This print-out should have 34 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

DNA 01
001 10.0 points

What was the basis of the belief of biologists for over two decades that proteins instead of DNA were the genetic material?

I) Proteins are made of 20 amino acids while DNA is made of four nucleotides;
II) Proteins have two different levels of structural organization while DNA has four;
III) Proteins have a greater variety of three-dimensional forms than does DNA.

1. II only

2. I and III only

3. I, II and III

4. III only

5. I only

DNA 06
002 10.0 points

What is *not* present in DNA?

1. oxygen

2. phosphorus

3. sulfur

4. nitrogen

5. carbon

DNA 08
003 10.0 points

To prove that there is a clear correlation between DNA and genetic information some students in a science fair wanted to repeat Hershey and Chase' experiment using labeled nitrogen instead of labeled phosphate on the assumption that there are more nitrogen atoms in a nucleotide than phosphate.

Why will this experiment *not* work?

1. There is no radioactive isotope of nitrogen.

2. Compared to phosphate there are more nitrogens in a nucleotide, so the latter are more radioactive.

3. Radioactive nitrogen has a half-life of 100,000 years and the material would be too dangerous for too long.

4. Meselson and Stahl already did this experiment.

5. Amino acids and thus proteins also have nitrogen atoms; thus the radioactivity would not distinguish between DNA and proteins.

DNA 09
004 10.0 points

Which of the following occurs when T_2 phages are grown in a medium containing radioactive phosphorus?

1. They are no longer able to transform bacterial cells.

2. Their proteins become radioactive.

3. They transfer their radioactivity to *E. coli* chromosomes during infection.

4. Their DNA becomes radioactive.

5. Their DNA is found to be of medium density in a centrifuge tube.

DNA 10
005 10.0 points

What happens when T_2 phage viruses attack a colony of bacteria grown in the presence of radioactive sulfur and multiply inside the bacterial cell?

1. The viral DNA is tagged by radioactiv-

ity.

2. The viral proteins are tagged by radioactivity.

3. The viral DNA is found to be of medium density in a centrifuge tube.

4. They transfer their radioactivity to *E. coli* DNA.

5. Both the viral DNA and the viral proteins are tagged by radioactivity.

DNA 11

006 10.0 points

What would be the percentage of thymine in a DNA sample if the percentage of cytosine were 38%?

1. 24%

2. It cannot be determined from the information provided

3. 12%

4. 31%

5. 38%

DNA 12

007 10.0 points

Which of the following could *not* be determined directly from X-ray diffraction photographs of crystallized DNA?

1. the sequence of nucleotides

2. the linear distance required for one full turn of the double helix

3. the helical shape of DNA

4. the diameter of the double helix

5. the width of the helix

DNA 14

008 10.0 points

Which of the following was *not* established by the Watson and Crick model of DNA?

1. The distance between the strands of the helix is uniform.

2. The purines are attracted to pyrimidines.

3. The two strands of the helix are held together by covalent bonds.

4. The framework of the helix consists of sugar-phosphate units of the nucleotides.

5. The two strands of the DNA form a double helix.

DNA 15

009 10.0 points

What led Watson and Crick to propose that their DNA model could carry a vast amount of hereditary information?

1. different base sequences on DNA strands

2. phosphate-sugar backbones

3. side groups of nitrogenous bases

4. different five-carbon sugars

5. complementary base pairing

DNA 16

010 10.0 points

What kind of information does an analysis of the nucleotide composition of DNA reveal?

1. All of these

2. A + T = G + C

3. A = C

4. A = G and C = T

5. A + C = G + T

DNA 22
011 10.0 points

What statement would be true if the strands that make up DNA are antiparallel?

1. One strand is positively charged while the other is negatively charged.

2. The $5'$ to $3'$ direction of one strand runs counter to the $5'$ to $3'$ direction of the other strand.

3. The chromosomes are circular in shape.

4. Base pairings create unequal spacing between the two DNA strands.

5. The twisting nature of DNA creates nonparallel strands.

DNA and Heredity
012 10.0 points

In Griffith's experiments, when heat-killed S strain pneumococci were injected into a mouse along with live R strain pneumococci,

1. there was no result.

2. DNA from the heat-killed S was taken up by the live R, converting the latter to S and killing the mouse.

3. RNA from the heat-killed S was translated into proteins that killed the mouse.

4. proteins released from the heat-killed S killed the mouse.

5. DNA from the live R was taken up by the heat-killed S, converting the latter to R and killing the mouse.

DNA and Heredity 02
013 10.0 points

In order to show that DNA is the "transforming principle," Avery, MacLeod, and McCarty showed that DNA could transform nonvirulent strains of pneumococcus. Their hypothesis was strengthened by their demonstration that

1. the transforming activity is destroyed by boiling.

2. other strains of bacteria also can be transformed successfully.

3. enzymes that destroy proteins also destroy transforming activity.

4. enzymes that destroy complex carbohydrates also destroy transforming activity.

5. enzymes that destroy nucleic acids also destroy transforming activity.

DNA and Heredity 05
014 10.0 points

During infection of E. coli cells by bacteriophage T2,

1. more than one infecting phage particle is required to produce infection.

2. only nucleic acids enter the cell.

3. both proteins and nucleic acids enter the cell.

4. proteins are the only phage components that enter the infected cell.

5. only protein from the infecting phage can also be detected in progeny phage.

DNA and Heredity 06
015 10.0 points

Bacteriophage nucleic acids were labeled by carrying out an infection of E. coli cells growing in

1. ^{14}C - labeled CO_2.

2. ^{18}O - labeled water.

3. ^{35}S - labeled sulfate.

4. ^{3}H - labeled water.

5. ^{32}P - labeled phosphate.

DNA and Heredity 14
016 10.0 points

The base composition of DNA isolated from a newly discovered virus is found to be 32 percent A, 17 percent C, 32 percent G, and 19 percent T. What would be a reasonable explanation for this observation?

1. The virus must be extraterrestrial.

2. The genome of the phage must be circular, not linear.

3. The genome of the phage is single-stranded, not double-stranded.

4. In some viruses, double-stranded DNA is made up of base pairs containing two purines or two pyrimidines.

5. Some of the T was converted to C during the isolation procedure.

DNA and Heredity 16
017 10.0 points

Which feature of the Watson-Crick model of DNA structure explains its ability to function in replication and gene expression?

1. Bases are exposed in the major groove of the double helix.

2. DNA replication does not require enzyme catalysts.

3. The double helix is right-handed, not left-handed.

4. There are structural and functional similarities between DNA and RNA.

5. Each strand contains all the information present in the double helix.

DNA and Heredity 31
018 10.0 points

Which one of the following is not found in DNA?

1. Sulfur

2. Nitrogen

3. Carbon

4. Oxygen

5. Hydrogen

DNA and Heredity 33
019 10.0 points

The structure of DNA explains which three major properties of genes?

1. They contain information, replicate exactly, and can change to produce a mutation.

2. They encode the organism's phenotype, are passed on from one generation to the next, and contain nitrogenous bases.

3. They contain information, direct the synthesis of proteins, and are contained in the cell nucleus.

4. They replicate exactly, are contained in the cell nucleus, and direct the synthesis of cellular proteins.

5. They contain nitrogenous bases, direct the synthesis of RNA, and are contained in the cell nucleus.

DNA and heredity 39
020 10.0 points

In the Meselson-Stahl experiment, the conservative model of DNA replication was ruled out by which of the following observations?

1. Three different DNA densities were observed after a single round of replication.

2. No completely "heavy" DNA was observed

after the first round of replication.

3. Completely "heavy" DNA was observed throughout the experiment.

4. The product that accumulated after two rounds of replication was completely "heavy."

5. No completely "light" DNA ever appeared, even after several replications.

DNA and heredity 40
021 10.0 points

During DNA replication

1. one template strand must be degraded to allow the other strand to be copied.

2. origins of replication always give rise to single replication forks.

3. the template strands must separate so that both can be copied.

4. two replication forks diverge from each origin but one always lags behind the other.

5. the template strands come back together after the passage of the replication fork.

DNA and heredity 43
022 10.0 points

Semiconservative replication of DNA involves

1. the complete separation of the original strands, the synthesis of new strands, and the reassembly of double-stranded molecules.

2. only one of the original strands acting as a template for a new strand.

3. the use of the original double-stranded molecule as a template.

4. None of these

5. each of the original strands acting as a template for a new strand.

DNA and heredity 50
023 10.0 points

DNA polymerase lengthens a polynucleotide strand by

1. adding lost DNA sequences to the 3' end.

2. threading the existing DNA through a replication complex.

3. covalently linking new nucleotides to a previously existing strand.

4. linking purines with pyrimidines.

5. building short DNA fragments that are later linked together.

DNA and Heredity 54
024 10.0 points

Fragments like those now called Okazaki fragments were expected even before they were discovered because

1. the replication fork moves forward along a double-stranded DNA molecule.

2. DNA replicates in the 5' to 3' direction.

3. DNA polymerase I can connect short segments.

4. DNA replicates in the 3' to 5' direction on the lagging strand.

5. RNA primase places short RNA primer sequences along the DNA molecule.

DNA and Heredity 56
025 10.0 points

The enzyme DNA ligase is required continuously during DNA replication because

1. the complex of proteins that work together at the replication fork must be kept from falling apart.

2. 3'-deoxynucleoside triphosphates must be converted to 5'-deoxynucleoside triphosphates.

3. fragments of the leading strand must be joined together.

4. fragments of the lagging strand must be joined together.

5. the parental strands must be joined back together.

GA SB2 02
026 10.0 points

If one strand of a DNA molecule is TACCTA, what is the sequence of the complentary strand?

1. ATGGAT

2. GTAGGT

3. GATCCA

4. TACCTA

Holt Bio 09 09
027 10.0 points

Who took x-ray diffraction photographs of DNA leading to the unraveling of its structure?

1. Chargaff

2. Watson

3. Rosalind Franklin

4. Crick

5. Griffith

Raven14 19
028 10.0 points

When live nonvirulent bacteria was mixed with dead virulent bacteria, Griffith unexpectedly found that the injected mice died.

He explained this behavior by suggesting that the nonvirulent strain of bacteria was

1. transformed.

2. translated.

3. expressed.

4. activated.

5. transcribed.

Starr 13 14
029 10.0 points

In the Hershey-Chase experiments, the DNA of bacteriophages was labeled with radioactive

1. carbon.

2. None of these

3. phosphorus.

4. nitrogen.

5. sulfur.

Starr 13 16
030 10.0 points

Bacteriophages consist only of

1. proteins, nucleic acids, and carbohydrates.

2. proteins and carbohydrates.

3. proteins and lipids.

4. proteins and amino acids.

5. proteins and nucleic acids.

Starr 13 21
031 10.0 points

In Hershey and Chase's experiment with bacteriophages, the most important clue to the chemical nature of the hereditary material was the

1. accumulation of sulfur on the surface of the bacteria.

2. entrance of radioactive nitrogen into the bacteria.

3. accumulation of phosphorus on the surface of the bacteria.

4. entrance of radioactive phosphorus into the bacteria.

5. entrance of radioactive sulfur into the bacteria.

Starr 13 23
032 10.0 points

Oswald Avery showed that bacterial extracts lose their ability to transform bacteria when they are treated with

1. RNA-digesting enzymes.

2. ligase enzymes.

3. protein-digesting enzymes.

4. DNA-digesting enzymes.

5. colchicine.

StarrW 12 04
033 10.0 points

One species' DNA differs from others in its

1. None of these

2. phosphate groups.

3. base sequence.

4. All of these

5. sugars.

Transformation
034 10.0 points

In his work with pneumonia-causing bacteria and mice, Griffith found that

1. the polysaccharide coat of bacteria caused pneumonia.

2. heat-killed pathogenic cells caused pneumonia.

3. bateriophages injected DNA into bacteria.

4. the protein coat from pathogenic cells was able to transform nonpathogenic cells.

5. some chemical from pathogenic cells was transferred to non-pathogenic cells, making them pathogenic.