

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
Post Graduate Department of Zoology
M.Sc. I Zoology SEM-II: (Autonomous) 2019-20

Question bank for ZOO-4202 Developmental Biology (4C)

Contributed by: Miss. K. B. Kumbhar, Miss. M. S. Waghmare and Dr. Y. B. Gaikwad

Two marks questions:

1. What is model system?
2. Write advantages of fish as a model organism.
3. Write disadvantages of mouse as a model organism.
4. What is spermiogenesis?
5. Role of pH in sperm motility.
6. What is r-DNA amplification?
7. Lampbrush chromosome
8. What is vitellogenesis?
9. Define capacitation.
10. What is acrosome reaction?
11. Define cleavage
12. What are types of cleavage?
13. What is blastulation?
14. Define organizer.
15. What is the role of Spemann's organizers in *Xenopus laevis*.
16. Write role of Bicoid as a anterior morphogen.
17. Role of nanos as a morphogen.
18. What is Neural competence.
19. Define growth.
20. Define regeneration.

Three/Four marks questions:

1. Write note on developmental patterns among the Metazoan
2. Give the importance of Frog (*Xenopus laevis*) as a model organism.
3. Write note on development in *C. elegans*.
4. Role of pH and divalent cation in sperm motility.
5. What are structure and types of eggs.
6. What is r-DNA amplification and transcription of lampbrushchromosomes ?
7. Add a note on vitellogenesis and its regulation.
8. Add a note on capacitation and species specific sperm attraction.
9. Explain the acrosome reaction in sea urchin.

10. Write the significance of fertilization.
11. Explain prevention of polyspermy in internal fertilization.
12. Describe various cleavage patterns.
13. Illustrate the regulation of cell cycle and utilization of maternal macromolecules and organelles during early development.
14. Role of Spemann's organizers in *Xenopus laevis*.
15. Explain Hunchback gradient.
16. Differentiate between apoptosis and necrosis.
17. Explain the process of cloning. Give any two limitations.
18. Write a note on maternal effect genes.
19. What are pair-rule genes in insect development.
20. Describe the role of homeotic genes.

Long answer questions(Six marks questions):

1. Write note on evolution patterns in unicellular protists with 2 examples.
2. Give advantages and disadvantages of Mouse as a model organism.
3. Explain the spermatogenesis process. Add note on regulation of sperm motility.
4. Describe process of spermiogenesis and tail fibre complex of spermatozoa.
5. Explain the process of oocyte maturation. What is the role of progesterone and fertilization in oocyte maturation?
6. Give an account of external fertilization in sea urchin.
7. Describe the process of slow block and fast block to polyspermy in sea urchin.
8. Describe cortical granule reaction and explain the role of calcium in egg activation.
9. What is blastulation and types of Blastulae?
10. Write short note on origin and specification of germ layers
11. Explain Hayflick's experiment.
12. Describe gastrulation in chick.
13. Describe various types of eggs in animals.
14. Describe the wnt signaling pathway.
15. Describe the RTK signaling pathway.
16. Describe JAK-STAT signaling pathway.
17. Describe the cloning.
18. Describe eye lens induction in vertebrates.
19. Explain the development of limb in vertebrates.
20. Describe the shaping of organ primordial.

Twelve mark questions:

1. Describe molecular signaling during neural induction.
2. Describe cell cycle regulation during early development.
3. Explain the fibroblast growth factor superfamily.

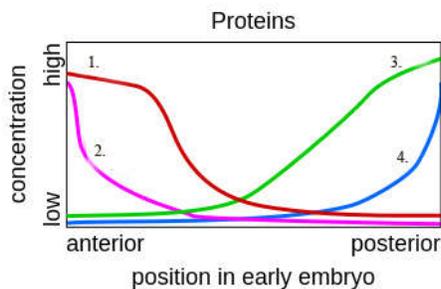
4. Illustrate regeneration in amphibians.
5. Give the role of Hensen's node as organizer in birds.
6. Explain the juxtracrine signaling and cell patterning.
7. Give the account of regulation of hunchback morphogen gradient in pattern formation in *Drosophila*.
8. Describe the process of aging in animals.
9. Describe the evolution of multicellularity in animals.
10. Diagrammatically explain antero-posterior body axis formation in *Xenopus*.
11. What is pattern formation? Add a note on role of maternal genes in development and pattern formation of embryo.
12. Give a comparative account of spermatogenesis and oogenesis.
13. Explain various cascades in apoptosis with example.
14. Give molecular strategy to ensure monospermy.
15. How we can study the migration of cells during gastrulation?
16. Explain the role of Spemann's organizer during vertebrate development.
17. Describe the genetics of axis specification in *Drosophila*.
18. Give an account of gamete fusion and prevention of polyspermy.
19. Describe the epimorphic regeneration in salamander.
20. Describe the basis of sex determination in animals.

Multiple Choice Questions:

1. _____ is father of embryology.

- A) William Harvey B) Lamark
C) Aristotle D) Darwin

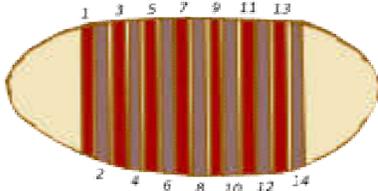
2. In following figure concentration of proteins during early embryonic development are shown. Identify the proteins 1, 2, 3 and 4.



- A) 1. Bicoid, 2.Nanos, 3.Caudal 4. Hunchback
B) 1. Bicoid, 2.Nanos, 3.Hunchback 4. Caudal

- C) 1. Hunchback, 2. Bicoid, 3. Caudal 4. Nanos
 D) 1. Nanos 2. Caudal 3. Hunchback 4. Bicoid

3. Following diagram shows expression of X genes in *Drosophila* embryo. Odd numbered is Y gene and even numbered is Z gene. Identify X, Y and Z genes.



- A) X= Pair Rule, Y = even-skipped, Z = fushi tarazu
 B) X= Homeotic, Y = even-skipped Z = fushi tarazu
 C) X= Pair Rule, Y = fushi tarazu, Z = even-skipped
 D) X = Maternal effect, Y = bicoid, Z = nanos

4. In sea urchins species specific binding of acrosomal process to egg cell surface is mediated by _____.

- A) ZP3 B) bindin C) acrosomin
 D) ZP1

5. Find correct pairing from following table.

	Organism	Type of Egg	Cleavage pattern
i	Tunicates	Isolecithal	Holoblastic Bilateral
ii	Cephalopod Molluscs	Telolecithal	Meroblastic, Bilateral
iii	Fish	Telolecithal	Holoblastic, Discoidal
iv	<i>Drosophila</i>	Centrolecithal	Holoblastic, Superficial

- A) Only i B) only iii and iv

C) i, iii and iii D) only i and ii

6. Mitotic germ cells in the testis are known as _____.

- A) seminiferous tubules B) spermatogonia
C) sperm mother cells D) Sertoli cells

7. Amongst the following processes _____ is/are the processes that generate multilayered structures from a simple epithelium.

- i. invagination
ii. involution

- A) only i B) only ii C) both i and ii
D) none

8. When cell is in G₀ phase _____ in cell.

- A) cdk and cyclins are absent B) only cdk is present
C) only cyclin is absent D) only cdk is present

9. Mammalian vitellogenesis is regulated by _____.

- A) Vitellogenin B) oestrogen
C) Progesterone D) Oxytocin

10. Sequence the events in egg activation process

- i. Sperm binding and/or fusion with egg membrane
ii. Na influx and Tyrosine kinase stimulation
iii. activation of phospholipase C
iv. Production of IP₃ and diacylglycerol
v. Calcium release and protein kinase C activation

- A) i, ii, iv, iii and v
B) v, iv, iii, ii and i
C) i, ii, iii, iv and v

D) i, iii, ii, iv and v

11. The transformation of spermatid into spermatozoa is called as

- A. Spermatogenesis
- B. Spermiogenesis
- C. Gametogenesis
- D. None of these

12. Rotational cleavage is unique to _____

- A. Amphibians
- B. Mammals
- C. Molluscs
- D. Lophotrochozoa

13. Outer layer of blastocyst that gives rise to ectoderm is _____

- A. Trophoblast
- B. Germinal vesicle
- C. Cnidoblast
- D. Amnion

14. Superficial cleavage is found in _____

- A. Amphibians
- B. Mammals
- C. Protostomes
- D. Insects

15. Syncytial blastula found in _____

- A. *Drosophila*
- B. Mammals
- C. *Xenopus*
- D. Chick

16. The process by which developing cells achieve their functional mature identity as liver or muscle is called as

- A. Cleavage
- B. Pattern formation
- C. Morphogenesis

D. Differentiation

17. Blastodisc found in-----

- A. Chick
- B. Mouse
- C. *Xenopus*
- D. Mammals

18. The first reaction of sperm, when it comes in contact with the egg surface, involves the-----

- A. Ca^{+2} gradient
- B. pH gradient
- C. acrosome
- D. mg^{+2}

19. The eggs are provided with one or more minute openings for entry of spermatozoa called -----

- A. Chorion
- B. Micropyle
- C. Jelly coat
- D. Binding sites

20. The changes in spermatozoa which makes it capable to fertilize the egg called as-----

- A. Capacitation
- B. Maturation
- C. Differentiation
- D. Spermiogenesis