KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2014/2015

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF MEDICINE AND BACHELOR OF SURGERY (MBchB)

HMG 200: HUMAN GENETICS

DATE: Wednesday, 15th April 2015 **TIME:** 8.00 a.m. – 10.00 a.m.

INSTRUCTIONS

Answer ALL questions in Section A and B in the spaces provided and in Section C answer four questions in the answer booklet(s) provided.

SECTION A: MULTIPLE CHOICE QUESTIONS (20 MARKS, ONE MARK EACH)

Tick (√) in the square against the one most correct answer on each question

1. Which one of the following genotypes gives one type of gamete?

   (a) AABbCC ☐
   (b) AaBb ☐
   (c) AaBbCc ☐
   (d) AABBCC ☐

2. Which one of the following human characteristic is sex influenced?

   (a) Phenylthiocarbamide (PTC) tasting ☐
   (b) Rhesus blood group ☐
   (c) Tallness ☐
   (d) Skin colour ☐

3. Which one of the following human cell organelles has a circular chromosome?

   (a) Vacuole ☐
   (b) Nucleus ☐
   (c) Mitochondria ☐
   (d) Endoplasmic reticulum ☐

4. Which among the following human chromosomes is nearly similar in length to X chromosome?

(a) Chromosome 5
(b) Chromosome 11
(c) Chromosome 22
(d) Chromosome 21

5. In which cell among the following would you find genetic material with associated histone proteins?

(a) Viruses
(b) Bacteria
(c) Animal
(d) Blue green algae

6. Which of the following is a test cross?

(a) Aa xAa
(b) AA x aa
(c) AaBb x aabb
(d) BB x bb

7. Selfing AaBb results in the following phenotypic ratio if there is dominance at both gene loci:

(a) 9 : 3 :3:1
(b) 1:2:1:2:4:2:1:2:1
(c) 1:2:1:3:6:3
(d) 9:6:1

8. Which one of the following terms describes measurable or observable trait(s)?

(a) Phenotype
(b) Genotype
(c) Alleles
(d) Loci

9. Which one of the following conditions would you expect to have the highest frequency in natural human populations?

(a) Patau's syndrome
(b) Downs's syndrome
(c) Turner's syndrome
(d) Edward's syndrome

10. Which one of the following conditions is expected to have an average IQ ?

(a) Klinefelter's syndrome
(b) Downs's syndrome
(c) Turner's syndrome
(d) Edward's syndrome

11. Which one of the following chromosomes trisomy leads to Edward's syndrome?

(a) 21
(b) 22
(c) 13
(d) 18

12. Which one of the following conditions presents with short in stature, shield shaped chest, and widely spaced nipples?

(a) Klinefelter's syndrome
(b) Downs's syndrome
(c) Turner's syndrome
(d) Edward's syndrome

13. A chromosome with a primary constriction near one end is said to be:

(a) Metacentric
(b) Telocentric
(c) Acrocentric
(d) Sub-metacentric

14. Which one of the following populations is in Hardy Weinberg equilibrium?

(a) 0 1 0
(b) .04 .32 .64
(c) .3 .6 .1
(d) .5 0 .5

15. The probability that families of five children will have at least three sons in any order is (assume that having a son or a daughter are equally likely events)

(a) ⅓
(b) ⅝
(c) ½
(d) ⅛

16. Which one of the following substances forms a clover tertiary shape?

(a) mRNA
(b) tRNA
(c) DNA
(d) rRNA

17 Human pattern baldness characteristic is determined by a gene which is:

(a) X-linked
(b) Sex limited
(c) Sex influenced
(d) Holandric

18 Which one of the following bases is not found in DNA?

(a) Cytosine
(b) Guanine
(c) Uracil
(d) Adenine

19 Each molecule of a pyrimidine base consists of:

(a) Two nitrogen carbon rings
(b) One nitrogen carbon ring
(c) No nitrogen carbon rings
(d) Three nitrogen carbon rings

20 The sugar molecule that is found in both DNA and RNA consists of:

(a) Three carbon atoms
(b) Four carbon atoms
(c) Five carbon atoms
(d) Six carbon atoms

SECTION B: SHORT ANSWER QUESTIONS (40 MARKS, 5 MARKS EACH)

Answer all questions in the spaces provided for each question

1. List blood group types of those, if you are blood type AB Rhesus negative, you would repeatedly (a) donate to (2 marks)

   (b) and receive blood from (3 marks)

2. Using a branching diagram show proportions of gametes expected from an individual of a genotype AABbCcDdEE

3. State the first and second Mendel's laws.

4 Compare the main structure of RNA and DNA

5 List listening skills one needs to develop to be a good genetic counselor.

6 Explain briefly how sex is assigned in human beings:

(a) In Kenya (3marks)

(b) In other some other countries (1 marks)

(c) For joining women Olympic game teams (1 marks)

7 Fill in the following table to differentiate mitosis from meiosis cell divisions:

	Answer	
	Mitosis	***Meiosis***
• Number of resulting daughter cells		
• Number of cell divisions per each cycle		
• Number of times chromosomes replicate		
• Biological purpose for each division		
• Number of chromosome numbers in daughter cells, Compared with those of the original parent cells		

8 Using human examples explain the terms:

- Penetrance

- Expressivity.

SECTION C: LONG ANSWER QUESTIONS (40 MARKS, 10 MARKS EACH)

Write an essay on the following four questions in the answer booklet(s) provided

1. Justify why a population needs to bear a genetic load to avoid extinction.

2. List and explain five main characteristics of the genetic codes.

3. Describe the most important discoveries in 1972 that made genetic engineering possible.

4. Explain why insulin produced by recombinant DNA technology has served much better than previous forms of insulin.