ZOO501 – DEVELOPMENT BIOLOGY

ALL OBJECTIVEs & SUBJECTIVEs FROM PAST FILES FOR FINAL TERM

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OBJECTIVEs

1. The rudiment of the central nervous system, is called_____ **Neurulation.**
2. Archenteron is used for _____**Primitive Gut**
3. **Spiral holoblastic** cleavage is characteristic of several animal groups including annelid,worms, some flatworms, And most mollusks……in snail
4. In sea urchins, cell fates are determined by….. **Signaling.**
5. The …… constitute a major Signaling center. **Micromeres**
6. Shell formation… **Snails**
7. Multinucleated type of cell forms the ……**Syncytiotrophoblas**
8. The Myelencephalon eventually becomes the ….**Medulla oblongata**
9. One agent of ventral specification is the ……**Sonic hedgehog.**
10. Failure to …..the human posterior neural tube regions at day 27. **Close**
11. Failure to close the anterior neural tube regions results in a lethal condition …… **Anencephaly**
12. Original ependymal layer of the cerebellum generates a wide variety of neurons and glial cells, including the distinctive and large…… **Purkinje neurons.**
13. **TGF-β** Family secreted from the surface ectoderm and roof of the neural tube.
14. Paracrine factors instruct the ……cells to become muscles. **Myotome**
15. The osteoblasts secrete a collagen-proteoglycan….. **Matrix**
16. Endochondral ossification involves the formation of…… **Cartilage Tissue**
17. Neurulation in… is exclusively secondary. **Fishes**
18. Archenteron is used **for** _____**Primitive Gut**
19. Spiral cleavage found in ____ **Snails**
20. ----------is characteristic of several animals' groups, including annelid worms, some flatworms, and most mollusks (snails)_____ **Spiral Holoblastic Cleavage**
21. Cell fates are determined by signaling. The micromeres constitute a major signaling center. βcatenin is important for the inducing capacity of the _____**Micromeres.**
22. Blastulae produced by radial cleavage have no blastocoel and are called_____ **Stereoblastulae.**
23. The resulting larvae of snail is called ------ which resemble tiny bear traps_____ **Glochidia**
24. --------constitute a major signaling center_____ **Micromeres**
25. Inner surface cells thin 30x5um process _____**Filopodia.**
26. The first------- divisions occur synchronously, forming a mound of cells that sits at the animal pole of a large yolk cell_____**12**
27. Gastrulation in Snails is accomplished primarily by_____ **Epiboly**
28. _____is characteristic of several animals' groups, including annelid worms, some flatworms, and most mollusks (snails). **Spiral Holoblastic Cleavage**
29. Cells, derived from the micromeres, are called the_____ **Primary Mesenchyme.**
30. Mollusca follow which types of cleavage_____ **Spiral Holoblastic Cleavage**
31. A mammalian blastula is called a_____ **Blastocyst.**
32. The blastomere cell cycle is governed by the synthesis and degradation of _____**Cyclin.**
33. The second step of gastrulation involves the_____ **Involution of The Mesoderm.**

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34. Multinucleated type of cell form-_____ Cyncytiotrophoblast
35. The first cell movement of fish gastrulation is **the** --------of the blastoderm cells over the yolk_____ **Epiboly**
36. Mother provides fetus with _____**Nutrients and Oxygen**
37. The most crucial, difference between mammalian cleavage and all other types involves the phenomenon of_____ **Compaction**
38. The neural form _____**Keel Fish**
39. They have a notochord as larvae but they lack _____**Vertebrae**
40. The mammalian oocyte is released from the ovary and swept by the fimbriae into _____**The Oviduct.**
41. Which has two parts in cell cycle options _____**Blastomere**
42. Fertilization of the chick egg occurs in the _____**Oviduct,**
43. 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**
44. This streak is first visible in birds as a thickening of the-------- at the posterior region of the embryo, just anterior to koller sickle_____ **Epiblast**
45. It secretes a ----- tunic (which gave the name "tunicates" to these creatures) ____ **Cellulose**
46. | will induce the uterine cells of the mammals to from the maternal portion of the placenta, the_____ **Decidua.**
47. Between the area pellucida and the area opaca is a thin layer of cells called the _____**Marginal Zone (Or Marginal Belt).**
48. The cells adjacent to the chordamesoderm, the ------- are the precursors of the mesodermal somites in the fish. _____ **Paraxial Mesoderm Cells**
49. The first segregation of cells within the inner cell mass results in the formation of the _____ **Hypoblast (Sometimes Called the Primitive Endoderm)**
50. Fertilization occurs in the -------- of the oviduct, a region close to the ovary___ **Ampulla**
51. This fetal organ the ---- is derived primarily from embryonic trophoblast cells. ___ **Chorine**
52. The fetal portion of placenta formed by _____ **Chorion**
53. The major structural characteristic of avian, reptilian, and mammalian gastrulation is the_____ **Primitive Streak.**
54. Between the blastoderm and the yolk is a space called the_____ **Sub-Germinal Cavity**
55. The first cleavage furrow appears centrally in the_____ **Blastodisc,**
56. The peripheral ring of blastoderm cells that have not shed their deep cells constitutes the area _____**Opaca.**
57. The depression is called the _____**Primitive Groove**
58. cytoplasm of the blastodisc becomes the embryo, this type of meroblastic cleavage is called_____ **Discoidal.**
59. The mammalian oocyte is released from the ovary and swept by the fimbriae into the_____ **Oviduct.**
60. Identical twins share a common _____**Chorion**
61. Sonic hedgehog is a type of_____ **Protein**
62. In birds -------differences appear crucial for distinguishing dorsal from ventral. _____ **pH**
63. Hox genes pattern the anterior-posterior axis and help to specify positions along that___ **Axis.**
64. The original type of ----- cells constitute a layer called the cytotrophoblast__ **Trophoblast**

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65. Which type of neurulation in fish _____ **Secondary**
66. Hindbrain_____ **Rhombencephalon**
67. The telencephalon will eventually form the cerebral hemispheres, and the diencephalon will form the thalamic and -------brain regions_____ **Hypothalamic**
68. Which forms spinal cord, hind brain and mid brain _____**Chordamesoderm.**
69. Fishes, ------, and birds undergo discoidal meroblastic cleavage, wherein the early cell divisions do not cut through the yolk of the egg. 63. The fast block, initiated by sodium influx into the cell in sea urchin_____ **Reptiles**
70. he rudiment of the central nervous system, is called_____ **Neurulation.**
71. Fraternal twins are the result of ------separate fertilization events_____ **Two**
72. The prechordal ------induces the formation of the forebrain; the chordamesoderm induces the formation of the midbrain, hindbrain, and spinal cord_____ **Plate**
73. About ------- of identical twins have two complete and separate chorions_____**33%**
74. Identical twins occur in roughly -------- of human births. _____ **0.25%**
75. Mammals undergo holoblastic ---------cleavage, _____ **Rotational**
76. In birds, ---------- is critical in determining the anterior-posterior axis _____ **Gravity**
77. The decidua becomes rich in the blood vessels that will provide --------and nutrients to the embryo. _____ **Oxygen**
78. In amphibians most of the xenopus most of tadpole is formed by ---------and tail of neural tube formed by 2ndry neurulation. _____ **Primary Neurulation**
79. Neural fold migrates to midline of embryo and fusing to form -------- beneath the overlying ectoderm. _____ **Neural Tube**
80. In frogs and chicks, ---------- is usually seen in the neural tube of the lumbar (abdominal) and tail 48. vertebrae. _____ **Secondary Neurulation**
81. Which type of neurulation in fish_____ **Exclusively Secondary.**
82. Secondary neurulation involves the making of a -------- and its subsequent hollowing into a neural tube. _____ **Medullary Cord**
83. In primary neurulation, the original ectoderm is divided into ----- sets of cells___ **Three**
84. The growing region at the tip of the lip is called the __**Chord Neural Hinge,**
85. The neural tube will form _____**Brain and Spinal Cord**
86. Each ICM (Inner Cell Mass) cell has the--------potency_____ **Same**
87. Retinoic Acid comes from _____ **Somite's**
88. Human brain contains _____**10" Glial Cells**
89. marginal zone to form clusters of neurons called_____ **Nuclei.**
90. ---------- plays a major role in eye formation_____**Pax6**
91. mantle cells differentiate into_____ **Gray Matter**
92. Paracrine factors such as TGF- and FGF7 are important in normal ___**Skin Development.**
93. Neural crest divides functionally indomains_____**4**
94. Dendrites are often numerous and do not extend far from the neuronal cell body, or----------, axons may extend for several feet. _____ **Soma**
95. One agent of ventral specification is the ---------hedgehog protein_____ **Sonic**
96. In frogs and chicks, ------- neurulation is usually seen in the neural tube ____ **Secondary**

97. The cells at dorsal most portion of neural tube become _____ **Neural Crest Cells.**
98. The neural crest cells originate at the------- most region of the neural tube. _____ **Dorsal**
99. The mantle zone cells differentiate into both _____**Neurons and Glia**
100. Those cells that remain integral components of the neural tube lining become ------ cells. _____ **Ependymal**
101. The cerebral cortex in humans has----------layers. _____ **Six**
102. Nervous system develops by _____**Neural Tube**
103. the space between two neurons which transmit are released_____ **Synapse**
104. There are----------major modes of bone formation, or osteogenesis _____**Two**
105. Paracrine factors instruct the ---------- to become muscles by inducing them to synthesize the Myoid protein_____ **Myotome Cells**
106. Paracrine factors instruct the Myotome cells to become_____ **Muscles**
107. Mutations of the -------- cause campomelic dysplasia, a rare disorder of skeletal development that results in deformities of most of the bones of the body_____**SOX9 Gene**
108. Mutation of sox9 gene cause _____**Campomelic Dysplasia**
109. ------- and Scleraxis are the transcription factors are thought to activate cartilage-specific genes ____ **pax1**
110. Fertilin protein is important for sperm-egg fusion in _____**Mammals**
111. Myogenic bHLH proteins are specific for development of _____**Muscle Cell**
112. The osteoblasts secrete a collagen-proteoglycan -- that is able to bind calcium salts. __ **Matrix**
113. TGF-β family secreted from the surface ----- and roof of the neural tube. ____ **Ectoderm**
114. Scleraxis is expressed in the mesenchyme ------the sclerotome_____ **From**
115. Process of osteogenesis_____**2**
116. Paracrine factors such as --- and FGF7 are important in normal skin development. ____ **TGF**
117. ------phase involves the invasion of the cartilage model by blood vessels _____**Fifth**
118. There are---------- major modes of bone formation, or osteogenesis**,** _____**Two**
119. the SOX9 gene, which ------ a DNA-binding protein, _____ **Encodes**
120. the entire region of calcified spicules becomes surrounded by ------ mesenchymal cells that form the Periosteum_____ **Compact**
121. The second step is the ------of the myoblasts together into chains. _____ **Alignment**
122. Osteoclasts are probably derived from the ---- precursors as macrophage blood cells__ **Same**
123. The direct conversion of mesenchymal tissue into bone is called _____**Intramembranous Ossification**
124. When myoblasts stop dividing, secrete _____**Fibronectin**
125. Endochondral ossification involves the formation of _____**Cartilage**
126. The direct conversion of mesenchymal tissue into ----- is called intramembranous ossification____ **Bone**
127. Mode of commitment_____ **3**
128. Strategies of Commitment_____**2**
129. There Are __approaches of anatomy_____**4**
130. Cell potency------- fate_____ >
131. Rana pippins usually lays around __2500eges while the bullfrog, Rana catesbiana, can lay as more than _____**20,000**
132. Slow block, initiated by the intracellular release of_____ **Calcium Ions**

133. Chlamydomonas. haploid, having copy of each chromosome _____**One**
134. Red blood cells make _____ **Globins,**
135. The requirement of capacitance varies from species to _____ **Species**
136. Resect diffuse readily in _____**Sea Water**
137. Fusion of -------and sperm cell plasma membrane. _____**Egg**
138. A condition in which cell lack instructions for development is called _____**Naive**
139. The major cell adhesion molecules appear to be the _____ **Cadherin**
140. The regulation of gene expression can be accomplished at _____**Several Levels**
141. Telolecithal is cleavage is found in eggs of _____**Birds and Fishes**
142. Digestive and the respiratory system are formed by_____ **Endoderm**
143. Brain has ------billion neurans_____**100**
144. Allows the mRNA to exit the nucleus. _____ **Poly A Tail**
145. Contact and___ between sperm and egg _____ **Recognition**
146. Metamorphosis is initiated by hormones from the tadpole's _____**Thyroid Gland**
147. The release of calcium from intracellular storage can be controlled by dyes ____ **Aequorin**
148. Cleavage sphere known as a _____**Blastula.**
149. The early embryonic cells need a supply of energy and amino acids which is provided by------proteins in the egg. _____ **Yolk**
150. During fertilization -------- molecules fuse to form long microfilaments. **Actin**
151. Both are anurans _____**Frogs and Toads**
152. Which regulate function of Promoter _____**Enhancer**
153. Acrosomal reaction in ------- is often highly specific to each species. _____ **Sea Urchins**
154. cells rearrange there-------- to create new immunoglobulin_____ **DNA**
155. The eggs of insects have their yolk in the -------- (i.e., they are centrolecithal), ___ **Center**
156. Egg activates due to which ion more_____ **Ca**
157. Char by desired to know the cause of ----- defects_____ **Birth**
158. acrosomal vesicles is derived from the Golgi apparatus and contains_____ **Enzymes**
159. Only a ----------percentage of the genome is expressed in any particular cell. ___ **Small**
160. major class of cadherin includes _____**N- Cadherin**
161. The mitotic spindle and contractile ring are-------- to each other_____ **Perpendicular**
162. All multicellular organisms arise by a slow process of progressive change called _____**Development.**
163. Which dermis give rise to brain _____**Ectoderm**
164. ------ have two parts of cell cycle. _____ **Blastomeres**
165. The human β-globin gene has an enhancer in its 3´ UTR, roughly ---- base pairs**.** _____**700**
166. Small subunits of MPF _____**Cyclin-Dependent Kinase.**
167. ZP3 is the specific glycoprotein in the _____**Mouse**
168. Large subunit of MPF is _____ **Cyclin B**
169. In early embryos of these----------, cell division is not complete. _____ **Insects**
170. Variable cleavages produce no-------fate assignments to cells. _____ **Invariant**
171. **Cortical** ---- are membrane-bound structures containing proteolytic enzymes. __ **Granules**
172. Which dermis give rise to _____**Ectoderm Eye**

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173. MITF necessary for the production of _____**Pigment Cells**
174. --------form nervous system in the fly or in the frog. _____ **Tissues**
175. Mod of commitment in insects_____ **Syncytial `Pacification**
176. J.Hammerling exchanged nuclei b/w two -----distinct species_____ **Morphologically**
177. developmental decisions are usually_____ **Irreversible**
178. Nucleosome is composed of an octamer of histone proteins wrapped with two loops containing approximately --------of DNA_____**140 Base Pairs**
179. the membrane potential of the sperm becomes ---------- as potassium ions leave the sperm. _____ **More Negative**
180. The male leopard ----------make their sperm in the summer_____ **Frog**
181. In mouse ZP3 is attached to _____**Zona Pellucid**
182. It is estimate----------egg is 25000 to 50000 mRNA. _____ **Sea Urchin**
183. Fast block to polyspermy is initiated by_____ **Sodium**
184. Transition from fertilization to cleavage is caused by factor _____**MPF**
185. Eggs having sparse and equally yolk space are called_____ **Isolethial**
186. ------- which divide mitotically to produce all the cells of the body_____ **Zygote**
187. the study of birth defect_____ **Teratology**
188. Identical twins occur in roughly ---------of human births. _____ **0.25%**
189. Requlatively development is seen in most vertebrate embryos and it is obviously critical in development of_____ **Identical Twins**
190. Insect such as ---------use all three mods of specification to commit their cells to particular fates_____ **Drosophila**
191. The speed of metamorphosis is directly linked with environment _____**Pressures**
192. In Acetabularia unicellular organisms, development us controlled at both the _____**Transcriptional and Translational**
193. The individuals of each species, however is divided into two mating types _____ **Plus and Minus Chlamydomonas**
194. 140 base pairs of DNAs ____ _____**Nucleosome.**
195. _____ the study of birth defect_____ **Teratology**
196. Vitelline envelop contains at least -------different glycoproteins ___ **Eight**
197. The first evidence suggesting the importance of sperm in reproduction came from a series of experiments performed by_____ **Lazzaro Spallanzani**
198. The volume of the sea urchin is about _____ **200, Pico Liters**
199. Number of cortical granules Sea urchin _____**15000.**
200. The embryo contains ---- The ectoderm, the endoderm and the mesoderm. ___ **Three Germ Layers**
201. **Diploblastic Animals** __are those who have ectoderm and endoderm but no true mesoderm _____**Hydra**
202. Even distribution of yolk in ovum_____**Isolecithal**
203. One chemotactic molecule, a 14- amino acid peptide called_____ **Resect**
204. Size of binding protein _____**30,500-Da**
205. The mitotic division of the nucleus is called _____**Karyokinesis**
206. Resting membrane potential of the egg is_____**70mv**

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207. The------, initiated by sodium influx into the cell in sea urchin. _____ **Fast Block**
208. Due to------- in hydrogen ions, pH rises. _____ **Loss**
209. As a result of gastrulation, ectoderm, mesoderm and------- a reformed. _____ **Endoderm**
210. ----------is step for gene expression regulation _____ **Differential Gene Transcription**
211. Coding regions of DNA _____**Exon.**
212. How many domains are present for transcription _____ **3**
213. pdx1 is present in--------- And Duodenall gene. _____ **Pancreatic**
214. Bacteria transmit genes from one cell to other by_____ **Sex Pili,**
215. Cells rearrange there --- to create new immunoglobin and antigen receptor gene. ___ **DNA**
216. Sea urchins contain ------mRNA_____**25,000 To 50,000**
217. In many species, sperm are attracted towards eggs by _____ **Chemotaxis**
218. Acrosomal protein mediating recognition by protein _____ **Binding**
219. Sea water has ---------sodium ion conc._____ **High**
220. The force for sperm propulsion is provided by_____ **Dynein**
221. Regulative development arises from _____**Conditional Specification.**
222. Fish have discoidal_____ **Telolecithal Pattern**
223. Reproduction in the absence of sex is characteristic of organisms that reproduce by___ **Binary Fission**
224. The macromeres divide meridionally, forming a tier of ----- cells _____**Eight**
225. When plus individuals initiate fusion by extending a fertilization tube.Which contacts & fuses with a specific NP site on the----------individual. _____ **Minus**
226. Promoter is ------- which is thought to regulate. _____ **Enhancer**
227. After fertilization developmental process proceed by_____ **Cleavage**
228. Ca ion responsible for cortical granules stores in_____ endoplasmic reticulum of cell
229. The division of embryo into_____ **3 Germ Layers**
230. The mammalian egg is also surrounded by a layer of cells called the --------- **Cumulus**
231. The sperm travel by the amoeboid motion of ------- of the cell membrane. _____ **Lamellipodial Extensions**
232. The sex and -------- process included into fertilization. ____ **Reproduction**
233. Sperm discovered in_____**1678**
234. in deuterostomes the mouth opening would for, opening _____**Anal**
235. The ability of embryonic cells to change their fates is called, _____ **Regulation**
236. Annelids, molluscs and flatworms belong to. _____ **Lophotrochozoa**
237. cell decrease if cell is committed. _____ **Potency**
238. fertilization in Rana Pippins usually lasts for about --------- years. _____ **3 (Three)**
239. Ca---------- ions maybe critical in activating cAMP_____ **Bicarbonate**
240. Peroxidase enzyme ----fertilization envelope. _____- **Hardens**
241. The ------ is achieved by changing the electric potential ____ **Fast Block to Polyspermy**
242. P-cadherin stands for ____ **Placental Cadherin**
243. Most transcription factor can bind to _____**Specific DNA Sequences**
244. MITF protein_____ **Necessary for Production of Pigments Cell and Their Pigments.**
245. Outside of plasma membrane is the ----- envelope_____ **Vitelline**

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246. Mouse ___ **Fertilin**___ is localized to posterior plasma membrane of the sperm ___**Head**
247. Whittaker stained blastomeres for the presence of the enzyme_____ **Acetyl Cholinesterase**
248. Mesoderm generates the_____ **Kidney.**
249. In Situ hybridization is_____ **Northern Blots,**
250. +Ve And - Ve mating take place_____ **Chlamydomonas**
251. Upon fertilization, the intracellular ------ concentration of the egg increases greatly____ **Calcium Ion**
252. Specification to commit their cells to particular fates 11. Nuclear control of cell morphogenesis and the interaction of nucleus and cytoplasm are well studied in_____ **Acetabularia.**
253. Insects such as ------ use all three modes of specification to commit them cells to particular fates_____ **Drosophila**
254. An----- program has been activated within the cell that causes it to follow a particular pathway of development_____ **Intrinsic**
255. Activation of ----- to start development_____ **Egg Metabolism**
256. Anatomical abnormalities are caused by_____ **Mutant Genes**
257. Ascidian called---------- **Tunisia**

SUBJECTIVEs

1. Composition Of Hyline Membrane.

The hyaline layer is actually made up of two layers, an outer lamina made primarily of hyalin Protein and an inner lamina composed of fibropellin proteins.

2. Which Type Of Egg Present In Birds Or Chick

Fishes, reptiles, and birds undergo discoidal meroblastic cleavage, wherein the early cell Divisions do not cut through the yolk of the egg. These cells form a blastoderm. In chick embryos, early cleavage forms an area opaca and an area pellucida. The region Between them is the marginal zone. Gastrulation begins at the posterior marginal zone, as the Hypoblast and primitive streak both start there.

3. In Which Portion Vegetal Hemisphere Present.

Since 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. Conversely, the upper half of the egg usually has less yolk and divides faster. This upper Portion is called the animal hemisphere of the egg.

4. Write The Names Of Three Vesicles Formed In Brain

°The brain forms three primary vesicles: prosencephalon (forebrain), mesencephalon (midbrain), and rhombencephalon (hindbrain).

- The brain expands through fluid secretion putting positive pressure on the vesicles.
- The neurons of the brain are organized into cortices (layers) and nuclei (clusters).

5. What Are Osteoclasts.

Osteoclasts are probably derived from the same precursors as macrophage blood cells, and They dissolve both the inorganic and the protein portions of the bone matrix. Each osteoclast extends numerous cellular processes into the matrix and pumps out Hydrogen ions onto the surrounding material, thereby acidifying and solubilizing it.

6. Difference B/W Identical And Fraternal Twins

Each ICM (Inner Cell Mass) .Human twins are classified into two major groups: **Monozygotic** (one egg, or identical) **Twins And Dizygotic** (two egg, or 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.day 9, the human embryo has Completed the construction of another extraembryonic layer, the lining of the amnion. After the formation of the chorion on day 5 but before the formation of the amnion on Day 9, then the resulting embryos should have one chorion and two amnions.

7. What Are The Three Axis Of Body Foundation.

Three axes are the foundations of the body: the anterior-posterior axis (head to tail or mouth To anus), the dorsal-ventral axis (back to belly), and the right-left axis (between the two lateral Sides of the body).

8. Write Detail Note On Osteoclasts.

Osteoclasts are probably derived from the same precursors as macrophage blood cells, and They dissolve both the inorganic and the protein portions of the bone matrix. If there are too many active osteoclasts, too much bone will be dissolved, and osteoporosis Will result. Conversely, if not enough osteoblasts are produced, the bones are not hollowed out For the marrow, and osteopetrosis results.

Osteopetrosis Or Marble Bone Disease

Osteopetrosis is a bone disease that makes bones abnormally dense and prone to breakage (fracture). This disorder is characterized by increased bone density and abnormal bone growth.

9. Differentiation of the Neural Tube

The anterior-posterior axis

In this region, the neural tube balloons into three primary vesicles.

- Forebrain (prosencephalon),
- Midbrain (mesencephalon),
- Hindbrain (rhombencephalon).
- The Prosencephalon becomes subdivided into the anterior Telencephalon and the more caudal diencephalon.

The telencephalon will eventually form the cerebral hemispheres, and the diencephalon will Form the thalamic and hypothalamic brain regions that receive neural input from the retina.The Rhombencephalon becomes subdivided into a posterior Myelencephalon and a more Anterior Metencephalon. The Myelencephalon eventually becomes the Medulla oblongata, The Metencephalon gives rise to the cerebellum, the part of the brain responsible for Coordinating movements, posture, and balance.

The dorsal-ventral axis : The neural tube is polarized along its dorsal-ventral axis. One Agent of ventral specification is the Sonic hedgehog protein, probably originating from the Notochord. Another agent specifying the ventral neural cell types is retinoic acid, The secreted Sonic hedgehog induces the medial hinge cells to become the floor plate of the Neural tube. Cells adjacent to the floor plate That receive high concentrations of Sonic hedgehog become the ventral (V3) neurons, while The next group of cells, exposed to slightly less Sonic hedgehog, become motor neuron

10. Tunicate Gastrulation?

Tunicates, like sea urchins and vertebrates, follow the deuterostome pattern of gastrulation in which the blastopore becomes the anus. Tunicate gastrulation is characterized by the invagination of the endoderm, the involution of the mesoderm, and the epiboly of the ectoderm.

11. Stereoblastula?

Blastulae produced by radial cleavage have no blastocoel and are called stereoblastulae.

12. Composition of Hyaline Membrane in Sea Urchin?

The hyaline layer is actually made up of two layers, an outer lamina made primarily of hyalin protein and an inner lamina composed of fibropellin proteins

13. What Is Blastocyst?

A mammalian blastula is called a blastocyst in which some differentiation of cells has occurred.

14. Cleavage Pattern in Sea Urchin, Nematode and Tunicate?

In all four invertebrates described in this Question, cleavage is holoblastic. In the sea urchin, cleavage is radial, in the snail, spiral. in the tunicate, bilateral, and in the nematode, rotational.

15. Tunicate Gastrulation

Tunicate gastrulation is characterized by the invagination of the endoderm,the involution of the mesoderm, and the epiboly of the ectoderm. About 4 5 hours after fertilization, the vegetal (endoderm) cells assume a wedge shape, expanding their apical margins and contracting near their vegetal margins.

16. Why Tunicate Give Name?

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).

17. Blastomere Progress

Blastomeres generally progress through a cell cycle consisting of just two steps: M (mitosis) And S (DNA synthesis).

18. What Is Sea Urchin Larva Name?

Pluteus larvae

19. Three Axes of Body Foundation

Three axes are the foundations of the body:

- The anterior-posterior axis (head to tail or mouth to anus),
- The dorsal-ventral axis (back to belly),
- The right-left axis (between the two lateral sides of the body).

20. Different Steps of Cleavage in Development of Snail.

Spiral holoblastic cleavage is characteristic of several animal groups, including annelid worms, some flatworms, and most molluscs. It differs from radial cleavage in numerous ways.

First, the cleavage planes are not parallel or perpendicular to the animal-vegetal axis of the egg; rather, cleavage is at oblique angles, forming a "spiral" arrangement of daughter blastomeres.

Second, the cells touch one another at more places than do those of radially cleaving embryos. In fact, they assume the most thermodynamically stable packing orientation, much like that of adjacent soap bubbles.

Third, spirally cleaving embryos usually undergo fewer divisions before they begin gastrulation, making it possible to follow the fate of each cell of the blastula. Blastulae produced by radial cleavage have no blastocoel and are called stereoblastulae

The first two cleavages are nearly meridional, producing four large macromeres (labeled A, B, C, and D). In each successive cleavage, each macromere buds off a small micromere at its animal pole

21. Define Isolecithal

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").

22. Difference Between Dextral Coiling and Sinistral Coiling.

Some snails have their coils opening to the right of their shells is called dextral coiling. Whereas, other snails have their coils opening to the left is called sinistral coiling.

23. Dose Ascidians Have Notochord.

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.

24. What Is Blastocyst?

A blastula is an embryonic structure composed of blastomeres. The cavity in the blastula is the blastocoel. A mammalian blastula is called a blastocyst.

25. 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.

26. Blastocoel Function?

The blastocoel probably serves two major functions in frog embryos:

- It permits cell migration during gastrulation, and
- It prevents the cells beneath it from interacting prematurely with the cells above it.

27. How Secondary Hypoblast Form in Avians?

Gastrulation of the Avian Embryo, a sheet of cells from the posterior margin of the blastoderm (distinguished from the other regions of the margin by Koller's sickle, a local thickening) migrates anteriorly to join the polyinvagination islands, thereby forming the secondary hypoblast.

28. Defect of Neutralization?

Different neural tube defects are caused when various parts of the neural tube fail to close. Failure to close the human posterior neural tube regions at day 27 results in a condition called spina bifida, the severity of which depends on how much of the spinal cord remains exposed. Failure to close the anterior neural tube regions results in a lethal condition, anencephaly. Here, the forebrain remains in contact with the amniotic fluid and subsequently degenerates. Fetal forebrain development ceases, and the vault of the skull fails to form.

29. What Is Syncytiotrophoblast?

The syncytiotrophoblast is the primary structure that determines which substances cross the placenta (e.g., nutrients and oxygen) and which substances do not (e.g., maternal hormones and certain toxins).

30. Cleavage in Mammals

The mammalian oocyte is released from the ovary and swept by the fimbriae into the oviduct. Fertilization occurs in the ampulla of the oviduct, a region close to the ovary. Meiosis is completed at this time, and first cleavage begins about a day later. Cleavages in mammalian eggs are among the slowest in the animal kingdom about 12-24 hours apart. Meanwhile, the cilia in the oviduct push the embryo toward the uterus; the first cleavages occur along this journey.

The most crucial, difference between mammalian cleavage and all other types involves the phenomenon of **compaction**. The cells of the compacted 8-cell embryo divide to produce a 16cell morula. The morula consists of a small group of internal cells surrounded by a larger group of external cells. Most of the descendants of the external cells become the trophoblast cells. This group of cells produces no embryonic structures. Rather, it forms the tissue of the chorion, the embryonic portion of the placenta.

These cells generate **the inner cell mass (ICM**), which will give rise to the embryo and its associated yolk sac, allantois, and amnion. By the 64-cell stage, the inner cell mass (approximately 13 cells) and the trophoblast cells have become separate cell layers, neither contributing cells to the other group. 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, is another hallmark of mammalian cleavage. Once out, the blastocyst can make direct contact with the uterus. The uterine epithelium (endometrium) "catches" the blastocyst on an extracellular matrix containing collagen, laminin, fibronectin, hyaluronic acid, and heparin sulfate receptors

31. What Is Hypoblast?

Area pellucida cells migrate individually into the sub germinal cavity to form the polyinvagination islands (primary hypoblast). Shortly thereafter, a sheet of cells from the posterior margin of the blastoderm migrates anteriorly to join the polyinvagination islands, thereby forming the secondary hypoblast.

32. Define Germ 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, and it is composed of a superficial layer, the epiblast, and an inner layer, the hypoblast.

33. What is Primitive Knot or Hansen Node?

At the anterior end of the primitive streak is a regional thickening of cells called the primitive knot or Hansen's node.

34. Define Marginal Zone or Marginal Belt.

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

35. Define: Area Opaca, Area Pellucida, Sub-Germinal Cavity, Marginal Zone

The peripheral ring of blastoderm cells that have not shed their deep cells constitutes the **area opaca** the deep cells in the center of the blastoderm are shed and die, leaving behind a one cell- thick **area pellucida.** Between the blastoderm and the yolk is a space called **the sub-germinal cavity**. Between the area pellucida and the area opaca is a thin layer of cells called the **marginal zone**

36. Defect of Neurulation?

Neural tube defects (NTDs) are severe congenital malformations affecting 1 in every 1000 pregnancies. 'Open' NTDs result from failure of primary neurulation as seen in anencephaly, myelomeningocele (open spina bifida) and craniorachischisis.

37. Meroblastic Cleavage?

Meroblastic cleavage, wherein the early cell divisions do not cut through the yolk of the egg. These cells form a blastoderm.

38. Fraternal and Identical Twin?

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.

39. Function of Placenta?

The chorion forms the fetal portion of the placenta, which functions to provide oxygen and nutrition to the embryo, to provide hormones for the maintenance of pregnancy, and to provide barriers to the mother's immune system.

40. Primary and Secondary Neurulation? OR Primary and Secondary Neural Tube

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.

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. Neurulation in fishes is exclusively secondary.

41. Neural Tube Close?

The failure of the entire neural tube to close over the entire body axis is called Craniorachischisis. Collectively, neural tube defects are not rare in humans, as they are seen in about 1 in every 500 live births.

42. What Happened Neural Tube Fail to Fuse?

The neural tube goes on to develop into your baby's brain and spinal cord. When the neural tube does not fuse together properly a problem with the development of the spine or brain occurs. This is known as a neural tube defect.

43. Two Way from Neural Tube?

There are two major ways of forming a neural tube

- Primary neurulation
- Secondary neurulation.

44. Amniotic Fluid?

The amniotic fluid is the protective liquid contained by the amniotic sac.This fluid serves as a cushion for the growing fetus, but also serves to facilitate the exchange of nutrients, water, and biochemical products between mother and fetus

45. How Neural Groove Formed in 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. In primary neurulation, the neural plate creases inward until the edges come in contact and fuse.

46. What Is Homology of Hox Genes in Drosophila and of Mammals?

The homology of gene structure and the similarity of expression patterns between Drosophila and mammalian Hox genes suggests that this patterning mechanism is extremely ancient.

47. Process of Neural Crest

A group of ectodermal cells that gives rise to the spinal ganglia and various structures of the autonomic nervous system. The neural crest cells originate at the dorsal most region of the neural tube. The neural crest can be divided into four mains functional (but overlapping) domains.

The cranial (cephalic) neural crest, whose cells migrate dorsolaterally to produce the craniofacial mesenchyme that differentiates into the cartilage, bone, cranial neurons, glia, and connective tissues of the face.

48. Major Pathways in Differentiation of Neural Crest

The trunk neural crest, whose cells take one of two major pathways.

- Neural crest cells that become the pigment-synthesizing melanocytes migrate dorsolaterally into the ectoderm and continue on their way toward the ventral midline of the belly.
- The second migratory pathway takes the trunk neural crest cells ventrolaterally through the anterior half of each sclerotome.
- Sclerotomes are blocks of mesodermal cells, derived from somites, that will differentiate into the vertebral cartilage of the spine.
- The vagal and sacral neural crest, whose cells generate the parasympathetic (enteric) ganglia of the gut.
- The vagal (neck) neural crest lies opposite chick somites 1-7, while the sacral neural crest lies posterior to somite 28.
- The cardiac neural crest is located between the cranial and trunk neural crests.
- The cardiac neural crest cells can develop into melanocytes, neurons, cartilage, and connective tissue.

49. Retinoic Acid Foundation

The specification of the ventral neural tube appears to be mediated by external tissues. One agent of ventral specification is the Sonic hedgehog protein, probably originating from the notochord. Another agent specifying the ventral neural cell types is retinoic acid, which probably comes from the adjacent somites.

50. Explain the Spina Bifida

Failure to close the human posterior neural tube regions at day 27 (or the subsequent rupture of the posterior neuropore shortly thereafter) results in a condition called spina bifida, the severity of which depends on how much of the spinal cord remains exposed.

51. Metacephalon?

The Metencephalon gives rise to the cerebellum, the part of the brain responsible for coordinating movements, posture, and balance.

52. Events in 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

53. Define Prechordal Plate?

Cells migrating through Hansen's node become notochord cells. These extend up to the presumptive midbrain, where they meet the prechordal plate. The prechordal plate induces the formation of the forebrain

54. Define Medial Hinge Point?

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 Hansen's node.

55. What Is Fate of Metencephalon?

The fate of the brain vesicles is determined by the combination of transcription factors. Signals from the secondary organizer, the anterior neural ridge and the mesencephalon– metencephalon boundary (isthmus), regulate expression of the transcription factors in the adjacent region and organize its fate.

56. Two Different Pathways of Neural Crest Cell?

Neural crest cells that become the pigment synthesizing melanocytes migrate dorsolaterally into the ectoderm and continue on their way toward the ventral midline of the belly. The second migratory pathway takes the trunk neural crest cells ventrolaterally through the anterior half of each sclerotome

57. Write 2 Major Difference Pathway of Neural Crest Cells?

The trunk neural crest, whose cells take one of two major pathways. Neural crest cells that become the pigment synthesizing melanocytes migrate dorsolaterally into the ectoderm and continue on their way toward the ventral midline of the belly. The second migratory pathway takes the trunk neural crest cells ventrolaterally through the anterior half of each sclerotome. Sclerotomes are blocks of mesodermal cells, derived from somites, that will differentiate into the vertebral cartilage of the spine. The vagal and sacral neural crest, whose cells generate the parasympathetic (enteric) ganglia of the gut. The vagal (neck) neural crest lies opposite chick somites 1-7, while the sacral neural crest lies posterior to somite 28. The cardiac neural crest is located between the cranial and trunk neural crests. The cardiac neural crest cells can develop into melanocytes, neurons, cartilage, and connective tissue (of the third, fourth, and sixth pharyngeal arches).

58. Neural Plate?

The neural plate is a key developmental structure that serves as the basis for the nervous system. Opposite the primitive streak in the embryo, ectodermal tissue thickens and flattens to become the neural plate. The region anterior to the primitive knot can be generally referred to as the neural plate.

59. Ectoderm Difference?

The ectoderm differentiates to form the nervous system (spine, peripheral nerves and brain), tooth enamel and the epidermis (the outer part of integument). It also forms the lining of mouth, anus, nostrils, sweat glands, hair and nails

60. Mental and Ventricular Zone?

New layer is called the mantle (or intermediate) zone, and the germinal epithelium is now called the ventricular zone (and, later, the ependyma).

61. What Is Growth Cone?

Dendrites are often numerous and do not extend far from the neuronal cell body, or soma, axons may extend for several feet. The Nerve outgrowth is led by the tip of the axon, called the growth cone. The growth cone moves by the elongation and contraction of pointed filopodia called Micro spikes. These micro spikes contain microfilaments, which are oriented parallel to the long axis of the axon.

62. Differentiation Process Of Medulla And Spinal Chord .

As the cells adjacent to the lumen continue to divide, the migrating cells form a second layer around the original neural tube.

This layer becomes progressively thicker as more cells are added to it from the germinal neuroepithelium. This new layer is called the mantle (or intermediate) zone, and the germinal epithelium is now called the ventricular zone. The mantle zone cells differentiate into both neurons and glia. The neurons make connections among themselves and send forth axons away from the lumen, thereby creating a cell-poor marginal zone.

Eventually, glial cells cover many of the axons in the marginal zone in myelin sheaths, giving them a whitish appearance. Hence, 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 three-zone pattern of ependymal, mantle, and marginal layers is retained throughout development. The gray matter (mantle) gradually becomes a butterflyshaped structure surrounded by white matter; and both become encased in connective tissue.

63. Define Neural Crest.

A group of ectodermal cells that gives rise to the spinal ganglia and various structures of the autonomic nervous system. The neural crest cells originate at the dorsal most region of the neural tube. The neural crest can be divided into four mains functional (but overlapping) domains.

64. Role of TGF Nd FGF7 In Human Body Development

Paracrine factors such as TGF- and FGF7 are important in normal skin development.

65. Difference Between 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 three-zone 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.

66. What Is Camptomelic Dysplasia?

Mutations of the SOX9 gene cause camptomelic dysplasia, a rare disorder of skeletal development, reproductive system, and other parts of the body that results in deformities of most of the bones of the body.

67. Myogenesis

The Development of Muscle:

Paracrine factors instruct the Myotome cells to become muscles by inducing them to synthesize the MyoD protein. Factors from the surrounding environment induce the Pax3 transcription factor.

In the absence of other inhibitory transcription factors (such as those found in the sclerotome cells), Pax3 then activates the genes encoding two muscle-specific transcription factors, Myf5 and MyoD.

MyoD and Myf5 belong to a family of transcription factors called **the myogenic bHLH** (basic helix-loop-helix) proteins (sometimes also referred to as the MyoD family). The proteins of this family all bind to similar sites on the DNA and activate muscle-specific genes. MyoD also directly activates its own gene. While Pax3 is found in several other cell types, the myogenic bHLH proteins are specific for muscle cells. Any cell making a myogenic bHLH transcription factor such as MyoD or Myf5 is committed to becoming a muscle cell. Transfection of genes encoding any of these myogenic proteins into a wide range of cultured cells converts those cells into muscle

68. Osteogenesis?

Osteogenesis imperfecta (OI), also known as brittle bone disease, is a group of genetic disorders that mainly affect the bones. It results in bones that break easily.

69. Bone Precursor Cell

During intramembranous ossification in the skull, neural crest derived mesenchymal cells proliferate and condense into compact nodules. Some of these cells develop into capillaries; others change their shape to become osteoblasts, committed bone precursor cells.

70. Periosteum

A Membrane that surrounds the bone is called periosteum**.** the entire region of calcified spicules becomes surrounded by compact mesenchymal cells that form the Periosteum

71. What BHLH protein specific for?

The myogenic bHLH proteins are specific for muscle cells. Any cell making a myogenic bHLH transcription factor such as MyoD or Myf5 is committed to becoming a muscle cell.

72. Describe Osteoclast in Detail

Osteoclasts are probably derived from the same precursors as macrophage blood cells, and they dissolve both the inorganic and the protein portions of the bone matrix. Each osteoclast extends numerous cellular processes into the matrix and pumps out hydrogen ions onto the surrounding material, thereby acidifying and solubilizing it.

The blood vessels also import the blood-forming cells that will reside in the marrow for the duration of the organism's life. The number and activity of osteoclasts must be tightly regulated.

If there are too many active osteoclasts, too much bone will be dissolved, and **osteoporosis** will result. Conversely, if not enough osteoblasts are produced, the bones are not hollowed out for the marrow, and **osteopetrosis** results.

73. Write Three Distinct Lineage Of Osteogenesis? Or What Are Lineages To Generate Skeleton? Or Osteogenesis In Detail?

There are three distinct lineages that generate the skeleton.

- The somites generate the axial skeleton.
- The lateral plate mesoderm generates the limb skeleton.
- The cranial neural crest gives rise to the branchial arch and craniofacial bones and cartilage.
- There are two major modes of bone formation, or osteogenesis, and both involve the transformation of a preexisting mesenchymal tissue into bone tissue.
- The direct conversion of mesenchymal tissue into bone is called **intramembranous ossification.** This process occurs primarily in the bones of the skull.
- In other cases, the mesenchymal cells differentiate into cartilage, and this cartilage is later replaced by bone. The process by which a cartilage intermediate is formed and replaced by bone cells is called **endochondral ossification.**

74. Endochondral Ossification?

Endochondral ossification involves the formation of cartilage tissue from aggregated mesenchymal cells, and the subsequent replacement of cartilage tissue by bone. The process of Endochondral ossification can be divided into five stages.

- First, the mesenchymal cells are committed to become cartilage cells. This commitment is caused by paracrine factors that induce the nearby mesodermal cells to express two transcription factors**, Pax1 and Scleraxis. Pax1 and Scleraxis** are the transcription factors are thought to activate cartilage-specific genes.
- During the second phase of endochondral ossification, the committed mesenchyme cells condense into compact nodules and differentiate into chondrocytes, the cartilage cells.
- During the third phase of endochondral ossification, the chondrocytes proliferate rapidly to form the model for the bone.
- In the fourth phase, the chondrocytes stop dividing and increase their volume dramatically, becoming hypertrophic chondrocytes.
- The fifth phase involves the invasion of the cartilage model by blood vessels

75. Exon Intron?

Both introns and exons are the genetic material. But the essential difference between the two is that one is made into protein and the other is not. DNA molecules are made up of small molecules that are called nucleic acids. An exon is a sequence of nucleic acids that are represented in the mRNA molecule.

76. How to Avoid Polyspermy?

Prevent the entry of more than one sperm into the egg. The sea urchin egg has two mechanisms to avoid polyspermy:

- A Fast reaction, accomplished by an electric change in the egg plasma membrane,
- And a slower reaction, caused by the exocytosis of the cortical granules

77. How Acrosomal Reaction Initiate in Sea Urchin?

In the sea urchin, contact with egg jelly initiates the acrosome reaction, which is a calcium-mediated process. ... The acrosomal vesicle (green) fuses with the plasma membrane, releasing enzymes from the tip of the sperm that aid digestion of egg jelly.

78. How Genetic Material Exchange in Paramecium?

The micronucleus is the generative, or germline nucleus, containing the genetic material that is passed along from one generation to the next. Paramecium reproduces asexually, by binary fission. During reproduction, the macronucleus splits by a type of amitosis, and the micronuclei undergo mitosis.

79. Name 4 Level Gene Regulation? Level Of Gene Regulation?

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

- **Differential Gene Transcription:** It regulates that which of the nuclear genes are 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 become translated into proteins.
- **Differential Protein Modification:** It regulates that which proteins are allowed to remain or function in the cell.

80. Cortical Granule Reaction?

Cortical granules are membrane-bound structures containing proteolytic enzymes. However, whereas each sperm contains one acrosomal vesicle, each sea urchin egg contains approximately 15,000 cortical granules

81. Slow Block Polyspermy?

The slow block to polyspermy begins within 10 seconds of fusion of the sperm and egg plasma membranes. A compound called inositol triphosphate (IP3) causes the release of Ca++ from intracellular stores in the egg endoplasmic reticulum.

82. Types of Cleavage?

The entire cell is divided equally. Four major holoblastic cleavage types can be observed in general: radial, spiral, bilateral, and rotational. Egg cells that have larger quantities of yolk undergo meroblastic cleavage after fertilization, in which only a portion of the zygote undergoes cleavage.

83. Response from Egg to 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.

84. Protozoans?

Protozoan is an informal term for single-celled eukaryotes, either free-living or parasitic, which feed on organic matter such as other microorganisms or organic tissues and debris.

85. Function of Enhancer:

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.

86. Blastomere Cleavage?

Production of a multicellular organism, many cells must be produced from the single-celled zygote. This task is accomplished by cleavage, a series of consecutive cell divisions. Cells produced during cleavage are called blastomeres.

87. What Is Meroblastic Cleavage?

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.

88. Cortical Granule Reaction? Cortical Reaction?

The cortical reaction is a process initiated during fertilization by the release of cortical granules from the egg, which prevents polyspermy, the fusion of multiple sperm with one egg.

89. Larval Stage of Frog?

A tadpole is the larval stage in the life cycle of an amphibian, particularly that of a frog or toad.

90. Commitment Strategy?

Two major strategies for establishing commitment

- The inheritance of cytoplasmic determinants
- The perception of external inductive signals.

91. Resting Potential Membrane?

The opening of the calcium channels involves the receptor's activating a cation channel (for sodium, potassium, or calcium), which would change the resting potential of the sperm plasma membrane. The calcium channels in the membrane would be sensitive to this change in membrane potential, allowing calcium to enter the sperm. resting membrane potential is generally about 70 mV.

92. Difference Between Cytokinesis and Karyokinesis?

Karyokinesis is the process of division of the nucleus of a cell during the phase of division (mitosis or meiosis). Cytokinesis is the process of division of cytoplasm of the cell. Cytokinesis divides cytoplasm and organelles including nuclei into its daughter cells.

93. Event of Fertilization?

The result of fertilization is a cell (zygote) capable of undergoing cell division to form a new individual. The fusion of two gametes initiates several reactions in the egg. One of these causes a change in the egg membrane(s), so that the attachment of and penetration by more than one spermatozoon cannot occur.

94. How Discovered Sperm?

A.V Leeuwenhoek, the Dutch microscopist who co-discovered sperm in 1678, first believed them to be parasitic animals living within the semen.

95. Conditional SP With Example?

Conditional specification: Characteristic of all vertebrates and few invertebrates. Specification by interactions between cells. Relative positions are important

96. MPF Subunit?

Mitosis-promoting factor contains two subunits. The large subunit is called cyclin B. Small subunit of MPF, the cyclin-dependent kinase

97. Difference Mono and Polyspermy?

Monospermy is fertilization of a single spermatozoon while polyspermy is the penetration of an ovum by more than one sperm.

98. Anatomical Approach

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.

99. Species Specific Recognition in Sea Urchin?

"Species specific recognition of sea urchin gametes occurs at the levels of sperm attraction, sperm activation, and sperm adhesion to the egg surface." The sea-urchin egg jelly contains a species-specific chemo-attractant (redact).

100. Chemotaxis?

Is the movement of an organism in response to a chemical.

101. Type of Egg in Insect?

These are polylecithal & centrolecithal eggs. The cytoplasm of insect egg is limited to periphery only whole central place is filled by yolk. Two types of egg envelop are present on egg of insects. Inner - Vitelline membrane - Primary egg membrane.

102.Name of Cell Movement During Gastrulation in Vertebrates?

Patterns of gastrulation cell movements relative to the blastopore and the organizer are similar from fish to mammals, and conserved molecular pathways mediate gastrulation movements.

103.Vegetal Pole and Animal Pole?

The yolk-rich pole is referred to as the **vegetal pole**, the yolk concentration in the **animal pole** is relatively low.

104.How Egg Protected from Sunlight?

Many eggs contain ultraviolet filters and DNA repair enzymes that protect them from sunlight

105.What Create Dramatic Change in The Structure of Organism?

Allometric growth can create dramatic changes in the structure of organisms.

106.Transcription Factor Group Together?

General transcription factors are involved in the formation of a pre initiation complex. The most common are abbreviated as TFIIA, TFIIB, TFIID, TFIIE, TFIIF, and TFIIH. They interact with the core promoter region surrounding the transcription start site(s) of all class II genes

107.Difference Between Enhancer and Promoter?

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.

108.Zona Pellucida?

The zona pellucida is a glycoprotein matrix, which is synthesized and secreted by the growing oocyte. In mammals the zona pellucida plays a role analogous to that of the vitelline envelope in invertebrates. The zona pellucida plays two major roles during fertilization:

- It binds the sperm.
- It initiates the acrosomal reaction after the sperm is bound.

109.When Capacitation Occur?

Set of physiological changes that allow the sperm to be competent to fertilize the egg is called capacitation. The requirement for capacitation varies from species to species. capacitation occurs after ejaculation, when the spermatozoa leave the vagina and enter the superior female reproductive tract.

110.What Is 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.

111.Syncytium?

A cytoplasm that contains many nuclei is called a syncytium

112.Fertilization in Frog?

In most species of frogs, fertilization is external. The male frog grabs the female's back and fertilizes the eggs as the female frog releases them.

113.Demonstration of Sperm Enter in The Egg Two Nuclie?

In 1876 Oscar Hertwig and Herman Fol independently demonstrated sperm entry into the egg and the union of the two cells' nuclei.

114.What Happens When Fusion Occur Between Sperm and Egg

The process of fertilization involves a sperm fusing with an ovum. After the sperm enters the cytoplasm of the oocyte the tail and the outer coating of the sperm disintegrate and the cortical reaction takes place, preventing other sperm from fertilizing the same egg. The oocyte now undergoes its second meiotic division producing the haploid ovum and releasing a polar body. The sperm nucleus then fuses with the ovum, enabling fusion of their genetic material. The successful fusion of gametes forms a new organism

115.Fertilin Function

- In mammals, the fertilin proteins in the sperm plasma membrane are essential for sperm membraneegg 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.
- fertilin appears to bind the sperm plasma membrane to the egg plasma membrane and then to fuse the two of them together. When the membranes are fused, the sperm nucleus, mitochondria, centriole, and flagellum can enter the egg

116.Function of Dynein

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

117.Example of Enhancer In Human

The human β-globin gene has an enhancer in its 3´ UTR, roughly 700 base pairs.

118.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.

119.Mode of Commitment

Three basic modes of commitment are,

- Autonomous specification
- Conditional specification
- Syncytial specification

120.What Is Hierarchical Development

The developmental hierarchy is the hierarchical series of decisions involving specific preexisting cell types. These developmental decisions are usually irreversible. Animal development is the division of embryo into the three germ layers. 1. Ectoderm 2. Mesoderm 3. Endoderm

121.Difference Between Germ Cells and Somatic Cells

Germ cells:

In many species a specialized portion of egg cytoplasm gives rise to cells that are the precursorsof 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.

Somatic cells:

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.

122.Step of Sperm and Egg Interaction

The interaction of sperm and egg generally proceeds according to five basic steps:

- 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.

123.Role of Calcium in Cortical Granule

Upon fertilization, the intracellular calcium ion concentration of the egg increases greatly. In this high-calcium environment, the cortical granule membranes fuse with the egg plasma membrane, releasing their contents. Once the fusion of the cortical granules begins near the point of sperm entry, a wave of cortical granule exocytosis propagates around the cortex to the opposite side of the egg.

The release of calcium from intracellular storage can be monitored visually using calcium activated luminescent dyes such as aequorin (isolated from luminescent jellyfish) or fluorescent dyes such as fura-2. These dyes emit light when they bind free calcium ions. Several experiments have demonstrated that calcium ions are directly responsible for propagating the cortical granule reaction, and that these calcium ions are stored within the egg itself.

124.Structure of Sperm

Each sperm consists of,

- A haploid nucleus,
- A propulsion system to move the nucleus, and
- A sac of enzymes that enable the nucleus to enter the egg.

During the course of sperm maturation, the haploid nucleus becomes very streamlined, and its DNA becomes tightly compressed In front of this compressed haploid nucleus lies the acrosomal vesicle, or acrosome, which is derived from the Golgi apparatus and contains enzymes that digest proteins and complex sugars; thus, it can be considered a modified secretory vesicle.

These stored enzymes are used to lyse the outer coverings of the egg. In many species, such as sea urchins, a region of globular actin molecules lies between the nucleus and the acrosomal vesicle. These proteins are used to extend a fingerlike acrosomal process from the sperm during the early stages of fertilization.

125.What Is Cleavage

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.

126.Patterns of Embryonic Cleavage

Indeed, different organisms undergo cleavage in distinctly different ways. The pattern of embryonic cleavage particular to a species is determined by two major parameters:

- The amount and distribution of yolk protein within the cytoplasm.
- The factors in the egg cytoplasm that influence the angle of the mitotic spindle and the timing of its formation.
- The yolk-rich pole is referred to as the vegetal pole; the yolk concentration in the animal pole is relatively low. The zygote nucleus is frequently displaced toward the animal pole. In general, yolk inhibits cleavage.

127.The Fast Block to Polyspermy

The Fast block to polyspermy is achieved by changing the electric potential of the egg plasma membrane. This membrane provides a selective barrier between the egg cytoplasm and the outside environment, and the ionic concentration of the egg differs greatly from that of its surroundings. This concentration difference is especially significant for sodium and potassium ions. Seawater has a particularly high sodium ion concentration, whereas the egg cytoplasm contains relatively little sodium. The reverse is the case with potassium ions.

128.Four Level 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 are transcribed into RNA.
- **Selective Nuclear RNA Processing:** It regulating which of the transcribed RNAs enter into the cytoplasm to become messenger RNAs.
- **Selective Messenger RNA Translation:** It regulates that which of the mRNAs in the cytoplasm become translated into proteins
- **Differential Protein Modification**: It regulates that which proteins are allowed to remain or function in the cell.

129.Transcription Factor?

Transcription factors domains Transcription factors have three major domains.

- DNA-binding domain

- Protein-protein interaction domain
- Trans-activating 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.

Examples of Transcription Factor:

MITF:

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

Pax6:

Paired box gene 6. The Pax6 transcription factor, which is needed for mammalian eye, nervous system, and pancreas development, contains two potential DNA-binding domains.

Pdx1:

Pancreatic and Duodenal Homeobox 1 gene. It is specific for the pancreatic region of the endoderm.

130. Types of Cleavage in Snail?

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").

131. Meroblastic Cleavage

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

132. Centrolecithal:

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).

133. Telolecithal:

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.

134.What Type of Molecules Involved in Histone Protein?

Nucleosome is composed of an octamer of histone proteins (two molecules each of histones H2A-H2B and histones H3-H4) wrapped with two loops containing approximately 140 base pairs of DNAs.

135.Define Air Space

An air space forms when the contents of the egg cool and contract after the egg is laid. The air cell usually rests between the outer and inner membranes at the egg's larger end.

136.Write Classes of Cadherins?

In vertebrate embryos, several major cadherin classes have been identified:

- E-cadherin
- P-cadherin o N-cadherin
- Proto-cadherins

E-cadherin: Epithelial cadherin is expressed on all early mammalian embryonic cells, even at the 1cell 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 E-cadherin expression. It is also highly expressed on the cells of the developing central nervous system.

Proto-cadherins: Calcium-dependent adhesion proteins that differ from the classic Cadherins in that they lack connections to the cytoskeleton through catenin's. Protocadherin have been found to be very important in separating the notochord from the other mesodermal tissues during Xenopus gastrulation.

137.Definer Silencer

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.

138.Difference Between 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. Sex and reproduction are two different processes that can or not to occur simultaneously. Sex must be considered as an exchange of genetic material doing new combinations, that can originate or not new individuals. While that the reproduction has that obligatorily to originate new beings.

139.Blastocoel?

A fluid-filled cavity, the blastocoel, forms in the animal hemisphere. This cavity will be important for allowing cell movements to occur during gastrulation.

140.Write Difference Between Bicoid And Nanos?

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.

141.Difference Between Axoneme And Dynein?

The major motor portion of the flagellum is called the axoneme.The force for sperm propulsion is provided by dynein, a protein that is attached to the microtubules.

142.What Is Naive?

An uncommitted cell can be described as naive, meaning that it has received no instructions directing it along a particular developmental pathway.

143.Egg Jelly Formation?

Many types of eggs have glycoprotein meshwork called egg jelly outside 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.

144.Differentiate Between Blastomere And Cleavage?

Cleavage is a series of extremely rapid mitotic divisions wherein the enormous volume of zygote cytoplasm is divided into numerous smaller cells.

145.Regulative Development.

Conditional specification gives rise to a pattern of embryogenesis called regulative development.

146.Diff B/W Late and Early Response of Egg To Sperm?

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 increases and the calcium ion elevation act together to stimulate new protein synthesis and DNA synthesis.

147.Write the General Concept Of Fertilization.

Fertilization is the process whereby two sex cells (gametes) fuse together to create a new individual with genetic potentials derived from both parents. Fertilization accomplishes two separate processes:

- **Sex (**the combining of genes derived from the two parents) and
- **Reproduction** (the creation of new organisms)

Thus, the first function of fertilization is to transmit genes from parent to offspring, and the second is to initiate in the egg cytoplasm those reactions that permit development to proceed.

148.Estrogen and Progesterone Function?

Estrogen is a hormone that can instruct the liver to make and secrete the yolk proteins, which are then transported through the blood into the enlarging eggs in the ovary. The yolk is transported into the bottom portion of the egg.

Another ovarian hormone, **progesterone,** signals the egg to resume its meiotic division. This is necessary because the egg had been "frozen" in the metaphase of its first meiosis. When it has completed this first meiotic division, the egg is released from the ovary and can be fertilized.

149.What Are Resect And Its Function?

Resect is specific for A. punctulate and does not attract sperm of other species. A. punctulate sperm have receptors in their plasma membranes that bind resect and can swim up a concentration gradient of this compound until they reach the egg. Resect also acts as a sperm-activating peptide.

150.Life Cycle of Chlamydomonas?

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 type-specific components that enable the cytoplasm to fuse.

151.J. Hammerling Experiment for Role of Nucleus in Morphology?

J. Hammerling exchanged nuclei between two morphologically distinct species, A. Mediterranean and A. crenulata.

J. Hammerling found that when he transferred the nucleus from one species into the stalk of another species, the newly formed cap eventually assumed the form associated with the donor nucleus. Thus, the nucleus was seen to control Acetabularia development. The formation of a cap is a complex morphogenic event involving the synthesis of numerous proteins, which must be accumulated in a certain portion of the cell and then assembled into complex, species-specific structures.

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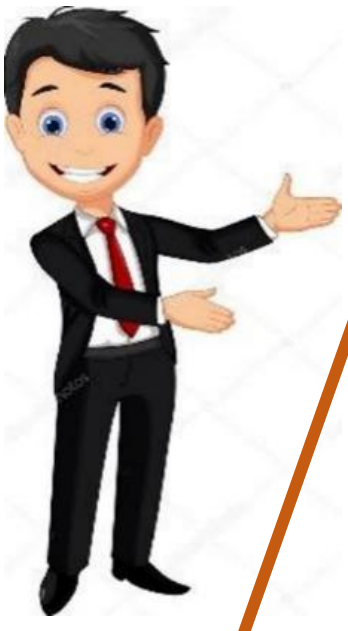

"EDUCATION IS THE KEY TO UNLOCKING THE WORLD. IT IS THE PASSPORT TO FREEDOM "

-Oprah winfrey