DECEMBER 2023
EBS 311P
GENERAL BIOLOGY PRACTICAL III
2 HOURS 30 MINUTES

Candidate's Index Number
Signature:

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
SCHOOL OF EDUCATIONAL DEVELOPMENT AND OUTREACH
INSTITUTE OF EDUCATION

COLLEGES OF EDUCATION
FOUR-YEAR BACHELOR OF EDUCATION (B.ED)
THIRD YEAR, END-OF-SECOND SEMESTER EXAMINATION, DECEMBER 2023

18TH DECEMBER 2023 GENERAL BIOLOGY PRACTICAL III 2:00 PM – 4:30 PM

Instruction: In this practical laboratory exercise, there are three activities to perform. After each activity, there are set of questions that you are required to answer based on your understanding of the related activity.

ACTIVITY 1: SELECTED ECOLOGICAL TOOLS AND THEIR FUNCTIONS

Introduction

Abiotic elements encompass non-living elements within an environment that exert an influence on organisms. These encompass factors such as air quality, water availability, temperature, soil composition, altitude, topography, sunlight exposure, latitude, and elevation. On the other hand, biotic elements encompass living organisms that actively influence and interact with their surroundings. For instance, in a freshwater ecosystem, biotic factors could include aquatic plants, fish, amphibians, and algae. In terrestrial ecosystems, examples may range from insects and bats to larger creatures like elephants. The interplay between biotic and abiotic factors is instrumental in shaping the distinct characteristics of a given ecosystem. Ecologists undertake the task of discerning how organisms (the biotic component) respond to these abiotic factors, a critical endeavour for assessing their survival, growth, and susceptibility to environmental stressors. Various specialized tools assist ecologists in delineating the attributes of both biotic and abiotic factors.

Aim

The aim of this activity is to identify some ecological tools and their functions as used in the study of biotic and abiotic components of an ecosystem.

Method

1. The ecological tools and apparatus are arranged as Specimens A-H.
2. Move around the lab and observe each specimen.
3. Return to your desk and answer ALL the questions that follow.

QUESTION 1
(20 MARKS)

a. Complete the table below with information on the identity and ecological use of each of Tool **A-E.** (5 marks)

TOOL	NAME	ECOLOGICAL FUNCTION
A		
B		
C		
D		
E		

b. In place of specimen labelled **A**, can a sweep net be used in the collection of lepidopterans? Give reasons for your answer. (4 marks)

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c. State any **three** importance of technology in ecological research. (3 marks)

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d. Make a well-labelled annotated diagram of ecological tool **B** in the space provided below. (8 marks)

ACTIVITY 2: MONOHYBRID CROSS

Background

A monohybrid cross is one in which both parents are heterozygous (or a hybrid) for a single (mono) trait. The trait might be petal colour in pea plants. When conducting crosses, the first generation is called P (or P0), the second generation is F1 (F is for filial), and the next is F2. Using monohybrid crosses, Mendel observed that although different alleles could influence a single trait, they remained indivisible and could be inherited separately. Additionally, the allele could be present but invisible in one generation, only to reappear in the next generation.

Aim

To simulate monohybrid inheritance and determine monohybrid ratios from genetic principles.

Materials

- 20 brown paper bags (10 labelled "Female" and 10 labelled "Male")
- Bag of white beans
- Bag of red beans

Procedure

Step 1: Each group of 2 students should pick up 2 paper bags filled with 10 red (**R**) beans and 10 white (**r**) beans. This represents 2 heterozygous parents.

Step 2. One student in the group should be in charge of the male bag and the other student should be in charge of the female bag.

Step 3. At the same time, each student should reach into their bag and pull out one of the beans. Mark the resulting genotype and phenotype in the data table.

Step 4. Return the beans back into the bag and conduct the same process 9 more times (10 total trials).

Step 5: Present your data table as shown in Table 1.

Table 1: Genotypes and phenotypes of offspring of a generation

Trial	Offspring's genotype	Offspring's phenotype	Comments
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

QUESTION 2
(20 MARKS)

a. What is the dominant trait and why? (1 mark)

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b. Which one is the recessive trait? (1 mark)

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c. What are the genotypes of the parents? (1 mark)

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d. What are the phenotypes of the parents? (1 mark)

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e. Is a **gene** different from an **allele**? Justify your answer. (3 marks)

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f. Assuming the parents have their genotypes to be **Rr** and **rr**, draw a clear and well-labelled genetic cross only to predict their reproduction outcome. (4 marks)

i. What is the genotypic ratio? (3marks)

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ii. What is the phenotypic ratio? (3 marks)

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iii. What is the probability that a red offspring will be produced? (3 marks)

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ACTIVITY 3: REPRODUCTIVE PARTS OF A FLOWER

Background

Flowers' beauty and fragrance evolved not to please humans but to attract pollinators (insects or birds), which are central to the reproductive process. As a plant's reproductive part, a flower contains a stamen (male flower part) or pistil (female flower part), or both, plus accessory parts such as sepals, petals, and nectar glands.

AIM

This activity provides opportunities for students to identify the reproductive parts of a flower.

Materials

- Large simple flowers: particularly hibiscus and lily
- Needle/craft knife
- Hand lens
- Paper
- Pencil

Procedure

With the help of the needle/craft knife, dissect and separate the different whorls of the flower.

QUESTION 3
(20 MARKS)

a. Label each isolated part from the outer whorl to the inner whorl. (8 marks)

b. Draw and label the 3rd and 4th floral whorls. (6 marks)

c. What role does the 2nd whorl play in pollination? (2marks)

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d. What type of flower is hibiscus? (2marks

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e. What would your answer in 3(c) be if the flower lacks either of the 3rd or 4th floral whorl? (2mark

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