ZOO501 – DEVELOPMENTAL BIOLOGY

FINAL TERM MOST IMPORTANT QUESTIONS

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GROUP LINK: https://chat.whatsapp.com/BjC6W0jZx8o9yaC2ISh1Gu

1. What is merozoic cleavage?

Merozoic cleavage is a type of incomplete or meroblastic cleavage that occurs in eggs with a large amount of yolk. In this type of cleavage, only a part of the egg undergoes division, while the yolk remains largely undivided.

This type of cleavage is typically seen in:

- ***Reptiles and birds (Discoidal cleavage):*** Cleavage occurs only in a small disc of cytoplasm on top of the yolk.
- ***Insects (Superficial cleavage):*** The nucleus divides multiple times without immediate cytoplasmic division, forming a syncytium before cellularization.

2. Explain Campomelic dysplasia.

Campomelic dysplasia is a rare genetic disorder that primarily affects the development of the skeleton and reproductive system. It is caused by mutations in the SOX9 gene, which plays a crucial role in cartilage and bone formation. The condition is characterized by bowing (curvature) of the long bones, short stature, abnormal facial features (such as a small chin and flat midface), underdeveloped lungs, and sometimes spinal abnormalities. Additionally, individuals with an XY chromosome may exhibit sex reversal, meaning they develop female or ambiguous genitalia despite having male chromosomes.

Campomelic dysplasia is typically severe, and many affected infants experience respiratory failure shortly after birth due to underdeveloped airways and rib abnormalities. In rare cases, individuals may survive into childhood or adulthood with milder forms of the disorder.

3. What is primary and secondary neurulation?

i. Primary Neurulation:

This process forms the neural tube from the ectoderm in the anterior (cranial) region of the embryo. The neural plate folds to create neural folds, which then fuse to form the neural tube. It primarily gives rise to the brain and most of the spinal cord (up to the lumbar region).

ii. Secondary Neurulation:

This occurs in the posterior (caudal) region of the embryo, forming the lower part of the spinal cord (sacral and coccygeal regions). Instead of folding, the mesenchymal cells condense and then cavitate to form a hollow neural tube.

4. Explain cleavage in Sea Urchins.

Sea urchin eggs exhibit radial cleavage, where the division of the zygote occurs symmetrically along the vertical axis. This cleavage is holoblastic, meaning the entire egg divides. The first cleavage occurs along the animal-vegetal axis, dividing the egg into two cells: the animal hemisphere (where the sperm entered) and the vegetal hemisphere (where the yolk is concentrated). Cleavage proceeds rapidly and results in the formation of a blastula, a hollow ball of cells, which is an early stage of embryonic development.

5. Explain cleavage in mammals.

Cleavage in mammals is a holoblastic and asynchronous process, meaning the entire zygote divides, but not all cells divide simultaneously. It begins after fertilization and leads to the formation of a blastocyst, which later implants into the uterus. The first cleavage occurs about 24 hours after fertilization, followed by subsequent divisions producing 2, 4, 8, and more cells. Around the 8-cell stage, the cells undergo compaction, tightly packing together to increase cell-to-cell interactions. As cleavage continues, a morula (solid ball of cells) forms, which then develops into a blastocyst, a fluid-filled structure. The blastocyst consists of two key components: the inner cell mass (ICM), which develops into the embryo, and the trophoblast, which contributes to the placenta. This early division process is crucial for the successful implantation and further development of the embryo.

6. Differentiate between fraternal and identical twins.

Fraternal twins, also known as dizygotic twins, develop from two separate eggs fertilized by two different sperm, resulting in siblings that share about 50% of their DNA, just like any other siblings. They can be of the same or different sexes and may look different from each other. **Identical twins**, or monozygotic twins, arise from a single fertilized egg that splits into two embryos, leading to genetically identical individuals who share 100% of their DNA. They are always of the same sex and usually have very similar physical traits. While fraternal twins have separate placentas and amniotic sacs, identical twins may share a placenta, depending on when the split occurs.

7. What role does ectoderm plays in embryo?

The ectoderm is one of the three primary germ layers in the developing embryo and plays a crucial role in forming various structures. It primarily gives rise to the nervous system, including the brain, spinal cord, and peripheral nerves, through a process called neurulation. Additionally, it forms the epidermis of the skin, hair, nails, and glands such as sweat and mammary glands. The ectoderm also contributes to sensory organs, including the eyes, inner ear, and parts of the nose. Certain specialized structures, like the enamel of teeth and the pituitary gland, also originate from the ectoderm. Thus, it is essential for the formation of the body's outer covering and the entire nervous system.

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8. In which species, species-specific sperm attraction takes place?

Species-specific sperm attraction occurs mainly in marine invertebrates that rely on external fertilization, where sperm and eggs are released into the water. This mechanism ensures fertilization occurs between the same species, preventing cross-species fertilization. Examples of species that exhibit species-specific sperm attraction include sea urchins, mollusks, and some amphibians.

In sea urchins, the egg releases chemotactic peptides (such as resact in *Arbacia punctulata*), which guide sperm of the same species toward the egg. Similar mechanisms exist in other marine species, ensuring reproductive success by attracting only compatible sperm.

9. Write role of Mantle zone and Ventral Zone.

The Mantle Zone, also known as the intermediate zone, is a layer of the developing neural tube that forms gray matter in the spinal cord and brain. It contains neuroblasts, which differentiate into neurons and glial cells, contributing to the formation of the dorsal (sensory) and ventral (motor) horns of the spinal cord.

The Ventral Zone, located in the ventral part of the neural tube, is responsible for generating motor neurons that control muscle movements. It plays a key role in the formation of the ventral horn of the spinal cord, where motor neurons extend their axons to innervate muscles. This zone is essential for voluntary and reflex motor functions.

10. What is Endochondral ossification.

Endochondral ossification is the process by which cartilage is transformed into bone during the development of the skeleton. It is the method by which most of the bones in the body, particularly the long bones (e.g., femur, tibia, humerus), are formed. In this process, a hyaline cartilage model of the bone is first formed during fetal development. Over time, this cartilage model is replaced by bone tissue.

The process begins with the formation of a cartilage template in the shape of the future bone. As the embryo develops, chondrocytes (cartilage cells) in the center of the cartilage model hypertrophy (enlarge) and die, creating a space that is replaced by a bone marrow cavity. Osteoblasts (bone-forming cells) then invade the space and begin laying down bone matrix, turning the cartilage into bone. This process occurs in several stages, including the development of a primary ossification center in the diaphysis (shaft) and secondary ossification centers in the epiphyses (ends) of the bone.

11. Write life cycle of Chlamydomonas.

The life cycle of *Chlamydomonas*, a unicellular green alga, alternates between haploid and diploid stages, following a haplontic life cycle. In the haploid stage, the organism exists as a single-celled haploid gametophyte. When environmental conditions are favorable, *Chlamydomonas* reproduces asexually by mitotic division, producing more haploid cells. However, under unfavorable conditions, sexual reproduction occurs, where two haploid gametes (from different individuals) fuse to form a diploid zygote. This zygote then undergoes meiosis to return to the haploid stage,

completing the cycle. The diploid zygote is encased in a thick wall, allowing it to survive harsh conditions, and can germinate once favorable conditions return.

12. What is Neural plate?

The neural plate is a thickened, flattened region of the ectoderm that forms during early embryonic development. It is the first structure in the process of neurulation, which leads to the formation of the nervous system. The neural plate arises in response to signals from the notochord, a mesodermal structure beneath it. As development progresses, the edges of the neural plate elevate to form neural folds, which eventually fuse to create the neural tube. This neural tube later differentiates into the brain and spinal cord, making the neural plate a crucial structure in the development of the central nervous system.

13. Write basic domain of Transcription factors.

Transcription factors contain specific domains that allow them to bind DNA, interact with other proteins, and regulate gene expression. The basic domains of transcription factors include:

- ***DNA-binding domain (DBD)*** – Recognizes and binds to specific DNA sequences (e.g., helix-turn-helix, zinc finger, leucine zipper, and helix-loop-helix motifs).
- ***Transactivation domain (TAD)*** – Interacts with co-activators or co-repressors to regulate transcription by enhancing or inhibiting RNA polymerase activity.
- ***Dimerization domain*** – Helps transcription factors form dimers (homo- or heterodimers), which is essential for their function (e.g., leucine zipper).
- ***Ligand-binding domain (LBD)*** – Present in some transcription factors (e.g., nuclear receptors), allowing them to respond to hormones or other signaling molecules.

14. Explain Hyaline membrane in Sea Urchins.

In sea urchins, the hyaline membrane (also called the hyaline layer) is a protective layer that surrounds the developing embryo after fertilization. It is formed from the hyaline protein, which is secreted by the egg's cortical granules during the cortical reaction. This layer helps in maintaining the structural integrity of the blastomeres during early cleavage stages and provides a stable environment for cell division. The hyaline membrane also plays a role in guiding proper cell adhesion and organization during embryonic development.

15. Which type of eggs do birds lay?

Birds lay telolecithal eggs, which are characterized by having a large amount of yolk concentrated at one end of the egg, with the cytoplasm and nucleus located in a small disc on top of the yolk. These eggs undergo discoidal meroblastic cleavage, meaning cleavage occurs only in the small cytoplasmic area (blastodisc) and not throughout the yolk. The yolk provides nutrients for the developing embryo, making these eggs well-suited for external development in a shelled, terrestrial environment.

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16. Which events occur in primary neurulation?

Primary neurulation is the process in which the neural tube forms from the neural plate in the anterior part of the embryo. It involves several key events:

- **Neural Plate Formation** – The ectoderm thickens in response to signals from the notochord, forming the neural plate.
- **Shaping and Folding** – The neural plate elongates, and its lateral edges rise to form neural folds, creating a central depression called the neural groove.
- **Elevation and Convergence** – The neural folds continue to elevate and move toward the midline, narrowing the neural groove.
- **Closure of the Neural Tube** – The neural folds fuse dorsally, forming the neural tube, which later differentiates into the brain and spinal cord.
- **Separation from the Surface Ectoderm** – The neural tube detaches from the overlying ectoderm, and neural crest cells migrate to form peripheral nervous system structures.

17. Define mode of commitment.

Mode of commitment refers to the process by which cells become specialized and determined to follow a specific developmental fate. It occurs in two main ways:

- **Specification** – A reversible stage where a cell can differentiate into a particular type but may change its fate if placed in a different environment.
- **Determination** – An irreversible stage where a cell is committed to a specific fate regardless of external influences.

  Cells can commit through different mechanisms, such as autonomous specification (intrinsic factors determine fate), conditional specification (interactions with neighboring cells influence fate), and syncytial specification (gradients of morphogens in a multinucleated cytoplasm determine fate). These modes ensure proper tissue and organ development in an embryo.

18. Write functions of Retinoic acid.

Retinoic acid (RA), a derivative of vitamin A, plays a crucial role in embryonic development and various physiological processes. Its key functions include:

- Embryonic Development – It is essential for the formation of the nervous system, limbs, heart, and other organs, guiding proper patterning and differentiation.
- Neural Development – RA helps in the formation of the anterior-posterior axis of the central nervous system and promotes neuronal differentiation.
- Limb and Skeletal Development – It regulates limb bud formation and controls growth and segmentation of bones.
- Cell Differentiation and Proliferation – RA influences the specialization of various cell types, including epithelial, immune, and stem cells.
- Maintenance of Epithelial Tissues – It supports skin health, vision, and mucosal integrity by regulating keratinocyte differentiation.
- Immune System Modulation – RA plays a role in immune responses, supporting T-cell differentiation and gut immunity.

19. Define Osteoblasts.

Osteoblasts are specialized bone-forming cells responsible for the synthesis, secretion, and mineralization of bone matrix. They originate from mesenchymal stem cells and play a crucial role in bone growth, remodeling, and repair. Osteoblasts produce collagen (mainly Type I), osteocalcin, and other proteins necessary for bone formation. They also regulate calcium and phosphate deposition to form the mineralized matrix. Once their function is complete, some osteoblasts become osteocytes (mature bone cells embedded in the matrix), while others undergo apoptosis or transform into bone-lining cells.

20. How hypoblast forms in avians?

In avian embryos, the hypoblast forms during early development as part of the bilaminar blastoderm. It arises from cells of the epiblast that migrate and rearrange beneath the epiblast layer. The process of hypoblast formation occurs in two main steps:

- **Delamination** – Some cells from the epiblast detach and move downward to form an initial hypoblast layer.
- **Migration of Secondary Hypoblast Cells** – Additional cells from the posterior marginal zone (mainly from Koller's sickle) migrate and replace the primary hypoblast, forming a more structured secondary hypoblast layer.

21. What are mucopolysaccharides?

Mucopolysaccharides, now known as glycosaminoglycans (GAGs), are long, unbranched polysaccharides composed of repeating disaccharide units that consist of a hexosamine (glucosamine or galactosamine) and a uronic acid (glucuronic or iduronic acid). They are essential components of the extracellular matrix, connective tissues, and various biological structures.

Functions of Mucopolysaccharides (GAGs):

- Provide structural support in connective tissues, cartilage, and skin.
- Maintain hydration and lubrication in joints and eyes.
- Play a role in cell signaling, wound healing, and inflammation.
- Act as a shock absorber in cartilage and synovial fluid.

Examples of Mucopolysaccharides:

- Hyaluronic acid – Found in synovial fluid, skin, and vitreous humor of the eye.
- Chondroitin sulfate – Present in cartilage, tendons, and bones.
- Heparin & Heparan sulfate – Involved in anticoagulation and cell signaling.
- Dermatan sulfate – Found in skin, blood vessels, and heart valves.
- Keratan sulfate – Located in the cornea, cartilage, and intervertebral discs.

22. Define sub germinal cavity and its functions.

The subgerminal cavity is a fluid-filled space that forms beneath the germinal disc (the area of the blastoderm where the embryo will develop) during early embryonic development in avians and

some other species. It is part of the early stages of embryogenesis, specifically during the formation of the blastoderm.

Functions of the Subgerminal Cavity:

- The cavity helps in the distribution of nutrients from the yolk to the developing embryo by creating a space for fluid exchange.
- It aids in maintaining the integrity and stability of the germinal disc during the initial stages of embryonic development.
- The subgerminal cavity plays a role in the formation of the extra-embryonic membranes, such as the yolk sac, which help in the nourishment and protection of the embryo.
- The fluid environment allows cells to migrate during early developmental processes like gastrulation, contributing to proper tissue and organ formation.

23. How do multicellular organisms develop from the fertilized egg?

Multicellular organisms develop from a fertilized egg through the following stages:

- ***Fertilization:*** The sperm fertilizes the egg, forming a zygote with a full set of chromosomes.
- ***Cleavage:*** The zygote undergoes rapid cell divisions, forming a blastula (hollow ball of cells).
- ***Gastrulation:*** Cells rearrange into three germ layers—ectoderm, mesoderm, and endoderm—that will develop into different tissues and organs.
- ***Neurulation:*** The neural tube forms, developing into the brain and spinal cord.
- ***Organogenesis:*** The germ layers differentiate into organs and tissues, forming a developing embryo.
- ***Growth and Differentiation:*** Cells continue to specialize, and the organism grows into a fully developed individual.

24. What is meroblastic cleavage?

Meroblastic cleavage is a type of incomplete cleavage observed in some animals, where the egg yolk prevents the cleavage from fully dividing the entire egg. In this process, only a portion of the egg undergoes division, typically the area where the cytoplasm is most concentrated, called the blastodisc.

This type of cleavage occurs in eggs with a large amount of yolk, such as those of birds, reptiles, and some fish. The yolk serves as a nutrient source, but it’s too dense for the cleavage to occur through the entire egg.

There are two main patterns of meroblastic cleavage:

- ***Discoidal cleavage:*** The cleavage is confined to a small disc of cytoplasm at the top of the egg (common in birds).
- ***Superficial cleavage:*** The cleavage occurs only at the surface of the egg (seen in some insects).

In contrast, holoblastic cleavage occurs in eggs with little to no yolk, where the entire egg undergoes complete cleavage.

25. Explain formation of Umbilical cord in mammals.

The umbilical cord forms during embryonic development and connects the fetus to the placenta. It develops as blood vessels grow, with two umbilical arteries carrying deoxygenated blood and one umbilical vein bringing oxygenated blood to the fetus. The cord is surrounded by the amnion and filled with amniotic fluid, protecting the vessels. It provides nutrients and removes waste for the fetus. After birth, the cord is cut, and the attachment site heals to form the belly button.

26. What are the names of three primary vesicles form from brain?

The three primary brain vesicles that form during early brain development are:

- Prosencephalon (forebrain)
- Mesencephalon (midbrain)
- Rhombencephalon (hindbrain)

27. Which factors are responsible for activation of cartilage specific gene?

The activation of cartilage-specific genes is influenced by:

- ***Transcription Factors:*** Key factors like Sox9, Sox5, and Sox6 regulate cartilage differentiation.
- ***Growth Factors:*** Molecules such as TGF-β, BMPs, and FGFs guide chondrocyte development.
- ***Mechanical Loading:*** Physical forces trigger gene activation via mechanotransduction.
- ***Epigenetic Regulation:*** DNA methylation and histone modifications affect gene expression.
- ***Wnt Signaling:*** Regulates mesenchymal cell differentiation and cartilage formation.
- ***Nutritional Factors:*** Vitamin A and D influence cartilage metabolism.

28. How did Laurent Chabrg try to demonstrate autonomous specifications?

Laurent Chabry conducted research to demonstrate autonomous specification in developing organisms, focusing on how cells and tissues can independently develop into specific types without external influences from surrounding cells.

In his experiments, Chabrg primarily worked with early embryonic development and used a combination of transplantation and manipulation of developing tissues to show that certain cells, even in isolation, can "autonomously" specify their fate. This means that these cells were able to follow their developmental pathways and differentiate into specific cell types based on their intrinsic genetic programming rather than external signaling cues.

Through these studies, Chabrg contributed to the understanding of cell fate determination, demonstrating that some aspects of cell development are hardwired within the cells themselves, allowing them to form specific tissues even in the absence of signals from other cells. This work was essential in advancing the concept of autonomous specification in developmental biology.

29. Which organ develop from the embryonic ectoderm?

The ectoderm is the outermost of the three primary germ layers in the embryo, and it gives rise to several key structures and organs, including:

- ***Nervous System:*** The brain, spinal cord, and peripheral nerves (via neural tube formation).

- ***Skin and Its Appendages:*** Epidermis (outer skin layer), hair, nails, sweat glands, and sebaceous glands.
- ***Sense Organs:*** Eyes (lens and retina), ears (inner ear structures), and parts of the nose (olfactory epithelium).
- ***Mouth and Anus:*** The lining of the mouth and anus is derived from the ectoderm.

These organs and structures are critical for sensory input, protection, and communication with the environment.

30. Describe the neural crest cells and their functions.

Neural crest cells are multipotent cells derived from the ectoderm that migrate from the neural tube during development. They contribute to:

- ***Peripheral Nervous System:*** Form sensory and autonomic ganglia.
- ***Melanocytes:*** Produce pigment in skin, hair, and eyes.
- ***Craniofacial Skeleton:*** Contribute to the formation of the skull and jaw.
- ***Heart:*** Help form the heart's outflow tract and smooth muscle.
- ***Teeth:*** Involved in dentin production.
- ***Connective Tissue:*** Contribute to tissues in the head and neck region.

31. Write role of osteoblasts.

Osteoblasts are bone-forming cells responsible for synthesizing and secreting the bone matrix, which consists of collagen and mineralized components like hydroxyapatite. They play a crucial role in bone formation, mineralization, and remodeling. Osteoblasts also regulate the activity of osteoclasts (bone-resorbing cells) and are involved in maintaining bone health and repair.

32. Differentiate between Monozygotic and Dizygotic.

Monozygotic (identical) twins arise from the splitting of a single fertilized egg (zygote) into two embryos early in development. Since both embryos come from the same zygote, they share the same genetic material, making them genetically identical. They typically have the same sex and look very similar, though environmental factors can cause minor differences in appearance and traits.

Dizygotic (fraternal) twins, on the other hand, develop from the fertilization of two separate eggs by two different sperm cells. These twins are genetically similar to regular siblings, sharing about 50% of their genetic material. They may or may not be the same sex and can vary greatly in appearance, as they inherit different combinations of genes from their parents.

33. How Myotube develop?

Myotube development involves the differentiation of muscle stem cells (satellite cells) into myoblasts, which then fuse to form multinucleated myotubes. These myotubes elongate and mature by synthesizing contractile proteins like actin and myosin, eventually becoming functional muscle fibers. This process is regulated by specific genetic factors and growth signals.

34. Write applications of Dactylography.

Dactylography, the scientific study of fingerprints, has several important applications:

- ***Forensic Identification:*** Fingerprints are used in criminal investigations to identify suspects, link individuals to crime scenes, or confirm the identity of victims.
- ***Security and Access Control:*** Fingerprint scanning is commonly used for biometric authentication in devices, secure facilities, and systems, ensuring only authorized individuals have access.
- ***Law Enforcement:*** Police and other law enforcement agencies use fingerprint databases to match prints found at crime scenes with known individuals.
- ***Employment and Background Checks:*** Employers may use fingerprinting for background checks to verify the criminal history of potential employees, especially for sensitive jobs.
- ***Immigration and Border Control:*** Fingerprints are used in immigration processes to verify identities and prevent fraud or illegal entry.
- ***Medical and Healthcare Records:*** In some healthcare systems, fingerprints are used to maintain accurate and secure patient records, ensuring proper identification.
- ***Civil Identification:*** Governments use fingerprints for national identification cards, voter registration, and passport applications.
- ***Surveillance:*** Fingerprints are often used in surveillance systems for tracking and monitoring individuals in high-security environments.

35. What is acrosome and cortical granules?

Acrosome:

The acrosome is a specialized structure found in the head of sperm cells. It is a membrane-bound organelle that contains enzymes, such as hyaluronidase and acrosin, which are crucial for fertilization. When a sperm comes into contact with an egg, the acrosome undergoes a process called acrosomal reaction, releasing these enzymes to break down the protective layers around the egg (the zona pellucida), allowing the sperm to penetrate and fertilize the egg.

Cortical Granules:

Cortical granules are small vesicles found in the cytoplasm of oocytes (egg cells), located just beneath the egg's plasma membrane. During fertilization, when a sperm penetrates the egg, the cortical granules undergo exocytosis (release of their contents). The enzymes released by the cortical granules cause changes in the egg's outer layer (the zona pellucida), preventing other sperm from binding to or penetrating the egg, a process known as the cortical reaction. This helps ensure that only one sperm fertilizes the egg.

36. How deceased individual is identified using fingerprints?

Identifying a deceased individual using fingerprints involves comparing the fingerprints found on the body (or at the scene) with existing records of known individuals, such as those stored in fingerprint databases or government identification systems. Here's the process:

i. ***Collection of Fingerprints:*** Fingerprints are collected from the deceased individual's fingers using various methods, such as ink printing or digital scanning, depending on the condition of the body. If the body is decomposed, advanced techniques like chemical treatments or lifting from surfaces may be used.

ii. ***Comparison with Known Records:*** The collected fingerprints are compared with fingerprint records in databases, such as criminal databases (e.g., AFIS - Automated Fingerprint Identification System) or civil records (e.g., passport, driver's license, or employment records).

iii. ***Analysis and Matching:*** Forensic experts analyze the ridge patterns and minutiae (specific features like ridge bifurcations and endings) in the collected prints. A match is confirmed if these features align closely with the individual's known fingerprints.

iv. ***Verification:*** If a match is found, further verification may be performed to ensure accuracy. This could involve cross-referencing other personal information or additional forensic evidence to confirm the identity.

v. ***Use in Forensic Investigation:*** In cases where the deceased's identity is not immediately known, fingerprint identification is a crucial tool for law enforcement or medical examiners to confirm the individual's identity, especially in situations like mass disasters, criminal investigations, or unknown remains.

37. How blastula forms in tunicates?

In tunicates, the blastula forms through a process of cleavage after fertilization. The fertilized egg undergoes rapid cell division, leading to the formation of a hollow sphere of cells called the blastula. This process typically involves radial cleavage, where the cells divide symmetrically around the embryo's axis, resulting in the formation of the blastula with an internal fluid-filled cavity known as the blastocoel. The blastula stage precedes the formation of the gastrula, where the embryo undergoes further developmental processes.

38. Explain Spina bifida.

Spina bifida is a birth defect in which the spinal cord and vertebrae do not develop properly, leaving part of the spinal cord exposed. It occurs when the neural tube, which forms the brain and spinal cord, fails to close completely during early pregnancy. This can lead to physical and neurological impairments, with symptoms ranging from mild to severe, depending on the location and size of the defect. The condition can be prevented or reduced with folic acid supplementation before and during pregnancy.

39. Explain Yolk syncytial in fish.

The yolk syncytial layer (YSL) in fish is a multinucleated structure formed during early embryonic development. It lies beneath the egg's outer membrane and above the yolk. The YSL is formed by the fusion of cytoplasmic regions and plays a critical role in signalling and providing nutrients to the developing embryo. It also contributes to the movement of yolk material and helps in the patterning and axis formation during early development.

40. What is monospermy and polyspermy?

Monospermy: The normal fertilization process in which only one sperm enters the egg, ensuring proper chromosome number and successful embryo development.

Polyspermy: An abnormal condition where multiple sperms enter the egg, leading to an excess of genetic material, which usually results in embryo inviability or developmental defects. Mechanisms like the cortical reaction help prevent polyspermy.