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

1) Innate immunity
   A) is activated immediately upon infection.
   B) utilizes highly specific antigen receptors on B cells.
   C) depends on a newly infected animal’s previous exposure to the same pathogen.
   D) is found only in vertebrate animals.
   E) is based on recognition of antigens that are specific to different pathogens.

2) An inflammation- causing signal released by mast cells at the site of an infection is
   A) histamine.
   B) mucus.
   C) sodium ions.
   D) lymphatic fluid.
   E) an interferon.

3) Adaptive immunity depends on
   A) pathogen- specific recognition.
   B) having exhausted all options for innate immunity responses.
   C) plants being exposed to new pathogens.
   D) traits common to groups of pathogens.
   E) maternal provision of antibodies to offspring.

4) A key part of the humoral immune response is
   A) the attack of phagocytes on living pathogens.
   B) perforation of infected host cells by perforin.
   C) the production of antibodies by plasma cells.
   D) the attack of cytotoxic T cells on infected host cells.
   E) the initiation of programmed cell death in infected host cells.

5) The receptors on T cells and B cells bind to
   A) double- stranded RNA.
   B) antibodies.
   C) antigens.
   D) natural killer cells.
   E) immunoglobulins.

6) Antigens are
   A) proteins that consist of two light and two heavy polypeptide chains.
   B) proteins found in the blood that cause foreign blood cells to clump.
   C) proteins embedded in B cell membranes.
   D) proteins released during an inflammatory response.
   E) foreign molecules that trigger the generation of antibodies.

7) A newborn who is accidentally given a drug that destroys the thymus would most likely
   A) lack humoral immunity.
   B) lack class I MHC molecules on cell surfaces.
   C) be unable to differentiate and mature T cells.
   D) be unable to genetically rearrange antigen receptors.
   E) have a reduced number of B cells and be unable to form antibodies.
8) Secondary immune responses upon a second exposure to a pathogen are due to the activation of
   A) macrophages.
   B) B cells.
   C) memory cells.
   D) T cells.
   E) stem cells.

9) The function of antibodies is to
   A) release perforins to disrupt infected cells.
   B) act as Toll-like receptors.
   C) secrete cytokines that attract macrophages to infection sites.
   D) inject toxins into living pathogens.
   E) mark pathogenic cells for destruction.

10) The cell-mediated immunity that destroys virally infected cells involves
    A) macrophages.
    B) cytotoxic T cells.
    C) B cells.
    D) natural killer cells.
    E) helper T cells.

11) Select the pathway that would lead to the activation of cytotoxic T cells.
    A) body cell becomes infected with a virus → new viral proteins appear → class I MHC molecule-antigen complex displayed on cell surface
    B) cytotoxic T cells → class II MHC molecule-antigen complex displayed → cytokines released → cell lysis
    C) complement is secreted → B cell contacts antigen → helper T cell activated → cytokines released
    D) self-tolerance of immune cells → B cells contact antigen → cytokines released
    E) B cell contact antigen → helper T cell is activated → clonal selection occurs

12) Arrange these components of the mammalian immune system as it first responds to a pathogen in
    the correct sequence.
    I. Pathogen is destroyed.
    II. Lymphocytes secrete antibodies.
    III. Antigenic determinants from pathogen bind to antigen receptors on lymphocytes.
    IV. Lymphocytes specific to antigenic determinants from pathogen become numerous.
    V. Only memory cells remain.
    A) III → II → I → V → IV
    B) II → I → IV → III → V
    C) I → III → II → IV → V
    D) IV → II → III → I → V
    E) III → IV → II → I → V

13) Portal blood vessels connect two capillary beds found in the
    A) posterior pituitary and thyroid gland.
    B) hypothalamus and thalamus.
    C) anterior pituitary and posterior pituitary.
    D) hypothalamus and anterior pituitary.
    E) anterior pituitary and adrenal gland.
14) Oxytocin and antidiuretic hormone are synthesized in the
A) posterior pituitary.
B) anterior pituitary.
C) adrenal cortex.
D) adenohypophysis.
E) hypothalamus.

15) The hypothalamus
A) includes neurosecretory cells that terminate in the posterior pituitary.
B) functions only in neuronal transmission.
C) does not have any hormone receptors on its cells.
D) secretes tropic hormones that act directly on the gonads.
E) functions only as an endocrine target, by having lots of receptors on its cells.

16) Iodine is added to table salt to help prevent deficiencies of an essential mineral needed for the
A) thyroid glands.
B) the exocrine pancreas.
C) adrenal glands.
D) parathyroid glands.
E) the endocrine pancreas.

17) Fight- or- flight reactions include activation of
A) the adrenal medulla, leading to increased secretion of epinephrine.
B) the pancreas, leading to a reduction in the blood sugar concentration.
C) the parathyroid glands, leading to increased metabolic rate.
D) the thyroid gland, leading to an increase in the blood calcium concentration.
E) the anterior pituitary gland, leading to cessation of gonadal function.

18) The increased contraction of the human uterus during labor and delivery is at least partially due to
the actions of
A) ecdysone.
B) oxytocin.
C) thyroxine.
D) growth hormone.
E) glucagon.

19) The operation of the sodium- potassium "pump" moves
A) sodium and potassium ions out of the cell.
B) sodium ions into the cell and potassium ions out of the cell.
C) sodium and potassium ions into the mitochondria.
D) sodium ions out of the cell and potassium ions into the cell.
E) sodium and potassium ions into the cell.

20) A cation that is more abundant as a solute in the cytosol of a neuron than it is in the interstitial fluid outside the neuron is
A) Ca^{++}.
B) Na^{+}.
C) Cl^{-}.
D) HCO_3^{-}.
E) K^{+}.
21) Action potentials move along axons
   A) by the direct action of acetylcholine on the axonal membrane.
   B) by reversing the concentration gradients for sodium and potassium ions.
   C) more slowly in axons of large than in small diameter.
   D) by activating the sodium-potassium "pump" at each point along the axonal membrane.
   E) more rapidly in myelinated than in non-myelinated axons.

22) Neurotransmitters are released from axon terminals via
   A) active transport.
   B) diffusion.
   C) exocytosis.
   D) transcytosis.
   E) osmosis.

23) The following steps refer to various stages in transmission at a chemical synapse.
   1. Neurotransmitter binds with receptors associated with the postsynaptic membrane.
   2. Calcium ions rush into neuron’s cytoplasm.
   3. An action potential depolarizes the membrane of the axon terminal.
   4. The ligand-gated ion channels open.
   5. The synaptic vesicles release neurotransmitter into the synaptic cleft.
Which sequence of events is correct?
   A) 1 → 2 → 3 → 4 → 5
   B) 4 → 3 → 1 → 2 → 5
   C) 3 → 2 → 5 → 1 → 4
   D) 2 → 3 → 5 → 4 → 1
   E) 5 → 1 → 2 → 4 → 3

24) The human knee-jerk reflex requires an intact
   A) hypothalamus.
   B) medulla.
   C) cerebellum.
   D) corpus callosum.
   E) spinal cord.

25) The system that modulates excitation and inhibition of smooth and cardiac muscles of the digestive, cardiovascular, and excretory systems is the
   A) central nervous system.
   B) autonomic nervous system.
   C) sympathetic nervous system.
   D) peripheral nervous system.
   E) parasympathetic nervous system.

26) Calculation, contemplation, and cognition are human activities associated with increased activity in the
   A) cerebellum.
   B) pituitary gland.
   C) spinal cord.
   D) hypothalamus.
   E) cerebrum.
27) Photosynthetic organisms are unique to most ecosystems because they
   A) use chemical energy to synthesize organic compounds.
   B) convert light energy into matter.
   C) synthesize inorganic compounds from organic compounds.
   D) synthesize organic compounds they obtain from decaying heterotrophs.
   E) use light energy to synthesize organic compounds.

28) Which of the following terms encompasses all of the others?
   A) heterotrophs
   B) secondary consumers
   C) primary consumers
   D) herbivores
   E) carnivores

29) A cow’s herbivorous diet indicates that it is a(n)
   A) secondary consumer.
   B) producer.
   C) autotroph.
   D) decomposer.
   E) primary consumer.

30) The major role of detritivores in ecosystems is to
   A) return energy lost to the ecosystem by other organisms.
   B) provide a nutritional resource for heterotrophs.
   C) recycle chemical nutrients to a form capable of being used by autotrophs.
   D) prevent the buildup of the organic remains of organisms, feces, and so on.

31) Which trophic level is most vulnerable to extinction?
   A) producer level
   B) decomposer level
   C) secondary consumer level
   D) tertiary consumer level
   E) primary consumer level

32) Nitrogen is available to plants only in the form of
   A) nitrite ions in the soil.
   B) uric acid from animal excretions.
   C) amino acids from decomposing plant and animal proteins.
   D) N\textsubscript{2} in the atmosphere.
   E) nitrate ions in the soil.

33) According to the competitive exclusion principle, two species cannot continue to occupy the same
34) Dwarf mistletoes are flowering plants that grow on certain forest trees. They obtain nutrients and water from the vascular tissues of the trees. The trees derive no known benefits from the dwarf mistletoes. Which of the following best describes the interactions between dwarf mistletoes and trees?
   A) parasitism
   B) mutualism
   C) commensalism
   D) competition
   E) facilitation

35) Evidence shows that some grasses benefit from being grazed. Which of the following terms would best describe this plant-herbivore interaction?
   A) parasitism
   B) predation
   C) commensalism
   D) mutualism
   E) competition

36) Although each of the following has a better chance of influencing gene frequencies in small populations than in large populations, which one most consistently requires a small population as a precondition for its occurrence?
   A) natural selection
   B) gene flow
   C) mutation
   D) genetic drift
   E) nonrandom mating

37) Over time, the movement of people on Earth has steadily increased. This has altered the course of human evolution by increasing
   A) genetic drift.
   B) gene flow.
   C) geographic isolation.
   D) nonrandom mating.

38) Evolution
   A) must happen, due to organisms’ innate desire to survive.
   B) requires that populations become better suited to their environments.
   C) requires the operation of natural selection.
   D) must happen whenever a population is not well-adapted to its environment.
   E) can happen whenever any of the conditions for Hardy-Weinberg equilibrium are not met.

39) What is true of macroevolution?
   A) It is the same as microevolution, but includes the origin of new species.
   B) It is evolution above the species level.
   C) It is defined as a change in allele or gene frequency over the course of many generations.
   D) It is the conceptual link between irritability and adaptation.
   E) It is defined as the evolution of microscopic organisms into organisms that can be seen with the naked eye.
40) What does the biological species concept use as the primary criterion for determining species boundaries?
   A) niche differences
   B) gene flow
   C) morphological similarity
   D) molecular (DNA, RNA, protein) similarity
   E) geographic isolation
1) A
2) A
3) A
4) C
5) C
6) E
7) C
8) C
9) E
10) B
11) A
12) E
13) D
14) E
15) A
16) A
17) A
18) B
19) D
20) E
21) E
22) C
23) C
24) E
25) B
26) E
27) E
28) A
29) E
30) C
31) D
32) E
33) C
34) A
35) D
36) D
37) B
38) E
39) B
40) B