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UNIVERSITY OF RUHUNA – FACULTY OF MEDICINE

ALLIED HEALTH SCIENCES DEGREE PROGRAMME

FOURTH BPHARM PART II EXAMINATION – JUNE 2017

PH 4231 –MOLECULAR GENETICS (SEQ)

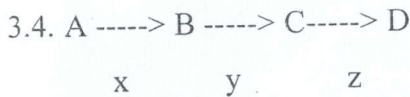


TIME: TWO HOURS

**INSTRUCTIONS**

- Answer **all** questions.
- No paper should be removed from the examination hall.
- Do not use any correction fluid.
- Use illustrations where necessary.

1. *Escherichia coli* bacteria is used as a model for genetic engineering.
  - 1.1. Draw a labeled diagram of the genetic map of *Escherichia coli* (20 marks)
  - 1.2. Describe the importance of studying the genetic map of *Escherichia coli* (20 marks)
  - 1.3. Describe **Hfr** conjugation (20 marks)
  - 1.4. Describe interrupted mating (20 marks)
  - 1.5. Describe the term “F prime” (20 marks)
2. Transduction is the process of moving bacterial DNA from one cell to another using a bacteriophage.
  - 2.1. Describe the following terms
    - 2.1.1. Exogenote (10 marks)
    - 2.1.2. Endogenote (10 marks)
    - 2.1.3. Merodiploid (10 marks)
    - 2.1.4. Generalized Transduction (15 marks)
    - 2.1.5. Specialized Transduction (15 marks)
  - 2.2. Briefly describe the term “transduction mapping experiment”. (30 marks)
  - 2.3. Name **one** example that transduction process is used in clinical practice. (10 marks)
3. All biochemical processes are genetically controlled. Different steps of the reaction involve different enzymes.
  - 3.1. Briefly describe the gene expression process seen in eukaryotes. (15 marks)
  - 3.2. Briefly describe frame shift mutation and its consequences in the process of gene expression. (15 marks)



Above reaction shows a biochemical reaction involving metabolism of substrate A in to product B. The enzymes involved are x, y and z. A patient was diagnosed as having a nonsense mutation in the coding region of the gene responsible for enzyme Z.

Briefly describe the pathogenesis of the phenotype. (25 marks)

3.5. State the karyotypes of the following conditions

- 3.5.1. Down syndrome (05 marks)
- 3.5.2. Edward syndrome (05 marks)
- 3.5.3. Klinefelter syndrome (05 marks)
- 3.5.4. Turner syndrome (05 marks)
- 3.5.5. Cystic fibrosis (05 marks)
- 3.5.6. Thalassaemia (05marks)

4.

4.1. Briefly describe Mendel's laws in genetics. (30 marks)

4.2. Consider **three** gene pairs, *Aa*, *Bb* and *Cc*, each of which affects a different character. In each case, the uppercase letter signifies the dominant allele. The three genes are located on different chromosomes. Calculate the probability of obtaining:

- 4.2.1. An *Aa BB Cc* zygote from a cross of *Aa Bb Cc* x *Aa Bb Cc*
- 4.2.2. An *Aa BB cc* zygote from a cross of *aa BB Cc* x *AA bb CC*
- 4.2.3. An *A B C* phenotype from a cross of *Aa Bb CC* x *Aa Bb cc*
- 4.2.4. An *a b c* phenotype from a cross of *AA BB CC* x *AA BB CC* (40 marks)

4.3. The tailless trait in the mouse results from an allele of a gene in chromosome 17.

The cross tailless x tailless produces tailless and wild type progeny in a ratio of 2 tailless: 1 wild type. All tailless progeny from this cross when mated with wild type, produce a 1 : 1 ratio of tailless to wild type progeny.

4.3.1. Is the allele for the tailless trait dominant or recessive?

4.3.2. What genetic hypothesis can account for the 2: 1 ratio of tailless: wild type and the results of the crosses between the tailless animals? (30 marks)