FIJI NATIONAL UNIVERSITY

COLLEGE OF AGRICULTURE, FISHERIES & FORESTRY
SCHOOL OF AGRICULTURE
FINAL EXAMINATION
TRIMESTER 3, 2017
TRADE DIPLOMA in AGRICULTURE
GPB 401 BASICS OF PLANT BREEDING AND SEED PRODUCTION

[Total Marks: 100]

Time Allowed : 3 hours plus 10 minutes reading time

Instructions : This paper consists of 7 pages.

Please check to see that your paper is complete.

Answer ALL questions in the answer booklet. Number your answers correctly in the answer booklet.

Write your student ID number on all the pages that you use including any additional sheet of paper.

Printed or written material is not allowed into the examination hall.

Mark values appear at the end of each question or part thereof.

Non-programmable calculators are permitted.

"MOBILE PHONES ARE STRICTLY NOT ALLOWED"

SECTION	DESCRIPTION	Marks	Suggested time (mins)
SECTION A	Part 1 – Matching	10	10
	Part 2 – True or False	15	20
	Part 3 – Fill in the Blanks	15	20
	Part 4 – Multiple Choice	10	10
SECTION B	Part 1 – Short Answer Questions	40	90
	Part 2 – Long Answer Question	10	30

SECTION A

PART 1 MATCHING [10 Marks]

Match List A with the corresponding correct answer from List B and write the answer in the answer booklet provided.

List A		List B
1. Nucleus	a.	Makes protein
2. Endoplasmic reticulum	b.	Green pigment
3. Ribosome	c.	Holds the DNA
4. Mitochondria	d.	Semi-permeable membrane
5. Chloroplasts	e.	Internal delivery system of cell
6. Golgi bodies	f.	Provides support and protection to the cell membrane
7. Vacuoles	g.	Transports materials to different locations
8. Cell wall	h.	Holds the organelles of the cell
9. Cytoplasm	i.	Stores water
10. Cell membrane	j.	Breaks down food to make ATP

PART 2 TRUE OR FALSE [15 Marks]

In the answer booklet provided, write TRUE if the statement is correct and FALSE if the statement is incorrect.

1. Mitotic division creates variation in genetic information.
2. Dihybrids (AABB) always give a phenotypic ratio of 9:4:3:2.
3. The term mutation was first coined by Hugo de vries (1901).
4. *Triticum aestivum* is the correct way of writing scientific name.
5. Combine or threshers are source of mechanical mixtures.
6. Ribosome are responsible for the production of DNA.
7. Seeds are an importance source of ensuring future food security.
8. Interpreting a dihybrid Punnett square results in a phenotypic ratio of 9:3:3:1.
9. During Prophase the spindle fibres disperse, and cytokinesis will start.
10. Plants with a narrow genetic base have poor adaptability.

11. Analytical purity indicates how much of the material in a bag belongs to the species stated on the label.
12. Plant breeding results in production of hybrids which are characterized by poor adaptability to biotic and abiotic stresses.
13. Germination percentage is used to determine the number of seeds of a true to type plant that produce healthy seedlings.
14. The production of healthy seedlings in poor growth conditions is termed seed vigour.
15. Synthesis of glucose is carried out in the chloroplasts of plant cells.

PART 3 FILL IN THE BLANKS [15 Marks]

Fill in the blanks to complete the following statements. Write your answers in the answer booklet.

1. _____ is the art and science of improving the heredity of plants for the benefit of mankind.
2. A _____ is a sudden heritable change in the structure of a gene or in an organisms DNA.
3. Removal of off type plants is known as _____.
4. _____ in the plant helps break down food to make ATP thus energy is produced.
5. _____ occurs when two alleles are equally dominant, and both appear in a phenotype.
6. A "mature ovule" or a reproductive unit formed from fertilized ovule, consisting of an embryo, reserve food, and, a protective cover is known as _____.
7. _____ species have staminate and carpellate flowers on separate plants.
8. DNA is organized into informational units called _____.
9. _____ ensures that the seed sold to the farmers is of the indicated variety, sufficiently pure, of good germination capacity, and disease free.
10. _____is defined as the methods through which the genetic and physical characteristics of seeds could be improved.
11. Mitosis produces two daughter cells that are _____ to the parent cell.
12. DNA is organized into informational units called _____.
13. _____ results in the production of 4 cells each of which are haploid.

14. _____ is a common crop grown in Fiji belonging to the Fabaceae family.

15. _____ crops have a lifespan of two consecutive seasons or years.

PART 4 MULTIPLE CHOICE [10 Marks]

Write the most appropriate answer of your choice in the answer booklet.

1. Uniform varieties have narrow genetic base. Such varieties generally have
   A. Good adaptability
   B. Wide adaptability
   C. Poor adaptability
   D. None of the above

2. The Phloem cell helps in the transportation of
   A. Sugars
   B. Water
   C. Sugar and water
   D. None of the above

3. Gene which causes the death of its carrier when in homozygous condition is called
   A. Dominant gene
   B. Incomplete dominance
   C. Co-dominance
   D. Lethal gene

4. Which of the following is correct sequencing of mitosis?
   A. Metaphase - Prophase - Anaphase - Telophase
   B. Prophase - Metaphase - Anaphase - Telophase
   C. Telophase - Prophase - Metaphase - Anaphase
   D. Prophase - Telophase - Metaphase - Anaphase

5. A characteristic of good seed is
   A. Genetic Purity
   B. A high germination percentage
   C. Correct moisture content
   D. All of the above

6. Mutagens are classified as:
   A. Environmental only
   B. Natural only
   C. Natural, physical and chemical

D. None of the above

7. The location of a gene on the chromosome is known as
   A. Loci
   B. Location
   C. Locale
   D. Locality

8. Which of the following in **not** an objective of Plant Breeding?
   A. Higher yield
   B. Biotic resistance
   C. Dormancy
   D. Increased susceptibility to minor pests and diseases

9. During which stage of Meiosis does the DNA of the chromosomes begin to twist and condense, making the DNA visible to the microscope.
   A. Prophase 1
   B. Anaphase 1
   C. Metaphase 1
   D. Telophase 1

10. Which of the following is good characteristic of a seed?
    A. True to type
    B. Poor emergence
    C. Low productivity
    D. Susceptible to pest and disease

SECTION B

PART 1 SHORT ANSWER QUESTIONS [40 Marks]

This section contains 13 short answer questions. ALL are COMPULSORY.

1. Specify the meaning of Plant breeding. What are two aims of plant breeding? **(3 Marks)**
2. Illustrate the difference mitosis and meiosis **(3 Marks)**
3. Define the terms seed technology, seed quality and seed certification **(3 Marks)**
4. Specify and explain the methods used to collect seeds **(4 Marks)**
5. Illustrate and explain three factors affecting/deteriorating genetic purity? **(3 Marks)**
6. Apply the concept of seed certification to Fijian agriculture and illustrate its importance **(3 Marks)**
7. Specify the six major agricultural crop families, provide their scientific names and give relevant examples for each **(4 Marks)**
8. Specify and explain the factors affecting seed longevity during seed storage **(3 Marks)**
9. Interpret the 'Law of Segregation' and 'Law of dominance?' **(3 Marks)**
10. Illustrate the importance of seed production **(3 Marks)**
11. Specify the difference between Aneuploidy and Euploidy **(3 Marks)**
12. Specify, with examples, the agronomic classification of 3 crops **(3 Marks)**
13. Interpret the difference between prokaryotes and eukaryotes **(2 Marks)**

PART 2 ESSAY [10 MARKS]

This section contains three essay questions. Candidates are required to ANSWER ONLY ONE (1). The question carries 10 marks thus the answer provided must meet the required length of AT LEAST 250 words OR FULLY ANSWER THE QUESTION.

1. With the help of suitable diagrams, illustrate the different stages of the meiotic cell cycle. Be sure to include the various events that take place during the different stages and specify at least **TWO** (2) differences between meiosis and mitosis. Your answer must contain at least 250 words.

2. A researcher has been attempting to produce a hybrid coconut plant. She wants plants that are dwarf in stature (height) and have yellow colored fruits. To achieve this, she crossed a homozygous dominant plant which was tall (TT) and had yellow fruits (YY) with a homozygous recessive plant which had orange fruits (yy) and was a dwarf (tt). After the initial cross, all plants were heterozygous and were tall with yellow fruits (TtYy). You have been hired as a research assistant responsible for keeping records.
   a. Draw a Punnett square to represent the offspring when two heterozygous tall plants with yellow fruits are crossed (TtYy)
   b. What is the phenotypic ratio?
   c. Describe the phenotype of the resulting plants
   d. How many of the plants will be dwarf with yellow fruits?

3. Write a 250 word essay on the types of cell organelles found in plant cells. Be sure to specify their roles within plant cells. You may use (an) illustration(s) of a plant cell or organelles in your essay.

THE END