

Sample exam 3
Answers are in bold

1. Recall the experiments in which crickets of two different species were mated with each other to make hybrid offspring. The hybrids produce a call with a sound intermediate between either of the parents. These experiments show that...
 - a. there is a great deal of neuronal plasticity in crickets.
 - b. there is seasonal growth and loss of neurons in the cricket brain song-recognition pathway.
 - c. crickets depend on non-associative learning only.
 - d. crickets have not fully exploited their fundamental niche
 - e. **none of the above.**

2. Which of the following is a reasonable consequence of a haplodiploid genetic system as is found in social insects?
 - a. **There are mostly sterile females in the population because daughters are more related to each other than to offspring they would have were they not sterile.**
 - b. An equal sex ratio with females raising males from the same queen, and males being sterile workers and soldiers.
 - c. Clonally-derived males and females that are both sterile, and have equal relatedness to themselves and to the queen.
 - d. Diploid males who mate with haploid females to generate triploid, and thus more robust (but sterile), workers.

3. Some behaviors have significant costs as well as benefits. This can lead to the evolution of adaptive strategies where animals adjust their behavior according to a current situation.
 - a. **T**
 - b. F

4. The presence of altruistic behavior in animals is most likely due to kin selection, a theory which maintains that...
 - a. aggression between sexes promotes the survival of the fittest individuals.
 - b. **genes enhance survival of copies of themselves by directing organisms to care for others who share those genes.**
 - c. companionship is advantageous to animals because in the future they can help each other.
 - d. critical thinking abilities are normal traits for animals and they have arisen, like other traits, through natural selection.
 - e. natural selection has generally favored the evolution of exaggerated aggressive and submissive behaviors to resolve conflict without grave harm to participants.

5. Organisms with short generation times and broad dispersal patterns are not as likely to have a gene for reciprocal altruism fixed in the population.
- T**
 - F
6. In species where there is definite sexual selection...
- the sex ratio changes such that there are many more females in the population compared with males.
 - it is very likely that one parent is making a particularly large energetic investment in rearing young compared with the other parent.**
 - sibling rivalry amongst the F1 generation is a major component of the population dynamics.
 - only females will defend territories.
7. Frogs and toads recognize bugs using...
- a learned action pattern.
 - a learned isolating mechanism.
 - a sign stimulus.**
 - Imprinting.
8. For some song birds, seasonal song learning involves...
- Habituation.
 - growth and death of brain interneurons.**
 - a novel form of pseudo-operant conditioning.
 - constant enlargement of the cerebellum.
9. In the context of behavioral ecology, the Tungara frog *Physalaemus pustulosus* has evolved an adaptive strategy. Which of the following statements describes this strategy?
- The frog buries in the ground during dry periods, and emerges only after heavy rains.
 - During advertisement calling, frogs only give the most attractive calls (to females) when they are competing with other males, but at risk of incurring bat predation.**
 - Female Tungara frogs only lay eggs in burrows protected by the most fit male frogs.
 - Female frogs produce predator warning calls that reduce the chance of a male frog being eaten.
10. The significance of gastrulation is to create multiple cell layers; signals passed between the layers set cells along different developmental fates.
- T**
 - F

11. How an embryonic cell differentiates depends on...
- its location in the embryo.
 - whether it migrates or not.
 - its birthdate in the embryo.
 - d. all of the above**
12. The entire set of membranes found in bird eggs (allantois, amnion, chorion and yolk sac) disappears in mammals as their role is taken over by the placenta.
- T
 - F**
13. The fertilization membrane is formed by...
- fusion of the plasma membrane with the vitelline membrane to form a single membrane.
 - Phagocytosis.
 - the first cleavage division.
 - fusion of diploid nuclei.
 - e. none of the above**
14. During the early cleavage stages in embryonic development of an amphibian...
- blastomeres are formed by meiosis.
 - the cytoplasm of the egg does not divide.
 - c. the embryo's cells get progressively smaller.**
 - the entire organism increases in size.
15. Homeotic genes that program the formation of entire structures, such as limbs, are highly conserved and homologous across all or most animals regardless of whether they are protostomes or deuterostomes.
- T**
 - F
16. Cloning experiments such as those with Dolly the sheep reinforce the notion that...
- Homeotic genes are responsible for regulative egg development.
 - If you remove the nucleus from a zygote very early (before the 1st cleavage division), and entire organism can be formed from that nucleus.
 - Spiral cleavage does not preclude the ability to clone advanced animals.
 - d. Any somatic cell can be triggered to activate silenced genes and replay an entire developmental program as if the genome were a recently fused sperm and egg nucleus.**
17. Cells differentiating in somites determine their fate by reading out multiple factor gradients, but this plasticity to become one tissue or another only lasts for a short time during embryonic life.
- T**
 - F

18. What do mother frogs put in their egg cytoplasm that controls development?
- Nothing – in frogs the zygote can direct all of its development.
 - A transcription factor gradient specifying which cells will become endoderm.**
 - Enteropneustic regulators that create a bilateral symmetry plane.
 - Only nutrients are put in the cytoplasm, providing energy for blastulation and gastrulation.
 - Epitaxy to make sure blastomeres stick together.
19. The immune system response to a second challenge with the same antigen typically leads to a quicker, larger production of antibodies. This is because...
- the appropriate memory cells undergo mitosis more rapidly the second time.
 - there is a larger pool of lymphocytes which recognize the antigen on the second challenge.**
 - differentiated plasma cells remain permanently in the blood ready to secrete more antibodies.
 - all of the above
 - none of the above
20. Which of the following form plasma cells that give rise to antibodies?
- cytotoxic T cells
 - helper T cells
 - natural killer cells
 - monocytes
 - B cells**
21. Immune system memory cells are typically...
- B-lymphocytes.
 - T-lymphocytes.
 - macrophages.
 - A & B**
 - A & C
22. Bone marrow stem cells...
- have the capacity for self renewal.
 - can differentiate into more committed progeny.
 - may produce either RBCs or leukocytes if pluripotential.
 - are constantly undergoing cell division.
 - all of the above**

23. An increase in vascular permeability is often associated with an immune response and serves to...
- squeeze lymphocytes out of the lymphatic system into the cytosol.
 - encourage foreign objects into the lymph.**
 - increase blood pressure to concentrate lymphokines.
 - ensure sufficient antibodies are maintained in the blood.
 - none of the above
24. One difference between B-lymphocytes and T-lymphocytes is...
- B-lymphocytes have cell walls but T-lymphocytes have plasma membranes.
 - T-lymphocytes are found only in the blood while B-lymphocytes are found only in the lymphatic system.
 - T-lymphocytes produce antibodies while B-lymphocytes do not.
 - only T-lymphocytes can be memory cells.
 - None of the above**
25. Antibodies are grouped into different classes based on whether they...
- are monomers, dimers, or pentamers.**
 - have variable and constant regions or not.
 - are proteins or sugars.
 - are derived from monera or protista.
 - have a high or low octane rating.
26. During an immune response, a foreign antigen stimulates mitosis in a subpopulation of pre-committed lymphocytes. This process is called...
- anaphalaxis.
 - clonal selection.**
 - IgM induction.
 - lymphoplasia.
 - immunosuppression.
27. Some years following an immunologic challenge, an identical foreign antigen again invades an animal. The new response to this antigen is...
- slower because plasma cells have been lost over time.
 - faster, but of lower magnitude, because the many killer T-cells left over from the first challenge are weaker.
 - faster and of greater magnitude due to recruitment of both memory B-cells and memory T-cells.**
 - slower but more prolonged since there are more helper T-cells to activate.
 - none of the above
28. A person with the ability to accept blood from any donor will have, on their own red blood cells, which antigens?
- "A" type only
 - "O" type only
 - "B" type only
 - both "A" and "B" types**
 - no antigens on their RBCs

29. A hybridoma is...
- a. made by the fusion of B- and T-lymphocytes.
 - b. a normal part of the immune response.
 - c. used to artificially generate large quantities of one type of antibody.**
 - d. an autoimmune condition.
 - e. formed when compliment protein adheres to a cell surface.
30. Epitopes bind to which portions of an antibody?
- a. heavy chains only
 - b. constant regions only
 - c. variable regions only**
 - d. both constant and variable regions
 - e. tail regions