JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF AGRICULTURAL AND FOOD SCIENCES

FOURTH YEAR SECOND SEMESTER UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN FOOD SECURITY

2020/2021 ACADEMIC YEAR

REGULAR

COURSE CODE: AFB 3426

COURSE TITLE: Biotechnology in Agriculture

EXAM VENUE: **STREAM: BSc. Food Security**

DATE: **EXAM SESSION:**

TIME: 2 HOURS

Instructions:

1. **Answer ALL questions in section A and ANY other 2 Questions in section B.**
2. **Candidates are advised not to write on question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

SECTION A [30 MARKS]

Answer ALL questions from this Section

1. Define or Explain the following terminologies
   (a) Totipotent plant cell **[1 MARK]**
   (b) Plant-made-vaccines and therapeutics **[1 MARK]**
   (c) Micropropagation **[1 MARK]**
   (d) DNA delivery system **[1 MARK]**
   (e) Phytoremediation **[1 MARK]**
   (f) Patent **[1MARK]**
   (g) Model organism **[1 MARK]**
   (h) Xenotransplantation **[1 MARK]**
   (i) Recombinant antibody **[1 MARK]**
   (j) Transgenesis **[1 MARK]**

2. Distinguish between the following:
   (a) Eukaryotes *vs* Prokaryotes **[2 MARKS]**
   (b) *Agrobacterium*-mediated transformation *vs* Biolistic transformation **[2 MARKS]**
   (c) DNA *vs* RNA **[2 MARKS]**
   (d) Reporter gene *vs* Promoter **[2 MARKS]**
   (e) Traditional breeding *vs* Genetic engineering **[2 MARKS]**

3. Society is worried about GMOs – yet the scientific community and regulatory bodies approved the commercialization of transgenic crop varieties such as *Bt* corn that express the protoxin gene from *Bacillus thuringiensis*. Explain the THREE reasons behind the decision to commercialize such transgenic crops from health, environmental, and economic point of view [**3 MARKS]**

4. Why is it a MUST to regulate genetically engineered livestock. Give THREE reasons

[3 MARKS]

5. Chimpanzees are our closest relatives. However - agricultural livestock such as pigs are being proposed as potential organ donors for humans in order to address the shortage of human organs to be used in transplants. Why? **[4 MARKS]**

SECTION B (40 MARKS)

Answer ANY TWO questions in this section

6a**.** The development of therapeutic proteins in plants is considered a safer, more efficient and cost-effective method of protein production. Explain in detail FOUR of the reasons that led to this observation **[10 MARKS]**

6a. Discuss in detail the FIVE ways we can take advantage of microbial biotechnology in agriculture **[10 MARKS]**

7a. Describe the EIGHT steps involved in DNA microinjection method for developing transgenic cattle **[10 MARKS]**

7b. There are FOUR advantages associated with use of recombinant antibodies in agriculture. GIVE a detailed explanation **[10 MARKS]**

8a. Micropropagation is the step that follows a successful biolistic transformation approach. Give a detailed description of the FOUR stages of micropropagation **[10 MARKS]**

8b. Application of biotechnology to agricultural sciences is like a double-headed snake. It comes with lots of benefits to mankind, and at the same it also brings lots of worries. Discuss FIVE of the benefits and FIVE of the worries. **[10 MARKS]**