

Applied Bioinformatics Course

Self-test of biology

The correct answer for each question can range from 0 to 4.

- 1) The scientist(s) who invented the binomial nomenclature for naming species of living things (using Latin name for the genus and species name) is/are the
a. English naturalist Charles Darwin
b. Austrian geneticist Gregor Mendel
c. Swedish botanist Carl Linnaeus
d. American geneticist Thomas Morgan
- 2) The book 'On the Origin of Species' established the basic concept of
a. natural selection
b. survival of the fittest
c. variation
d. gene
- 3) Based on the results from the pea hybridization experiment, Mendel discovered the
a. mechanism of evolution
b. basic law of genetics
c. structure of the chromosome
d. shape and structure of cell
- 4) Using fruit fly for genetic experiments, Morgan proposed the
a. theory of gene
b. theory of evolution
c. theory of cell
d. theory of chromosome
- 5) The double helix model of DNA
a. is made up of two DNA molecule coiling together in an anti-parallel direction to form a double helix

- b. the skeleton of the double helix is made up of ribonucleic acid and phosphoric acid groups
 - c. nucleic bases pair to each other via hydrogen bonds and are distributed on the exterior of the molecule
 - d. the plane containing the nucleic base is perpendicular to the axis of the helix
- 6) The scientific name for the modern human is ()
- a. Human
 - b. Human being
 - c. *Homo being*
 - d. *Homo sapiens*
- 7) *Arabidopsis thaliana* ()
- a. belongs to the Brassicaceae family
 - b. is a perennial plant
 - c. gene is easily manipulated
 - d. has a wide distribution and a short life cycle
- 8) The human genome ()
- a. contains approximately 3 billion base pairs
 - b. has 23 chromosomes
 - c. the total length of the protein-coding genes is approximately half of the length of the genome
 - d. contains a lot of repeated sequences
- 9) The model organism(s) assigned by the Human Genome Project include(s) ()
- a. Mouse, *Mus musculus*
 - b. Zebrafish, *Danio rerio*
 - c. Baker's yeast, *Saccharomyces cerevisiae*
 - d. Rice, *Oryza sativa*
- 10) Archaea ()
- a. are the oldest bacteria in the evolution status
 - b. lived on the earth more than a billion years ago but are extinct now
 - c. normally live in extreme conditions
 - d. are smaller than bacteria

- 11) The genome of eukaryotes ()
- a. the size of the genome is related to the number of chromosome
 - b. animal genomes are larger than plant genomes
 - c. the numbers of chromosome in animal genomes are greater than that of plant genomes
 - d. the genes from the same family are distributed on the same chromosomes
- 12) The genes of eukaryotes ()
- a. contain at least one intron
 - b. contain at least one exon
 - c. have polyadenylation [poly(A)] signals at the 3'-end
 - d. have a transcription start site at the 5'-end
- 13) The central dogma of molecular biology states ()
- a. DNA is the carrier of genetic information
 - b. RNA is obtained from the transcription of DNA
 - c. mRNA as a messenger will follow the codons to guide the synthesis of proteins
 - d. protein can regulate the replication and transcription of DNA
- 14) The basic unit(s) of a chromosome is/are the ()
- a. nucleosome
 - b. ribosome
 - c. mitochondria
 - d. chloroplast
- 15) The location(s) for protein synthesis is/are the ()
- a. chromosome
 - b. ribosome
 - c. nucleosome
 - d. mitochondria
- 16) The biomolecule(s) that regulate gene transcription is/are ()
- a. transcription factors
 - b. enzymes
 - c. hormones
 - d. microRNAs
- 17) The length of a mature microRNA is ()

- a. >30 nt
- b. <20 nt
- c. 21-24 nt
- d. 25-28 nt

18) The principle(s) of designing a PCR primer include(s) ()

- a. hairpins cannot be formed between primers
- b. hairpins cannot be formed due to self-folding of primers
- c. the GC content of the primer should be 50-60%
- d. the 3'-end of the primer should have 3 continuous Cs or Gs

19) The guanine nucleotide in a DNA molecule can be expressed by the alphabet ()

- a. A
- b. C
- c. G
- d. T

20) The pyrimidine in a DNA molecule can be expressed by the alphabet ()

- a. Y
- b. R
- c. W
- d. S

21) The genetic code has the following characteristic(s) ()

- a. there are several nucleic bases between two consecutive codons
- b. the codons of animals and plants are different
- c. mitochondria use the same codons as eukaryotic genomes
- d. the same amino acid can be translated by several codons

22) Which of the following is/are the start codon(s) ()

- a. TGA
- b. AGT
- c. ATG
- d. GAT

23) Which of the following is/are the stop codon(s) ()

- a. TAA

- b. TGA
- c. TAG
- d. TGG

24) How many codons code for leucine (Leu/L) ()

- a. 1
- b. 2
- c. 4
- d. 6

25) Which amino acid(s) has/have only one codon ()

- a. glutamate (Glu/E)
- b. glycine (Gly/G)
- c. Serine (Ser/s)
- d. Tryptophan (Trp/W)

26) Which of the following is/are hydrophobic amino acid(s) ()

- a. phenylalanine (Phe/F)
- b. methionine (Met/M)
- c. isoleucine (Ile/I)
- d. alanine (Ala/A)

27) The amino acid(s) which have a negatively charged side chain include(s) ()

- a. serine (Ser/S)
- b. asparagine (Asn/N)
- c. histidine (His/H)
- d. glutamate (Glu/E)

28) Aromatic amino acids include ()

- a. methionine (Met/M)
- b. tyrosine (Tyr/Y)
- c. arginine (Arg/R)
- d. proline (Pro/P)

29) Which amino acid(s) is/are often found in the active sites of proteins ()

- a. serine (Ser/S)
- b. valine (Val/V)

- c. histidine (His/H)
 - d. lysine (Lys/K)
- 30) Amino acid(s) that can undergo phosphorylation in protein molecules include(s) ()
- a. serine (Ser/S)
 - b. threonine (Thr/T)
 - c. histidine (His/H)
 - d. lysine (Lys/K)
- 31) The chemical bond(s) for stable protein secondary structure is/are ()
- a. peptide bond
 - b. covalent bond
 - c. ionic bond
 - d. hydrogen bond
- 32) The chemical bond(s) that connects neighboring amino-acid residues in the protein primary structure is/are ()
- a. peptide bond
 - b. covalent bond
 - c. ionic bond
 - d. hydrogen bond
- 33) The chemical bond(s) that connects non-consecutive amino-acid residues in the protein primary structure is/are ()
- a. disulfide bond
 - b. glycosidic bond
 - c. phospholipid bond
 - d. hydrogen bond
- 34) The classic alpha helix ()
- a. the amide groups and carboxyl groups on the backbone forms hydrogen bonds
 - b. the direction of the hydrogen bond is perpendicular to the helix axis
 - c. the length of the hydrogen bond is about 2.8\AA
 - d. the side chains are distributed around the helix
- 35) The classic beta sheet ()
- a. the amide groups and carboxyl groups on the backbone forms hydrogen bonds

- b. there are two possibilities for the direction of the peptide chains, parallel or anti-parallel
 - c. the direction of the hydrogen bond is parallel to the peptide chain
 - d. the side chains are distributed on the top and bottom of the beta sheet
- 36) A mature human insulin molecule ()
- a. is made up of two chains
 - b. the two chains are connected by two pairs of disulfide bonds
 - c. its secondary structures include the alpha helix and beta sheet
 - d. one of the histidine is connected to a zinc ion
- 37) Human hemoglobin has ()
- a. 4 totally identical subunits
 - b. 4 totally different subunits
 - c. 4 subunits with 2 different groups, each group has 2 identical subunits
 - d. 2 subunits and they are different
- 38) The amino acid(s) that covalently bond to the iron ion in center of the heme porphyrin ring in hemoglobin is/are ()
- a. phenylalanine (Phe/F)
 - b. arginine (Arg/R)
 - c. threonine (Thr/T)
 - d. histidine (His/H)
- 39) The human immunoglobulin IgG molecule has ()
- a. two heavy chains and two light chains
 - b. each heavy chain contains 4 domains
 - c. each light chain contains 2 domains
 - d. there are 3 pairs of disulfide bonds between two heavy chains whereas there is a pair of disulfide bond between a heavy chain and a light chain
- 40) The common metal element(s) that act(s) as cofactor for protein molecules include(s) ()
- a. zinc
 - b. selenium
 - c. copper
 - d. cadmium