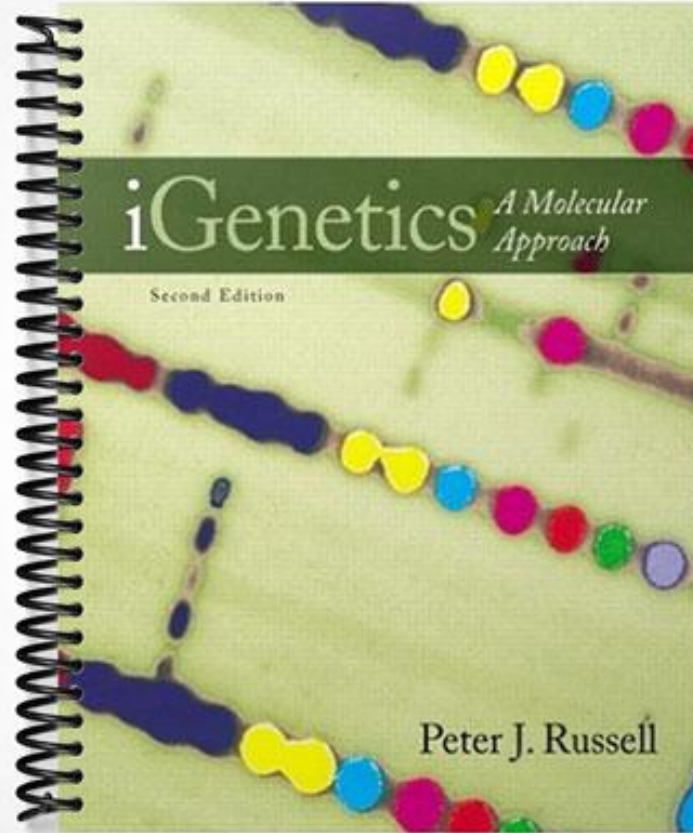


**TEST BANK**



MATCHING. Choose the item in column 2 that best matches each item in column 1.

Please select the best match for each term.

- |                            |   |          |
|----------------------------|---|----------|
| 1) Centromere<br>Answer: B | A) The constituent monomer of DNA and RNA   | 1) _____ |
| 2) Nucleoid<br>Answer: D   | B) Region of a eukaryotic chromosome found near the attachment point of mitotic or meiotic spindle fibers | 2) _____ |
| 3) Nucleotide<br>Answer: A | C) The basic structural unit of chromatin with "bead-on-a-string" morphology                              | 3) _____ |
| 4) Chromosome<br>Answer: E | D) The region of a prokaryotic cell where the chromosome is located                                       | 4) _____ |
| 5) Nucleosome<br>Answer: C | E) A DNA molecule and associated proteins   | 5) _____ |

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 6) Loosely aggregated DNA bound to proteins in a eukaryotic cell is called \_\_\_\_\_; when the cell divides, this condenses into \_\_\_\_\_.  
A) chromatid, nucleus  
B) chromosomes, centromere  
C) nucleoid, nucleus  
D) chromatin, chromosomes  
E) chromosomes, chromatin  
Answer: D
- 7) The C value is the amount of DNA in a \_\_\_\_\_.  
A) haploid genome.  
B) cell's nucleus.  
C) eukaryotic genome.  
D) diploid genome.  
E) bacterial genome.  
Answer: A
- 8) The chromosome of most prokaryotes differs from those of eukaryotes because \_\_\_\_\_.  
A) the prokaryotic chromosome is linear, while the eukaryotic is circular.  
B) the prokaryotic chromosome is circular, while the eukaryotic is linear.  
C) the prokaryotic chromosome does not contain genes, while the eukaryotic does.  
D) the prokaryotic chromosome is not necessary for survival, while the eukaryotic is.  
E) the prokaryotic chromosome does not replicate before mitosis, while the eukaryotic does.  
Answer: B
- 9) A Barr body is an example of \_\_\_\_\_.  
A) facultative euchromatin.  
B) facultative heterochromatin.  
C) a nucleosome.  
D) constitutive heterochromatin.  
E) constitutive euchromatin.  
Answer: B

- 10) The definition of transformation is 10) \_\_\_\_\_  
A) the shift of genetic information from DNA to protein.  
B) the genetic alteration of an organism.  
C) the uptake of information by a cell from the environment.  
D) Both B and C  
E) None of the above

Answer: D

- 11) Whose experiment involved the transformation of *Streptococcus pneumoniae* R strain into S strain? 11) \_\_\_\_\_  
A) Beadle and Tatum  
B) Crick  
C) Hershey and Chase  
D) Griffith  
E) Avery

Answer: D

- 12) What was the transforming principle of the experiment in the previous question? 12) \_\_\_\_\_  
A) Polysaccharide  
B) RNA  
C) Virus  
D) Protein  
E) DNA

Answer: E

- 13) Who used radioactively labeled T2 bacteriophage to confirm the identity of the transforming principle? 13) \_\_\_\_\_  
A) Gierer and Schramm  
B) Griffith  
C) Beadle and Tatum  
D) Hershey and Chase  
E) Avery

Answer: D

- 14) What part of the T2 bacteriophage entered *E. coli* cells in the experiment in the previous question? 14) \_\_\_\_\_  
A) The protein coat  
B) The RNA  
C) No part  
D) The whole virus

Answer: B

- 15) Who used the X-ray crystallography technique to examine diffraction patterns of DNA molecules? 15) \_\_\_\_\_  
A) Watson and Crick  
B) Franklin  
C) Avery  
D) Miescher  
E) Chargaff

Answer: B

- 16) What did the X-ray diffraction patterns *initially* reveal about the DNA molecule? 16) \_\_\_\_\_
- A) It is a helical molecule with paired bases in the center
  - B) It contains the hereditary information
  - C) It is of uniform diameter and has a highly repetitive structure
  - D) It is acidic, phosphorus-rich, and large
  - E) It is double-stranded with antiparallel strands

Answer: C

- 17) What did Watson and Crick deduce about the three-dimensional structure of DNA based on the work of others? 17) \_\_\_\_\_
- A) It contains a lot of phosphorus.
  - B) It consists of supercoiled chromatin.
  - C) It is a double-stranded helix.
  - D) There is a repeating pattern every 3.4 nm and every 0.34 nm.
  - E) It is a large molecule.

Answer: C

- 18) Which of the following is a nonhistone protein found in chromatin? 18) \_\_\_\_\_
- A) HMG
  - B) H5
  - C) H1
  - D) H2A
  - E) All of the above

Answer: A

- 19) Antiparallel means that 19) \_\_\_\_\_
- A) the two polynucleotide chains run in opposite directions.
  - B) each DNA molecule consists of one old and one new strand.
  - C) the helix twists to the right.
  - D) there is complementary base-pairing.
  - E) opposite strands are held together by base pairing.

Answer: A

- 20) Complementary base-pairing allows for 20) \_\_\_\_\_
- A) DNA to serve as its own template for replication.
  - B) covalent bonds to form between the opposite bases.
  - C) genes to be expressed as phenotype.
  - D) replication to be semiconservative.
  - E) spontaneous mutations to occur.

Answer: A

- 21) A purine is a \_\_\_\_\_ molecule, while a pyrimidine is a \_\_\_\_\_ molecule. 21) \_\_\_\_\_
- A) one-ring, two-ring
  - B) two-ring, one-ring
  - C) two-ring, three-ring
  - D) one-ring, one-ring
  - E) two-ring, two-ring

Answer: B

- 22) In *Escherichia coli*, the genome is organized into a molecule that has approximately \_\_\_\_\_ looped domains, while an average human chromosome has approximately \_\_\_\_\_ looped domains. 22) \_\_\_\_\_  
A) 10, 100  
B) 4, 5  
C) 10,000, 12,000  
D) 4,000, 4,000  
E) 100, 2,000

Answer: E

- 23) Which form of DNA is a left-handed double helix? 23) \_\_\_\_\_  
A) A-DNA      B) L-DNA      C) B-DNA      D) Z-DNA      E) R-DNA

Answer: D

- 24) Which of the following nucleotide sequences would be most likely to "bend?" 24) \_\_\_\_\_  
A) CGGATTT  
B) CAAAAAT  
C) GGGCCCC  
D) AAAAGGG  
E) TATATAT

Answer: C

- 25) The genetic material of a virus may be 25) \_\_\_\_\_  
A) single-stranded DNA.  
B) single-stranded RNA.  
C) double-stranded DNA.  
D) double-stranded RNA.  
E) all of the above.

Answer: E

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

- 26) DNA and RNA both contain phosphate and ribose. 26) \_\_\_\_\_  
Answer: True  False

- 27) In RNA, the pyrimidine bases are cytosine and thymine. 27) \_\_\_\_\_  
Answer: True  False

- 28) In a strand of DNA, a hydrogen bond connects that phosphate group of one nucleotide to the sugar of the adjacent nucleotide. 28) \_\_\_\_\_  
Answer: True  False

- 29) The genome of the T-even family of bacteriophage consists of single-stranded RNA. 29) \_\_\_\_\_  
Answer: True  False

- 30) *Borrelia burgdorferi* is a bacterium whose genome consists of one large and several small linear chromosomes. 30) \_\_\_\_\_  
Answer:  True      False

- 31) By weight, the amount of DNA in chromatin is less than that of histone. 31) \_\_\_\_\_  
Answer: True  False

- 32) The virus first shown to have RNA as its genetic material was tobacco mosaic virus (TMV). 32) \_\_\_\_\_  
 Answer:  True  False
- 33) The more condensed a part of a chromosome is, the more likely it is that the genes in that region will be active. 33) \_\_\_\_\_  
 Answer:  True  False
- 34) The genome of most prokaryotes consists of moderately repetitive DNA. 34) \_\_\_\_\_  
 Answer:  True  False
- 35) In eukaryotes, the greatest amount of tandemly repeated DNA is associated with centromeres and telomeres. 35) \_\_\_\_\_  
 Answer:  True  False

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 36) In Griffiths' transformation experiments, when did the injected mice die? 36) \_\_\_\_\_  
 Answer: The mice died when they were injected with living, virulent bacteria and when they were injected with living, nonvirulent bacteria mixed with heat-killed, virulent bacteria.
- 37) How could you test whether the transforming ability of a cell extract was due to DNA and not RNA? 37) \_\_\_\_\_  
 Answer: You could treat the extract with a DNase enzyme and test whether its transforming ability was intact.
- 38) One of the strands in a DNA double helix has the nucleotide sequence 5'-ACCTGCTACGG-3'. What is the sequence of the complementary DNA strand? 38) \_\_\_\_\_  
 Answer: 3'-TGGACGATGCC-5'
- 39) What is the function of dispersed repeated sequences such as SINEs and LINEs in eukaryotes? 39) \_\_\_\_\_  
 Answer: Little is known about the function of such sequences, but one hypothesis is that they have no function at all. Another is that they are involved in regulating gene expression.
- 40) What is the C-value paradox, and what is its cause? 40) \_\_\_\_\_  
 Answer: There is also no direct relationship between the C value (the total amount of DNA in the haploid genome) and the structural or organizational complexity of the organism. This is due in part to the amount of repetitive sequence DNA found in the genome of some organisms.
- 41) Define Chargaff's rules of the base composition of DNA. 41) \_\_\_\_\_  
 Answer: Chargaff's rules include the following: (1) the amount of adenine = the amount of thymine, (2) the amount of guanine = the amount of cytosine, and (3) the amount of purines = the amount of pyrimidines.

- 42) Describe the differences between heterochromatin and euchromatin in chromosomes. Are there any situations in which one can be changed into the other? 42) \_\_\_\_\_  
 Answer: Euchromatin contains actively transcribed genes and undergoes normal cycles of condensation and decondensation in the cell cycle. Heterochromatin remains condensed and contains genes that are usually transcriptionally inactive. Euchromatin can be inactivated, as in the case of Barr bodies; then it is known as facultative heterochromatin.
- 43) What must be the three principle characteristics of the hereditary molecule in cells? 43) \_\_\_\_\_  
 Answer: (1) It must be able to carry information, (2) it must be able to accurately pass on the information to progeny cells (replicate), and (3) it must be capable of change (evolution).
- 44) Name the constituent parts of a nucleoside and a nucleotide. 44) \_\_\_\_\_  
 Answer: A nucleoside consists of a pentose sugar covalently bonded to a nitrogenous base; a nucleotide is a nucleoside with the addition of a phosphate group.
- 45) The DNA phage  $\Phi$ X174 was found to have a ratio of bases of 25A:33T:24G:18C. This departs from the usual A/T = 1 and G/C = 1 ratios. How can you explain this? 45) \_\_\_\_\_  
 Answer: The genome of the phage consists of single-stranded, rather than double-stranded, DNA.
- 46) Describe two ways in which compacting of a chromosome to fit into a small space inside the cell is achieved. 46) \_\_\_\_\_  
 Answer: Chromosomes are (1) supercoiled and (2) packed into looped domains. Supercoiling is the twisting of the double helix about its own axis and can be achieved with both circular and linear chromosomes. Looped domains are also produced, which are isolated from one another and can separate regions of supercoiling.
- 47) Why do you suppose the amino acid sequences of eukaryotic histones are so similar to one another, even among distantly related species? 47) \_\_\_\_\_  
 Answer: Evolutionary conservation of these sequences is a strong indicator that histones perform the same basic role in organizing the DNA in the chromosomes of all eukaryotes.
- 48) Explain the packing of chromatin from the 10-nm to the 30-nm fiber stage. What is the role of histones? 48) \_\_\_\_\_  
 Answer: 10-nm chromatin fiber consists of nucleosomes—"beads" of DNA wound around eight core histone proteins—connected by strands of linker DNA. The 30-nm chromatin fiber comes about by the binding of histone H1, which brings the linker DNA and the nucleosomes closer together. The solenoid model of the 30-nm fiber has the nucleosomes brought together into a spiraling helical structure, with about six nucleosomes per complete turn.
- 49) What is the importance of centromeres and telomeres? 49) \_\_\_\_\_  
 Answer: Centromeres are the chromosomal regions where mitotic or meiotic spindle fibers attach. They are therefore responsible for the accurate segregation of chromosomes to daughter cells during replication. Telomeres are heterochromatic regions of chromosomes that are also required for replication and stability. They are usually found at the ends of the chromosome, associated with the nuclear envelope.

50) If the base pairs in a DNA helix are 0.34 nm apart, and a complete (360°) turn of the helix takes 3.4 nm, how many base pairs per turn are there in a DNA molecule?

50) \_\_\_\_\_

Answer: There are 10 base pairs per turn.