

**ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2011**

**EXAMINATION CATEGORY: TECHNICAL
PAPER II: GENERAL SUBJECT KNOWLEDGE FOR BIO SCIENCE GROUP**

Date: October 29, 2011
Maximum Marks: 100
Examination Time: 1.5 hours (90 minutes)
Reading Time: 15 Minutes (Prior to examination time)

1. General instructions

- 1.1 Under the provision of Technical Graduates Selection Examination procedures of the Royal Civil Service Commission, candidates shall write their **Roll No.** only on the answer booklet provided separately. All questions should be answered in this answer booklet.
- 1.2 No other particulars that would indicate the identity of the candidate shall be written on the answer booklet. Any candidate found guilty of writing their particulars or making any identification marks in the answer booklet shall be disqualified from consideration of future employment by the RCSC.
- 1.3 This question booklet is the property of the RCSC and shall not be torn or removed from the examination hall. It consists of **13 printed pages** including this page. Any page found missing should be reported to the invigilators within the first 15 minutes of the receipt of the question booklet.
- 1.4 Candidates shall not be allowed to carry any papers inside the examination hall.
- 1.5 Candidates shall be required to produce the Admission Card while entering the examination hall and when demanded by concerned authorities.

2. Specific instructions

- 2.1 Do not write anything during the first 15 minutes, which does not include the 90 minutes for answering. This time is to be spent in reading the instructions, the questions and to make sure that no pages are missing.
- 2.2 Any misprint/clarification of questions must be raised during the first 15 minutes.
- 2.3 Once the examination begins, you will not be allowed to ask for clarifications or leave the examination hall.
- 2.4 PART A consists of 70 multiple choice questions of 1 (one) mark each and PART B consists of 10 short answer questions of 3 (three) marks each. **All questions are compulsory.**
- 2.5 Marks will be given based on the knowledge of the subject, clarity and preciseness of your response.

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PAPER II: GENERAL SUBJECT KNOWLEDGE FOR BIO SCIENCE GROUP

Time Allotted: 90 minutes

PART A (Maximum Marks: 70)

MULTIPLE CHOICE. *Choose the one alternative that best completes the statement or answers the question.*

1. Arrange the taxonomic hierarchy in descending order of size:
 - a. Kingdom, phylum, class, family, order, genus, species
 - b. Species, genus, family, order, class, phylum, kingdom
 - c. Kingdom, phylum, class, order, family, genus, species
 - d. Species, genus, family, order, class, phylum, kingdom

2. A newborn baby's immunity, which is acquired from the mother, is often referred to as:
 - a. Active immunity
 - b. Passive immunity
 - c. Bistander immunity
 - d. Physical immunity

3. Liverworts and mosses belong to phylum:
 - a. Bryophyta
 - b. Filicinophyta
 - c. Coniferophyta
 - d. Angiospermophyta

4. Xylem transports:
 - a. Food
 - b. Carbon dioxide
 - c. Water and mineral salts
 - d. All of above

5. Which of the following metals react violently with water to produce hydrogen gas?
 - a. Sodium
 - b. Zinc
 - c. Platinum
 - d. Silver

6. Commensalism is when:

- a. Both species benefit
- b. Neither species affects the other
- c. One species benefits while the other is unaffected
- d. Both species are harmed

7. The correct human permanent dental formula is:

- a. $2\left[\begin{array}{cccc} i & 0 & c & 0 \\ 3 & 1 & 2 & 2 \\ pm & m & m & m \\ 2 & 3 & 3 & 3 \end{array} \right]$
- b. $2\left[\begin{array}{cccc} i & 2 & c & 2 \\ 2 & 2 & 2 & 2 \\ pm & m & m & m \\ 2 & 3 & 3 & 3 \end{array} \right]$
- c. $2\left[\begin{array}{cccc} i & 1 & c & 1 \\ 2 & 2 & 2 & 2 \\ pm & m & m & m \\ 2 & 3 & 3 & 3 \end{array} \right]$
- d. $2\left[\begin{array}{cccc} i & 2 & c & 1 \\ 2 & 1 & 2 & 2 \\ pm & m & m & m \\ 2 & 3 & 3 & 3 \end{array} \right]$

8. Which of the following term is a measure of the central tendency?

- a. Standard Deviation
- b. Variance
- c. Average
- d. None of these

9. In which year did Bhutan ratified two conventions-Conventions on Biological Diversity and United Nations Framework Convention on Climate Change?

- a. 2000
- b. 1998
- c. 1995
- d. 1996

10. Which of the following transports blood away from the heart?

- a. Artery
- b. Veins
- c. Capillary
- d. Heart

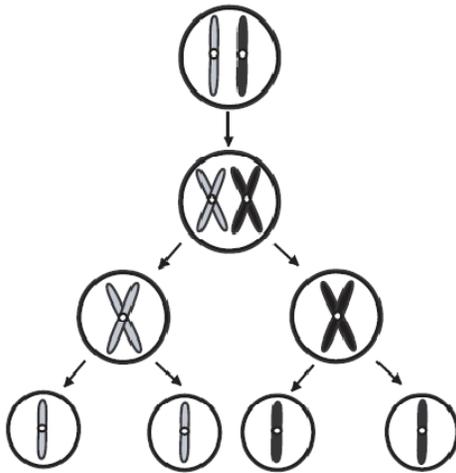
11. Yellow fever is spread by:

- a. Rat flea
- b. Human faeces
- c. Mosquitoes
- d. Wound infection

12. What is the fundamental difference between matter and energy?

- a. Matter is cycled through ecosystems; energy is not
- b. Energy is cycled through ecosystems; matter is not
- c. Energy can be converted into matter; matter cannot be converted into energy
- d. Matter can be converted into energy; energy cannot be converted into matter

13. The diagram below shows a cellular process that occurs in organisms. This process is known as:



- a. Cendocytosis
- b. Phagocytosis.
- c. Meiosis
- d. Mitosis

14. Roots are best described as adventitious depending upon their:

- a. Place of origin
- b. Function
- c. Position
- d. Modification

15. Ginger is a stem and not a root because:

- a. It is underground
- b. It has nodes and internodes
- c. It stores food
- d. It is non-green in colour

16. Resource partitioning would be most likely to occur between:

- a. Sympatric populations of a predator and its prey
- b. Sympatric populations of species with similar ecological niches
- c. Allopatric populations of the same animal species
- d. Allopatric populations of species with similar ecological niches

17. Which of the following method of water absorption is affected by opening and closing of stomata?

- a. Passive
- b. Active
- c. Both of these
- d. None of these

18. Field capacity is:

- a. Higher for sandy soils than clay soils
- b. Amount of water in soil available for plants
- c. Same as permanent wilting point
- d. Amount of water left in the soil after drainage

19. Minerals are absorbed in the form of:

- a. Ions
- b. Molecules
- c. Compounds
- d. Mixtures

20. The raw material most used by plants is:

- a. K
- b. O₂
- c. CO₂
- d. N₂

21. Name the gland that is both exocrine and endocrine:

- a. Salivary gland
- b. Liver
- c. Pancreas
- d. Spleen

22. Which of the following is not considered a characteristic or property of a gas?

- a. Volume
- b. Mass
- c. Pressure
- d. Particles

23. Which of the following is used as an indicator for air pollution by scientists?

- a. Mosses
- b. Fungi
- c. Lichens
- d. Algae

24. In man, which of the following structures is analogous to the spiracles of cockroaches?

- a. Alveoli
- b. Lungs
- c. Bronchioles
- d. Nostrils

25. Which of the following represents the simplest chemical formula:
- Empirical formula
 - Molecular formula
 - Structural formula
 - Primary formula
26. Myopia or near sightedness is a defect of eyes in which:
- The diameter of eyeball is longer than usual and the image is formed slightly in front of retina
 - The diameter of eyeball is normal but the image formed is at the blind spot
 - The diameter of the eyeball is normal and the image is formed slightly behind the retina due to faulty lens
 - The curvature of the cornea is irregular so that only some portion of the object is seen properly
27. Rabbits introduced into Australia over 100 years ago have become a serious pest to farmers. Rabbit populations increased so much that they displaced many native species of plant eaters. What is the *most* logical explanation for their increased numbers?
- Rabbits have a high death rate
 - There are few effective predators
 - Additional rabbit species have been introduced
 - There is an increase in rabbit competitors.
28. All higher mammals are:
- Oviparous
 - Ovoviviparous
 - Viviparous
 - Either oviparous or viviparous
29. Growth and development are synonymous, respectively, with which of the following:
- Division and multiplication
 - Multiplication and division
 - Multiplication and differentiation
 - Zygote and embryo
30. Which would have the greatest cooling effect for a plant?
- Close stomata
 - Evaporate water (i.e., convert from liquid to gas)
 - Melt water (i.e., convert from solid to liquid)
 - Use sugar at faster rate

31. In most stable freshwater environments, populations of *Daphnia* are almost entirely female and reproduce asexually. However, males are observed in low oxygen environments or when food is scarce. Based on these observations, a researcher suggests that male *Daphnia* develop in response to unfavourable environmental conditions. This is an example of a:
- Result
 - Theory
 - Procedure
 - Hypothesis
32. The process of destroying all living organisms is called:
- Immunization
 - Pasteurization
 - Sanitation
 - Sterilization
33. Homologous organs are those that show similarity in:
- Size
 - Origin
 - Appearance
 - Function
34. The concept of inheritance of acquired characters was developed by:
- Aristotle
 - August Weismann
 - Jean Baptiste de Lamarck
 - Charles Darwin
35. Adaptation of a species is its:
- Acquired characters
 - Ecdysis
 - Hereditary character
 - Metamorphosis
36. Common origin of man and chimpanzee is best shown by:
- Chromosome number and banding pattern
 - Cranial capacity
 - Binocular vision
 - Dental formula

37. Early human civilisation developed in:

- a. River valleys
- b. High mountains
- c. Sea shores
- d. Plains

38. The first transgenic crop was:

- a. Cotton
- b. Tobacco
- c. Flax
- d. Pea

39. New varieties of plants are produced by:

- a. Selection and hybridisation
- b. Mutation and selection
- c. Introduction and mutation
- d. Selection and introduction

40. Farmers cannot use seeds of plants showing hybrid vigour in successive years because:

- a. It is cheaper to purchase fresh seeds
- b. Hybrid vigour is lost in inbreeding
- c. Drunkel's proposal
- d. They are not allowed to sow their own seeds

41. Fish meat is better than the meat of other animals because it contains more:

- a. Proteins
- b. Fat
- c. Starch
- d. Water

42. Live stock means:

- a. Domestic and pet animals
- b. Poultry and pet animals
- c. Domestic animals
- d. Pet animals

43. Pesticides are chemicals that kill:

- a. Weeds
- b. Pathogens
- c. Insects, mites
- d. All of these

44. Bordeaux mixture consists of:

- a. $\text{CuSO}_4 + \text{Ca(OH)}_2$
- b. $\text{CuSO}_4 + \text{NaOH}$
- c. $\text{CuSO}_4 + \text{CaCO}_3$
- d. All of these

45. Integrated pest management stands for:

- a. Chemical control
- b. Biological control
- c. Host plant resistance
- d. Integration of above

46. Maximum genetic diversity is found where agriculture is:

- a. Irrigation based
- b. Primitive
- c. Advanced
- d. None of these

47. Koch's postulates are not applicable to:

- a. Protozoan diseases
- b. Bacterial diseases
- c. Viral diseases
- d. Fungal diseases

48. All living things have:

- a. Organelles
- b. Cells
- c. Tissues
- d. Cell wall

49. The standard deviation of any sampling distribution is called

- a. Sampling error
- b. Type -I error
- c. Standard error
- d. Non sampling error

50. What will be the result of a pregnancy when the mother's blood group is A^+ and father's blood is B^+ ?

- a. It will result in abnormality because blood groups are not universal recipients
- b. It will result in abnormality because antifactors A of foetus will attack the mother's blood
- c. It will result in abnormality because the foetus will be attacked by antifactor B of mother
- d. It will be normal as the individuals with different blood groups are perfectly normal

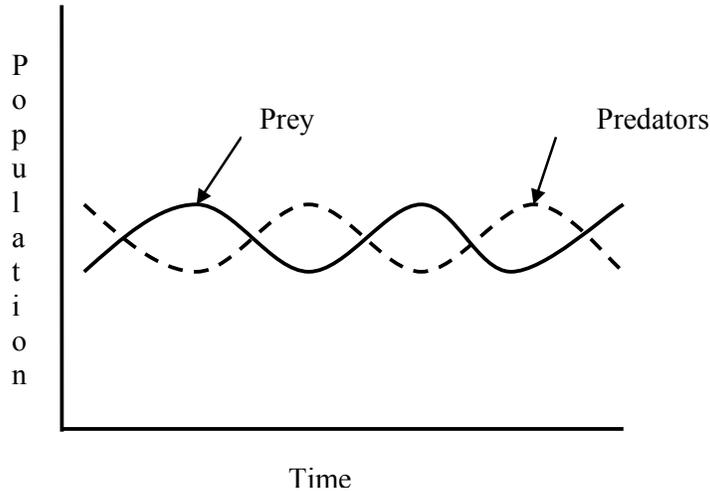
51. Drugs are consumed for:
- Prevention of disease
 - Cure of disease
 - Physical and mental welfare
 - Keeping the mood cheerful
52. Which of the following compounds are widely distributed in both plants and animals?
- Acetic acid
 - Vitamins
 - Insulin
 - Steroids
53. Which one is correctly matched?
- Vitamin A- Thiamine
 - Vitamin B- Calciferol
 - Vitamin D- Riboflavin
 - Vitamin E- Tocopherol
54. Biogas is composed of:
- C_2H_6 , $CO+H_2$
 - CH_4 , CO_2 and H_2
 - C_2H_5OH , CO_2 and H_2
 - $CH_4 + SO_2 + H_2$
55. The physiological capacity of a species of animals to produce their progeny in the absence of natural enemies, diseases or other inhibiting factor is:
- Carrying capacity
 - Biotic potential
 - Population explosion
 - Environmental resistance
56. In winter months, the lateral highway which is generally covered with snow is often sprayed with salt to:
- Increase the freezing point of water
 - Lower the freezing point of water
 - Prevent vehicles from skidding
 - None of the above
57. Practical lessons learned by studying agricultural science include:
- Understanding of earth's interconnectedness
 - How to successfully deplete natural resources
 - How to plant a garden
 - Protect environment

58. The gas that is formed in the land fill due to the decomposition of rubbish dumps which could cause explosion, if for example a spark starts the reaction is:
- Hydrogen sulphide
 - Nitrous oxide
 - Methane
 - Ethane
59. In the chemistry lab, for safety reasons, when a concentrated acid is mixed with water:
- The water is always added to the acid
 - The acid is always added to the water
 - These can only be mixed at cold temperatures
 - These can never be mixed
60. If there is an indirect relationship between rainfall & yield of crops then:
- Yield is higher if rainfall is less
 - Yield is lower if rainfall is less
 - Yield is higher if rainfall is higher
 - Yield is higher if rainfall is nothing
61. The national animal of Bhutan is:
- Ailurus fulgens*
 - Uncia uncia*
 - Budorcas taxicolor*
 - Trachypithecus geei*
62. The conservation status of White bellied heron is:
- Endangered
 - Critically endangered
 - Threatened
 - Vulnerable
63. The disciplines in Life Science include:
- Statistics and logic
 - Human behaviour
 - Microbiology
 - All of the above
64. What anatomical structure connects the stomach and the mouth?
- Trachea
 - Spinal column
 - Hepatic duct
 - Esophagus

65. A wire of resistance $5\ \Omega$ is drawn out so that its new length is 3 times its original length. What is the resistance of the new wire?
- $45\ \Omega$
 - $15\ \Omega$
 - $5/3\ \Omega$
 - $5\ \Omega$
66. It is difficult to cook rice in an open vessel by boiling it at Lunana than Punakha because of:
- Low boiling point and high pressure
 - High boiling point and low pressure
 - Low boiling point and low pressure
 - High boiling point and high pressure
67. Which of the following materials is the best conductor of electricity?
- Platinum
 - Gold
 - Silicon
 - Copper
68. Which of the following statements about enzymes is not true?
- Enzymes are catalysts
 - Almost all enzymes are proteins
 - Enzymes operate most efficiently at optimum pH
 - Enzymes are destroyed during chemical reactions.
69. Which of the following contributes to the double helical structure of DNA?
- Hydrogen bond
 - Covalent bond
 - Disulphide bond
 - van-der Waal's force
70. ----- is a government issued document that provides the holder the exclusive rights to manufacture, use or sell an invention for a defined period.
- Patent
 - Copyright
 - Trademark
 - Claims

PART B: Ten short answer questions of 3 marks each (Maximum Marks: 30). Answer all the 10 questions. Write your answers in the answer booklet provided.

1. When do weeds play a useful role in agroecosystems?
2. What was the green revolution? What were the advantages and problems of green revolution?
3. What does the figure below depict? Discuss on the graphical representation of the figure.



4. What is the unit of energy? Which of the two, a human or a mouse require more energy per unit weight and why?
5. What is genetic engineering? List any three applications of genetic engineering in various fields.
6. Name one each specific plant hormone which performs the following exclusive physiological roles:
 - a. Maintenance of apical dominance of shoots
 - b. Internodal elongation
 - c. Enhancement of cell division
7. What is a biological corridor and why is it important? List three important management strategies used in the conservation of Bhutan's natural resources?
8. List the four pillars of Gross National Happiness and describe briefly the one that directly relates to natural resource sector?
9. Find the mean, median, and mode for the following list of values:
13, 18, 13, 14, 13, 16, 14, 21, 13
10. Differentiate between transpiration and guttation? Give three points.