

ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2010
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALIZATION PAPER FOR HORTICULTURE

Date : 24th November, 2010
Total Marks : 100
Examination Time : 2.5 hours
Reading Time : 15 Minutes (Prior to exam time)

General Instructions:

1. Write your Roll Number clearly on the answer booklet in the space provided
2. The first 15 minutes is being provided to check the number of pages, printing errors, clarify doubts and to read the instructions. You are **NOT PERMITTED TO WRITE** during this time.
3. Use either **Blue** or **Black** ink pen or ball point pen for the written part and **H.B. Pencils** for the sketches and drawings.
4. All answers should be written on the Answer Booklet provided. Candidates are not allowed to write anything on the question paper.
5. This Question Booklet consists of **7 pages**. It is divided into two sections – **SECTION A** and **SECTION B**.
6. **SECTION A** consists of two parts - **Part I** and **Part II**.

Part I consists of 30 multiple choice questions carrying one (1) mark each and is compulsory. The answer of your choice should be clearly written in whole along with the question and option number on your answer booklet.

Part II consists of four (4) short answer questions of five (5) marks each and all questions are compulsory.

7. **SECTION B** consists of two Case Studies. Choose only ONE case study and answer the questions under your choice. Each case study carries fifty (50) marks in total.

Section A (Answer all the Questions)

Part I. Choose the correct answer (30 X 1 = 30 marks)

1. TSS (Total Soluble Solids) level can be measured by using a simple instrument called
 - a. Refractometer
 - b. Penetrometer
 - c. Spectrophotometer
 - d. Chlorophyll Meter

2. The citrus cultivation in Bhutan is dominated by
 - a. *Citrus reticulata* Blanco
 - b. *Citrus aurantifolia*
 - c. *Citrus limon*
 - d. *Citrus sinensis*

3. The first symptom is a yellowish green blotch near the base of the leaf between the midrib and the outer edge. The yellow area enlarges until the only green remaining is at the tip and base of the leaf as an inverted V-shaped area on the midrib and it is the sign of
 - a. Potassium deficiency
 - b. Phosphorus deficiency
 - c. Magnesium deficiency
 - d. Nitrogen deficiency

4. Potato originated from the highlands of
 - a. Europe
 - b. South America
 - c. Africa
 - d. Asia

5. One of the main production constraints in chili pepper in Bhutan is due to a disease caused by
 - a. *Phytophthora capsici*
 - b. *Colletotrichum capsici*
 - c. *Sclerotium rolfsii*
 - d. *Fusarium oxysporum*

6. Wild edible mushrooms has been collected and consumed from times immemorial in Bhutan. The most important popular wild edible mushroom with export market potential is
 - a. *Chanterellus cibarius*
 - b. *Tricholoma matsutake*
 - c. *Lyophyllum shimeji*
 - d. *Auricularia auricula*

7. As per Bhutan Trade Statistics 2009, the income generated in terms of value from export was Nu. 893.95 million. Majority of it was from the export of
- Cardamom
 - Apple
 - Potato
 - Mushroom
8. Apple scab is the most important disease of apples worldwide and it is caused by
- Gloeodes pomigena*
 - Gymnosporangium* species
 - Venturia inaequalis*
 - Podosphaera leucotricha*
9. India is the second largest producer of vegetable next only to
- Australia
 - Canada
 - Mexico
 - China
10. It is richer in vegetables than in fruit crops. Most of its requirements of the body can be met from green leaves and even nutritional anaemia can be easily cured by the leafy vegetables. It is the integral essential part of the red blood corpuscle and is the best known oxygen carrier in the body. What mineral is it?
- Calcium
 - Iron
 - Phosphorus
 - Sodium
11. An endogenous growth substance present in plant and it increases cell division and cell elongation, promotes growth of leaf, flower and fruit and also break dormancy and induce flowering. What is it:
- Gibberellins
 - Auxins
 - Ethylene
 - Abscisic acid
12. Radish, *Raphanus sativus* L. belongs to the family
- Crucifereae*
 - Chenopodiaceae*
 - Alliaceae*
 - Solanaceae*

13. Olericulture deals with the production, storage, processing and marketing of
- Fruits
 - Vegetables
 - Nuts
 - Medicinal plants
14. The crop need not have a pollinizer variety
- Apple
 - Kiwi fruit
 - Mango
 - Banana
15. Interspecific hybridization refers to
- Crossing of two different species of plants
 - Crossing of two different genus of plants
 - Crossing of three different sub-species
 - None of the above
16. A popular method of vegetables and fruits processing which employs an energy form termed ionizing radiation is called
- Pasteurization
 - Food Irradiation
 - Microwaving
 - Freeze drying
17. In USA, GM (genetically modified) crops are being grown on a large scale. About $\frac{1}{2}$ of the area and more than $\frac{1}{3}$ of the area is now sown with GM seeds. What are they?
- Soybean and Maize
 - Potato and Chickpea
 - Mustard and Kale
 - Cabbage and Cauliflower
18. Vitamins and minerals are required by our body for
- Providing energy
 - Heat generation
 - Muscle development
 - Electrolyte balance and metabolic processes

19. Glycemic index is a
- measure of the effect of carbohydrate on blood sugar level
 - measure of the effect of proteins on blood sugar level
 - measure of the effect of carbohydrate on blood hemoglobin level
 - measure of the effect of proteins on blood hemoglobin level
20. WTO (World Trade Organization) was established on January 1, 1995 as a result of the Uruguay Round and it has replaced
- GATT (General agreement on Tariffs and Trade)
 - GATS (General Agreement on Trade in Services)
 - SAPTA (SAARC Preferential Trading Agreements)
 - SAFTA (South Asian Free Trade agreement)
21. In the post harvest technology of fruits and vegetables, ethylene is used in gas or liquid form for
- Prolonging the shelf life
 - De-greening or ripening
 - Protection from pests and diseases
 - Removing dirt from the produce
22. A farming which is an ICT based systems within field management of crops using technologies like GIS, GPS and Remote Sensing and it increases crop production efficiency, improving produce quality, efficient use of inputs and energy conservation and it is called
- Precision farming
 - Organic farming
 - Conventional farming
 - Nature Farming
23. One of the most important medicinal plants found in Bhutan in Singkhar Lauri geog under Samdrup Jongkhar Dzongkhag and the plant is well known for its very bitter taste and its medicinal value. What is it?
- Carum carvi*
 - Carthamus tinctorius*
 - Saussurea lappa*
 - Swertia chirayita*
24. Flowers which are highly suitable for making dried flowers without much intervention are
- Tulips and Daffodils
 - Roses and Carnations
 - Statice and Straw Flower
 - Geraniums and Begonias

25. A technique that transfers gene(s) of interest to develop and improve plants, animals and other organisms is called
- Genetic engineering
 - Conventional breeding
 - Mutation
 - None of the above
26. It is a micaceous mineral that expands markedly when heated. Chemically it is a hydrated magnesium-aluminium-iron silicate, neutral in reaction with good buffering properties, and insoluble in water and widely used as media for propagating and growing nursery plants. What is it:
- Peat
 - Vermiculite
 - Perlite
 - Rockwool
27. Soil reaction (or pH) is a measure of the concentration of
- Hydrogen ions in the soil
 - Oxygen ions in the soil
 - Haze particles in the soil
 - Carbon ions in the soil
28. Many plant species have specific mechanisms that prevent self pollination and a mechanism where pollen is shed at a different time than when the pistil is receptive is called
- Dioecy
 - Monoecy
 - Dichogamy
 - Gametophytic sterility
29. A seed class which is the progeny of breeder's seed and is so handled as to maintain the highest standard of genetic identity and purity is called
- Breeder's seed
 - Certified seed
 - Foundation seed
 - Registered seed
30. A method of handling dormant seeds in which the imbibed seeds are subjected to a period of chilling to after-ripen the embryo is called
- Stratification
 - Scarification
 - Leaching
 - Osmo-conditioning

Part II. Answer the following short questions (4 X 5 = 20 marks)

1. Many pests, diseases and disorders produce characteristic symptoms that make it possible to diagnose the causes of trouble with a fair degree of certainty. Describe the symptoms of Citrus Huanlongbing (HLB, ex Citrus Greening).
2. The many different types of treatments that have been devised to prevent or limit pests, diseases and disorders can be classified in several ways but the simplest general distinction is between non-chemical and chemical treatments. Describe three non-chemical treatments in details.
3. The PCR (Polymerase Chain Reaction) is a versatile technique that was invented in the mid-1980s. Since the introduction of thermostable DNA polymerases in 1988, the use of PCR in research and clinical laboratories has increased tremendously. Describe some of the uses of PCR in horticulture research.
4. Apart from providing the nutrition, few vegetables are also the source of antioxidants and are used in curing some of the commonly occurring diseases in humans. List three such vegetables and describe their curing properties.

Section B. Choose one of the case studies presented and answer the question (50 marks)

1. The growth and development of vegetable crops are influenced by both internal factors of the crop and external factors prevailing around the crops. Describe all the dominating factors influencing the crops and what major interventions can be made to improve the growth and development of vegetable crops in Bhutan.
2. Plant breeding aims to improve the characteristics of plants so that they become more desirable agronomically and economically. Describe the main objectives of plant breeding. In addition, also describe how and why we should employ plant breeding techniques to improve our local chili pepper land races in Bhutan.

END OF QUESTION PAPER

GOOD LUCK AND TASHI DELEK!!!