

Name _____ **KEY** _____

**Biology 411 - Developmental Biology
Winter Quarter 2010**

Midterm 3 KEY

**100 Total Points
Open Book**

All of the 25 multi-choice questions are single-answer. Choose the best answer. (4 pts each)
Place your answer on the ScanTron sheet. Make sure you put on name and student number on the ScanTron sheet.

1. (p. 380) Increase of folic acid will decrease the incidence of spina bifida because
 - a. folic acid is needed to specify folic acid receptors
 - b. folic acid is needed to make N-cadherin active
 - c. folic acid is needed to bind to folic acid receptors**
 - d. all of the above
 - e. none of the above

2. (p. 384) If the Shh gradient were eliminated in the forming neural tube, what would happen to the specification of neural fates?
 - a. no major change would occur
 - b. the entire neural tube would adopt a floorplate identity because the BMP gradient would be unopposed by the Shh gradient
 - c. verticle cell divisions could no longer occur
 - d. an expansion of dorsal cell identities would occur**
 - e. the floorplate would expand or duplicate

3. (p. 383) The ventricles of a zebrafish embryos are filled with
 - a. salt water**
 - b. collagen
 - c. Na⁺/K⁺ ATPase
 - d. all of the above
 - e. none of the above

4. (p. 468) The human cloaca is
 - a. the remnant of the primitive streak
 - b. a precursor of the rectum and urinary sinus**
 - c. a remnant of the allantois
 - d. a precursor of the allantois
 - e. a dilation of the Wolffian duct

5. (p. 409) Mutation of a *Hox* gene results in the mis-specification of neural crest cells in the region of the embryo spanning somites 1-3. Which of the following developmental defects would be expected to arise?
- defective adrenal glands
 - loss of the vagal nerve
 - loss of thoracic ribs
 - a and b
 - none of the above**
6. (p. 413 and p. 220) An inventor files for a patent, claiming that Li^+ containing shampoo can restore dark hair to people with grey hair. You are asked to judge the patent claim. Which of the following statements in the patent claim is *false*.
- Li^+ application can stimulate the Wnt signaling pathway
 - Li^+ application will activate Wnt ligands**
 - Li^+ application will stabilize beta-catenin in melanocytes
 - Expression of melanin pathway enzymes will be upregulated by Li^+ application
 - Melanin pigment synthesis will be upregulated by Li^+ application
7. (p. 412) A knockdown of Eph receptors in neural crest cells would result in:
- the ability of neural crest to migrate through the notochord
 - ability of neural crest to migrate through posterior sclerotome**
 - motor neurons migrating in the dorsolateral route
 - expression of glial-derived neurotrophic factor (GDNF)
 - excessive incorporation of neural crest cells into the adrenal glands
8. (p. 435-436) The neurotrophin BDNF (brain-derived neurotrophic factor)
- triggers apoptosis in developing neurons
 - triggers the turning of commissural neurons near the midline of the spinal cord
 - promotes the survival of dopaminergic neurons in Parkinson's Disease
 - promotes the growth of sympathetic neurons
 - none of the above**
9. (paper from Discussion section) Injection of *terra*-MO into early cleavage stage zebrafish embryos would have what effect on later development?
- loss of the tailbud
 - cardiac expression of the *her1* gene
 - fusion of left and right sides of embryo
 - loss of synchrony in rhombomere formation
 - randomization of *pitx2* expression**

10. (p. 459) What would happen if the expression of *Shh* was downregulated in the diagram shown in Figure 14.19?
- more tendons would form**
 - more cartilage would be produced
 - the sclerotome would not form
 - all of the above
 - none of the above
11. (p. 473) What would occur if Noggin secretion from the notochord was blocked?
- blood precursors would not form
 - endoderm would form the endocardium
 - intermediate mesoderm would not form
 - lateral plate mesoderm would not form
 - the cardiogenic mesoderm region would expand**
12. (pp. 437-439) What outcome would result from overexpressing EphB1 in retinal ganglia neurons?
- no ipsilateral projections in the optic chiasma would occur
 - no contralateral projections in the optic chiasma would occur**
 - projections to both tecta would occur
 - projections to the contralateral tectum would be inverted
 - none of the above
13. (p. 491) What would happen to a hematopoietic stem cell (HSC) if it expressed a null version of Frizzled?
- the cell would be frizzled in appearance
 - the cell could no longer bind N-cadherin
 - the cell could no longer undergo self-renewal**
 - the cell could no longer transduce Angiopoietin-1 signals
 - all of the above
14. (pp. 474-475) Cardia bifida could arise if
- the gene *miles apart* is not expressed in the embryo**
 - the splanchnopleure fails to fuse in the lumbar region
 - cardiac neural crest cells fail to enter the cardiac primordium
 - the liver primordium forms in an ectopic location
 - none of the above
15. (p. 460) What would happen if nephrogenic mesenchyme was removed from an embryo?
- Pax2 expression would increase in paraxial mesoderm

- b. the paraxial mesoderm would stop secreting Lim1
- c. there would be no effect on the induction of the kidney rudiment
- d. the metanephros would not form**
- e. the intermediate mesoderm would transform into paraxial mesoderm

16. (pp. 446-449) Embryos that lack the gene *Paraxis*

- a. have no somites
- b. have no presomitic mesoderm
- c. fail to form somitic boundaries
- d. have no expression of *hairy* genes
- e. have no epithelial cells in their somites**

17. (p. 425) Downregulation of Lim3 in the Medial Motor Column of the hindlimb would

- a. convert sympathetic neurons into motor neurons
- b. cause medial motor neurons to target ventral limb muscle**
- c. cause medial motor neurons to target intercostal muscle
- d. cause medial motor neurons to become sympathetic neurons
- e. none of the above

18. (p. 429) In an embryo that lacks a functional *semaphorin 3* gene, mechanoreceptor neurons would

- a. not enter the spinal cord
- b. undergo apoptosis
- c. show chemotaxis toward the spinal cord midline
- d. increased chemotaxis away from the spinal cord midline
- e. would migrate into the ventral region of the spinal cord**

19. (p. 433) In a null Robo-3 *Drosophila* mutant (two answers acceptable)

- a. CNS neurons fail to respond to Netrin**
- b. CNS neurons fail to respond to Slit
- c. CNS neurons upregulate Robo-3
- d. CNS neurons downregulate Robo-3
- e. CNS neurons fail to cross the midline**

20. (handout article) Pain in neonate mammals can be caused by

- a. a loss of C-fibers
- b. a loss of A-fibers
- c. overlap of A-fiber and C-fiber terminals in the spinal cord**
- d. anti-inflammatory drugs
- e. lack of pain receptors

21. (p. 579) An amphibian blastema treated with retinoic acid inhibitor
- is unable to specify proximal cell identities**
 - undergoes dorsalization
 - is unable to specify distal limb cell fates
 - induces proximal tissues to transdifferentiate
 - none of the above
22. (pp. 580-583) If a hydra has a null mutation in the *shinguard* gene
- it is unable to regenerate a body axis
 - it forms two heads at the midbody
 - it regenerates two basal discs
 - it forms a foot and the hypostome
 - it forms a head bud at its foot**
23. (pp. 588-589) Activation of the dauer phenotype in *C. elegans* is linked to
- an increase in reactive oxygen species
 - activation of the *dauer* gene
 - activation of an insulin-like receptor
 - excessive amounts of food
 - none of the above**
24. (pp. 671-672) DES (diethylstilbestrol) is an endocrine disruptor. It disrupts oviduct development by
- induces excessive amounts of mesenchyme
 - inducing uterine mesenchyme
 - activating inappropriate Hox genes
 - disrupting mesenchyme specification
 - none of the above**
25. (p. 659) A mutation in a gene for cardiac contractility results in hypertension. In which organ would you expect a relational pleiotropy of this gene? (two answers acceptable)
- lungs
 - kidney**
 - liver
 - capillaries**
 - bone