THIRD YEAR EXAMINATION FOR THE AWARD BACHELOR OF SCIENCE IN AGRICULTURE AND BACHELOR OF SCIENCE IN FOOD TECHNOLOGY

AGRO 222 PLANT BREEDING

STREAM: BSC AGRIC, BSC HORTICULTURE   TIME: 2 HRS

DAY: DATE :

INSTRUCTIONS:
Answer all the questions

Q1.)   i.) A geneticist crossed an inbred Round (W) yellow (G) pea with inbred
wrinkled (w) green (g) pea.
a.) Give the genotypic and phenotypic of F_1 and F_2 progenies   **(4 marks)**
b.) How and why would you carry out a test cross for this cross   **(2 Marks)**

ii.) A plant breeding student crossed a Red (I) flowered snapdragon
plant with ivory (i) flowered snapdragon plant. In amazing results,
he got some pink flowers in the product of second of meisois. Clearly,
illustrate crossing pattern, genotypic and phenotypic of his results.   **(4 Marks)**

Q2. a.) In plant breeding, pedigree is an important piece of information.
(i)   What is the importance of pedigree?   **(1 Mark)**
(ii)   Explain how the following pedigree of a wheat variety
was arrived at
K.Kulungu/Mbuni//Pasa/Tembo/3/Kwale/4/K.Fahari.   **(2 Marks)**

(iii)   The data given below shows the nature of inheritance in relation to the
genotypes illustrated.
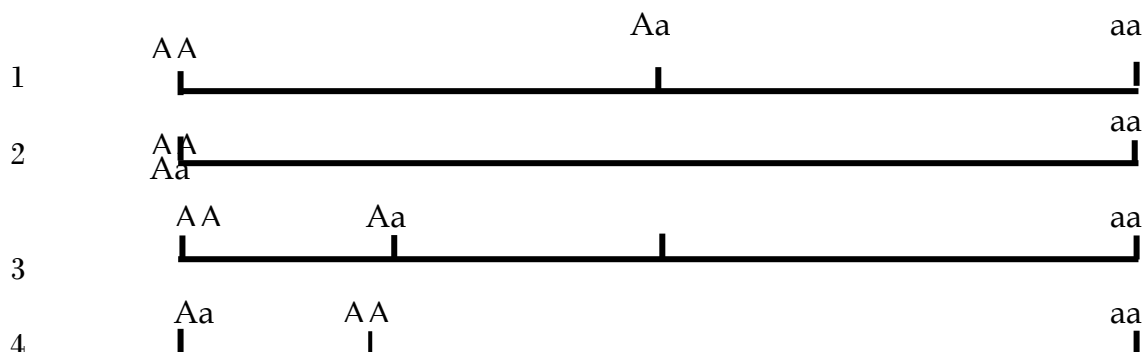
Explain the above information in terms of gene action, additive, complete,
over and partial dominance. State your assumptions.   **(4 marks)**

(iv)   What frequency of $F_{2:5}$ line would have segregating progeny? **(2 Marks)**

(v)   What frequency of $F_{2:3}$ lines would have segregating progeny? **(2 Marks)**

(vi)   What is the frequency of susceptible plants in the F_4 generation after selection for resistance among F_3 plants?   **(4 Marks)**

b.) i.) Define Hardy Weinberg Law   **(2 Marks)**

ii) Consider a population of garden pea plants in which genes F for full pods and f for constricted pods are segregating. When a sample of 1,500 plants were classified, the following phenotypes were recorded: 1365 full-podded plants and 135 constricted podded plants. Assume that the sample classified was representative of the population, and that the population was in state of genetic equilibrium, what are the frequencies of the two alleles? How many of the full podded plants are heterozygous?   **(4 Marks)**

iii.) From (b ii.) above, calculate genotypic and gene frequencies in the second cycle of generation   **(4 Marks)**

Q3.   a.) i.) Briefly, explain three ways by which plant manipulations can be achieved   **(3 Marks)**.

ii.) Why do you think that other alternative methods of plant breeding emerged?   **(2 Marks)**

b.)   What is your understanding of Tissue culture as a method of crop improvement? What are the four (4) stages of plant tissue culture that have been defined by scientific pioneers in the field?   **(4 Marks)**.

c.) Suggest any three (3) main differences between tissue culture and propagation done by cuttings, pullings, divisions or seeds   **(3 Mark).**

d.) Below are some of the types of genetic markers based on the number of loci screened:

i.) Multilocus marker *ii.*) Single-locus marker *iii.*) Dominant marker and *iv.*) Co-dominant marker Define these terms.   **(4 Marks)**

Q4   a.) Explain the following terms as used in plant breeding
i.).Genetic gain *ii.*). Heritability *iii.*) Selection differential (D).   **(3 Marks)**

b.) Discuss the necessary steps you will consider as a plant breeder as you evaluate alternative breeding methods to use for any crop improvement **(6 Marks)**.

Q5. Using diagrammatic representation, describe an early generation testing of F_2 derived lines.   **(12 Marks)**