Biology 40S Review

1. Why is the X chromosome considered to be genetically stronger than the Y?

2. Could DNA be considered to be an enzyme?

3. If a female has the genotype $X^{c}X^{c}$, is she considered to be a carrier?

4. Place the following in the correct order: tRNA, Protein, DNA, RNA.
    a. What is the above process called?

5. Which of the following genotypes can protect you against malaria: $Hb^{n}Hb^{n}$, $Hb^{n}Hb^{s}$, $Hb^{s}Hb^{s}$. (n-normal; s=sickle cell) Why?

6. Loss of a piece of chromosome is known as:

7. Gain of a piece of chromosome is known as:

8. Adding a piece of chromosome is known as:

9. Non disjunction in a male sex chromosome could result in what syndrome (show all possibilities)?

10. What is the difference between inbreeding and outbreeding?

11. How are the following terms different: anticodon, code and codon? Explain.

12. Are dominant genes always more common than recessive genes? Explain.

13. Will a dominant gene have the same phenotype expression in the homozygous or heterozygous condition?

14. What enzyme adds primers?

15. Why do you need primers?

16. Are any of the following codons start codons? AAA, UUU, UCC. Explain.

17. In a DNA double helix:
    a. What molecules from the rungs?

    b. What molecules form the sides?

c. What molecules do nitrogen bases always attach to in a single polynucleotide chain?

18. If a male is colour blind, what does this possible tell you about his parents?

19. What do we mean when we say that an F1 plant is allowed to self-pollinate?

20. Which of the following does not occur in the nucleus:
    a. DNA synthesis, replication, transcription, translation?

    b. If it doesn't take place in the nucleus, where does it take place?

21. mRNA is edited before it attaches to ribosomes, how is this done?

22. In human, how many pairs of homologous chromosomes would you end up with at the end of:
    a. Mitosis

    b. Meiosis

23. Is it possible that a true breeding organism could show a dominant or a recessive phenotype? Explain.

24. When Mendel crossed two true breeding peas (between white and purple, for example) the F2 generation always yields the following:
    a. Genotypic Ratio

    b. Phenotypic Ratio.

25. T-Tall, t-short, R- round, r-wrinkled. If you mate a plant that is heterozygous for both characteristics with another of the same genotype:
    a. What fraction of the offspring will be tall and wrinkled?

    b. What fraction will also be short and round?

26. Two heterozygous tall round plants are crossed, the probability of one of their offspring being short is ¼ the probability of one of the offspring being wrinkled is ¼. What is the probability that the one of their offspring will be short with wrinkled seeds?

27. A brown mouse is mated to a white mouse and all of the offspring are brown.
    a. Could the brown mouse be a hybrid?

    b. If two offspring from the above cross are mated, what fraction of the offspring will be white? What fraction will be homozygous? Heterozygous?

    c. What could you do to find out the genotype of one of the above F2 brown mice?

28. Both DNA and RNA are polymers made up of subunits called _____.

29. When does DNA replication always take place?

30. Which of the following is needed for DNA replication? RNA replication?

    Ribosomes, tRNA, mRNA, RNA polymerase, nucleotides, DNA sense strand, DNA polymerase.

31. If a red eyed drosophila female, heterozygous for white eyes is mated to a red eyed male, what will be the phenotypic ratios for sex and eye colour in their offspring?

32. List the genotypes of the following:

    a. A male heterozygous for chinchilla and Himalayan.

    b. A female heterozygous for Himalayan and albino.

    c. What kind of offspring can they have and in what proportion?

33. Is it possible for two normal vision people to have:
    a. A colour blind son?

    b. A colour blind daughter?

34. If two people of normal vision have a colour blind son,
    a. What is the probability that their next son will be colour blind?

    b. What are the chances that their next child will be colour blind?

35. In pea plants the gene for tall (T) is dominant over the gene for short (t) and the gene for round (R) is dominant over the gene for wrinkled (r).
    a. What is the genotype of a pure tall round pea plant? b) How many different kinds of gametes can it produce?

    b. What is the genotype of a pure tall hybrid round pea plant? d) How many different kinds of gametes can be produced? e) What is the genotype of a short wrinkled seed plant?

    c. How many different kinds of games can be produced?

36. A tall round seeded plant of unknown genotype is crossed with a pea plant homozygous for both recessive traits. Do a punnet square for each of the following offspring phenotypic ratio scenarios to determine the genotypes of the parents.
    a. 4 tall round: 4 tall wrinkled: 4 short round: 4 short wrinkled seeded plants.

    b. 8 tall round : 8 tall wrinkled seeded plants.

c. All 16 offspring are tall and round.

d. 8 tall and round: 8 short and round.

37. Vitamin D resistant rickets in a human is a sex linked dominant trait.
    a. What is the genotype of a man with this disease.

    b. What is the genotype of a woman who does not have this disease.

    c. What kinds of children can they have and what proportion.

38. Achondroplasia, a form of dwarfism resulting from a defect in metaphysical plates forming long bones is an autosomal dominant trait. What is the genotype of a male who does not have this disease?

39. Consider the following pedigrees of a straight forward two allele A, a inheritance.

    a. Do a punnett square for individuals 1 and 2.

    b. Do a punnett square for individuals 3 and 4.

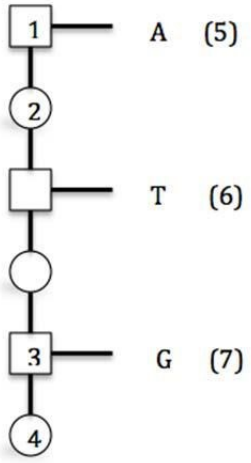
    c. Give the possible genotypes of all the people in both pedigrees.

40. A cross between two pink flowers produces offspring in the ratio of 17 red, 31 pink, and 19 white. What type of inheritance is involved and do a Punnett square to prove your choice.

41. In guinea pigs black coat colour (B) is dominant to white. A white male is mated to two black females. Female A has 9 offspring all black, female B has 12 offspring, 5 or which are white. Give the genotypes of the: the male_____, female A _____, female B _____.

42. Define the term test cross.

43. . What is the following structure, label numbers 1 through 7.



a. What numbered structure represents the 3' end?

b. What numbered structure represents the 5' end?

c. Make the above structure into a DNA molecule.

d. If the above structure was RNA, which of the above numbers would be different?

e. How else would the molecule be different?

44. Briefly describe in point form the process of DNA replication. Include in your answer the welder, main builder, eraser, un-zipper, straightener, the main builders helper, and the starter.

45. What are the original names for the above and their function:
    a. The welder

    b. Un-zipper

    c. Main builder

    d. Eraser

    e. Straightener

    f. Main builders helper

    g. Starter

46. Define the following:

a. Point mutation.

b. Missense mutation.

c. Silent mutation.

d. Frameshift mutation.

e. Chromosomal mutation.

47. Which of the following chromosomal mutation would you need two different kinds of chromosomes to the show the mutation: inversion, deletion, polyploidy, translocation, addition.

48. Using the following two chromosomes and genes, explain four different kinds of chromosome mutations:
ABCDEFGHIJKL RSTUVWXYZ

49. Similarities and differences between DNA and RNA.

	DNA	RNA
Ribose Present		
Phosphate Present		
Uracil Present		
Guanine Present		
Contains a chemical message or code		
Remains in the nucleus		

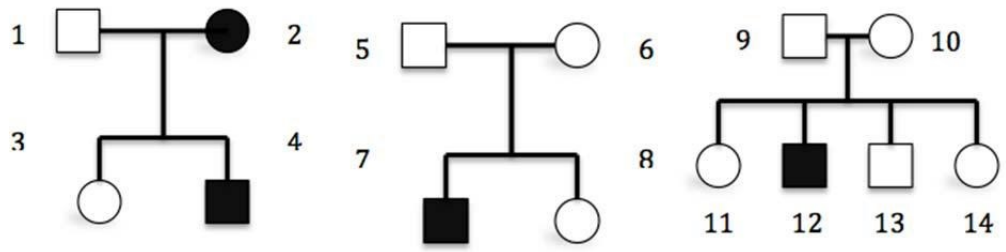
50. Similarities and differences between messenger RNA and transfer RNA.

	mRNA	tRNA
Contains a chemical message or code		
Contains a triplet on nitrogen bases		
Called a codon		
Thymine present		
Adenine present		
Carries an amino acid		
Single stranded		
Double stranded		

51. Briefly describe in point form, the process of transcription of genes.

52. Briefly describe in point form, the process of DNA replication.

53. The filled in squares and circles represents people who are colour blind. Give all the possibilities for people 1-14.



1.	2.	3.	4.	5.
6.	7.	8.	9.	10.
11.	12.	13.	14.	15.

54. Describe the genotypes and phenotypes of the following:
    a. A normal X sperm and a non-disjunction egg with both sex chromosomes.

55. If a male of blood group A marries a female of blood group B, they have a child of blood group O and another of blood group A. What are the genotypes of the parents and children? If they have any more children, what are the chances of an A child.

56. Using chromosome 1 as a template, illustrate what the genetic sequence would be like for the following chromosome mutations.

    Chromosome 1 - ABCDEFGH Chromosome 2 – PQRSTUVW

    a. Inversion

    b. Deletion

    c. Translocation

    d. Polyploidy

    e. Addition

57. Explain how polyploidy can occur in gametes.
    a. These organisms are usually taller and more productive than diploid species, why?

58. Fill in the following table:

DNA Code	mRNA codon	tRNA Codon	Amino Acid
			methionine
TTC			
		GGA	

59. Using the chart in the above question, answer the following question.

    a. If TTC is part of a sense strand of a DNA molecule what does TTC code for?
    b. What type of point mutation would occur in TTC was changed to TTG?
    c. What does TTG code for?
    d. If TTC was changed to TTT? What does TTT code for?
       What type of point mutation would occur?
    e. If TTC was changed to ATC what does ATC code for?
       What type of mutation would occur?
    f. What type of point mutation was not mentioned above?
       Explain how this type of mutation can occur.
    g. Explain whether this mutation is more harmful than the mutations mentioned before it?

60. What is a somatic cell?

61. A human has how many chromosomes in every somatic cell?

62. All chromosomes in normal body cells can be divided into two groups. What are the groups?

63. Describe the differences between the following, using genotypes that could be used to illustrate the results.

    a. Mendel's principle of dominance.
    b. Mendel's principle of independent assortment. c.
       Mendel's principle of segregation.

64. What are the chromosomal differences between Down's syndrome and Kleinfelter's syndrome?

65. What is the main difference between sex-linked genes and linked genes?

66. List 4 statements you can make about sex chromosomes.

67. Suppose that non disjunction occurred in the sex chromosomes of a female.

    a. If the resulting egg was fertilized by a X containing sperm, what would the possible genotypes of the offspring be?

    b. If fertilization was by a Y containing sperm, how would the results differ?

68. Explain the difference between DNA chromosome and genes if there is any.

69. Guinea pigs can either be black or white. Explain a cross that would produce:
    a. 50% black and 50% white offspring.
    b. 75% black offspring.
    c. 100% black offspring.
    d. 25% white offspring.

70. What is the best explanation for the inheritance of traits such as hair colour with a wide range of phenotypes?

71. List the 3 main differences between DNA and RNA.

72. What are the main function of the following:
    a. mRNA
    b. tRNA
    c. rRNA

73. We often say that one gene codes for one protein, but a better explanation would be one gene codes for one _____.

74. If a fertilized egg of a species has 22 chromosomes:
    a. A skin cell would contain _____ chromosomes.
    b. An unfertilized egg would contain _____ chromosomes.
    c. A somatic cell would contain _____ chromosomes.
    d. A sperm would contain _____ chromosomes.
    e. A gamete would contain _____ chromosomes.

75. Define a lethal gene.
    a. Which are more common: dominant or recessive lethal genes. Explain.

Vocabulary – ALL UNITS

CELL STRUCTURE

- prokaryote
- eukaryote
- plasma membrane
- nucleus
- nuclear membrane
- ribosomes
- smooth ER
- rough ER
- golgi apparatus
- lysosome
- cell wall
- mitochondria
- chloroplasts
- cytoskeleton
- centrosome/centrioles

MITOSIS

- cell cycle
- G1, S, G2
- Genome
- Somatic cell
- Gamete
- chromatid
- Cytokinesis
- Prophase
- Metaphase
- Anaphase
- Telophase
- Mitotic spindle
- Kinetochore/centromere
- Cell plate
- Cleavage
- Binary fission
- **MEIOSIS**
- Genes
- Asexual reproduction
- Sexual reproduction
- Karyotype
- Homologous chromosome
- Sex chromosome
- Autosome
- Gamete
- Diploid cell (2n)
- Haploid (n)
- Zygote
- Prophase I
- Metaphase I
- Anaphase I
- Telophase I
- Prophase II
- Metaphase II
- Anaphase II
- Telophase II
- Synapsis
- Crossing over
- Trisomy 21
- Klienfelter's Syndrome

MOLECULAR GENETICS

- RNA
- DNA
- Nucleotide
- Nitrogenous
- Adenine
- Guanine
- Cytosine
- Thymine
- Uracil
- transforming principle
- Chargaff's Rule
- Purine
- Pyrimidines
- Complementary
- Antiparallel
- semi-conservative
- replication origin
- DNA polymerase
- replication forks
- helicases
- primer
- Okazaki fragments
- leading strand
- DNA ligase
- lagging strand
- primase
- Okazaki fragments
- leading strand
- DNA ligase
- lagging strand
- primase
- gene
- genome
- exon
- introns
- genetic code
- gene expression
- transcription
- translation
- codon
- mRNA
- RNA polymerase
- sense strand
- anti-sense strand
- tRNA
- anticodon
- ribosome
- rRNA
- mutation
- somatic cell mutation
- silent mutation
- mis-sense mutation
- nonsense mutation
- frameshift mutation
- spontaneous mutation
- induced mutation
- mutagem
- physical mutagen
- chemical mutagen

MENDELLIAN GENETICS

- traits
- heredity
- inherited

- genetics
- variations
- purebred
- true breeding
- P generation
- filial generation
- F_1 generation
- hybrid
- monohybrid
- dominant
- recessive
- principle of dominance
- F_2 generation
- Mendelian ratio
- law of segregation
- genes
- alleles
- homozygous
- heterozygous
- probability
- product rule
- Punnett's Square
- genotype
- phenotype
- complete dominance
- test cross
- di-hybrid cross
- law of independent assortment
- incomplete dominance
- co-dominant
- multiple alleles
- pedigree
- carrier
- sex-linked inheritance
- polygenic inheritance
- continuous variation
- albinism
- sickle cell anemia
- phenylketonuria (PKU)
- progeria
- heterozygous advantage
- sickle cell anemia
- Huntington's disease
- karyotype

EVOLUTION/CLASSIFICATION

- Charles Darwin
- Evolution
- natural selection
- adaptation
- behavioural adaptation
- physiological adaptation
- structural adaptation
- mimicry
- camouflage
- fossil molds
- fossil casts
- fossil imprints
- fossil amber
- trace fossils
- palaeontologist
- sedimentary rock
- radiometric dating
- relative dating
- homologous structures
- analogous structures
- vestigial structures
- embryological development
- Main points of Darwin's Theory
- Overproduction
- Competition
- Variation
- Speciation
- stabilizing selection
- directional selection
- disruptive selection
- allopatric speciation
- sympatric speciation
- reproductive isolation
- behavioural isolation
- chromosome mutation
- divergent evolution
- convergent evolution
- parallel evolution
- punctuated equilibrium
- gradualism
- mutation
- genetic drift
- gene flow
- bottle neck effect
- founder effect
- taxonomy
- classification
- phylogenetics
- binomial nomenclature
- Taxon
- classification of organisms
- Carl Linnaeus
- Genus
- Species
- Family
- Order
- Phylum
- Kingdom
- Domain
- Division
- Class

DIAGRAMS – *Label the Process and/or Diagram as Appropriate*