MATCHING Place the one letter of the correct answer to the left of the number.

A belt desmosomes
B ZP3
C profilin
D epiboly
E PAX3
F IP3
G protein kinase C
H fertilization membrane
I NCAM
J Yolk platelets
K dorsal lip of the blastopore
L The archenteron
M In situ hybridization of cDNA
N primitive streak
O exogastrulation
P presumptive ectoderm
Q Germinal vesicle breakdown
R The grey crescent region
S Fertilizin
T cyclin

1. Formed due to products released from the cortical granules
2. Necessary for activation of maturation promoting factor in eggs
3. cavity resulting from gastrulation in frogs
4. important in nerve cell specificity of adhesion
5. Abnormal movement of endo- and meso-derm resulting in no adhesion to ectoderm.
6. formed to make an epithelial barrier to water loss or gain
7. Glycoprotein on the surface of the eggs of marine organisms which reacts with sperm receptors.
9. Product of phospholipase C which causes release of Ca++.
10. Phosphorylates Na/H antiport to activate it and change pH.
11. Protein capping G-actin in sperm head which is removed at sperm activation.
12. marks the posterior and dorsal end of the gastrula.
13. Present on surface of mouse egg to cause acrosomal reaction in sperm.
14. the anterior half of the chick blastodisc contains it.
15. Demonstrates location of a gene or gene control region in chromosomes.
16. Shows cell is ready to proceed with maturation divisions.
17. the cite of chordamesoderm differentiation in frog development.
18. Region where endo- and meso-derm cells pass to the interior in amniotes.
19. Present in a size gradient going from large at vegetal pole to small at animal pole.

TRUE FALSE Enter your answers on your scantron answer sheet
1. Dissociated endodermal cells cover over dissociated mesodermal cells when placed back into Ca+.
2. Cadherens require identical molecules on each cell for cell adhesion to occur.
3. The maturation inducing factor of the frog egg has the same effect when injected into other eggs as treating them with
progesterone.
4. Acetabularia decapitated and then placed in the dark cannot regenerate a cap any faster when taken into the light than a cell that is newly decapitated and kept in the light.
5. The fate map of the early chick blastodisc epiblast shows that it contains all three embryonic germ layers.
6. Delamination is characteristic of mesoderm.
7. Involution is movement of cells through the dorsal lip of the blastopore.
8. There is a release of Ca++ in the sperm at the time of the acrosome reaction.
9. The neural crest cells give rise to interneurons.
10. The first cleavage in always through the animal-vegetal axis and perpendicular to the earth's surface under normal conditions.
11. The sperm entry path usually determines the formation of the ventral side of the embryo on the opposite side of the egg.
12. Telolecithal eggs have yolk distributed equally throughout the cell.
13. Gradients in unfertilized eggs are not the factors controlling the setting of embryonic gradients or axes.

MULTIPLE CHOICE Enter the letter of the one correct answer on your scantron. 2 points each.
14. Which of the following statement is not true regarding the plane of bilateral symmetry: it
   a) is first set at the time that notochord appears under the ectoderm
   b) divides the embryo into right and left halves
   c) passes through the animal-vegetal egg axis
   d) is usually determined by the point of sperm entry

15. Meiosis differs from mitosis because in meiosis;
   a) chromosomes are not duplicated so the chromosome number is reduced
   b) non-homologous chromosomes do not behave independently
   c) homologous chromosomes synapse and do not separate at the first division, so that tetrads migrate to opposite poles
   d) the centromeres are not duplicated in the first division and the chromatin not duplicated in the second
   e) the process occurs in sex glands and mitosis does not.

16. Proteases or lysins released from the acrosome do not:
   a. digest a hole in the jelly and vitelline membrane.
   b. release other sperm egg attachments
   c. break down intercellular connections
   d. cause the change in membrane potential

17. The pH of the egg goes up at fertilization due to:
   a. exchange of acid for sodium at the membrane.
   b. release of ammonia by the sperm
   c. presence of calcium ionophore in sperm
   d. polymerization of actin

18. A gene which is important (as shown by knockouts) for development of mesencephalon and as a result the cerebellum is a) wnt, a mouse gene homologous to wingless, b) bicoid c)
acetylcholine d) actin e) ECM

SHORT ANSWER ESSAY 10 point each. Allow yourself 6 minutes for each one. If time is left at the end, go back and add more. ANSWER ONLY A OR B, NOT BOTH/ BE SURE TO LABEL WHICH ONE YOU ANSWERED. WRITE THE ANSWERS IN ORDER IN THE BLUE BOOK, SO IF YOU ARE GOING TO SKIP ONE TO DO ANOTHER LEAVE A PAGE FOR IT. I GRADE ALL NUMBER 1, THEN ALL NUMBER 2 ETC.
1.a. Calcium ionophore activation causes the cortical reaction in sea urchin eggs but they do not cleave or develop. Explain.
   B. Present evidence that an unfertilized egg is a differentiated cell.
2.A. Defend the germ layer hypothesis, or the idea that the position of a cell in the embryo is related to its future fate and function.
   b. Explain one way the cell surface is important to embryonic development.
3.a. How can it be demonstrated that different parts of the genome are transcribed into RNA at different stages of development?
   b. Cite experimental evidence to show that the nucleus is important for differentiation.
4. Draw and label a fate map of a. frog gastrula
   b. Label a cross section of embryonic nerve tube and describe what kinds of neurons will develop from which areas.