ZOO501 – DEVELOPMENT BIOLOGY

ALL OBJECTIVEs & SUBJECTIVEs FROM PAST FILES FOR MID TERM

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OBJECTIVEs

1. How many strategies for developmental commitment--------- **2**
2. -------is a discipline that studied embryonic and other developmental processes------**Develpmental Biology**
3. Insect characteristics are----------specification_____**Syncytial**
4. **M**ode of commitments are----------**3**
5. Third anatomical approach to developmental biology is-----**Tetratology**
6. An uncommitted cell can be described as----------**-Naïve**
7. Potency is ----------property_____**Intrinsic**
8. Cytoplasm that contains many nuclei is called ---------- **Syncytium**.
9. The **ectoderm forms** -------- **Epidermis, Nervous System, And Pigment Cells.**
10. Series of extremely rapid divisions in zygote is ------**Cleavage**
11. Insect such as ___drosophila __**Use All Three Modes Of Specification To Commit Their Cells To Particular Fates.**
12. Regulative development arises from ----------**Conditional Specification**.
13. Cleavage sphere known as----------**Blastula**
14. After fertilizationthe developmental process procedd by----------**Cleavage**
15. The division of embryo into 3----------**Germ Layers**
16. Mathematical modeling seeks to desire developmental phenomenon in term of -----**Equations**.
17. … is the study of the birth defect. ----------**Teratology**
18. Cell potency … fate ---------- ≥
19. Syncytial specification found in ..... **Insects**
20. Germ layers are formed as a result of .....**Gastrulation**
21. All multicellular organisms arise by a slow process of progress change called .... **Development**
22. Animals development is the division of embryo into three layers ectoderm, mesoderm and ..... **Endoderm**
23. The embryo contains ... The ectoderm, the endoderm and the mesoderm -**Three Germ Layers.**
24. Major class of cadherin includes: ----------**N-Cadherin**
25. Neural folds migrate toward the midline of the embryo and fusing to form … beneath the overlying ectoderm. ----------**Neural Tube**
26. *Rana pipiens* usually lays around … eggs while the bullfrog, *Rana catesbiana* can lay as many as----------**2500, 20,000**

27. The individuals of each species, however are divided into two mating types. ----------**Plus & Minus**
28. ..... animals are those who have ectoderm and endoderm but not true–mesoderm, i.e. hydra. --------**Diploblastic**
29. Cleavage sphere is known as: ----------**Blastula**
30. The fetal portion of placenta formed by: ------**Chorion**
31. Hammerling exchanged nuclei b/w two__ distinct species. ---**Morphologically**
32. When plus individuals initiate fusion by extending a fertilization tube, which contacts & fuses with a specific site on the … individual. ---------- **Minus**
33. The major cell adhesion molecules appear to be the: ---------- **Cadherins**
34. The second major group of protostomes are the: ---------- **Lophotrochozoa**
35. Annelids, molluscs and flatworms belong to:---------- **Lophotrochozoan**
36. In protostomes, mouth is formed first than: ----------**Deuterostomes**
37. **Fertilization**---------- transmits genes from parents to offspring
38. -ve and +ve mating take place **in**---------- **Chlaymadomonas**
39. ---Is a step for gene expression regulation:---**Differential Gene Transcription**
40. Coding regions of DNA:------**Exons**
41. How many domains are present for transcription**:**----**3**
42. pdx1 is present in**:**----------**Pancreatic And Duodenal Homeobox 1 Gene**
43. Plays a major role in eye formation**.**----------**Pax6**
44. ---------- and scleraxis are the transcription factors are thought to activate cartilagespecific genes**.**-------**Pax1**
45. The human β-globin gene has an enhancer in its 3′ UTR, roughly base pairs-**700**
46. The SOX9 gene, … a DNA binding protein------**Encodes**
47. MITF is necessary for the production of----------**Pigment Cells**
48. Promoter is … which is thought to regulate transcription. ---------**Enhancer**
49. The negative enhancers are called:----------**Silencers**
50. TAFs used in----------**Transcription Factor Activity**
51. Allows the mRNA to exit the nucleus:-----**Poly (A) Tail**
52. Red blood cells make:----------**Globin**
53. Enhancers are**:** ----------**DNA Sequences**
54. A region that is not translated in proteins**:**---------**Untranslated Region (UTR)**
55. RNA polymerase binds with … in start transcription---------- **Promoter**

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56. Regulation of gene expression accomplished by:---**Selective Mrna Translation**
57. MITF protein---**Is Necessary For The Production Of Pigment Cells And Their Pigments**
58. RNA polymerase bind with -----in start of transcription----------**Promotor**
59. Sea urchin contain … mRNA.----------**25,000 To 50,000**
60. In many species, sperm are attracted toward eggs by----------**Chemotaxis**
61. Number of cortical granules in sea urchin**:** ----------**15,000**
62. One chemotactic molecule, a 14-amino acid peptide called:----------**Resact**
63. Force for sperm propulsion is provided by--------**Dynein**
64. The volume of the sea urchin is about … pico liters.----------**200**
65. The egg jelly factors that initiate the acrosomal reaction in … are often highly species specific.----------**Sea Urchins**
66. Contact & … b/w sperm and egg**:**----------**Recognition**
67. The early embryonic cells need a supply of energy and amino acid which is provided by … proteins in the egg----------**Yolk**
68. The mammalian egg is surrounded by layer called**:**--------**Cumulus**
69. The sperm travel by the amoeboid motion of … of the cell membrane-----**Lamellipodial Extensions**
70. In 1824…claimed that sperm were not parasites.-----**J.L. Prevost & J.B. Dumas**
71. Sperms discovered in----------**1678**
72. Egg shell formed … weight of egg -------**9 To 12%**
73. ____constitute the head of the sperm**.**----------**Acrosome & Nucleus**
74. Acrosomal reaction has … components**.**------**2**
75. Acrosome-reacted sperm transfer their binding from ZP3 to the adjacent: **ZP2 Molecules**
76. Finally, a fourth cortical granules protein … forms a coating around egg.--------**Hyaline**
77. Ribosomes produce in sea urchin-----10^{12}
78. It is estimate..... egg is 25000 t0 50000 mRNA ----------**Sea Urchins**
79. Resact diffuse readily in---------**Sea Water**
80. Mammalian egg is surrounded by layer called----------**Cumulus**
81. .....constitute the head of sperm----------**Acrosome And Nucleus**
82. Outside of plasma membrane is the.....envelop----------**Vitelline**
83. The region of globular actin molecule lies between nucler and acrosomal vesicle in-------**Sea Urchin**
84. Egg activates due to which ion more------**ca**

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85. Acrosomal protein mediating recognition by protein-------**Bindin**
86. Resting membrane potential of the egg is:----------**70 Mv**
87. In mouse ZP3 is attached to:---------- **Zona Pellucida**
88. Size of bindin protein---------**30,500-Da**
89. The egg jelly factors that initiate the acrosomal reaction in … are often highly species specific.----------**Sea Urchins**
90. ZP3 is the specific glycoprotein in:----------**Mouse**
91. The fast block method is used to prevent: ---------- **Polyspermy**
92. Acrosome-reacted sperm transfer their binding from ZP3 to adjacent---**ZP2 Molecules**
93. Calcium and .....ions may be critical in activating cAMP ----------**Bicarbonate**
94. The.....is achived by changing of electical potential **Fast Block To Polyspermy**
95. Outside of plasma membrane....envelop----------**Vitelline**
96. Na and .....is important in fast block to polyspermy-------**K**
97. The membrane potential of the sperm becomes … as potassium ions leave the sperm----------**More Negative**
98. Due to….of hydrogen, pH rises------**Loss**
99. The mitotic spindle & contractile ring are … to each other--------**Perpendicular**
100. Slow block, initiated by the intracellular release of---------- **Calcium Ions**
101. Egg activates due to which ion more:----------**Ca**
102. Fertilin protein is important for sperm-egg fusion in----------**Mammals**
103. The mitotic division of the nucleus is called: ---------- **Karyokinesis**
104. The … initiated by sodium influx into the cell in sea urchin.---------- **Fast Block**
105. The larger subunit of MPF--------**Cyclin B**
106. Release of Ca from intracellular storage controlled by dye:--------**Aequorin**
107. Contact & … b/w sperm and egg:--------**Recognition**
108. In slow block method which is cortical granule protein:------ **Hyalin & Peroxidase**
109. Fishes have discoidal … pattern-------**Telolecithal**
110. The eggs of insects have their yolk in the (i.e. they are centrolecithal)------**Center**
111. Archenteron is used for:------**Primitive Gut**
112. Spiral cleavage found in------**Snails**
113. The macromeres divide meridionally, forming a tier of … cells------**Eight**

114. Cells, derived from the micromeres are called the-----**Primary Mesenchyme**

115. A mammalian blastula is called a:----------**Blastocyst**

116. Dendrites are numerous and do not extend far from the neuronal cell body or …, axons may extend for several feet----------**Soma**

117. One agent of ventral specification is the … protein----------**Sonic Hedgehog**

118. In frogs & chicks, … neurulation is seen in neural tube----------**Secondary**

119. The cells at dorsal most portion of neural tube become:---- **Neural Crest Cells**

120. About … of identical twins have two complete & separate chorions---------**33%**

121. Mammals undergo holoblastic … cleavage.----------**Rotational**

122. In birds, … is critical in determining anterior-posterior axis----------**Gravity**

123. Decidua becomes rich in blood vessels that will provide…and nutrients to embryo.--- **Oxygen**

124. Mammalian oocyte is released from ovary and swept by fimbriae into the:------ **Oviduct**

125. Fertilization in chick egg occurs in---------**Oviduct**

126. Small subunit of MPF----------**Cyclin-Dependent Kinase**

127. It secretes a--tunic (which gave the name "tunicates" to these creatures)--**Cellulose**

128. Inner surface cells thin 30 × 5µm process----------**Filopodia**

129. β-catenin is important for inducing capacity of----------**Micromeres**

130. In fishes, first … divisions occur synchronously, forming a mound of cells that sits at the animal pole of a large yolk cell----------**12**

131. Fertilization occurs in … of the oviduct, a region closed to the ovary.--**Ampulla**

132. In amphibians, such as xenopus, most of the tadpole neural tube is made by …, but the tail neural tube is derived from secondary neurulation------- **Primary Neurulation**

133. Neural folds migrate toward the midline of the embryo and fusing to form … beneath the overlying ectoderm---------**Neural Tube**

134. Paracrine factors instruct … to become muscles by inducing them to synthesize MyoD protein.---------- **Myotome Cells**

135. Scleraxis is expressed in the mesenchyme … the sclerotome.---------**From**

136. Which type of neurulation is present in fish:--------- **Exclusively Secondary**

137. Human brain contains **… Glial Cells**

138. Process of osteogenesis---------**-2**

139. The first cell movement of fish gastrulation is the---of the blastoderm.------ **Epiboly**

140. This fetal organ the … is derived primarily from embryonic trophoblast cells-------**Chorion**

141. Secondary neurulation involves in the making of a … and its subsequent hollowing into neural tube.----------**Medullary Cord**

142. The mantle zone cells differentiate into both … and …. ---------**Neurons & Glia**

143. The cerebral cortex in humans has … layers----------**Six**

144. Paracrine factors such as … and … are important in normal skin development------**Tgf & Fgf7**

145. The--phase involves the invasion of the cartilage model by blood vessels--**Fifth**

146. Telolecithal is cleavage found in eggs of----------**Birds & Fishes**

147. Which dermis give rise to brain:----------**Ectoderm**

148. Which dermis give rise to eye:----------**Ectoderm**

149. Sonic hedgehog is a type of----------**Protein**

150. Neural crest divides functionally in … domains.---------- **4**

151. Myogenic bHLH proteins are specific for the development of:-----**Muscle Cell**

152. Identical twins occur in roughly … of human births.---------- **0.25%**

153. Hindbrain:------ **Rhombencephalon**

154. The most crucial, difference b/w mammalian cleavage and all other types involves the phenomenon of:----------**Compaction**

155. Fishes, … and birds undergo discoidal meroblastic cleavage, wherein the early cell divisions do not cut through the yolk of the egg.--------- **Reptiles**

156. The rudiment of the central nervous system is called: ---------**Neurulation**

157. Blastula produced by the radial cleavage has no blastocoel and are called----------**Stereoblastulae**

158. Fraternal twins are the result of … separate fertilization events------**Two**

159. The … induces the formation of the forebrain; the chordamesoderm induces the formation of the midbrain, hindbrain and spinal cord.--------- **Prechordal Plate**

160. The resulting larvae of snail is called … which resemble tiny bear traps----------**Glochidia**

161. The metencephalon gives rise to the:---------**Cerebellum**

162. In primary neurulation, the original ectoderm is divided into…sets of cells. -- **3**

163. The growing region at the tip of the lip is called the: ----**Chordoneural Hinge**

164. Neural tube will form----------**Brain And Spinal Cord**

165. Each ICM (Inner Cell Mass) cell has the … potency.--------- **Same**

166. Osteoclasts are probably derived from the … precursors as macrophage blood cells.-------- **Same**

167. Those cells that remain integral components of the neural tube lining become … cells--------**Ependymal**

168. The original type of … cells constitute a layer called the cytotrophoblast-----**Trophoblast**

169. The major structural characteristics of avian, reptilian & mammalian gastrulation is the: ---------- **Primitive Streak**

170. The blastomere cell cycle is governed by the synthesis and degradation of--**Cyclin**

171. Both have anurans------Toad & frog

172. They have a notochord as larvae (chordates), but they lack: ----**Vertebrae**

173. Between the blastoderm and the yolk is a space called----**Sub-Germinal Cavity**

174. The second step of gastrulation involves the---------**Involution Of The Mesoderm**

175. The first cleavage furrow appears centrally in the----------**Blastodise**

176. Mother provides fetus with: ---------- **Nutrients & Oxygen**

177. The fetal portion of placenta formed by:---------- **Chorion**

178. Paracrine factors instruct myotome cells to become: -----**Muscles**

179. When myoblasts stop dividing, secrete----------**Fibronectin**

180. Retinoic acid comes from: ---------- **Somites**

181. Hox genes pattern the anterior-posterior axis and help to specify positions along that-------**Axis**

182. The telencephalon will eventually form the cerebral hemispheres, and the diencephalon will form the thalamic and---brain regions.--------**Hypothalamic**

183. Endochondral ossification involves the formation of--------**Cartilage**

184. J. Hammerling exchanged nuclei b/w two…distinct species. --**Morphologically**

185. Mantle cells differentiate into the: **Gray Matter**

186. The peripheral ring of blastoderm cells that have not shed their deep cells constitutes the area:--------- **Opaca**

187. During fertilization, the … molecules fuse to form the long microfilaments-----**Actin**

188. Brain has … billion neurons.------- **100**

189. ____Can show which cells are transcribing particular genes---------**Northern Blot, In-Situ Hybridization & PCR**

190. …is the glycoprotein matrix which is synthesized and secreted by the growing oocyte-----**Zona Pellucida**

191. Zygotes containing large accumulations of yolk undergoes----cleavage wherein only a portion of the cytoplasm is cleaved mesoblastic..... **Meroblastic**

192. Autonomous specification was first demonstrated in 1887 by a French medical student……. ----------**Laurent Chabry**

193. Sex without reproduction is also common among…Organism---**Unicellular**

194. The eggs have sparse, equally spaced of yoked called as ----------**Isolethal**

195. In most species of frog, fertilization is…. the male frog grabs the female backs and fertilizes the egg as the female frog releases them-----**External**

196. The initiated by sodium influx into the cell in sea urchin--------**Fast Block**

197. Multinucleated type of trophoblast is called----- **Syncytiotrophoblast**

198. Thickening of epilogizing blastoderm in fishes is called---- **Germ Ring**

199. Release of calcium from intracellular storage is controlled by which dye **Luminescent**

200. Size of DNA in nucleosome is----- **147 Bp**

201. Cadherin molecules dependent on------**Calcium**

202. In Rana pigpens egg development lasts for..... Years--------**3**

203. Snail larvae called ---------- **Glochidia**

204. Ascidian called---------- **Tunisia**

SUBJECTIVEs

1. What are two main startegie of developmental commitment? 3

There appear to be two major strategies for establishing commitment and hence initiating the series of events that result in cell differentiation.

- **The inheritance of cytoplasmic determinants:** Cytoplasmic determinants are the molecules in cytoplasm that can help to determine cell fate. The asymmetric distribution of cytoplasmic determinants indicates that the mechanism of differentiation is entirely intrinsic
- **The perception of external inductive signals:** The process where one cell or group of cells changes developmental fate of another is termed induction. It is extrinsic process that depends on the position of a cell in the embryo.

2. Difference B/W Somatic Cell and Germ and Cell blastomere ?

a) **Germ Cell:** In many species a specialized portion of egg cytoplasm gives rise to cells that are the precursors of the gametes (the sperm and egg). The gametes and their precursor cells are collectively called germ cells, and they are set aside for reproductive function.

b) **Somatic Cell:** All the other cells of the body are called Somatic cells. This separation of somatic cells (which give rise to the individual body) and germ cells (which contribute to the formation of a new generation) is often one of the first differentiations to occur during animal development.

c) **Blastomeres** After fertilization, the development of a multicellular organism proceeds by a process called **Cleavage**, a series of mitotic divisions whereby

the enormous volume of egg cytoplasm is divided into numerous smaller,-nucleated cells. These cleavage-stage cells are called **blastomeres**

3. Modes of commitment 5

Three basic modes of commitment are,

- **Autonomous specification**
- **Conditional specification**
- **Syncytial specification**

- **Autonomous specification**: Specification by differential acquisition of certain cytoplasmic molecules present in the egg. Characteristic of most invertebrates. Cell type specification
- **Conditional specification**: Characteristic of all vertebrates and few invertebrates. Specification by interactions between cells. Relative positions are important.

Variable cleavages produce no invariant fate assignments to cells. o Massive cell rearrangements and migrations precede or accompany specification. o Capacity for "regulative" development: allows cells to acquire different functions.

- **Syncytial specification**: Characteristic of most insect classes. Specification of body regions by interactions between cytoplasmic regions prior to cellularization of the blastoderm. Modes of commitment Variable cleavage produces no rigid cell fates for particular nuclei. After cellularization, conditional specification is most often seen.

4. Syncatiam 2

In early embryos of these insects, cell division is not complete. Rather, the nuclei divide within the egg cytoplasm. This creates many nuclei in the large egg cell.

A cytoplasm that contains many nuclei is called a **syncytium**.

5. Gastrulation

Is a phase early in the embryonic development of most animals, during which the single-layered blastula is reorganized into a multilayered structure known as the gastrula.

6. What is difference between biciod and nanos.

In *Drosophila*, for instance, the anterior most portion of the egg contains an mRNA that encodes a protein called **Bicoid**.

The posterior most portion of the egg contains an mRNA that encodes a protein called **Nanos**.

7. Name the three germ layer in animals?

I. Ectoderm
II. Mesoderm
III. Endoderm

8. What is different B/W Sex and Fertilization?

- **Fertilization:** Fertilization is the process whereby two sex cells (gametes) fuse together to create a new individual with genetic potentials derived from both parents.
- **Sex:** involves the combining of genes from two different individuals into new arrangements.

9. What is difference B/W protocadherin and other Cadherin?

- **Protocadherins**: Calcium-dependent adhesion proteins that differ from the classic Cadherins in that they lack connections to the cytoskeleton through catenins. Protocadherins have been found to be very important in separating the notochord from the other mesodermal tissues during Xenopus gastrulation.
- **E-cadherin:** Epithelial cadherin is expressed on all early mammalian embryonic cells, even at the 1-cell stage. Later, this molecule is restricted to epithelial tissues of embryos and adults.
- **P-cadherin:** Placental cadherin appears to be expressed primarily on the trophoblast cells (those placental cells of the mammalian embryo that contact the uterine wall) and on the uterine wall epithelium.
- **N-cadherin:** Neural cadherin is first seen on mesodermal cells in the gastrulating embryo as they lose their Ecadherin expression. It is also highly expressed on the cells of the developing central nervous system.

10. What is the larve stage of frog?

A tadpole (also called a pollywog) is the **larval stage**in the **life cycle** of an amphibian, particularly that of a**frog** or toad. They are usually wholly aquatic, though some species have tadpoles that are terrestrial.

11. Protostome?

(Greek, "mouth first"), which include the mollusc, arthropod, and worm phyla, are so called because the mouth is formed first, at or near the opening to the gut, which is produced during gastrulation. The anus forms later at another location. There are two major branches of the protostomes. **Ecdysozoa, Lophotrochozoa.**

12. Cadherin types?

1) **E-cadherin**
2) **P-cadherin**
3) **N-cadherin**
4) **Protocadherins**

13. Define sex and reproduction

Sex and reproduction are two distinct and separable processes. Reproduction involves the creation of new individuals. Sex involves the combining of genes from two different individuals into new arrangements

14. Lifecycle of calaymadomonas 5m

Let us take an example of the life cycle of Chlamydomonas. Which is usually haploid, having just one copy of each chromosome. The individuals of each species, however, are divided into two mating types: plus and minus. When a plus and a minus meet, they join their cytoplasm, and their nuclei fuse to form a diploid zygote. The flagella of two individuals twist around each other, enabling specific regions of the cell membranes to come together. These specialized regions contain mating typespecific components that enable the cytoplasms to fuse. Following flagellar agglutination, the plus individuals initiate fusion by extending a fertilization tube. This tube contacts and fuses with a specific site on the minus individual. In evolving sexual reproduction, two important advances had to be achieved. The first was the mechanism of meiosis whereby the diploid complement of chromosomes is reduced to the haploid state. The second was a mechanism whereby the two different mating types could recognize each other.

15. Hammerling Hypothesis:

The nucleus synthesizes a stable mRNA that lies dormant in the cytoplasm until the time of cap formation". Nucleus contains information specifying the type of cap produced (i.e., it contains the genetic information that specifies the proteins required for the production of a certain type of cap).

16. Differentiate B/W Promoter and Enchancer?

- **Promoter**: A region, which is responsible for the binding of RNA polymerase and for the subsequent initiation of transcription.
- **Enhancer:** It is a DNA sequence that can activate the utilization of a promoter, controlling the efficiency and rate of transcription from that particular promoter. The human β-globin gene has an enhancer in its 3´ UTR, roughly 700 base pairs

17. Transcription Factor Domain?

Transcription factors have three major domains. 1. DNA-binding domain 2. Protein-protein interaction domain 3. Trans-activating domain

18. Difference between exon and intron

- **Exon:** Coding region of DNA
- **Interon:** Non Coding region of DNA

19. Transcription factor

Transcription factors are proteins that bind to enhancer or promoter regions and interact to activate or repress the transcription of a particular gene. Most transcription factors can bind to specific DNA sequences. Transcription factors have three major domains.

a. DNA-binding do- main
b. Protein-protein interaction domain
c. Trans-activating domain

20. Transcription domain

DNA-binding domain: It recognizes a particular DNA sequence**.**

Protein-protein interaction

Domain: It allows the transcription factor's activity to be modulated by TAFs or other transcription factors.

Trans-activating domain: It activates or suppresses the transcription of the gene whose promoter or enhancer it has bound. Usually, this trans-activating domain enables the transcription factor to interact with proteins involved in binding RNA polymerase.

21. Regulation of gene expression

The regulation of gene expression can be accomplished at several **levels**

❖ **Differential gene transcription**:

It regulates that which of the nuclear genes is transcribed into RNA.

☩ **Selective nuclear RNA processing:**
It regulating which of the transcribed RNAs (or which parts of such a nuclear RNA) enter into the cytoplasm to become messenger RNAs.

☩ **Selective messenger RNA translation:**
It regulates that which of the mRNAs in the cytoplasm becomes translated into proteins.

☩ **Differential protein modification:**
It regulates that which proteins are allowed to remain or function in the cell.

22. Developmental Genetics

It is the discipline that examines how the genotype is transformed into the phenotype, and the major paradigm of developmental genetics is differential gene expression from the same nuclear repertoire.

23. MITF

(Microphthalmia-Associated Transcription Factor. The microphthalmia (MITF) protein is necessary for the production of pigment cells and their pigments

24. What Are Silencers

Enhancers can also be used to inhibit transcription. In some cases, the same transcription factors that activate the transcription of one gene can be used to repress the transcription of other genes. These "negative enhancers " are also called silencers

25. Polyadenylation

Polyadenylation is the addition of a poly(A) tail to an RNA transcript, typically a messenger RNA (mRNA). The poly(A) tail consists of multiple adenosine monophosphates; in other words, it is a stretch of RNA that has only adenine bases. ... In many bacteria, the poly(A) tail promotes degradation of the mRNA.

a) The poly(A) tail Confers stability on the messenger

b) RNA. Allows the mRNA to exit the nucleus.

c) Permits the mRNA to be translated into protein

26. What are the event of Fertilization?

Although the details of fertilization vary from species to species, conception generally consists of four major events:

- Contact and recognition between sperm and egg. In most cases, this ensures that the sperm and egg are of the same species.
- Regulation of sperm entry into the egg. Only one sperm can ultimately fertilize the egg
- Fusion of the genetic material of sperm and egg.
- Activation of egg metabolism to start development.

27. Who discover sperm?

A.V Leeuwenhoek, the Dutch microscopist who co-discovered sperm in 1678

28. How many type of mRNA are present in sea urching egg?

Sea Urchins contain 25,000 to 50,000 different types of mRNA

29. How Egg is protected form sunlight?

Which of Egg protected form sunlight? Many eggs contain ultraviolet filters and DNA repair enzymes that protect them from sunlight; some eggs contain molecules that potential predators find distasteful; and the yolk of bird eggs even contains antibodies.

30. Composition of Egg Yolk?

Yolk vitamins and minerals. Yolks hold more than 90% of the calcium, iron, phosphorus, zinc, thiamine, vitamin B6, folate, vitamin B12, and pantothenic acid of the egg. In addition, yolks cover all of the fat-soluble vitamins: A, D, E, and K in theegg, as well as all of the essential fatty acids.

31. What is Microvilli? Microfilaments?

Microfilaments are necessary for cell division, and they also are used to extend the egg surface into small projections called microvilli, which may aid sperm entry into the cell

32. What is function of vitelline envelop?

The vitelline envelope which is used either to attract or to activate sperm. The egg, then, is a cell specialized for receiving sperm and initiating development.

33. What are the function of zone pellicuda?

The zona pellucida supports communication between oocytes and follicle cells during oogenesis; protects oocytes, eggs, and embryos during development, and regulates interactions between ovulated eggs and freeswimming sperm during and following fertilization.

34. Cumulus and crona radiata?

The mammalian egg is also surrounded by a layer of cells called the cumulus. The innermost layer of cumulus cells, immediately adjacent to the zona pellucida, is called the corona radiata.

35. First layer of egg shell makes defense system

The shell is the egg's outer covering, accounting for about 9 to 12% of its tota weight depending on egg size. The shell is the egg's first line of defense against bacterial contamination. This bumpy and grainy outer covering has approximately 17,000 tiny pores and is made almost entirely of calcium carbonate. It is semipermeable, which means that air and moisture can pass through its pores.

The Shell Membranes

Lying between the eggshell and albumen, these two transparent protein membranes provide efficient defense against bacterial invasion. These tough membranes are made partly of keratin, a protein also found in human hair

36. What is microvili?

During fertilization, these actin molecules polymerize to form long cables of actin known as microfilaments. Microfilaments are necessary for cell division, and they also are used to extend the egg surface into small projections called microvilli, which may aid sperm entry into the cell.

37. Define zona pellucida

Zona pellucida: The strong membrane that forms around an ovum as it develops in the ovary. The membrane remains in place during the egg's travel through the fallopian tube. To fertilize the egg, a sperm must penetrate the thinning zona pellucida. If fertilization takes place, the zona pellucida disappears, to permit implantation in the uterus

38. The interaction of sperm and egg generally proceeds according to five basic step:

- The chemo-attraction of the sperm to the egg by soluble molecules secreted by the egg.
- The exocytosis of the acrosomal vesicle to release its enzymes.
- The binding of the sperm to the extracellular envelope (vitelline layer or zona pellucida) of the egg.
- The passing of the sperm through this extracellular envelope.
- Fusion of egg and sperm cell plasma membranes

39. Capacition?

Capacitation is the penultimate step in the maturation of mammalian spermatozoa and is required to render them competent to fertilize an oocyte. This step is a biochemical event; the sperm move normally and look mature prior to capacitation

40. Zp3 and its role

Thus, ZP3 is the specific glycoprotein in the mouse zona pellucida to which the sperm bind. ZP3 also initiates the acrosomal reaction after sperm have bound to it

41. The acrosomal reaction in sea urchins.

In most marine invertebrates, the acrosomal reaction has two components:

The fusion of the acrosomal vesicle with the sperm plasma membrane (an exocytosis that results in the release of the contents of the acrosomal vesicle).The extension of the acrosomal process. The acrosomal reaction in sea urchins is initiated by contact of the sperm with the egg jelly. Contact with egg jelly causes the exocytosis of the sperm's acrosomal vesicle and the release of proteolytic enzymes that can digest a path through the jelly coat to the egg surface. In sea urchins, the acrosomal reaction is thought to be initiated by a fucose-containing poly-saccharide in the egg jelly that binds to the sperm and allows calcium to enter into the sperm head. The exocytosis of the acrosomal vesicle is caused by the calcium-mediated fusion of the acrosomal membrane with the adjacent sperm plasma membrane. The second part of the acrosomal reaction involves the extension of the acrosomal process. This protrusion arises through the polymerization of globular actin molecules into actin filaments. The egg jelly factors that initiate the acrosomal reaction in sea urchins are often highly specific to each species.

42. Role of calcium and bicarbonate in capactation.

Calcium and bicarbonate ions may be critical in activating cAMP (Cyclic adenosine monophosphate) production and in facilitating the membrane fusion events of the acrosomal reaction

43. Fusogenic & Fertilin Protein

Fusion is an active process, often mediated by specific "fusogenic" proteins. Gamete Fusion in Mammals In mammals, the fertilin proteins in the sperm plasma membrane are essential for sperm

membrane-egg membrane fusion. Mouse fertilin is localized to the posterior plasma membrane of the sperm head. It adheres the sperm to the egg by binding to the 6β1 integrin protein on the egg plasma membrane. Moreover, like sea urchin bindin (to which it is not structurally related), fertilin has a hydrophobic region that could potentially mediate the union of the two membranes.

44. Fertiline and Gametogenesis:

In mammals, the fertilin proteins in the sperm plasma membrane are essential for sperm membrane-egg membrane fusion. The development of gametes, called gametogenesis, is usually not completed until the organism has become physically mature.

45. ROLE AND CAUSE OF MPF.?

Role of MPF in Early Developmental Processes The transition from fertilization-to cleavage is caused by the activation of mitosis promoting factor (MPF).

MPF was first discovered as the major factor responsible for the resumption of meiotic cell divisions in the ovulated frog egg. Blastomeres generally progress through a cell cycle consisting of just two steps: M (mitosis) and S (DNA synthesis). Cleaving cells can be experimentally trapped in S phase by incubating them in an inhibitor of protein synthesis. When MPF is microinjected into these cells, they enter M. Their nuclear envelope breaks down and their chromatin condenses into chromosomes. After an hour, MPF is degraded and the chromosomes return to S phase.

What causes this cyclic activity of MPF?

Mitosis-promoting factor contains two subunits.

➢ The large subunit is called cyclin B.

➢ Small subunit of MPF, the cyclin-dependent kinase

Cyclin B is often encoded by mRNAs stored in the oocyte cytoplasm, and if the translation of this message is specifically inhibited, the cell will not enter mitosis. The presence of cyclin B depends upon its synthesis and its degradation. Cyclin B regulates the small subunit of MPF, the cyclin-dependent kinase.

46. Early and late response of egg sperm.

The responses of the egg to the sperm can be divided into "early" responses, which occur within seconds of the cortical reaction, and "late" responses, which take place several minutes after fertilization begins.

Early Responses:

Contact between sea urchin sperm and egg activates the two major blocks to polyspermy: the fast block, initiated by sodium influx into the cell, and the slow block, initiated by the intracellular release of calcium ions. The activation of all eggs appears to depend on an increase in the concentration of free calcium ions within the egg. Such an increase can occur in two ways: calcium ions can enter the egg from outside, or calcium ions can be released from the endoplasmic reticulum within the egg.

Late Responses:

Shortly after the calcium ion levels rise in a sea urchin egg, its intracellular pH also increases. The rise in intracellular pH begins with a second influx of sodium ions, which causes a 1:1 exchange between sodium ions from the seawater and hydrogen ions from the egg. This loss of hydrogen ions causes the pH to rise. It is thought that the pH increase and the calcium ion elevation act together to stimulate new protein synthesis and DNA synthesis. The late responses of fertilization brought about by these ionic changes include the activation of DNA synthesis and protein synthesis.

47. Role of calcium in fusion of sperm and egg.

The third step is the cell fusion event itself. As in most membrane fusions, calcium ions are critical, and fusion can be activated by calcium ionophores, such as A23187, that carry calcium ions across cell membranes. Fusion appears to be mediated by a set of metalloproteinases called meltrins. These proteins were discovered during a search for myoblast proteins that would be homologous to fertilin, a protein implicated in sperm-egg membrane fusion.

48. What are the factor that activate the mitosis promoting factor.

Mitosis-promoting factor contains two subunits.

- The large subunit is called cyclin B.
- Small subunit of MPF, the cyclin-dependent kinase

Cyclin B is often encoded by mRNAs stored in the oocyte cytoplasm, and if the translation of this message is specifically inhibited, the cell will not enter mitosis. The presence of cyclin B depends upon its synthesis and its degradation. Cyclin B regulates the small subunit of MPF, the cyclin-dependent kinase.

49. Differnce b/w Karyokinesis and Cytokinesis

- **Karyokinesis the mitotic division of the nucleus.**

The mechanical agent of this division is the mitotic spindle, with its microtubules composed of tubulin (the same type of protein that makes up the sperm flagellum).

- **The second process is cytokinesis the division of the cell.**

The mechanical agent of cytokinesis is a contractile ring of microfilaments made of actin (the same type of protein that extends the egg microvilli and the sperm acrosomal process). The relationship and

coordination between these two systems during cleavage, in which a sea urchin egg is shown undergoing first cleavage.

The mitotic spindle and contractile ring are perpendicular to each other, and the spindle is internal to the contractile ring. The contractile ring creates a cleavage furrow, which eventually bisects the plane of mitosis, thereby creating two genetically equivalent blastomeres.

50. MPF Sub-Units

Mitosis-promoting factor (MPF) contains two subunits.

- The large subunit is called cyclin B.
- Small subunit of MPF, the cyclin-dependent kinase

Cyclin B is often encoded by mRNAs stored in the oocyte cytoplasm, and if the translation of this message is specifically inhibited, the cell will not enter mitosis. The presence of cyclin B depends upon its synthesis and its degradation. Cyclin B regulates the small subunit of MPF, the cyclin-dependent kinase.

51. What causes this cyclic activity of MPF?

Mitosis-promoting factor contains two subunits.

- The large subunit is called cyclin
- B. Small subunit of MPF, the cyclin-dependent kinase

Cyclin B is often encoded by mRNAs stored in the oocyte cytoplasm, and if the translation of this message is specifically inhibited, the cell will not enter mitosis. The presence of cyclin B depends upon its synthesis and its degradation. Cyclin B regulates the small subunit of MPF, the cyclin-dependent kinase.

52. Reasons why snail cytoplasm don't diffuse during development?

At one extreme are the eggs of sea urchins, mammals, and snails. These eggs have sparse, equally spaced yolk and are thus isolecithal (Greek, "equal yolk"). In these species, cleavage is holoblastic (Greek holos, "complete"). meaning that the cleavage furrow extends through the entire egg. Zygotes containing large accumulations of yolk undergo meroblastic cleavage, wherein only a portion of the cytoplasm is cleaved. The cleavage furrow does not penetrate into the yolky portion of the cytoplasm. The eggs of insects have their yolk in the center (i.e., they are centrolecithal), and the divisions of the cytoplasm occur only in the rim of cytoplasm around the periphery of the cell (i.e., superficial cleavage). The eggs of birds and fishes have only one small area of the egg that is free of yolk (telolecithal eggs), and therefore, the cell divisions occur only in this small disc of cytoplasm, giving rise to the discoidal pattern of cleavage.

53. Differentiate between animal pole and vegetable pole

Vegetal Pole the point on the surface of an egg that is diametrically opposite to the animal pole and usually marks the center of the protoplasm containing more yolk, dividing more slowly and into larger blastomeres than that about the animal pole,

54. PreChordal Plate

In the development of vertebrate animals, the prechordal plate is a "uniquely thickened portion" of the endoderm that is in contact with ectoderm immediately rostral to the cephalic tip of the notochord. It is the most likely origin of the rostral cranial mesoderm. The prechordal plate induces the formation of the forebrain; the chordamesoderm induces the formation of the midbrain, hindbrain, and spinal cord.

55. Area Pellucida

Between the blastoderm and the yolk is a space called the subgerminal cavity. This space is created when the blastoderm cells. Absorb fluid from the albumin ("egg white") and secrete it between themselves and the yolk. At this stage, the deep cells in the center of the blastoderm are shed and die, leaving behind a onecell- thick area pellucida.

56. Area Opaca

The peripheral ring of blastoderm cells that have not shed their deep cells constitutes the area opaca

57. Periderm

The second cell population distinguished at the midblastula transition is the enveloping layer (EVL).It is made up of the most superficial cells of the blastoderm, which form an epithelial sheet a single cell layer thick. The EVL eventually becomes the periderm, an extra-embryonic protective covering that is sloughed off during later development

58. Blastocyst?

A blastomere is a cell derived from cleavage in an early embryo. A blastula is an embryonic structure composed of blastomeres. The cavity in the blastula is the blastocoel. A mammalian blastula is called a blastocyst. During a process called cavitation, the trophoblast cells secrete fluid into the morula to create a blastocoel. The inner cell mass is positioned on one side of the ring of trophoblast cells. The resulting structure, called the blastocyst,

59. What is the process of primary neurulation

In primary neurulation, the cells surrounding the neural plate direct the neural plate cells to proliferate, invaginate, and pinch off from the surface to form a hollow tube.

60. What is the differences between primary and secondary neurulation.

a. **In Primary Neurulation**, the cells surrounding the neural plate direct the neural plate cells to proliferate, invaginate, and pinch off from the surface to form a hollow tube.

b. **In Secondary Neurulation**, the neural tube arises from a solid cord of cells that sinks into the embryo and subsequently hollows out to form a hollow tube.

61. Primary Neurulation

During primary neurulation, the original ectoderm is divided into three sets of cells.

- The internally positioned neural tube, which will form the brain and spinal cord.
- The externally positioned epidermis of the skin.

The neural crest cells. The neural crest cells form in the region that connects the neural tube and epidermis, but then migrate elsewhere; they will generate the peripheral neurons and glia, the pigment cells of the skin, and several other cell types

62. Gray And White Matter.

The mantle zone, containing the neuronal cell bodies, is often referred to as the Gray matter; the axonal, marginal layer is often called the White matter. In the spinal cord and medulla, this basic threezone pattern of ependymal, mantle, and marginal layers is retained throughout development. The gray matter (mantle) gradually becomes a butterfly-shaped structure surrounded by white matter; and both become encased in connective tissue

63. Define Marginal zone, Area pellucida, Sub germinal cavity, Area opaca.

Between the blastoderm and the yolk is a space called the sub-germinal cavity. This space is created when the blastoderm cells absorb fluid from the albumin ("egg white") and secrete it between themselves and the yolk. At this stage, the deep cells in the center of the blastoderm are shed and die, leaving behind a onecell- thick area pellucida. This part of the blastoderm forms most of the actual embryo. The peripheral ring of blastoderm cells that have not shed their deep cells constitutes the area opaca.Between the area pellucida and the area opaca is a thin layer of cells called the marginal zone (or marginal belt).

64. Why ascidian are called tunicates.

Ascidians, members of the tunicate subphylum, are fascinating animals for several reasons, but the foremost is that they are invertebrate chordates. They have a notochord as larvae (and therefore are chordates), but they lack vertebrae. As larvae, they are free-swimming tadpoles; but when the tadpole undergoes metamorphosis, it sticks to the sea floor, its nerve cord and notochord degenerate, and it secrete a cellulose tunic (which gave the name "tunicates" to these creatures).

65. Marginal Belt.

Between the area pellucida and the area opaca is a thin layer of cells called the marginal zone (or marginal belt).

66. Embryonic shield.

The cells of both the epiblast and hypoblast intercalate on the future dorsal side of the embryo to form a localized thickening, the embryonic shield

67. Difference between identical and frontal twins.

Fraternal twins are the result of two separate fertilization events, whereas identical twins are formed from a single embryo whose cells somehow dissociated from one another. Identical twins occur in roughly 0.25% of human births. About 33% of identical twins have two complete and separate chorions, indicating that separation occurred before the formation of the trophoblast tissue at day 5.

68. Write typical factors which determine the interior – posterior axis in bird.

In birds, gravity is critical in determining the anterior-posterior axis, while pH differences appear crucial for distinguishing dorsal from ventral. The left-right axis is formed by the expression of nodal on the left side of the embryo.

69. What is meant by MHP.

In birds and mammals, the cells at the midline of the neural plate are called the medial hinge point (MHP) cells. They are derived from the portion of the neural plate just anterior to Hensen's node and from the anterior midline of Hensen's node.

70. Explain the causes of MHP.

Different neural tube defects are caused when various parts of the neural tube fail to close.

71. Dendrites

The fine extensions of the neuron that are used to pick up electrical impulses from other cells are called dendrites. Some neurons develop only a few dendrites, whereas other cells (such as the Purkinje neurons) develop extensive dendritic trees

72. PreChordal Plate

In the development of vertebrate animals, the prechordal plate is a "uniquely thickened portion" of the endoderm that is in contact with ectoderm immediately rostral to the cephalic tip of the notochord. It is the most likely origin of the rostral cranial mesoderm. The prechordal plate induces the formation of the forebrain; the chordamesoderm induces the formation of the midbrain, hindbrain, and spinal cord

73. Chordamesoderm

Axial mesoderm, or chordamesoderm, is the mesoderm in the embryo that lies along the central axis under the neural tube. will give rise to notochord starts as the notochordal process, whose formation finishes at day 20 in humans.the chordamesoderm induces the formation of the midbrain, hindbrain, and spinal cord. The first cells migrating laterally through the primitive streak become endoderm, displacing the hypoblast.

74. Why Ascidians are Called Tunicates

As larvae, Ascidians are free-swimming tadpoles; but when the tadpole undergoes metamorphosis, it sticks to the sea floor, its nerve cord and notochord degenerate, and it secrete a cellulose yunic (which gave the name "tunicates" to these creatures).Thats why , they are called as Tunicates

75. Gastrulation in Snails

The snail stereoblastula is relatively small. Gastrulation in Snails is accomplished primarily by epiboly, wherein the micromeres at the animal cap multiply and "overgrow" the vegetal macromeres. Eventually, the micromeres will cover the entire embryo, leaving a small slit at the vegetal pole. In the typical cleavage of molluscs, cells divides to produce most of the larval structures, including a gland capable of producing a large shell.

76. Neural Tube Function in Tunicates

The neural tube is the embryonic structure that ultimately forms the brain and spinal cord. The neural tube is formed during a process called neurulation, which begins when the underlying dorsal mesoderm signals the ectodermal cells above it to elongate into columnar neural plate cells

77. Periderm

The second cell population distinguished at the midblastula transition is the enveloping layer (EVL).It is made up of the most superficial cells of the blastoderm, which form an epithelial sheet a single cell layer thick. The EVL eventually becomes the periderm, an extra-embryonic protective covering that is sloughed off during later development

78. Vegetal and Animal Hemisphere

a. The bottom half of the egg usually contains the yolk, it divides more slowly (because the large yolk deposits interfere with cleavage). This portion is the vegetal hemisphere of the egg.

b. The upper half of the egg usually has less yolk and divides faster. This upper portion is called the animal hemisphere of the egg

79. How Can Sperm Be Prevented From Trying To Fertilize Egg Of Another Specie.

One major barrier that prevents the fusion of isolated gametes from different species is the **zona pellucida (internet)**

80. What Is Calcium Ionophore

The third step is the cell fusion event itself. As in most membrane fusions, calcium ions are critical, and fusion can be activated by calcium ionophores, such as A23187, that carry calcium ions across cell membranes.

81. D/F B/W Dynein and Axoneme 3

The major motor portion of the flagellum is called the axoneme. It is formed by microtubules emanating from the centriole at the base of the sperm nucleus. The force for sperm propulsion is provided by dynein, a protein that is attached to the microtubules. Dynein hydrolyzes molecules of ATP and can convert the released chemical energy into the mechanical energy that propels the sperm.

82. Teratology And Evolutionary Embryology

Evolutionary embryology:

The second strand, based on the first, is evolutionary embryology, the study of how changes in development may cause evolutionary changes and of how an organism's ancestry may constrain the types of changes that are possible.

Teratology:

The third anatomical approach to developmental biology is teratology, the study of birth defects. These anatomical abnormalities may be caused by mutant genes or by substances in the environment that interfere with development. The study of abnormalities is often used to discover how normal development occurs.

83. Autonomous Specification By Laurent Chabry

Autonomous specification was first demonstrated in 1887 by a French medical-student, Laurent Chabry. Chabry desired to know the causes of birth defects, and he reasoned that such malformations might be caused by the lack of certain cells. Chabry set out to produce specific malformations by isolating or lancing specific blastomeres of the cleaving tunicate embryo. He discovered that each blastomere was responsible for producing a particular set of larval tissues.

84. Role Of MPF

The transition from fertilization to cleavage is caused by the activation of mitosis promoting factor (MPF). MPF was first discovered as the major factor responsible for the resumption of meiotic cell divisions in the ovulated frog egg. Blastomeres generally progress through a cell cycle consisting of just two steps: M (mitosis) and S (DNA synthesis). Cleaving cells can be experimentally trapped in S phase by incubating them in an inhibitor of protein synthesis. When MPF is microinjected into these cells, they enter M. Their nuclear envelope breaks down and their chromatin condenses into chromosomes. After an hour, MPF is degraded and the chromosomes return to S phase.

85. What Causes This Cyclic Activity To MPF?

Mitosis-promoting factor contains two subunits.

1) The large subunit is called cyclin B.
2) Small subunit of MPF, the cyclin-dependent kinase
3) Cyclin B is often encoded by mRNAs stored in the oocyte cytoplasm, and if the translation of this message is specifically inhibited, the cell will not enter mitosis. The presence of cyclin B depends upon its synthesis and its degradation. Cyclin B regulates the small subunit of MPF, the cyclindependent kinase.

86. Difference Between Cleavage And Blastomere

Cleavage is a series of extremely rapid mitotic divisions wherein the enormous volume of zygote cytoplasm is divided into numerous smaller cells. These cells are called blastomeres, and by the end of cleavage, they generally form a sphere known as a blastula

87. Define Developmental Biology

Developmental biology is a discipline that studies embryonic and other developmental processes.

88. What Is Gram Ring?

After the blastoderm cells have covered about half the zebra fish yolk cell, a thickening occurs throughout the margin of the epilogizing blastoderm. This thickening is called the germ ring

89. Regulative Development

Conditional specification gives rise to a pattern of embryogenesis called regulative development. Regulative development is seen in most vertebrate embryos, and it is obviously critical in the development of identical twins.

90. Resact

The mechanisms of chemotaxis differ among species. One chemotactic molecule, a 14- amino acid peptide called resact, has been isolated from the egg jelly of the sea urchin Arbacia punctulata.

91. Difference B/W Identical And Fraternal Twins

Fraternal Twins are the result of two separate fertilization events, whereas identical twins are formed from a single embryo whose cells somehow dissociated from one another.

Identical Twins occur in roughly 0.25% of human births. About 33% of identical twins have two complete and separate chorions, indicating that separation occurred before the formation of the trophoblast tissue at day 5.

92. Deutrostome

Deuterostomia are animals typically characterized by their anus forming before their mouth during embryonic development.

93. Mode of Commitment

Mode of commitment is sometimes called conditional specification, because the fate of a cell depends upon the conditions in which the cell finds itself. This mode of commitment involves interactions with neighboring cells.

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اپنی آواز کی بجائے اپنے دلائل کو
بلند کیجئے۔ پھول بادل کے گرجنے
سے نہیں برسنے سے اگتے ہیں۔

رومی