 - C. Clay
 - D. Coarse sand
15. Plants have evolved to develop certain special tissues to adapt to their environment. One such amazing tissue is the aerenchymatous tissue. Which of the following has it:
- A. Maize
 - B. Rice
 - C. Buckwheat
 - D. Millet
16. The other term for hybrid vigour is:
- A. Heterosis
 - B. Homozygosity
 - C. Epistasis
 - D. Pluralism
17. Nitrate-nitrogen can be lost from soil to the atmosphere by conversion to gaseous N_2O or N_2 under anaerobic conditions by a variety of bacteria. This process is called:
- A. Nitrification
 - B. Denitrification
 - C. Ammonification
 - D. Nitrogen mineralization
18. Crop yields obtained on experimental plots under best available technology is called:
- A. Actual yield
 - B. Record yield
 - C. Attainable yield
 - D. Potential yield
19. Kjeldahl analysis is a simple technique to measure in plant materials the:
- A. Total nitrogen
 - B. Total lipids
 - C. Total carbohydrates
 - D. Total minerals

20. The interference exerted by a plant onto its neighbours by way of releasing chemical substances is termed:
- A. Allelopathy
 - B. Antipathy
 - C. Encephalopathy
 - D. Enteropathy
21. The practice of planting one crop within open areas of another, usually in alternating rows, in the same field is called:
- A. Intercropping
 - B. Mixed cropping
 - C. Relay cropping
 - D. Cover cropping
22. A researcher wishes to examine the impact of a training program imparted to farmers. He gives the training to 25 farmers. Their skills and knowledge were assessed individually before and after the training so that the impact could be assessed. Which of the following statistical test is appropriate in this case:
- A. 2 sample student t-test
 - B. Paired t-test
 - C. Chi-square test of independence
 - D. ANOVA
23. The “Dust Bowl” event in the 1930s happened in:
- A. USA
 - B. England
 - C. USSR
 - D. Australia
24. The “Dust Bowl” event is attributed to:
- A. Climate change
 - B. El nino
 - C. Unsustainable farming practices
 - D. The Great Depression
25. Which of the following pathogen affecting potato was responsible for The Great Famine in Ireland in the 1840s that resulted in the deaths of millions and mass emigration to USA, Canada and elsewhere:
- A. *Phytophthora infestans*
 - B. *Erysiphe cichoracearum*
 - C. *Botrytis cinerea*
 - D. *Fusarium oxysporum*

26. In 1962, a book titled “Silent Spring” was published. It talked about the indiscriminate use of chemical pesticides on farms and the devastating effects on environment. Although it received fierce opposition from chemical companies, the book became so famous that it inspired a wave of environmental movements. Who was the author of “Silent Spring”?
- A. Sir Bobby Charlton
 - B. Clifford Geertz
 - C. Jeff Goodwell
 - D. Rachel Carson
27. Which of the following crops has the highest tolerance to salinity?
- A. Bean
 - B. Maize
 - C. Wheat
 - D. Barley
28. When supply increases in an agricultural market, farmers’ earnings might fall because:
- A. Supply is price elastic
 - B. Demand is price inelastic
 - C. The government buys up all the excess production
 - D. All output must be sold at a maximum price
29. If a farmer wants to apply 100 kg nitrogen, how much urea should be use?
- A. 40 kg
 - B. 87 kg
 - C. 115 kg
 - D. 217 kg
30. Silt has intermediate characteristics between:
- A. Sand and loam
 - B. Clay and loam
 - C. Loam and gravel
 - D. Sand and clay

PART II – Short Answer Type Questions (20 Marks)

Answer ALL the questions. Each question carries 5 marks. Mark for each sub-question is indicated in the brackets.

1. What does Food Fortification mean and its purpose? Give 3 examples of fortified food. (5 marks)

2. Which government agency in Bhutan oversees the RNR Research Policy 2012? Give an example each to describe the following four types of research: (5 marks)
 - a. Basic research
 - b. Applied research
 - c. Adaptive research
 - d. Policy research

3. For each of the following common cereals grown in Bhutan, give their Latin names. The first part of the name, i.e. at the genus level is enough (e.g. for oat, it is Avena): (5 marks)
 - a. Rice
 - b. Wheat
 - c. Barley
 - d. Maize
 - e. Buckwheat

4. Write True or False for each of the following 5 statements: (5 marks)
 - a. Green Revolution advocated organic farming
 - b. In Conservation Agriculture, no agrochemicals are used
 - c. Import of GMO products, including for pharmaceutical purposes, are not allowed in Bhutan
 - d. C4 plants are more water-efficient than C3 plants
 - e. Rice is a C3 plant

SECTION B

Case Study

Choose either Case 1 or Case 2 from this section. Each case study carries 50 marks. Mark for each sub-question is indicated in the brackets.

Case Study 1

Write an essay titled, “Agriculture Extension in Bhutan”. It should cover a brief history of agriculture extension in Bhutan (10 marks), how it is currently set up and functioning (10 marks), what are the achievements so far (10 marks), the gaps/weaknesses that you see (10 marks) and your views as to how agriculture extension can be improved (10 marks).

OR

Case Study 2

Bhutan has opened its door to Foreign Direct Investment (FDI), including in the RNR sector. Mountain Hazelnut Ventures Ltd is an example of an agro-based FDI company in Bhutan and is in operation for the last several years. Write an essay describing your general understanding of FDI (10 marks), critically point out the pros and cons of welcoming FDI in the agriculture sector in Bhutan (20) and articulate your views with regard to how Bhutan should handle FDI so that it leads to a win-win situation (20).