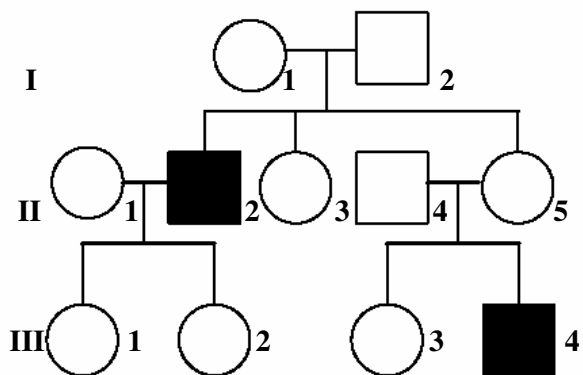


## For Medical Entrance Exam.

1. A gene located on 5<sup>th</sup> chromosome (5q13.3-14) of human is meant for an enzyme involved in cholesterol synthesis. Here, q means
  - (a) long arm of the chromosome
  - (b) short arm of the chromosome
  - (c) chromosome type
  - (d) gene type
2. Chromosome architecture is modified by
  - (a) endoduplication of chromosome
  - (b) inversion of chromosome
  - (c) aneusomaty
  - (d) aneuploidy
3. Most of the cultivated wheat crops are
  - (a) diploids
  - (b) aneuploids
  - (c) polyploids
  - (d) haploids
4. Significance of haploidy in crop improvement programmes is that
  - (a) it helps to develop homozygous lines
  - (b) it is used to identify harmful mutations
  - (c) it is exploited for larger grains
  - (d) it is used in more than one of the above
5. Cytosterility is found in
  - (a) maize
  - (b) wheat
  - (c) sugarcane
  - (d) several crops
6. Back crosses are useful when you are breeding crops for
  - (a) inculcating resistance against a pathogen
  - (b) mutational changes
  - (c) heterosis
  - (d) none of the above
7. C-mitosis is induced in plants through a chemical agent that is
  - (a) an alkaloid
  - (b) a terpenoid compound
  - (c) a glycoside
  - (d) a fatty acid derivative
8. Tubulins are proteins organizing
  - (a) microfilaments
  - (b) bacterial flagella
  - (c) ribosomes
  - (d) none
9. Cdk's (Cyclin dependent kinases ) are involved in
  - (a) Cell cycle control in eukaryotes
  - (b) ATP production in mitochondria
  - (c) Cyclic phosphorylation in chloroplasts
  - (d) Cyclosis
10. Crossing over between homologous chromosomes in plant/animal cell meiosis occurs in
  - (a) diplotene
  - (b) pachytene
  - (c) diakinesis
  - (d) leptotene
11. Dictyosomes are equivalent to
  - (a) Golgi bodies
  - (b) bacterial mesosomes
  - (c) sphaerosomes
  - (d) lysosomes
12. For meiotic division of chromosomes in eukaryotes, DNA replication
  - (a) occurs in Anaphase I
  - (b) is not required
  - (c) takes place in pre-meiotic interphase
  - (d) occurs between Division I and II
13. Eight ascospores in the typical asci of *Neurospora* in relation to two genes of a chromosome show 2AB + 2Ab + 2aB + 2ab due to
  - (a) random chromosome segregation in meiosis
  - (b) crossing over separating the two genes
  - (c) ascospore formation by meiosis followed by mitosis
  - (d) mitotic crossing over
14. If Mendel had continued his experiments in a cross pollinating plant instead of a selfer like garden pea, he could have probably
  - (a) not discovered his principles of heredity
  - (b) discovered linkage as well
  - (c) performed better than he did
  - (d) convinced his detractors about his findings in 1865 itself
15. 2A + XXY chromosome complement in man induces
  - (a) maleness with inputs from the other sex also
  - (b) maleness with aggressive attitude
  - (c) femaleness with few male inputs
  - (d) intersex condition due to sex mosaicism

16. If you are told to obtain mitochondria out of a eukaryotic cell, which procedure you would employ of the following?  
 (a) Spectroscopy (b) Cell fractionation (c) X-ray diffraction  
 (d) Electrophoresis
17. Magnifying capacity of a microscope does not depend on  
 (a) numerical aperture of the objective lens (b) focal length of the objective  
 (c) focal length of the eye piece lens (d) tube length of the microscope
18. Turner's condition is female due to  
 (a) absence of Y chromosome (b) lack of double X  
 (c) presence of an X chromosome (d) one or more of the above
19. In recessive epistasis, recessive homozygous state of a gene is inhibitive to the expression of another gene involved together in phenotype production as in case of coat colour in mouse. A male mouse with dominant agouti coat with the genotype AaBb was crossed with an albino female mouse of the genotype aaBb. If black coat is the other coat type recessive to agouti, what % of offspring could be albino?  
 (a) 25% (b) 50% (c) 15% (d) 0%
20. t-RNA molecules of the cell are involved in gene expression as  
 (a) amino acid carriers (b) mRNA-ribosome binding (c) gene transcriptors  
 (d) feedback inhibitors for the gene
21. mRNA codon for the t-RNA anticodon UAC would be  
 (a) 3' AUG 5' (b) 5' AUG 3' (c) 5' UAC 3' (d) none
22. The molecule size that can cross plasma membrane of cells is  
 (a) 1-25 Å<sup>0</sup> (b) 15-75 Å<sup>0</sup> (c) 8-10 Å<sup>0</sup> (d) 1-15 Å<sup>0</sup>
23. A man who is affected with phenylketonuria marries a woman who is heterozygous for it at that locus. What is the probability that her first child could have phenylketonuria?  
 (a) 1/8 (b) 1/4 (c) 1/2 (d) 3/4
24. If the penetrance for familial polydactyly is 80%, what is the probability that a woman with familial polydactyly will have a normal child?  
 (a) 2/5 (b) 1/2 (c) 3/5 (d) 1/10  
 [Familial polydactyly is a rare autosomal dominant trait where the affected has 6 or more fingers in one or more limbs]
25. If p represents allele A and q represents allele a of the gene producing a photosynthetic enzyme in the anemophilous maize crop. Frequency of heterozygotes in the standing crop would be  
 (a) p<sup>2</sup> (b) q<sup>2</sup> (c) 2pq (d) p<sup>2</sup>q
26. Regarding DNA, which of the following is not true?  
 (a) Attached to 1' position of the sugar ring is one of the four bases  
 (b) The bases lie stacked on each other 3.4 Å<sup>0</sup> apart  
 (c) The guanine-cytosine bonds are made of two hydrogen bonds  
 (d) Nucleotides are joined by 3'-5' phosphor-diester bonds
27. Which of the following statements regarding meiosis is false ?  
 (a) In meiosis II, whole chromosomes separate.  
 (b) In spermatogenesis, meiosis begins at puberty  
 (c) Exchange of paternal and maternal DNA takes place in meiosis I  
 (d) Anaphase lag leads to numerical chromosome aberrations.
28. Which of the following statements regarding the Y chromosome is false?  
 (a) It carries several loci concerned with metabolism.  
 (b) It is the only acrocentric chromosome seen in humans.  
 (c) It carries the Testis Determining Factor on its short arms.  
 (d) It may be detected in some phenotypic females.
29. The X chromosome  
 (a) carries the gene for sickle cell anaemia  
 (b) of the male can be demonstrated in a buccal smear test  
 (c) is found in the nuclei of all spermatozoa

- (d) carries the gene for the Xg blood group.
30. A karyotype
- helps in the diagnosis of genetic disorders
  - is made from cells arrested at telophase of mitosis
  - from a Patau syndrome patient shows an extra chromosome No. 18
  - helps in the identification of the Philadelphia chromosome in chronic myeloid leukaemia.
31. Turner syndrome
- is seen only in females
  - may have one chromosome as an isochromosome
  - is usually associated with severe mental retardation
  - cannot be detected at birth.
32. Which of the following conditions is a chromosome aberration?
- Fragile X syndrome.
  - Phenylketonuria.
  - Cri du chat* syndrome.
  - Down syndrome.
33. Barun, who is healthy, has a sister who has an autosomal recessive disease. If Barun's wife is a carrier of the same disease, what is the probability that their first child would suffer from the disease?
- (a) 1/2      (b) 1/4      (c) 1/8      (d) 1/16
34. The pedigree below is for a very rare X-linked recessive disease. Identify the individuals who must be carriers!

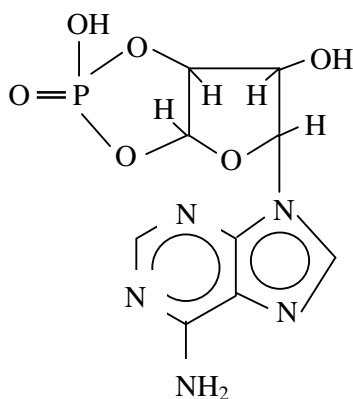


- (a) II      (b) II and II5      (c) III1 and II5      (d) II, II5 and III3
35. Which suppresses production of recombinants in most cases?
- Linkage
  - Co-dominance
  - Linkage and Inversion
  - Inversion
36. Cytological proof of pericentric inversion in a chromosome in a heterozygote state is
- dicentric bridge at anaphase I
  - bridge along with an acentric fragment at anaphase I
  - loop like configuration at pachytene
  - loop like configuration at pachytene without dicentric bridge and acentric fragment at A-I
37. An albino maize variety
- has a lethal gene in chloroplast
  - has the genotype *aa* for an autosomal gene
  - bears an X-linked mutant gene
  - contains a defective mitochondrial gene
38. In *Drosophila*, a fly that is XXY will develop as
- a somatic female
  - a male
  - gynandromorphy
  - either (a) or (b)
39. In human, an individual with a mutant Y chromosome that is deleted for the SRY gene will develop as
- male
  - female
  - sterile
  - none

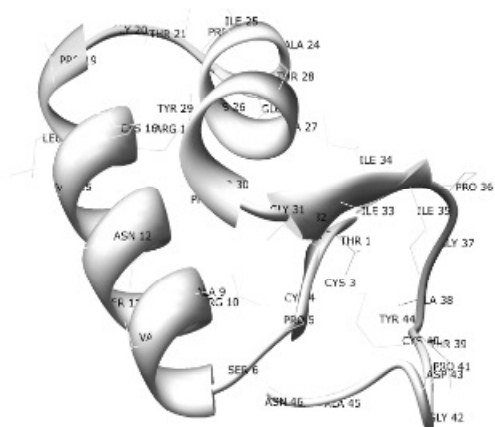
40. A researcher has identified a new mutation called *mom* that results in anatomical abnormalities in fruit flies. The researcher establishes that *mom* is a recessive maternal effect mutation. If *mom/+* females are crossed with *mom/+* males then
- 1/4 of their progeny are expected to display the mutant phenotype
  - 1/2 of their progeny are expected to display the mutant phenotype
  - all offspring would show the mutant character
  - all offspring would bear normal phenotype
41. You identify a mutant gene that causes cancer. The mutant allele is a loss-of-function mutation in a gene whose product normally induces cell death.
- This gene is a tumor suppressor gene
  - This gene is a normal house keeping gene
  - This gene is related to cell cycle regulation
  - This gene is a cancer inducing gene
42. If the gene for tyrosinase protein is mutant in a person, he or she would
- be deficient in tyrosine incorporation in proteins
  - not be able to intake tyrosine from external sources
  - have several dysfunctions in tyrosine related metabolism
  - be an albino
43. Most of the polyploids are
- |                        |                          |
|------------------------|--------------------------|
| (a) autopolyploids     | (b) allopolyploids       |
| (c) autoallopolyploids | (d) segmental polyploids |
44. Interspecific hybrids in certain cases are found to be slightly or considerably fertile. It is because of the fact that
- the species have diverged from each other in the recent past
  - all such hybrids are more or less fertile
  - they have fully identical genomes
  - they have not lost fertility factors yet
45. Neuraminidase is the antigenic glycoprotein membrane bound enzyme of influenza virus that cleaves off sialic acid residues from the mucous layers of the respiratory tract to facilitate multiplication of the virus. Control of viral epidemic may be achieved by
- inhibitory binding by molecules that are analogous to sialic acid
  - inducing mutation into neuraminidase producing gene of the virus
  - replacing the terminal sialic acid units from the cell surface oligosaccharides in the host cells
  - combination of all the above mentioned approaches
46. Transfer of gene into a plant from other sources could be achieved by exploiting
- Ti plasmid containing *Agrobacterium* species of bacteria
  - plant viruses such as CMV or TMV
  - bacteriophages that infect agrobacteria
  - any of the above means
47. In mice the *cvd2* allele is a recessive maternal effect mutation that causes a curved spine in her progeny. You expect to see progeny with a curved spine if
- both the mother and the father are heterozygous for *cvd2*.
  - the mother is homozygous mutant for *cvd2*.
  - the progeny is homozygous mutant for *cvd2*.
  - all of the above conditions are met
48. A neoplastic cell is one that proliferates as a result of
- |                        |                              |          |          |
|------------------------|------------------------------|----------|----------|
| (a) a somatic mutation | (b) a germinal cell mutation | (c) both | (d) none |
|------------------------|------------------------------|----------|----------|
49. If a mutation is present in the promoter of the  $\beta$  globin gene of a child, he would
- be suffering from sickle cell anaemia with sickle shaped RBCs
  - have  $\beta$  thalassemia where haemoglobin would not have polypeptide chain B
  - suffer from  $\alpha$  thalassemia with haemoglobin without chain B
  - contain  $\alpha$  globin gene that is also affected
50. Quantitative phenotypes are controlled by

- (a) Co-dominant alleles                      (b) digenic interactions                      (c) polygenes  
(d) monogenic autosomal inheritance
51. In a plant, its height is under the control of three genes with two alleles each. All the alleles show additive effect and first allele ( $f$ ) of all the allelic pairs adds 2' height while the second of each ( $s$ ) gives 1' only above the residual value of 1.5'. The total height of a plant having genotype  $AfAfBfBsCfCs$  would be  
(a) 10'                      (b) 11.5'                      (c) 12'                      (d) 8.5'
52. A population of deer is polymorphic for a dominant mutation R which changes the color of the nose from brown to red. (The wildtype is the r allele.) Neither allele affects the fitness of the individual (i.e., there is no natural selection). Out of 200 individuals, you observe the following numbers of each genotype:  
20 R/R  
40 R/r  
140 r/r  
What is the allele frequency of the r allele?  
(a) 0.8                      (b) 0.7                      (c) 0.2                      (d) 0.5
53. Referring to the above question, after one generation of random mating, what are the expected genotype frequencies?  
(a)  $RR=0.4$ ,  $rr=0.5$ ,  $Rr=0.1$                       (b)  $RR=0.25$ ,  $rr=0.15$ ,  $Rr=0.6$   
(c)  $RR=0.35$ ,  $rr=0.05$ ,  $Rr=0.6$                       (d)  $RR=0.04$ ,  $rr=0.64$ ,  $Rr=0.32$
54. The ultimate source of all genetic variation is  
(a) recombination  
(b) natural selection  
(c) genetic drift  
(d) mutation
55. G-6-PD (glucose-6-phosphate dehydrogenase) deficiency in RBCs causing hemolytic anemia is due to an X-linked recessive. A girl heterozygous for the gene would be  
(a) suffering from fully blown hemolytic condition  
(b) partially deficient for G-6-PD enzyme  
(c) completely free from any defect  
(d) none of the above
56. Which is incorrect regarding eukaryotic genes?  
(a) They are mostly interrupted                      (b) They are expressed for their shorter length  
(c) Their promoters are different from those of prokaryotes  
(d) They are regulated through operon mechanism
57. Concept of the fine structure of gene was first elucidated by S. Benzer in  
(a) *Neurospora*                      (b) *Drosophila*                      (c) T4 phage                      (d) mouse
58. One of the following is an autosomal dominant disorder. Which one?  
(a) Albinism                      (b) Huntington's disease (HD)                      (c) Fragile X-syndrome  
(d) PKU
59.  $\alpha 2\beta\beta'\sigma\omega$  is the structural representation of  
(a) a pentameric protein associated with membrane transport  
(b) eukaryotic RNA polymerase                      (c) prokaryotic RNA polymerase  
(d) a promoter binding factor in eukaryotes
60. Symbiotic cytoplasmic particles in *Drosophila* inducing high degree of sensitivity towards  $CO_2$  (previously called  $\sigma$  particles) are  
(a) RNA particles                      (b) DNA aggregate                      (c) Plasmid                      (d) unknown
61. Which of the following carries/carry extranuclear genome (plasmon)?  
(a) plant leucoplast                      (b) plant chloroplast                      (c) both                      (d) none
62. Regulation of eukaryotic gene function occurs by  
(a) CAAT box control of transcription                      (b) Methylation of a specific site near gene  
(c) Non-triggering of modification of the gene product                      (d) one or more of the above
63. The purpose of anti-sense RNA in prokaryotes is

- (a) to synthesize chaperon proteins  
 (c) to enhance the activity of a gene
64. Catabolite repression is found in  
 (a) bacteria (b) mammals (c) viruses (d) all organisms
65. Identify the molecule given below –

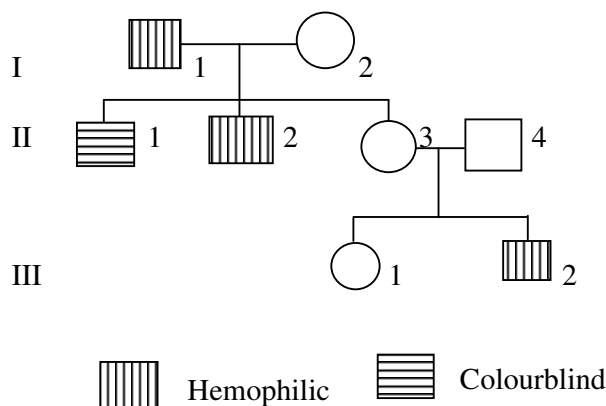


- (a) Second messenger cyclic-AMP  
 (c) Rare energy provider GMP
- (b) Energy currency ATP  
 (d) None
66. Following is a small seed protein Crambin with 46 amino acids in total. How many nucleotides the reading frame of its gene would consist of ?



- (a) 46 (b) 96 (c) 138 (d) impossible to say
67. How many  $\alpha$  helices and  $\beta$  sheets the above protein has?  
 (a) two each (b) two and three respectively (c) two and four respectively  
 (d) two and one respectively
68. Which amino acid lies at N-terminus of the Crambin protein?  
 (a) Arginine (b) Lysine (c) Threonine (d) Asparagine
69. The sequence of a segment of a gene is 3'...aaccttgctgacttaagacgtgtccaggttctaagacggct...5'. It has been treated with the restriction enzyme *EcoRI*. How many places, it would be cut at?  
 (a) None at the best (b) One (c) Three (d) Two
70. Method for DNA sequencing was developed by  
 (a) F. Sanger (b) W. Gilbert and A. Maxam (c) Sanger and Gilbert & Maxam  
 (d) G. Kohler
71. Nitrocellulose papers are required when you normally perform the experiment for  
 (a) DNA isolation (b) RNA isolation (c) Southern Blotting (d) all of the above

72. The famous classical geneticist known for his works in the area of sex linked inheritance was  
 (a) C.P. Swanson (b) T.H. Morgan (c) M.W. Strickburger (d) E.L. Tatum
73. Superbug capable of eating out petroleum spills was constructed in  
 (a) *Pseudomonas* (b) *Klebsiella* (c) *E. coli* (d) *B. subtilis*
74. The term 'Gene library' is associated with  
 (a) gene constructs (b) parks/zoo etc. (c) library of books on genes (d) none
75. AUG is the codon for the amino acid  
 (a) Tyrosine (b) Valine (c) Alanine (d) Methionine
76. Genetic code was cracked by  
 (a) M.W. Nirenberg (b) H.G. Khorana (c) Nirenberg & Khorana both  
 (d) R. Holley
77. 'Cap' of mRNA of eukaryotes is composed of  
 (a) poly-A (b) 5'-methyl cytosine (c) 7'-methyl guanosine  
 (d) either (a) or (b)
78. Rarely, initiation codon in few bacteria is  
 (a) GUG (b) CGC (c) AUG (d) AAC
79. If blood groups of the parents are A and B respectively, children of the couple would bear  
 (a) group A or B (b) group A or AB (c) group AB or O (d) group A, B, O or AB
80. Number of possible genotypes in a genetic system with 6 alleles would be  
 (a) 10 (b) 21 (c) 12 (d) 20
81. In the following pedigree, find out the genotype of III1?



- (a)  $X^cX$  (b)  $X^hX$  (c)  $X^cX$  or  $X^hX$  (d)  $XX$
82. *Triticale* is the hybrid developed from  
 (a) Durum wheat & Rye (b) Emmer wheat & Rye  
 (c) Bread wheat & Maize (d) Wheat & Barley
83. Base chromosome ( $x$ ) number in wheat is  
 (a) 12 (b) 14 (c) 7 (d) 21
84. The ratio of the genotypes Ppqq, PPqq, PpQq and ppqq in a Mendelian dihybrid cross will be  
 (a) 2:1:4:1 (b) 1:2:4:1 (c) 2:2:4:1 (d) 9:3:3:1
85. Complementary to trisomy is  
 (a) disomy (b) nullisomy (c) tetrasomy (d) monosomy
86. A triploid crop like *Colocasia* is found to be sexually sterile. This is because of  
 (a) agamospermy (b) parthenogenesis (c) failed meiosis (d) mitotic errors
87. Bateson and Punnett obtained 1:7:7:1 ratio in the dihybrid test cross in sweet pea due to  
 (a) linkage of genes and *trans* dihybrid (b) linkage and *cis* dihybrid  
 (c) crossing over in *trans* dihybrid (d) more than one of the above
88. It is normally found that the frequency of recombination by crossing over per chromosome is lesser in case of  
 (a) outbreeders (b) inbreeders (c) monoploids (d) vegetative reproduction

89. Which histone is not associated with the octamer protein core of the chromosomes?  
 (a) H2a (b) H3 (c) H4 (d) H1
90. Amniocentesis is a technique  
 (a) to discover sex of an unborn foetus (b) to detect inborn defects prenatally  
 (c) to know the genotypic traits of an adult (d) none
91. Following is the photograph of the karyotype of a foetus obtained from amniotic fluid cells. Identify the chromosomal disorder the baby has –



- (a) Patau's syndrome (b) Down's syndrome  
 (c) Edward's syndrome (d) Klinefelter's syndrome
92. Which stage of mitosis the photograph presented below is depicting?



- (a) metaphase (b) anaphase (c) telophase (d) prophase
93. Chromosomes are mostly  
 (a) metacentric (b) acrocentric (c) sub-metacentric (d) telocentric
94. Brachyphalangy (condition of blunted fingers) is due to a lethal gene inducing the condition in heterozygotes. Marriage between two heterozygous individuals would lead to  
 (a) all children with brachyphalangy (b) 2/3 with brachyphalangy and 1/3 normal  
 (c) 50% children with brachyphalangy (d) none with brachyphalangy
95. HNO<sub>2</sub> is a mutagen. It causes  
 (a) base pair substitution in DNA through deamination of bases  
 (b) base pair substitution by tautomerization of bases  
 (c) deletion of bases from DNA strands  
 (d) inversion of a lengthy intercalary sequence of DNA
96. What role mutation plays in organic evolution?  
 (a) It creates a panorama of variations for natural selection to operate on  
 (b) It restricts biotic potential of organisms and minimises the number of offspring  
 (c) It causes survival of the fittest

- (d) It is always adaptive in nature, and hence, induces organisms to survive in adversity
97. In case of genetic self incompatibility in angiospermic plants, several alleles are involved such as S1, S2, S3, S4 etc.. A stigma of the genotype S1S3 would be successfully pollinated by the pollen containing  
(a) S1 allele                      (b) S2 allele                      (c) S3 allele                      (d) any of the given
98. Parasexual genetic recombination as shown by some lower organisms like few species of fungi is achieved through  
(a) random picking of required number of alleles from a set of allelic forms  
(b) recombination by somatogamy  
(c) crossing over                      (d) none mentioned
99. Selfish genes are  
(a) genes which regulate their own function  
(b) repetitive DNA that has no regular function  
(c) genes involved in meiotic obliteration  
(d) DNA sequences carried over by viruses into genomes of the host organisms
100. Transposition of genes was first observed in  
(a) bacteria                      (b) maize                      (c) *Drosophila*                      (d) Barley

*Dear students,*

*You may mail your answers to [jainendra@dbbttcoc.edu.in](mailto:jainendra@dbbttcoc.edu.in) to get evaluatory response. (Do not forget to include your current e-mail address).*

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