SELECT THE ONE BEST ANSWER FOR EACH QUESTION. EACH QUESTION IS WORTH 2 POINTS. EVERYONE HAS THE RIGHT TO PRIVACY OF THEIR TEST INFORMATION. KEEP YOUR EYES ON YOUR OWN WORK. TURN OFF CELL PHONES AND PAGERS.

1. The fallacy of the study of creation as a science is: a) creation "scientists" do not conduct experiments; b) invoking the idea of special creation exceeds the realm of the laws of nature; c) creation is an established fact and requires no further discussion; d) a and b; e) b and c.

2. In the struggle to persist generation after generation as environmental conditions change, organisms rely on which of the following characteristics? a) cells; b) metabolism; c) reproduction; d) adaptation; e) a and c.

3. A weak link in Darwin's theory was: a) no supportable evidence; b) creation was proved; c) knowledge of inheritance was lacking; d) in his time p + q did not equal one; e) all the above.

4. A species of meadow mouse has its range cut into by an advancing glacier. The two populations are separated for 40,000 yrs. before the glacier recedes. The individuals of the two populations meet and do not successfully interbreed. What does this represent? a) sympatric speciation; b) allopatric speciation; c) pre-zygotic speciation; d) reverse speciation; e) parapatric speciation.

5. What does \( q^2 + .5 \) equal? a) nothing; b) 1-q; c) 1-p; d) the frequency of a third allele; e) the frequency of allele p.

6. A theory is: a) based on conclusive evidence; b) equal to an hypothesis; c) equal to a law; d) based on faith; e) none of the above.

7. Most animal species probably arose by: a) polyploidy; b) allopatric speciation; c) sympatric speciation; d) hybrid vigor; e) polymorphism.

8. The Hardy-Weinberg rule: a) is useful in determining the extent to which a sexually reproducing deme is evolving; b) is used to predict when genetic drift will occur in a sexually reproducing population; c) is useful in determining the extent to which polyploidy is occurring in specific plant population; d) is used to predict when specific groups of organisms will become extinct; e) all of the above.

9. The worse possible outcome of a population that has too few individuals is: a) genetic drift; b) loss of one or the other sex; c) hybrid vigor; d) fixed alleles; e) selection.

10. The lack of any significant change in the frequency of an allele indicates: a) diversifying selection; b) sexual selection; c) stabilizing selection; d) directional selection; e) the creationists are right.

11. Genetic mutations of any type are least likely characterized as: a) frequent and lethal; b) rare and beneficial; c) rare and harmful; d) frequent and beneficial; e) medium rare.

12. Experiments like those first performed by Miller and Oro demonstrated that: a) DNA forms readily and reproduces itself; b) certain organic molecules required for life can form under abiotic conditions; c) complete, functioning protaryotic cells are formed after approximately three months; d) a lipid-protein film will eventually be formed by thermal convection; e) all of the above.

13. Which of the following is not true with respect to a gene pool? a) it is composed of alleles common to a species; b) it is protected by prezygotic mating mechanisms; c) it is protected when character displacement occurs; d) it is changed by mutation; e) allelic frequencies are consistent among demes.

14. The raw genetic material for natural selection to act on comes from: a) mutations; b) allelic shifts; c) directional selection; d) fixation; e) founder effect.

15. Although living organisms have many similarities, they are a diverse group. The reason for this diversity is: a) DNA; b) growth and development; c) polymorphisms; d) adaptation; e) the ability of carbon to bond many ways.
16. The actual process of natural selection acts on: a) males only; b) females only; c) young individual only; d) genotypes; e) phenotypes.

17. Biochemical similarities among species are evidence of: a) creation; b) common ancestry; c) coincidence; d) nothing of any value; e) natural, selective characters.

18. Genetic studies or methods substantiating certain evidence of evolutionary thought include the following except: a) electrophoresis; b) DNA sequencing; c) selection experiments; d) knowledge of genetic mutation rates; e) no exceptions are listed.

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19. Evolution is best describe as: a) adaptive radiation; b) formation of new species; c) change in allelic frequencies over time; d) survival of the fittest.

20. The fossil record is poor because: a) very few organisms were preserved as fossils; b) organisms tend to decay before becoming a fossil; c) animals with hard parts are preserved more easily; d) geological processes may destroy fossils; e) all of the above.

21. An example of a post-zygotic isolating mechanism would be: a) hybrid sterility; b) spontaneous abortion; c) species breeding at different times of the year; d) a and b; e) a and c.

22. Index fossils are important because: a) they characterize specific rock strata over large geographical areas; b) they identify key evolutionary events; c) they often link related taxonomic groups; d) a, b, and c; e) none of the above.

23. The co-formulator with Darwin of the theory of evolution was: a) Wallace; b) Lamarck; c) Malthus; d) Cuvier; e) Huxley.

If the gene (allelic) frequency of "A" is 0.3 and there is only one other allele, "a", answer the following:

24. What is the probability of finding a homozygous individual? a) 0.42; b) 0.58; c) 0.21; d) 0.3; e) 0.50.

A population of 1,000 people is in Hardy-Weinberg Equilibrium. Only brown (dominant) and blue eye colors are possible. 190 people have brown eyes. Answer the next question using this information.

25. What is the probability of finding a brown-eyed individual in the 5th generation? a) .99; b) .09; c) .9; d) .01; e) .1.

26. The Hershey and Chase experiments determined that _____ was not the genetic material because it went inside the cell.
   A. DNA; ^32P
   B. DNA; ^31P
   C. Protein; ^35S
   D. RNA; ^32P
   E. Protein; ^31P

27. Which of the following correctly describes features of the DNA structure proposed by Watson and Crick?
   A. Single-stranded, right-handed, antiparallel, complementary.
   B. Double-stranded, uniform diameter, left-handed, antiparallel, complementary.
   C. Triple-stranded, uniform diameter, left-handed, antiparallel.
   D. Double-stranded, uniform diameter, right-handed, antiparallel, complementary.
   E. None of the above.
28. Given a DNA template of 5' GTTCGAT 3'. What is the sequence of the daughter (replicated) DNA strand?
   A. 3' ATGCAAC 5'
   B. 5' ATCGAAC 3'
   C. 5' CAAGCTA 3'
   D. 5' TAGCTTG 3'
   E. None of the above.

29. What happened when Griffith injected a mixture of heat-killed S strain and living R strain pneumococcus into a mouse?
   A. DNA from the heat-killed S was taken up by the live R, converting it into S and killed the mouse.
   B. DNA from the live R was taken up by the heat-killed S, converting it into R and killed the mouse.
   C. Proteins released from the heat-killed S killed the mouse.
   D. DNA released from the heat-killed S produced proteins that killed the mouse.
   E. RNA was replicated and transmuted into a deadly virus that killed the mouse.

30. You have just completed DNA analysis of a new type of virus. You determined that the base composition is 30% A, 20% C, 30% G and 20% T. Which of the following is the most reasonable explanation of your results?
   A. The virus is from another planet.
   B. The virus has A-G and C-T base pairs.
   C. The virus has A-T and G-C base pairs.
   D. The virus has a single-stranded genome.
   E. The virus genome is circular.

31. Which of the following are pyrimidines?
   A. Adenine and guanine.
   B. Cytosine, thymine and uracil.
   C. Adenine, thymine and ribose.
   D. Cytosine, guanine and uracil.
   E. Guanine and thymine.

32. Which of the following is a key feature that defines DNA structure?
   A. Two hydrogen bonds form between A-U base pairs.
   B. Three hydrogen bonds from between G-A base pairs.
   C. Covalent bonds form between G-C base pairs.
   D. The amount of G is equal to the amount of A.
   E. The molecule is a right-handed helix.

33. Which of the following observations by Meselson and Stahl ruled out the conservative model of DNA replication?
   A. No completely light DNA ever appears, even after several replications.
   B. No completely heavy DNA is observed after the first round of replication.
   C. The product that accumulates after two rounds of replication is completely "heavy".
   D. Completely "heavy" DNA is observed throughout the experiment.
   E. Three different DNA densities are observed after a single round of replication.

34. Which feature of the Watson-Crick model of DNA structure explains its ability to function in replication and gene expression?
   A. Each strand contains all the information present in the double helix.
   B. Structural and functional similarities of DNA and RNA.
   C. The double helix is right-handed and not left-handed.
   D. DNA replication does not require enzyme catalysts.
   E. Exposure of the bases in the major groove of the double helix.
C. The double helix is right-handed and not left-handed.
D. DNA replication does not require enzyme catalysts.
E. Exposure of the bases in the major groove of the double helix.

35. RNA and DNA are similar in the following way:
A. Both contain T and a ribose peptide.
B. Both contain U and a ribose peptide.
C. Both contain purine and pyrimidine bases, phosphodiester bonds, and sugars.
D. Both are usually double-stranded, contain peptide bonds, and nitrogenous bases.
E. None of the above.

36. The enzyme DNA ligase is required continuously during DNA replication because ...
A. fragments of the leading strand must be joined together.
B. fragments of the lagging strand must be joined together.
C. RNA polymerase is too large to access the replication fork.
D. the complex of proteins that work together at the replication fork must be kept from falling apart.
E. DNA polymerase synthesizes DNA in the 3’ to 5’ direction.

37. In eukaryotic cells, each chromosome has ...
A. one origin of replication.
B. two origins of replication.
C. only one origin of replication per nucleus.
D. many origins of replication.
E. none of the above.

38. How are mistakes in DNA corrected?
A. Excision repair, polymerase proofreading, mismatch repair.
B. The DNA is maintained without errors or damage.
C. RNA polymerase maintains the correct genomic sequence.
D. Mistakes in DNA are lethal.
E. More than one of the above.

39. tRNA is Crick ‘ adaptor’ molecule. What is the adaptor function of tRNA?
A. It is the adaptor linking the ribosome to the mRNA.
B. It is the adaptor linking the anticodon to the mRNA.
C. It is the adaptor linking the codon to the amino acid.
D. It is the adaptor linking the amino acid to the rRNA.
E. None of the above.

40. Which is/are true statement(s) about the Central Dogma of Molecular Biology?
A. DNA is produced by transcription of RNA.
B. Protein is produced by translation of DNA.
C. RNA is translated to produce DNA.
D. RNA is transcribed to produce protein.
E. None of the above.

41. mRNA is synthesized in the ___ direction which corresponds to the ___ of the protein.
A. 5’ to 3’; N terminus to C terminus.
B. 3’ to 5’; N terminus to C terminus.
C. 5’ to 3’; C terminus to N terminus.
D. N terminus to C terminus; 5’ to 3’.
E. N terminus to C terminus; 3’ to 5’.
42. Mutations are ...
A. heritable changes in the sequence of DNA bases that produce an observable phenotype.
B. heritable changes in the sequence of DNA bases.
C. mistakes in the incorporation of amino acids into proteins.
D. heritable changes in the mRNA of an organism.
E. None of the above.

43. The type of mutation that is an insertion or a deletion of a single base is a ...
A. nonsense mutation.
B. silent mutation.
C. missense mutation.
D. frame-shift mutation.
E. lethal mutation.

44. In eukaryotes, signal sequences cause the protein to be transported into the endoplasmic reticulum (ER) because ...
A. the mRNA interacts with a receptor protein on the ER.
B. the ribosome interacts with a receptor protein on the ER.
C. the amino terminus of the protein being synthesized interacts with a receptor protein on the ribosome.
D. the amino terminus of the protein being synthesized interacts with a signal recognition particle and docking protein on the ER.
E. proteins are involved in transcription.

45. The genetic code is best described as
A. ambiguous, but not redundant.
B. redundant, but not ambiguous.
C. both ambiguous and redundant.
D. neither ambiguous nor redundant.
E. nonsense.

46. Initiation of transcription of requires ...
A. a temporary stoppage of DNA replication.
B. destruction of one of the strands of the template DNA.
C. ribosomes, charged tRNA molecules, messenger RNA.
D. induction of covalent bonds to join the base pairs in the DNA template.
E. RNA polymerase, nucleotides, single-stranded DNA template.

47. To perform the Ames Test (a test to determine whether a chemical is a carcinogen) you need auxotrophic bacteria (histidine requiring), a suspected carcinogen, and ground-up liver cells. After incubating these items together, they are plated on minimal media bacterial growth plates. After two days no colonies are observed on these plates. What does this result mean?
A. the chemical is so nasty, all the cells were killed.
B. the chemical was not bad at all, since no cells mutated to become prototrophic.
C. you forgot to add histidine to the media.
D. the liver cells killed the bacteria cells.
E. bacteria can live on minimal media.
### Question 48
DNA template 5' ATG 3', incorporate:
A. Glutamine; B. Histidine; C. Serine; D. Methionine; E. Not here.

### Question 49
Codon 5' CGC 3', incorporate:
A. Aspartic acid; B. Alanine; C. Arginine; D. Proline; E. Not here.

### Question 50
Anticodon 5' UUG 3', incorporate:
A. Glutamine; B. Aspartic acid; C. Leucine; D. Valine; E. Not here.

<table>
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<th>First letter</th>
<th>Second letter</th>
<th>Third letter</th>
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<tr>
<td>U</td>
<td>UUU, UUC, UUA, UUG Phenylalanine, Leucine</td>
<td>UU, UGC, UCA, UCG Serine, Tyrosine, Stop codon</td>
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<tr>
<td>C</td>
<td>CU, CCC, CUA, CUG Leucine, Proline</td>
<td>CA, CAC, CAG Histidine, Glutamine, Stop codon</td>
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<tr>
<td>A</td>
<td>AU, ACC, AUA, AUC, AAG Methionine, start codon</td>
<td>AA, AAG, ACG Threonine, Asparagine, Lysine</td>
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<tr>
<td>G</td>
<td>GU, GCC, GUA, GUG Valine, Alanine</td>
<td>GA, GAC, GAG Aspartic acid, Glutamic acid, Glycine</td>
</tr>
</tbody>
</table>

| U            | UC, UAG, UGA Cysteine, Stop codon, Tryptophan |
| C            | CG, CGC, CGA, CGG Arginine |
| A            | AG, AGA, AGG Serine, Arginine |
| G            | GC, GGC, GGA, GGG |