1. What is the chromosomal basis of inheritance?
   - Genes have specific loci along chromosomes; chromosomes segregate and
     assort independently.

2. In your own words, explain what is demonstrated by 15.2 on page 287.
   - Genes on chromosomes go through meiosis and follow
     the law of segregation and law of independent assortment which
     separates them into gametes.

3. What does wild type mean?
   - A character commonly observed in a natural population.

4. Why was Morgan’s choice of fruit fly such a good one for genetic experiments?
   - Prolific breeder, produce hundreds of offspring, short generation time,
     easy to see phenotypes, easy to take care of, 4 pairs of chromosomes.

5. How did Morgan associate traits with the sex of the fruit fly?
   - Found white eyes in only males in F2 after white male crossed with
     red female in F1, somehow eye color was related to the sex of the fly.

BE CAREFUL with the way the letters represent the traits – the + superscript means the trait is
absent – vg+ means normal wings, not vestigial wings. This is counterintuitive and appears
backwards – be careful with it while you read or you will get VERY confused.

6. What does it mean when genes are linked or we can say there is linkage?
   - A gene is located on a particular chromosome
     Sex-linked gene is on the X chromosome
     Linked genes are located near each other on the same chromosome and are
     frequently inherited together.

AGAIN – the word recombinant is critical. Recombinants are the traits that are in the offspring –
mix and matched – meaning – think of it in terms of the peas – round and yellow parents crossed
with green and wrinkled seeds. The offspring that are round and yellow OR green and wrinkled
ARE NOT recombinants. The offspring that are yellow and wrinkled OR green and round ARE
recombinants. The parental genes are – mix and matched. Understanding this term is essential to
your reading.

7. In what step of meiosis would recombinants form and why?
   - Prophase I, it occurs during crossing over.
8. What is the difference between a genetic map, a linkage map and a cytogenetic map?
   - Genetic map: ordered list of genetic loci along a chromosome
   - Linkage map: genetic map based on recombination frequencies
   - Cytogenetic map: locating genes along chromosomes with respect to chromosomal features

9. Explain the chromosomal basis of sex determination in the following organisms:
   a. Mammals
      - XX-female, XY-male
   b. Grasshoppers
      - X-0 system: XX-female, X-male
   c. Birds and some fish
      - ZW system: ZW-female, ZZ-male
   d. Bees and ants
      - haplo-diploid system: females diploid, males haploid

10. What is the SRY gene and why is it important?
    - Sex-determining region of Y
    - Absence of SRY, gonads develop into ovaries

11. What is a sex-linked gene?
    - Gene located on either sex chromosome

12. What is X inactivation?
    - Females have XX, one X randomly condenses into a Barr body
    - Most of the genes on the Barr body are not expressed, only genes on the activated X chromosome are expressed

13. Why are most Calico cats female?
    - Tortoiseshell gene is on the X chromosome, one allele for orange fur on one for black fur; if female cat is heterozygous, she will have orange patches and black patches where X-inactivation occurs

14. What is nondisjunction and when in meiosis can it occur?
    - Homologous chromosomes don't separate correctly in Meiosis I
    - Sister chromatids don't separate correctly in Meiosis II
15. Define the following terms:
   a. **Aneuploidy** - abnormal number of chromosomes
   b. **Monosomic** - missing a copy of a particular chromosome
   c. **Polyploidy** - more than two complete sets of chromosomes

16. Label the following alterations in chromosomal structure. Define the term alongside the diagram. These terms will be used in the coming chapters.

   (a) **Deletion** - removes a chromosomal segment

   (b) **Duplication** - repeats a segment

   (c) **Inversion** - resees a segment within a chromosome

   (d) **Translocation** - moves a segment from one chromosome to a non-homologous chromosome

17. Explain the following human disorders that result from chromosomal alterations.
   a. **Down Syndrome**
      Trisomy 21
      Characteristic facial features, short stature, heart defects, mental retardation, respiratory infections
      Monosomy for chromosome 21 during meiosis I

   b. **Klinefelter Syndrome**
      XXX
      Male sex organs, sterile, female body characteristics

   c. **Turner Syndrome**
      XO
      Phenotypically female, sterile

   d. **CML**
      Chronic myelogenous leukemia
      Large portion of chromosome 22 translocates with small portion of chromosome 9 during mitosis of cells that will become white blood cells
18. What is genomic imprinting?
   - Gametes formed, only one allele of certain genes is expressed – either
     the one from the male or the female
   - Imprints are transmitted to all body cells
19. What are extranuclear genes?
   - Genes located outside the nucleus
   - Found in mitochondria or chloroplasts
20. What are two diseases carried in maternal mitochondria?
   - Diabetes
   - Heart disease
   - Alzheimer’s disease
   - Mitochondrial myopathy
   - Leber’s hereditary optic neuropathy