TOPIC: GENETICS, HEREDITY AND VARIATION
Time: 2 ½ hours
Attempt all questions in this paper

SECTION	MARKS
A	
B	
TOTAL	

SECTION A (40 MARKS)

1. Which one of the following representations of genotypes would produce only one type of gametes?
   A. TtHh
   B. TtHh
   C. TTHh
   D. tthh
2. A man with allele for normal color vision married a woman whose father was color blind. The probability of a couple getting a child with a defective allele is
   A. ¼
   B. ½
   C. $^1/_3$
   D. ¾
3. A couple had children with a disorder that appeared only in sons. Which one of the following is true about this occurrence? The disorder is
   A. Sex linked and the mother is a currier
   B. Caused by multiple allele
   C. Sex linked and both parents are carrier
   D. Sex limited to males and the father is a carrier
4. When a tall red flowered plant was crossed with a short and white flowered plant, all the offspring were tall and red flowered. When F1 plants were selfed, the F2 plants' phenotypes were in the ration of 3:1. This occurrence suggests the occurrence of
   A. Epistasis
   B. Recombination
   C. Crossing over
   D. Linkage
5. A man of blood group B married a woman of blood group AB. Which one of the following blood group types would not be of their child?
   A. AO
   B. BO
   C. AA
   D. BB
6. Sickle cell anemia is caused by a double recessive gene and sufferers usually die before maturity. This continued existence of the sickle cell allele among the human population demonstrates
   A. Drug resistance
   B. Heterozygous advantage
   C. In-breeding
   D. Genetic drift
7. Albinism in corn plant is due to double recessive gene which causes them to die before maturity. The trait however continues to appear in generation because
   A. Albina plant can develop chlorophyll when exposed to light
   B. Normal green plants may carry recessive alleles
   C. New varieties may be produced by crossing-over in albino plants
   D. Mutation may occur to change albino plant to green
8. An occurrence of phenotypic ratio of 3:1 in a dihybrid cross is an indication of
   A. Linkage
   B. Crossing of over of chromosome
   C. Failure of homologous chromosome to separate
   D. Dominance
9. In flowers, the heterozygous condition of the alleles for red petal [R] and white [W], are pink. Which one of the following proportions and color of petals is correct if a pink flowered plant is crossed with a red flowered plant?
   A. 3 red: 1 white
   B. 3 red: 1pink
   C. 1pink: 1 red
   D. 1 pink: 1 white
10. Use the information to answer questions 10 and 11 In mice, yellow for [Y] is dominant over grey for [y] when two mice were mated, the off spring were in the ratio of 2 yellow :1 grey. From the results, which of the following were likely genotype of the parents?
    A. Both were homozygous dominant
    B. Both are heterozygous
    C. one was heterozygous and the other homozygous dominant
    D. Both were homozygous recessive
11. Which of the following best explains results?
    A. Double recessive allele for color is lethal
    B. Heterozygous condition for color is lethal
    C. For color could be sex link
    D. Double dominant allele for color is lethal.
12. According to Mendel, all the following are correct except

A. Each characteristic of an organism is controlled by a pair of alleles
B. Each allele is transmitted from generation to generation in a discrete unit
C. There are several varieties of allele of each from each parent
D. Each organism inherits one allele of each pair, from each parent

13. Which one of the following statement is not correct about a test cross?
A. It is carried out on an organism with dominant phenotype
B. The offspring of the cross may all have dominant phenotype
C. The organism of unknown genotype is crossed with a homologous dominant individual
D. The offspring of the cross may have the ratio of 1 dominant phenotype: 1 recessive phenotype
14. Mendelian expected probabilities of genotypes in a cross occur when
A. Small number of offspring are produced
B. Migrations occur in the population
C. Mutation arise
D. Fertilization is random
15. 15. Establishing the genotype of an organism by crossing it with a homologous recessive individual is carrying out a
A. Test cross
B. Dihybrid cross
C. Back cross
D. Monohybrid cross
16. In guinea pigs, the allele for rough coat (R) is dominant over one for smooth coat (r) and that for black coat (B) is dominant over one for white coat (b). the alleles for coat type and color are not linked. A cross between rough black pig and rough white one produced 28 rough black, 31 rough white, 11 smooth black and 10 smooth white. Which one of the following could be the genotype of the parent?
A. RrBb xRrbb
B. RRBB x RRbb
C. RRBb x Rrbb
D. RrBB x Rrbb
17. Which one of the following is true about sex-linked characters in human?
A. Female never suffers from the trait
B. Father do not pass on the character to their son
C. Females are either normal or carriers
D. Male are either carriers or sufferers
18. Which of the following cannot be a parent of a child of blood group O?
A. Man, of blood group A and woman of blood group B
B. Both man and woman of blood group A
C. Both man and woman of blood group B
D. Man of blood group AB and woman of blood group O
19. A rhesus positive fetus whose mother is rhesus negative may not be born alive because the
A. Mothers body produces antigens against fetal antibodies
B. Fetus lack antibodies against the mothers' antigens
C. Mother's body produces antibodies against the fetal antigens
D. Mother's red blood cells mix with the fetal blood
20. Which one of the following is true of linked characteristics? They
A. Are always transmitted as a single block
B. Are allelic to each other
C. Occur on non-homologous chromosomes
D. Can be transmitted independently
21. Assuming that in humans, allele fur the length and color of hair are linked and the ones for long and brown hair are dominant over those for short and dark hair. A child with long and dark hair from a mother who is homozygous for long and brown hair and a father with short and dark hair would be due to
A. Mutation
B. Crossing over
C. Recombination
D. Closeness of the alleles on the chromosome
22. Which one of the following hereditary characteristics is known to be sex linked?
A. Hemophilia
B. Baldness
C. Albinism
D. Color blindness
23. In a plant species, the allele for tallness (T) and blue flower (B) is dominant to that for shortness (t) and white flowers (b). A tall plant with blue flowers was crossed with sort plants with white flowers. The results obtained are: 1tallblue: 1tallwhite: 1shortblue: 1short white The genotype of the blue flowered plant was
A. TtBb
B. ttBB
C. TTBB
D. TtBB
24. Which one of the following is caused by a defect on a recessive sex linked allele?
A. Albinism
B. Color blindness

C. Sickle cell
D. ABO blood group system

25. In flower, the heterozygous condition of allele for red petal (R) and white petal (W), is pink. Which of the following proportions and color of petals is correct if a pink plant is crossed with a red flowered plant?
A. 3 red: 1white
B. 3 red: 1 pink
C. 1pink:1 red
D. 1pink: 1 white
26. Use the information below to answer 26 and 27 In mice, yellow fur (Y) is dominant over grey fur (y), when two yellow mice were mated, the offspring were in ratio of 2 yellow to 1 grey From the results, which of the following were the likely genotype of the parent
A. Both were homozygous dominant
B. Both were heterozygous
C. One was heterozygous and the other homozygous dominant
D. Both were homozygous recessive
27. Which of the following best explains the result?
A. Double recessive allele for color are lethal
B. Heterozygous condition for color is lethal
C. Fur color could be linked
D. Double dominant alleles for fur is lethal
28. What would be phenotypes of children born of a colorblind man and a normal worm?
A. All normal
B. Only girls normal
C. Only boy color blind
D. All color blind
29. A woman produces five children. The first two children were girls, followed a boy. The last two are girls. What is the probability that the sixth child will be a boy
A. ¼
B. ½
C. 1/6
D. 1/8
30. A boy has blood group A and his sister has blood group B. which combination of genotype cannot belong to their parents?

	Mother	Father
A.	I A I A	I B I O
B.	I A I B	I B I B
C.	I O I O	I A I B
D.	I B I O	I A I O

31. A ratio of 3:1 obtained among the offspring in a dihybrid cross is a result of
A. Crossover
B. Linkage
C. Non-disjunction
D. Dominance
32. The phenotype resulting from a cross between red eyed and white eyed fruit flies depends on which parent is red eyed. This means that the gene for eye color is
A. polygenic
B. sex linked
C. homogametic
D. sex limited
33. Which one of the following would lead to genetic death in an animal population?
A. Hemophilia in a population
B. Sickle Cell trait in a population
C. Infertile males in a population
D. Albinism in a population 34.
34. The following can result in some variation of offspring except
A. Haploid parthenogenesis
B. Conjugation
C. Fragmentation
D. Self-fertilization
35. A coffee plant known to be heterozygous for a recessive defect which makes the plant fail to produce viable seeds, was self-pollinated and gave rise to 600 seedlings. How many of the seedling were heterozygous?
A. 150
B. 200
C. 300
D. 400
36. If a father has blood group A and the mother blood group AB then the number of possible genotype of their offspring is
A. 2
B. 3
C. 4
D. 6
37. Which one of the following phenotypic ratios results from a recombination due to the linkage?
A. 4:1:1:4
B. 1:2:1
C. 2:1
D. 1:1
38. What is the maximum number of triplets of nucleotides that could code for the 20 amino acids?
A. 3
B. 6
C. 48
D. 63
39. The following results were obtained from the selfing of F1 generation of pure breading parents for tall and dwarf plants Dominant trait Recessive trait Number of

F2 offspring Tall plants Dwarf plants 8250 What would be the actual number of F2 offspring with tall plants?
A. 6189
B. 4126
C. 2063
D. 1500

40. Variations during mutations of meiotic recombination are
A. random and directionless
B. random and directional
C. small and directional
D. random, small and directional

SECTION B (60 MAKS)

41. In human albinism is caused by an autosomal receive allele. On average, 1 person in 10,000 is an albino.
(a) Give two characteristic of an albino.

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(b) Using Hardly formula $p^2 + 2pq + q^2 = 1$, determine the
(i) Frequency of the albino allele in the human population.

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(ii) Frequency of the heterozygous genotypes in the population.

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(c) Explain why it is difficult to eliminate allele from a population.

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42. (a) Explain the meaning of the Hardy-Weinberg equilibrium principle

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(b) State four conditions that must be fulfilled in order for the principle to hold true

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(c) Brown eyes in a human population is caused by a dominant. If in a population, 84% of the people have brown eye, using Hardy-Weinberg formula, determine the percentage of the population who are.
(i) Heterozygous for eye colour. show your working.

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(ii) Homozygous dominant for eye colour. Show your working

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43. In an oil seed plant species, the allele for tallness is dominant over that for dwarfness. Meanwhile the allele for chlorophyll production and non-chlorophyll show incomplete dominance. The heterozygous plants are variegated.
(a) Using suitable symbols, construct a diagram of a cross between a tall plant with green leaves and a dwarf plant with variegated leaves, to show the genotype and phenotypes of the offspring.

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(b)Explain why 25% of the offspring of the cross in (a) would fail to survive.

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44. In poultry feather color is controlled by two sets of alleles, W [white] dominant over w [colored] and B [black] dominant over b [brown] A foul heterozygous for both alleles WwBb is white.
(a) Explain why the genetic constitution of WwBb is white?

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(b) Work out to show the phenotypic ratio of crossing a white cock (WwBb), with brown hen.

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(c) State the possible genotype of a black fowl.

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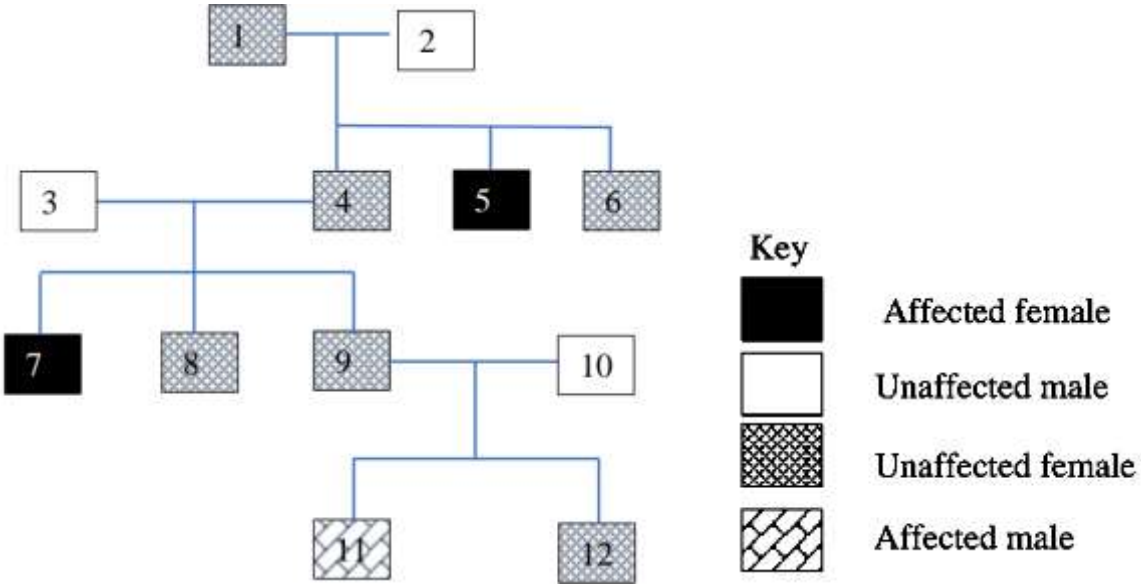
45. The figure below shows how sickle cell anemia has affected a family line. Sickle cell anemia is a recessive genetic defect which is not sex linked individuals are numbered.



(a) State the number of all individuals in the family line that are certain to be heterozygous for this gene (2marks)

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(b) What is the probability that individual 6 is heterozygous for this gene? (show your working)

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(c) The parasite which cause malaria digest hemoglobin in the red blood cells. Suggest two reasons an individual who is heterozygous for this gene may show resistance to malaria.

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(d) State the difference between individuals who have sickle cell anemia and those that have sickle cell trait. (3marks)

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46. (a) Distinguish between sex linked and sex limited genes.

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(b) Color blindness in man is caused by a recessive gene found on X-chromosome.
(i) A boy with normal eye sight married a color blond girl. Using suitable symbols, work out the probability of producing a normal girl affected female Unaffected male Affected male Unaffected female.

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(ii) If one the daughters from the marriage in (b)(i) above married a man with normal eyesight, what is the probability that they will produce a boy with normal eyesight?

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