DSE B1 Model Questions

Unit 1 Introduction to Genetics

Very short answer type questions (1 mark each)

SL. No.	
1.	Why has been *A. thaliana* chosen as a model organism?
2.	After whom has been *E. coli* named?
3.	What was the initial name of *E. coli*?
4.	How do the wild *D. melanogaster* look different from the lab grown flies?
5.	What is meant by 'quiescence'?

Short answer type questions (2 marks each)

SL. No.	
1.	What are model organisms and why are they useful in genetic studies?
2.	Name one model organism each from prokaryotes, plants and animals which have significantly helped in biological research.
3.	What is meant by the term holometabolous?
4.	What is meant by Androdioecy?
5.	The famous 'one gene-one protein hypothesis is associated with which organism? Who are the concerned scientists?

Broad answer type questions (more than 2 marks each)

SL. No.	
1.	State the properties an ideal model organism should have.
2.	Briefly discuss the two alternative life cycles of *C. elegans* in /presence of ample resources and under stressful conditions.
3.	What are the advantages of Drosophila as a lab strain?
4.	What is 'Saccharomyces sensu stricto complex'? What is its significance?
5.	Give a schematic representation of the life cycle of *S. cerevisiae.*

Unit 2

1. What is codominance? 1
2. What is test cross? 1
3. What is overdominance? 1
4. How can you define hybrid? 1
5. What is meant by independent assortment? 1
6. What is pseudoallele? 1
7. What is penetrance? 1
8. What is incomplete dominance? 1
9. How can you confirm a trait is a dominant trait? 1
10. What is epistasis? 1
11. What are multiple alleles? 2
12. Distinguish between epistasis and hypostasis. 2
13. How many gametes are expected in a cross AaBbCc x AaBbcc? 2
14. Mention two principles on which second law of Mendel is based. 2
15. Mention two criteria of Mendel's second law. 2
16. How can you explain human ABO blood group is a codominance phenomenon? 2
17. Distinguish between incomplete dominance and codominance. 2
18. State Mendel's second law. 2
19. Why did Mendel choose pea plant for his experiments? 2
20. Mention two phenomena that do not obey Mendel's law. 2
21. What is complementation test? Explain it with a suitable example. 1+4
22. With a suitable example explain the phenomenon of multiple allele. 4
23. What is dominant epistasis? Explain it with a suitable example. 1+4
24. What is recessive epistasis? Explain it with a suitable example. 1+4

25. What is polygenic inheritance? What is its significance? 2+2

26. Problems on Mendelean principles.3

27. Problems on Mendelean variation. 3

28. Problems on gene interations. 4

Unit 3

1. What is absolute linkage? 1
2. What is linkage group? 1
3. What is incomplete linkage? 1
4. What is complete linkage? 1
5. Where does crossing over take place? 1
6. What is cytological marker? Cite an example. 1
7. Distinguish between crossing over and translocation. 1
8. What is three point test cross? 1
9. What is branch migration? 1
10. What is Holliday junction? 1
11. How can you know certai genes are linked? 2
12. What is mapping function? 2
13. Mention the functions of RuvA and RuvC. 2
14. Does mitotic crossing over occur? If yes when? 2
15. What do you mean by recombinant character? 2
16. What is chiasma? 2
17. Explain incomplete linkage with a suitable example. 4
18. Explain complete linkage with a suitable example. 4
19. How can you detect crossing over cytologically in plant specimen? 5
20. How can you detect crossing over cytologically in animal specimen? 5

21. Explain the terms coupling and repulsion with examples. 4

22. Describe crossing over at four strand stage. 5

23. Describe briefly the molecular mechanisms of crossing over according to Holliday model. 5

24. Problems on linkage and crossing over.5

Unit 4: Extranuclear Inheritance

Very short answer type questions (1 mark each)

SL. No.

1. Shell coiling in Lymnaea is found at the stage of……

2. Paramecium strains possessing kappa particles are…….

3. .....petites lack majority of mtDNA

4. Chloroplast mutation in mirabilis jalapa was reported by……

5. The first known cytoplasmic mutation, streptomycin resistance (*strR*) in *Chlamydomonas,* was reported by the scientist ……..

Short answer type questions (2 marks each)

SL. No.

1. What are the 3 major types of extranuclear inheritance?

2. How ENI differs from nuclear inheritance?

3. Name two organisms where a) chloroplast mutation b) mitochondrial mutations are found

4. Differentiate between maternal effect and maternal inheritance

5. What are poky strains?

6. What are petites?

7. How many types of petites are found? What are they?

8. What are kappa particles? Where do we find them?

9. Why are the poky strains slow growing?

10. Why do petite strains give small size colonies?

Broad answer type questions (more than 2 marks)

SL. No..

1. Explain the hypotheses that can explain suppressiveness of organelle heredity.

2. Explain how maternal genes exert their effects during the early stages of development.

3. How do you prove that transmission of kappa particles occurs via cytoplasmic exchange?

4. Mention the characteristics of maternal influence.

Unit 5:Characteristics of Chromosomes

Very short answer type questions (1 mark each)

SL. No.

1. What is the length (in bps) of a typical eukaryotic chromosome?

2. Name the scientist who first described the chromosomes.

3. Name the scientist who first coined the term ‘chromosomes’.

4. Why was the term chromosome ascribed?

5. What is euploidy?

6. What are nullisomics?

7. In which phase of the cell division are chromosomes generally measured?

8. State a potential disadvantage of the Q banding.

9. What is Down’s syndrome?

10. What is the difference between chromosome and chromatin?

11. What is a hemizygous allele?

12. What is a Philadelphia chromosome?

13. What is the approximate length of DNA inside each adult human nucleus?

14. Where is H5 histone found?

15. Which are the major scaffold proteins?

Short answer type questions (2 mark each)

SL. No.

1. Which type of amino acid occurs with highest frequency in histones and why?

2. Differentiate between karyotype and idiotype.

3. Classify chromosomes according to the position of centromeres.

4. Differentiate between facultative and constitutive heterochromatin.

5. What is the biological significance of the heterochromatin region?

6. What is a “Satellite DNA”?

7. How are giant Polytene chromosomes formed?

8. Differentiate between pericentric and paracentric inversions.

9. What is the function of HAT enzyme in gene expression?

10 Which banding pattern will you use if you want to visualize the constitutive heterochromatin region? Explain.

11. Differentiate between terminal deletion and intercalary deletion.

12. Is it possible to visualise gene expression even when the cells are dividing? Explain

13. Differentiate between a chromatosome and a nucleosomal core particle

14. What are scaffold proteins?

15. State the structure of a 30 nm chromatin fibre.

Broad answer type questions (more than 2 marks)

SL. No..

1. On digestion of the 11 nm chromatin fibre and subsequent electrophoresis, a 200 bp ladder is obtained. Explain this observation.

2. What is Cri-du-chat syndrome? Why does it occur?

3. What are Barr bodies? How are they formed?

4. What is a kinetochore? Explain its significance in cell division.

5. What is meant by position effect? Explain the role of Sir proteins in position effect.

6. Write a short note on the different methods of chromosome banding.

7. Briefly describe with a cartoon, the general structure of a histone octamer.

8. Design an experiment to find out which region of a chromosome is euchromatin and which is heterochromatin

9. Show with a schematic the effect of a) RNase treatment and b) DNAse treatment on bacterial nucleoid.

10. Write a short note on bacterial histone like proteins.

Unit 6: Recombination

Very short answer type questions (1 mark each)

SL. No.

1. What is the function of resolvase?

2. Which protein promotes branch migration?

3. What is a chi site?

4. What is a R-loop?

5. What is the other name of the DSB repair pathway?

6. What is branch migration?

7. What is a crossover product?

8. What is illegitimate recombination?

9. In which step of meiosis recombination takes place?

10. Define one centiMorgan.

11. What do you mean by synapsis?

Short answer type questions (2 mark each)

SL. No.

1. What are the three types of recombination?

2. Compare homologous and nonhomologous recombination.

3. Define reciprocal recombination with a suitable diagram.

4. What are the advantages of recombination?

5. Define heteroduplex DNA.

6. What are the characteristics of a chi site? Why is it present in the bacterial genome?

7. Write a note on Rec A protein.

8. Define plectonemic and paranemic joints.

9. What is the difference between complementation and recombination?

10. Define ectopic or homeologous recombination with example.

11. Why is recombination stimulated on the 5' side of a chi site?

12. Explain transactivation. Who causes transactivation?

Broad answer type questions (more than 2 marks)

SL. No.

1. Holliday junctions can be resolved in two different ways. What are the consequences of the strand choice used in resolution?

2. What are the steps of homologous recombination?

3. Write the function of each subunit of RecBCD enzyme.

4. Explain site specific recombination in bacteriophage.

Unit 7: Human genetics

SL. No. Answer the followings: (2 marks each)

1. What is an ideogram/karyotype?
2. What is the basis of Denver's chromosome classification?
3. What are the meanings of standard symbols (p,q,r) describing karyotype?
4. Mention the applications of karyotyping.
5. What are the three categories of genetic disorders?
6. Define and give examples of three categories of genetic disorder.
7. What is the first step of analysis of genetic disorder?
8. What is a pedigree chart? How is proband shown in the pedigree chart?
9. What are the four patterns of single gene disorder?
10. What is lod score?
11. Mention the significance of lod score
12. Describe the features of four patterns of single gene mutation
13. Give example of four patterns of single gene mutation
14. Draw the pedigree chart of four patterns of single gene mutation