

PART A (ATTEMPT ANY 15)

1. If $1\ 1\ 1\ 1=R$

$2\ 2\ 2\ 2= T$

$3\ 3\ 3\ 3= E$

$4\ 4\ 4\ 4= N$

Then $5\ 5\ 5\ 5=?$

(1) K (2) A

(3) Y (4) P

2. Most Indian tropical fruit trees produce fruits in April-May.

The best possible explanation for this is

(1) optimum water availability for fruit production.

(2) the heat allows quicker ripening of fruit

(3) animals have no other source of food in summer.

(4) the impending monsoon provides optimum conditions for propagation.

3. Three boxes are coloured red, blue and green and so are three balls. In how many ways can one put the balls one in each box such that no ball goes into the box of its own colour?

(1) 1 (2) 2

(3) 3 (4) 4

4. A boy receives grades of 91, 88, 86 and 78 in four of his major subjects. What must he receive in his fifth major subject in order to average 85?

(1) 86 (2) 82

(3) 84 (4) 83

5. John has more money than Sam but less than Bill. If the amount held by John, Sam and Bill are x , y and z respectively, which of the following is true?

(1) $z < x < y$ (2) $x < z < y$

(3) $y < x < z$ (4) $y < z < x$

6. A labourer is paid Rs. 8 per hour for an 8 hour day and 1.5 times that rate for each hour in excess of 8 hours in a single day. If the labourer received Rs. 80 for a single day's work, how long did he work on that day?

(1) 6 hrs 40 min (2) 9 hrs 20 min

(3) 9 hrs 30 min (4) 9 hrs 40 min

7. How many times will the minute hand and hour hand coincide between 11 am and 1 pm?

(1) 0 (2) 1

(3) 2 (4) 3

8. What is the smallest angle between the minute hand and hour hand at 8:40 pm?

(1) 20 (2) 30

(3) 160 (4) 340

9. The time gap between the two instants, one before and one after 12, when the angle between the hour hand and the minute hand is 132° is?

(1) 24 min (2) 36 min

(3) 40 min (4) 48 min

10. An accurate clock shows 8 o'clock in the morning. By how much angle (in degrees) did the hour hand rotate when the clock shows 2 o'clock in the afternoon?

(1) 90 (2) 144

(3) 150 (4) 180

11. At what time after 6 o'clock will the hour hand and the minute hand of a clock coincide?

(1) 6:31:24 (2) 6:31:59

(3) 6:32:14 (4) 6:32:44

12. Two trains running in opposite directions cross a man standing on the platform in 27 s and 17 s respectively and they cross each other in 23 s. The ratio of their speeds is?

(1) 1:2 (2) 1:3

(3) 3:2 (4) 3:4

13. A man is facing west. He turns 45 degree in the clockwise direction and then another 180 degree in the same direction and then 270 degree in the anticlockwise direction. Find which direction he is facing now?

(1) South-West (2) West

(3) South (4) East-South

14. One day, Raviraj left home and cycled 20 Km southwards, turned right and cycled 10 km and turned right and cycled 20 Km and turned left and cycled 20 Km. How many kilometres will he have to cycle to reach his home straight ?

(1) 50 Km (2) 30 Km

(3) 40 Km (4) 60 Km

15. A dog runs 20 meter towards East and turns Right, runs 10 meter and turns to right, runs 9 meter and again turns to right, runs 5 meter and then turns to left, runs 12 meter and finally turns to left and runs 6 meter. Now which direction dog is facing?

(1) East (2) North

(3) West (4) South

16. Kunal walks 10 km towards North. From there he walks 6 Km towards South. Then, he walks 3 Km towards east. How far and in which direction is he with reference to his starting point?

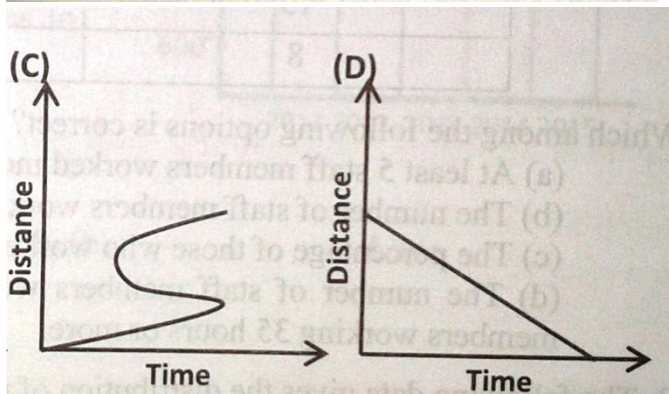
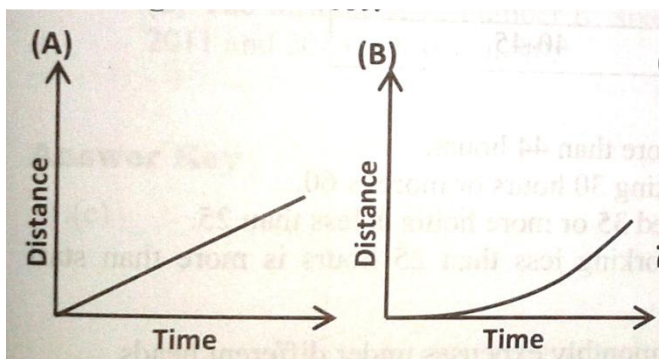
(1) 5 Km North (2) 5 Km South

(3) 5 Km East (4) 5 Km North-East

17. A student observes the movement of four snails and plots the graphs of distance moved as a function of times as given in figures (A), (B), (C) and (D). Which one of the following is not correct?

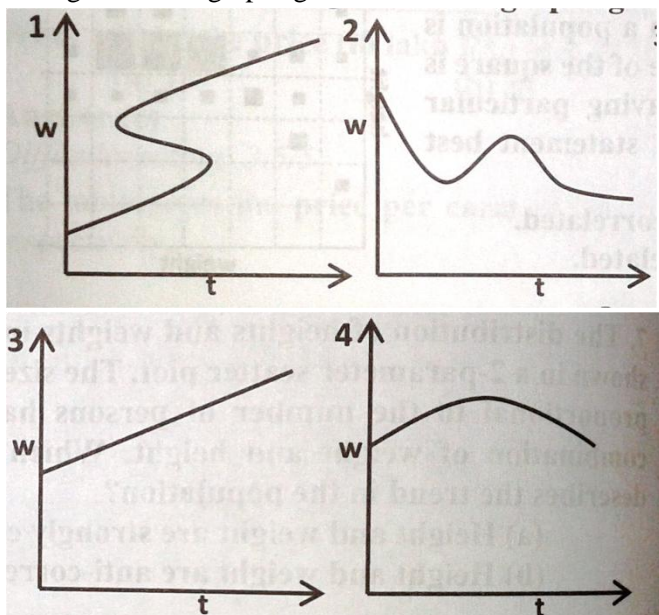
(3) (2/8) (4) (1/16)

PART B (ATTEMPT ANY 35)



- (1) Graph A (2) Graph C
(3) Graph B (4) Graph D

18. If we plot the weight (w) versus age (t) of a child in a graph, the one that will never be obtained from amongst the four graphs given below is



- (1) 2 (2) 1
(3) 3 (4) 4

19. Fill the blank in the middle of the series or end of the series.

SCD, TEF, UGH, _____, WKL

- (1) CMN (2) UJI
(3) VIJ (4) IJT

20. Look at this series: 2, 1, (1/2), (1/4), ... What number should come next?

- (1) (1/3) (2) (1/8)

21. Which of the following are not necessary for movement of the sperm flagellum?

- (1) dynein (2) microtubules
(3) mitochondria (4) filopodia

22. The main purpose of gametogenesis is to

- (1) make a haploid cell
(2) specialize the gametes
(3) organize the 3 germ layers
(4) 1 and 2

23. In the egg, contain(s) proteolytic enzymes that are released by exocytosis after fertilization and are important for preventing polyspermy

- (1) cortical granules
(2) vitelline envelope
(3) acrosome
(4) jelly layer

24. Which of the following is an example of a factor that helps to achieve species specificity in sea urchin fertilization?

- (1) Actin (2) Microfilaments
(3) Bindin (4) Cortical granules

25. Which is not a property of resact?

- (1) Influences flagellar movement
(2) Confers species specificity
(3) Degrades jelly layer
(4) Acts as a chemokinetic

26. Cells in a specific region of late gastrula stage of embryo always give rise to the blood cells in frog. These cells in the gastrula embryo are best described as

- (1) Differentiated (2) Specified
(3) Determined (4) De-differentiated

27. A specific chemical can prevent the degradation of the mitosis promoting factor (MPF) What results if this chemical were added to early cleavage stage frog embryos?

- (1) The cells cannot exit mitosis and enter S phase
(2) The cells cannot exit S phase and enter mitosis
(3) The cell enters mid blastula transition
(4) The cell begins zygotic transcription

28. The first step in sea urchin gastrulation is

- (1) the ingression of the primary mesenchyme into the blastocoel
(2) the invagination of the primary mesenchyme into the blastocoel
(3) the convergent extension of the primary mesenchyme into the blastocoel
(4) the involution of the ectoderm into the blastocoel

29. During sea urchin gastrulation,

(1) the cells that will form the ectoderm move inside the embryo

(2) the cells that will form the endoderm and mesoderm move inside the embryo

(3) the cells that will form the endoderm and mesoderm move outside the embryo

(4) the cells that will form the ectoderm and mesoderm move inside the embryo

30. You have a female fly that has mutations in both copies of the *gurken* gene. In her ovary, her cells cannot produce functional *gurken* protein. What phenotype might you reasonably expect to obtain in her progeny?

(1) The embryos will develop normally

(2) The embryos will be dorsalized

(3) The embryos will be ventralized

(4) Half the embryos will be normal, and half will be dorsalized

31. The following are important for setting up the anterior-posterior body axis in *Drosophila*

(1) *bicoid* and *pipe*

(2) *bicoid* and *nanos*

(3) *cactus* and *nanos*

(4) *cactus* and *pipe*

32. Frog embryos are injected with a morpholino against fibronectin. Which of the following developmental processes will be affected

(1) neural tube closure

(2) migration of cells during gastrulation

(3) the first cell division will be blocked

(4) the first nuclear division will be blocked

33. Dorsal endoderm is cultured with ectoderm. The ectoderm is converted to

(1) ventral ectoderm (2) ventral endoderm

(3) organizer (4) *nieuwkoop* Center

34. These 3 signaling pathways are important for induction and formation of the organizer

(1) TGF- β , Wnt, Nodal

(2) Notch, Wnt, Nodal

(3) BMP, Fibronectin, Nodal

(4) TGF- β , FGF, Nodal

35. In a mammalian embryo, the trophectoderm

(1) gives rise to the inner cell mass

(2) gives rise to the embryo

(3) gives rise to extraembryonic tissues

(4) is pluripotent

36. The neural tube becomes separated from the epidermis by

(1) expression of N-cadherin in the epidermis

(2) differential cadherin expression in epidermis versus neural plate

(3) induction of medial hinge point cells by the notochord

(4) pushing forces exerted by the migrating neural crest

37. According to 'ABC-model' of flowering, if a flower is mutated for both A and 'B' classes of genes, the mutant flowers will have

(1) sepal, petal, stamen, carpel

(2) sepal, sepal, sepal, sepal

(3) leaf, stamen/carpel, stamen/carpel, leaf

(4) carpel, carpel, carpel, carpel

38. Which of the following is not derived from the ectoderm

(1) neural tube

(2) spinal cord

(3) epidermis

(4) muscle

39. Determination of dorsal ectoderm to become neural rather than epidermal requires

(1) BMP signals from the organizer

(2) BMP antagonist signals from the organizer

(3) BMP antagonist signals from the ventral mesoderm

(4) BMP signals from the ventral mesoderm

40. Injection of *Noggin* mRNA in cells that will become the future ventral side of a frog embryo mimics the effect of an organizer graft to the ventral side. This experiment demonstrates

(1) that *Noggin* is a transcription factor

(2) that *Noggin* is committed to organizer fates

(3) that *Noggin* is required to induce a secondary axis

(4) that *Noggin* is sufficient to induce a secondary axis

41. The neural crest is a population of cells that

(1) form at the border between the epidermis and neural tube

(2) undergo an epithelial to mesenchymal transition

(3) migrate to distant parts in the body

(4) all of the above

42. After removing the epidermis, the neural tube

(1) lacks ventral neural fates

(2) lacks dorsal neural fates

(3) an ectopic roof plate is induced

(4) more sensory relay neurons are formed

43. Removing the epidermis from a developing embryo and observing the effect on the neural tube, is a

(1) loss-of-function experiment

(2) gain-of-function experiment

(3) fate map experiment

(4) knock-down experiment

44. Fate mapping in a 16-cell stage sea urchin embryo shows that the mesomere cells, which are in the animal pole, always give rise to the ectoderm. You then perform a series of experiments. In the first experiment, you remove the mesomeres, culture them alone in a dish, and see that they still give rise to ectoderm. In the next experiment, you remove the mesomeres and transplant them adjacent to the vegetal pole of another 16-cell stage embryo (in a region that will become endoderm). This time, your transplanted

cells develop into the endoderm. From these experiments, you can conclude that the mesomere cells at the 16-cell stage are

- (1) specified, but not determined to become ectoderm
- (2) specified but not determined to become endoderm
- (3) determined but not specified to become ectoderm
- (4) both specified and determined to become ectoderm

45. Which technique provides information about mRNA in a tissue sample?

- (1) Southern blot
- (2) Fate mapping
- (3) Microarray
- (4) Immunohistochemistry

46. Fate mapping in a frog species shows that cells in a specific region of a blastula stage which kept on original position or neutral medium always develop into skin but if its position is shifted and placed near the mesodermal cells it get converted in muscles. Based on this information, these cells in the blastula embryo are best described as

- (1) specified
- (2) committed
- (3) determined
- (4) differentiated

47. The process of commitment proceeds in which of the following ways

- (1) differentiation → specification → determination
- (2) specification → determination → differentiation
- (3) determination → specification → differentiation
- (4) determination → differentiation → specification

48. The concept of epigenesis meant that

- (1) embryos were pre-formed in the germ cells
- (2) embryos were pre-formed in certain genders' gametes
- (3) embryos were bom from eggs
- (4) embryos were formed from new materials

49. Which of the following does not require you to know the gene you want to study

- (1) gene targeting
- (2) forward genetic screen
- (3) RNAi
- (4) mRNA overexpression using microinjection

50. Inductive interactions between two cells can involve

- (1) secretion of a morphogen from one cell
- (2) direct signaling between membrane-bound proteins in neighboring cells
- (3) a receptor of one cell binding a secreted molecule
- (4) all of the above are possible

51. Specialization, or the process by which cells become structurally and functionally distinct, is known as

- (1) specification
- (2) determination
- (3) differentiation
- (4) both 1 and 3

52. The reverse transcriptase-polymerase chain reaction (RT-PCR) is useful because

- (1) it can be used to measure protein levels in a cell population

(2) it can be used to study chromatin

(3) it can be used to detect the presence of specific transcripts in a tissue

(4) it can be used to visualize distribution of transcripts in a tissue section

53. You wish to visualize muscle formation in live zebrafish embryos so you decide to make a transgenic fish. To do this, you use a piece of DNA 5' to the start of a muscle-specific gene, containing the ----- to express-----in muscle cells

- (1) Control region, GFP
- (2) Control region, LacZ
- (3) Reporter, LacZ
- (4) Reporter, myosin

54. Transgenic animals are best described as the result of the-----of a piece of DNA that is-----the next generation

- (1) removal, removed from
- (2) addition, removed from
- (3) addition, transmitted to
- (4) removal, transmitted to

55. Cancers of epithelial origin are called

- (1) sarcoma
- (2) leukemia
- (3) carcinoma
- (4) lymphoma

56. The most permanent way to fate map a group of cells is

- (1) performing in situ hybridization to detect transcripts
- (2) making chick-quail chimeras
- (3) labeling cells with vital dye
- (4) labeling cells with fluorescent dye

57. The result of transferring AER from late limb blastema to early limb bud will lead to

- (1) inhibition of limb growth
- (2) only distal structure would be formed
- (3) limb will elongate with proximal values leading to doubling of zeugopod
- (4) normal development of limb

58. The sex of the echiuroid worm, *Bonellia viridis* depended on

- (1) chromosomes
- (2) temperature
- (3) ploidy level
- (4) hormonal environment

59. If hydra is fragmented into various parts, separate group of cells repattern themselves into various small hydra. Such a mode of development is termed as

- (1) regeneration
- (2) morphlaxis
- (3) epimorphogenesis
- (4) all of the above

60. Morphylaxis can be defined as

- (1) Production of lost organ by division in remaining cell
- (2) Reinitiation of cell division in existing cells, followed by repatterning of those cells
- (3) Production of complete organism by single cell
- (4) Movement of organism toward stimulus

61. Which of the following represents the gametophyte generation in plants?

- (1) Microspore (2) Megaspore
(3) Embryo sac (4) Pollen

62. Sex determination in Ants, Bees and Wasps depends on

- (1) XX-XY System (2) XX-XO System
(3) AA-AO System (4) ZZ-ZW System

63. Which of the following phenotypes is obtained upon deletion of the ultrabithorax gene in *Drosophila*?

- (1) Fly with four wings (2) Fly with six wings
(3) Fly with no wings (4) Fly with two wings

64. Specification of the limb field is by

- (1) hox genes
(2) retinoic acid
(3) hox genes and retinoic acid
(4) FGF

65. When bicoid mRNA is injected at the posterior pole of a wild type *Drosophila* embryo, which one of the following phenotypes is expected?

- (1) Head structures at both the poles
(2) Head structures at the posterior pole only
(3) Head structures at the anterior pole only
(4) No head structures at all

66. During embryogenesis, discoidal cleavage occurs in

- (1) Chicken (2) *Drosophila*
(3) Mouse (4) *C. elegans*

67. Nuclei from frog kidney, upon transplantation into newt oocytes, support the synthesis of

- (1) frog kidney-specific proteins
(2) frog oocyte-specific proteins
(3) newt kidney-specific proteins
(4) newt oocyte-specific proteins

68. True avian embryo forms almost entirely from the

- (1) epiblast (2) hypoblast
(3) meroblast (4) marginal cells

69. Mouse embryonic stem cells are used in gene inactivation experiments because they

- (1) can be cloned to give rise to a stable cell line
(2) are chimeric and will produce cells heterozygous for the gene
(3) are the only mouse cells that can be genetically engineered to inactivate genes
(4) are totipotent and can give rise to all types of differentiated cells

70. What is the best method to identify the cellular location of a protein in vivo?

- (1) Place a reporter gene next to the promoter of the gene encoding the protein and identify the cellular location of the reporter protein

(2) Use a labelled antibody to identify the cellular location of the protein

(3) Separate the cellular compartments by centrifugation and screen the different compartments with an antibody

(4) Tag the protein with fluorescent amino acids and identify the cellular location by fluorescent microscopy

PART C (ATTEMPT ANY 25)

71. The correct sequence of appearance of the given structures during the development of CNS in any vertebrate is

- (1) neural groove, neural plate, neural tube
(2) neural plate, neural groove, neural tube
(3) neural plate, neural tube, neural groove
(4) neural groove, neural tube, neural plate

72. In *Amphioxus*, the coelom is formed by

- (1) splitting of the lateral mesoderm
(2) development of an additional mesodermal layer from the somatic mesoderm
(3) spreading of the dorsal mesodermal somites
(4) the formation of mesodermal pouches from the dorso-lateral walls of the archenteron

73. Which of the following pairs are correctly matched?

- (a) Amnion - Vascularised foetal membrane
(b) Chorion - Somatopleure in origin
(c) Allantois - Organ of respiration Select the correct answer using the codes given below

Codes:

- (1) a, b and c (2) a and b
(3) a and c (4) b and c

74. Consider the following statements: The function of fertilization is to

1. facilitate the contents of the nuclei of the gametes to unite
2. mix the paternal and maternal characters in the offspring
3. restore the normal diploid number of these statements

- (1) 1, 2 and 3 are correct
(2) 1 and 2 are correct
(3) 2 and 3 are correct
(4) 1 and 3 are correct

75. In the unfertilized egg, inactivated NAD kinase is made active only

- (1) when capacitation and contact between the gametes have been established
(2) after the penetration of the sperm head into the vicinity of the egg plasma membrane
(3) when the second polar body of the egg has been discharged
(4) when the amphimixis is over

76. "Intercalary growth" in a regenerating amphibian limb means that if a distal blastema is grafted to a proximal stump,

(1) the distal blastema grows back, to regenerate proximal elements, then out, to regenerate distal structures

(2) the stump grows out to regenerate proximal structures, until the positional values of the blastema are produced, at which time the distal blastema takes over and completes outgrowth of distal structures

(3) the distal blastema grows proximally, intercalating intermediate structures between it and the stump, then growth stops, resulting in a regenerate lacking distal structures

(4) the stump grows out, intercalating intermediate structures between it and the distal blastema, then growth stops, resulting in a regenerate lacking distal structures

77. In *clavata* (*clv*) mutant of *Arabidopsis*, shoot apical meristem (SAM) size as well as expression of *wuschel* (*wus*) are increased whereas SAM size is reduced in *wus* mutant plants. With this information, choose the correct statement which best describes the function of *wus* and *clv* genes

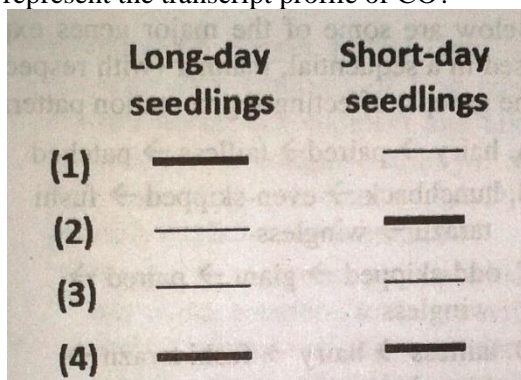
(1) *Clv* positively regulates *wus* expression and negatively regulates SAM size

(2) *Clv* negatively regulates *wus* expression and *wus* positively regulates SAM size

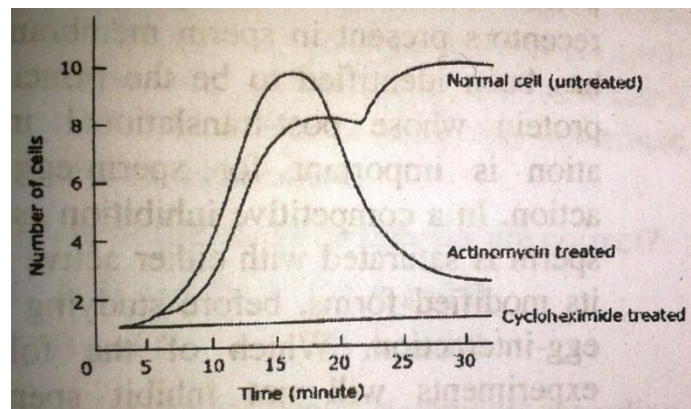
(3) *wus* negatively regulates SAM size and *Clv* expression

(4) *wus* and *Clv* independently regulate SAM size

78. Mutations in *CONSTANS* (*CO*) of *Arabidopsis thaliana* results in late flowering phenotype. Transcript levels of *CO* were determined in long day and short day seedlings. Which of the following would likely represent the transcript profile of *CO*?



79. A newly fertilized eggs were treated either to cycloheximide or actinomycin D immediately, following fertilization. In presence of cycloheximide, the fertilized egg failed to divide while in presence of actinomycin D the egg divided several times to reach an early embryonic stage blastula. Data is also obtained on effect of differential treatment on protein synthesis (figure)



A. mRNA needed for earliest stages in sea urchin development must be present already

B. gene expression is not necessary for earliest of sea urchin development

C. gene expression is necessary for further progression of cells beyond early stage

D. from experiment it can be concluded that actinomycin D prevented cell cycle protein expression

Identify the correct conclusions

(1) A and B

(2) A and C

(3) A, B and C

(4) A, B, C and D

80. Segmentation genes in *Drosophila* are divided into three groups (gap, pair rule and segment polarity) based on their mutant phenotype.

Below are some of the major genes expressed in a sequential, manner (with respect to the groups) affecting segmentation pattern

A. hairy → paired → tailless → patched

B. hunchback → even-skipped → fushi tarazu → wingless

C. odd-skipped → giant → paired → wingless

D. tailless → hairy → fushi tarazu → gooseberry

Which of the above sequence(s) of genes expressed from early to late embryo is/are correct?

(1) D. only

(2) A and B

(3) C and B

(4) B and D

81. During fertilization "in mammals, sperm- egg interaction is mediated by zona pellucida (ZP) membrane proteins and their receptors present in sperm membrane. ZP3 has been identified to be the principle ZP protein whose post-translational modification is important for sperm-egg interaction. In a competitive inhibition assay the sperm is saturated with either active ZP3 or its modified forms, before studying sperm-egg-interaction. Which of the following experiments will not inhibit sperm-egg-interaction

(1) Saturate sperm with ZP3 protein prior to use

(2) Deglycosylate the ZP3 protein and use it for saturation of sperm

(3) Phosphorylate the ZP3 protein and use it for saturation of sperm

(4) Dephosphorylate the ZP3 protein and use it for saturation of sperm

82. Consider the following features of messenger RNA

A. The mRNA in acts as a true 'messenger', being produced within the nucleus and migrating to the cytoplasm for translation to occur

B. Most mRNA is extremely short-lived; it typically has a half-life of a few minutes only, which may be less than the time required for producing or translating it. This can only be achieved by the coupling of transcription and translation

C. The ribosome in attaches to the 5' end of the mRNA and migrates until it reaches the start codon

D. Generally, genes contain introns and mRNA is often (but not always) polyadenylated, i.e. it has a run of adenine residues at the 3' end

Which of the following are characteristic feature of prokaryotic m-RNA?

- (1) A only (2) A and C both
(3) B only (4) B, C and D

83. CUC (cup-shaped cotyledon) and STM (shoot meristem less) are two important regulators for shoot meristem (SAM) development and mutant of both the classes of genes fails to develop SAM. If artificially snoot meristem (SAM) is induced in CUC- mutant, the growth of the shoot takes place normally, whereas, in STM-mutant the artificially induced shoot meristem gets lost after a few rounds of cell division. What can be concluded from these observations?

- (1) CUC gene is required for initiation and maintenance of SAM
(2) CUC gene is required only for maintenance of SAM
(3) STM gene is required for initiation and maintenance of SAM
(4) STM gene is required only for maintenance of SAM

84. During early cleavage of Caenorabditis elegant embryos, each asymmetrical division produces one founder cell which produces differentiated descendants and one stem. cell. The very first cell division produces one anterior founder cell, namely AB and one posterior stem cell, namely PI. When these blastomeres are experimentally separated and allowed to proceed further with development, one could get the following possible outcomes

- (1) PI cell would develop autonomously while the AB would show conditional development
(2) PI cells would show conditional development while AB would show autonomous development
(3) Both would show autonomous specification and result in mosaic development
(4) Both would show conditional specification and result in regulative development

85. In case of sea urchin, which of the following is the correct sequence of events taking place during the interaction of sperm and egg?

- (1) Chemoattraction of sperm to the egg by soluble molecules secreted by the egg → exocytosis of the sperm acrosomal vesicle to release its enzymes → binding of the sperm to the extracellular matrix of

the egg → passage of sperm through this extracellular matrix → fusion of egg and sperm cell membranes

(2) Chemoattraction of sperm to the egg by soluble molecules secreted by the egg → binding of the sperm to the extracellular matrix of the egg → exocytosis of the sperm acrosomal vesicle to release its enzymes → passage of sperm through this extracellular matrix → fusion of egg and sperm cell membranes

(3) Chemoattraction of sperm to the egg by soluble molecules secreted by the egg → binding of the sperm to the extracellular matrix of the egg → passage of sperm through this extracellular matrix → exocytosis of the sperm acrosomal vesicle to release its enzymes → fusion of egg and sperm cell membranes

(4) Chemoattraction of sperm to the egg by soluble molecules secreted by the egg → passage of sperm through this extracellular matrix → binding of the sperm to the extracellular matrix of the egg → exocytosis of the sperm acrosomal vesicle to release its enzymes → fusion of egg and sperm cell membranes

86. Injection of noggin mRNA into a 1-cell, UV-irradiated embryos of frog completely rescues dorsal development and allows the formation of a complete embryo. Some of the following statements (A-D) could possibly explain this observation

- A. Noggin is a secreted protein which induces dorsal ectoderm to form neural tissue and it dorsalizes the mesoderm cells which would otherwise contribute to ventral mesoderm
B. Noggin binds directly to BMP4 and BMP2 thus preventing complex formation with their receptors
C. Noggin along with other molecules prevent BMP from binding to and inducing ectodenn and mesoderm cells near the organizer
D. Noggin is a secreted protein which induces the dorsal ectoderm to form the epidermis and it ventralizes the mesoderm cells which would otherwise contribute to dorsal mesoderm

Which of the above statement combination is correct?

- (1) A, B and C (2) A and B
(3) B and C (4) A and D

87. Consider the following statements regarding functioning of pax6

- A. Pax6 generates competence in optic vesicle and induces lens formation from head ectoderm
B. Pax6 generates competence in head ectoderm, so that it can respond to inducer from optic vesicle
C. Optic vesicle can induce lens formation of any part of head ectoderm which expresses pax6
D. Lens formation can also be induced by BMP and FGF besides pax6

Which of the following statement is correct?

- (1) A and B (2) B and C
(3) C and D (4) B only

88. The type of cleavage in fertilized egg is decided by amount and distribution of yolk. Which of the following statement is correct?

- (1) Centrolecithal egg → Holoblastic cleavage

- (2) Telolecithal egg → Holoblastic cleavage
 (3) Isolecithal egg → Holoblastic cleavage
 (4) Isolecithal egg → Meroblastic cleavage

89. Consider the following statements regarding specification?

- A. Potency of cell is equal to normal fate in mosaic development
 B. Potency of cell is greater than normal fate in mosaic development
 C. Potency of cell is equal to normal fate in regulative development
 D. Potency of cell is greater than normal fate in regulative development

Which of the following statement is correct?

- (1) A and B (2) A and D
 (3) B and C (4) B and D

90. Consider the following statement regarding development of limb in amphibians

- A. If AER is removed during limb elongation further development ceases
 B. If hind limb mesenchymal cell is placed below fore limb AER, at the end hind limb structure would develop
 C. If hind limb mesenchymal cell is placed below fore limb AER, at the end fore limb structure would develop
 D. If extra AER is grafted in limb bud, supernumerary structure develops at distal end

Which of the following statement is correct?

- (1) A and B (2) C and D
 (3) A, B and D (4) A, C and D

91. Consider the following statement regarding plant development

- A. Lateral roots develops from epidermal cells
 B. Shoot axillary meristem develops from shoot apical meristem
 C. Root cap cells are mainly dead cells
 D. Lateral meristem and radial meristem are responsible for secondary growth in roots

Which of the following statements are correct?

- (1) B and D (2) A and C
 (3) B and C (4) A and D

92. Dictyostelium has been a wonderful 1 experimental organism for developmental biologists because they are part time multicellular and initially identical cells are differentiated into one of two alternative cell types, spore and stalk.

Consider the following statements

- A. Aggregation is initiated as each of the cells begins to synthesize cGMP
 B. When surgically removing the anterior part of the slug it abolishes its ability to form a stalk
 C. DIF appears to be necessary for stalk cell differentiation
 D. The adenylyl cyclase expressed during aggregation, ACA is responsible for the synthesis of cAMP that is required for cell-cell signaling in early development. ACB is required for terminal

differentiation. ACG, acts as an osmosensor and is involved in controlling spore germination

Which of the following is correct?

- (1) A and C (2) B and D
 (3) A and B (4) C and D

93. The sequence of expression of genes during embryonic development of *Drosophila* is

A	<i>hunchback, Krüppel, knirps, giant, tailless</i>
B	<i>engrailed, wingless, gooseberry, cubitus interruptus, patched, hedgehog, disheveled,</i>
C	<i>runt, hairy, fushi tarazu, even paired, odd paired, skipped, sloppy, paired, odd skipped</i>

- (1) A → B → C (2) A → C → B
 (3) B → C → A (4) B → A → C

94. The dorsal-ventral axis defines the back (dorsum) & belly (ventrum) of a *Drosophila*.

Consider the following statements

- A. Dorsal protein remains in the cytoplasm; this side will become the dorsal surface. Along the other side, Dorsal protein is taken up into the nuclei; this side will become the ventral surface
 B. The nuclear uptake of Dorsal protein is thought to be governed by a protein called Cactus, which binds to Dorsal protein and traps it in the cytoplasm
 C. The presence of Toll, can alter Dorsal, allowing it to dissociate from Cactus and move into the nucleus
 D. High nuclear concentration of Dorsal protein (as on the ventral side of the embryo) activates a gene called decapentaplegic, which causes mesoderm to develop

Which of the following is correct?

- (1) A, B and C (2) B, C and D
 (3) A, B and D (4) A, C and D

95. The development of the vulva in *C. elegans* offers several examples of induction on the cellular level. Consider the following statements

- A. The anchor cell secretes the LIN-3 protein, a relative of epidermal growth factor (EGF) and the Boss protein
 B. The six VPCs influenced by the anchor cell form an equivalence group
 C. The LIN-3 protein is received by the LET-23 receptor tyrosine kinase on the VPCs, and the signal is transferred to the nucleus through the RTK-Ras pathway
 D. The cell secreting LAG-2 becomes the ventral uterine precursor cell, while the cell receiving the signal through its LIN-12 protein becomes the gonadal anchor cell

Which of the following is correct?

- (1) A, B and C (2) B, C and D
 (3) A, B and D (4) A, C and D

96. Consider the following statements for eye development in *Xenopus*

A. Pax6 responsive for acquiring competence becomes expressed in the throughout surface ectoderm of the embryo

B. Competence to respond to the optic vesicle inducer can be conferred on ectodermal tissue by incubating it next to anterior neural plate tissue

C. The optic vesicle appears to secrete two paracrine factors, one of which may be BMP4, a protein that is received by the lens cells and induces the production of the Sox2 transcription factors. The other paracrine factor is Fgf8, signal that induces the appearance of the L-Maf transcription factor

D. The combination of Pax6, Sox2, and L- Maf in the ectoderm is needed for the production of the lens and the activation of lens-specific genes such as 6-crystallin

Which of the following is correct?

- (1) A, B and C (2) B, C and D
(3) A, B and D (4) A, C and D

97. Consider the following statement for limb development in tetrapods

A. Fgf10 immediately prior to limb formation restricted to lateral plate mesoderm where the limbs will form due to action of Wnt proteins-Wnt2b in the chick forelimb region and Wnt8c in the chick hindlimb region-which stabilize Fgf10 expression at these sites

B. The gene encoding the Tbx5 transcription factor in mice is transcribed in the anterior lateral plate mesoderm and in the forelimbs while the genes encoding the transcription factors Tbx4 and Pitx1 are expressed in the posterior lateral plate mesoderm and in the hindlimbs

C. Fgf8 is capable of inducing the AER in the competent ectoderm between the dorsal and ventral sides of the embryo

D. Fgf8 from the lateral plate mesoderm acts by inducing a Wnt protein (Wnt3a in chicks; Wnt3 in humans and mice) in the prospective limb bud ectoderm. The Wnt protein acts through the canonical β -catenin pathway to induce Fgf10 expression and form the AER. Fgf10 stimulates mitosis in the mesenchyme cells beneath it and causes these cells to keep expressing Fgf8

Which of the following statement are correct?

- (1) B and C (2) B, C and D
(3) A and B (4) A, C and D

98. The proximal-distal growth and differentiation of the limb bud are made possible by a series of interactions between the AER and the limb bud mesenchyme directly (200 μ m) beneath it.

Consider the following statements

A. If the AER is removed at any time during limb development, further development of distal limb skeletal elements ceases

B. If an extra AER is grafted onto an existing limb bud, mirror images at the most distal end of the limb

C. If leg mesenchyme is placed directly beneath the wing AER, distal hind-limb structures develop at the end of the limb

D. If limb mesenchyme is replaced by nonlimb mesenchyme beneath the AER, the AER progresses and new limb development start from ectopic position

Which of the following statements are correct?

- (1) A and C (2) B and D
(3) A and D (4) C and D

99. Thyroid hormones appear to play significant role in metamorphogenesis of amphibians by activating the transcription of some genes and repressing the transcription of others. Consider the following statements

A. Thyroid hormone receptors of two major types TR α and TR β and binds to their specific sites on the chromatin only in presence of T3 hormones

B. When T3 or T4 enters the cell, hormone-receptor complex is converted from a repressor to a strong transcriptional activator

C. T3 receptor forms a dimer with the retinoid receptor. This dimer binds T3 and can enter the nucleus to effect transcription

D. The hormone prolactin has been found to be responsible for the up-regulation of TR α and TR β mRNAs

Which of the following statements combination is correct?

- (1) A and C (2) C and D
(3) B and C (4) B, C and D

100. The metamorphosis of insects appears to be regulated by effector hormones, which are controlled by neurohormones in the brain.

Consider the following statement

A. Insect molting and metamorphosis are controlled by two effector hormones: the steroid 20 hydroxyecdysone and the lipid juvenile hormone (JH)

B. The molting process is initiated in the brain, where neurosecretory cells release prothoracicotropic hormone (PTTH) in response to neural, hormonal, or environmental signals

C. PTTH is a peptide hormone stimulates the production of ecdysone by the prothoracic gland

D. An EcR protein forms an active molecule by pairing with an Ultraspiracle (Usp) protein, the homologue of the amphibian RXR that helps form the thyroid hormone receptor

Which of the following statements are correct?

- (1) A and C (2) C and D
(3) B and C (4) All of the above

101. The mesonephric duct or Wolffian duct develops as a

- (1) ventro-lateral evagination from the mesonephric vesicle
(2) dorsal evagination from the mesonephric vesicle
(3) ventral evagination from the mesonephric vesicle
(4) dorso-lateral evagination from the mesonephric vesicle

102. The correct sequence in the formation of spermatozoa is

- (1) Spermatogonia → spermatids → spermatocytes → spermatozoa
 (2) Spermatids → spermatogonia → spermatocytes → spermatozoa
 (3) Spermatids → spermatogonia → primary spermatocytes → secondary spermatocytes → spermatozoa
 (4) Spermatogonia → primary spermatocytes → secondary spermatocytes → spermatids → spermatozoa

103. Which of the following pairs regarding the source and the protective coverings formed from such source in hen's egg are correctly matched?

1. Vitelline membrane - Primary envelope secreted by the egg itself
2. Albumen (egg white) - Secondary envelope secreted by the follicle cells
3. Outer calcareous shell - Tertiary envelope secreted by the oviduct

Select the correct answer using the codes given below

- (1) 1 and 2 (2) 2 and 3
 (3) 1 and 3 (4) 1, 2 and 3

104. Which of the following pairs are correctly matched?

1. Blastocoele - Blastula of insect
2. Blastopore - Blastula of frog
3. Blastocyst - Blastula of man
4. Blastodisc - Blastula of bony fish

Select the correct answer using the codes given below

Codes:

- (1) 2, 3 and 4 (2) 1, 3 and 4
 (3) 1, 2 and 4 (4) 1, 2 and 3

105. Which one of the following combinations of chromosome number (N) and DNA content (C) is true of the diplotene stage of mammalian oocyte?

- (1) 1N & 2C (2) 2N & 4C
 (3) 2N & 2C (4) 1N & 4C

106. Neoteny in Axolotl larva is the phenomenon where a larva

- (1) gains new tone in its body muscles.
- (2) metamorphoses in a normal manner.
- (3) becomes sexually mature and can reproduce but remains other systems in their larval state.
- (4) permanently retains all its systems in their larval state without any exception.

107. In an experiment, a piece of cellophane paper is placed between the chordamesoderm layer and the overlapping ectoderm in an early gastrula of frog, then

- (1) it will develop into a normal embryo.
- (2) it will stop further development.
- (3) an embryo with two central nervous systems will be developed
- (4) an embryo without a central nervous system will be developed.

108. If two blastomeres of an embryo at 2-cell stage are separated from each other,

- (1) they will die

(2) one will die and the other will develop, into a complete embryo

- (3) each of them will develop into a complete embryo
 (4) They will give two half-embryos - one developing only left half and the other only the right half

109. If the two blastomeres of a cleaving embryo of frog at 2-cell stage are carefully separated, which one of the following will be the fate of the blastomeres?

- (1) Both of them will die
- (2) Each of them will give rise to a perfectly normal embryo
- (3) the two will develop into two half embryos, one right half and the other left half
- (4) one will develop into an anterior half of the embryo and the other a posterior half.

110. Extrusion of second polar body from the egg-nucleus in mammals occurs

- (1) in the fallopian tube before fertilization
- (2) in the fallopian tube after fertilization
- (3) in the ovary before release of egg
- (4) at the time of entry of oocyte in the fallopian tube

111. The correct sequence of events during fertilization in mammals is

- (1) capacitation, activation of egg, acrosomal reaction and entry of sperm in egg
- (2) capacitation, acrosomal reaction, activation of egg and entry of sperm in egg
- (3) acrosomal reaction, activation of egg, capacitation and entry of sperm in egg
- (4) activation of egg, acrosomal reaction, entry of sperm in egg and capacitation.

112. In syndesmochorial placenta, the sequence of maternal tissue between the maternal blood and the foetal tissue is

- (1) maternal endothelium, connective tissue and epithelium
- (2) maternal connective tissue and epithelium
- (3) maternal epithelium, endothelium and connective tissue
- (4) maternal endothelium and connective tissue

113. Extrusion of second polar body in frog's egg occurs

- (1) after the spermatozoon has entered the egg but before the completion of act of fertilization
- (2) with no relationship to either the entry of spermatozoon or the act of fertilization
- (3) before the spermatozoon has entered the egg
- (4) after the completion of the act of fertilization

114. The grey crescent of frog's embryo represents the future

- (1) anterior side of the developing embryo
- (2) posterior side of the developing embryo
- (3) dorsal side of the developing embryo
- (4) ventral side of the developing embryo

115. During metamorphosis of frog

- (1) gills get converted into lungs
- (2) intestine develops and becomes greatly elongated
- (3) tail gets shed by breaking at its root
- (4) skin gets cornified and mucous and poisonous glands develop in it

(1)	2	3	4	1
(2)	1	5	3	2
(3)	1	3	4	2
(4)	2	5	3	1

116. Gastrula is the stage in the embryonic development of frog when

- (1) the embryo is hollow ball of single layered ectodermal cells
- (2) the embryo has three primary germ layers as ectoderm, mesoderm and endoderm
- (3) the embryo has two layers, an ectoderm and an endodermal tube opening through blastopore
- (4) the embryo has an ectodermal and endodermal tube and a rudimentary central nervous system

117. During cleavage, the cell division is very rapid. The daughter cells do not undergo any growth and the cells thus become gradually smaller in volume. Hence:

- (1) there is no growth in the volume of the embryo
- (2) the embryo grows in volume
- (3) the embryo becomes smaller in volume
- (4) the embryo remains static

118. Cleavage is a unique form of mitotic division in that

- (1) the nucleus does not participate
- (2) there is no growth of the cells
- (3) no spindle develops to guide the chromosomes
- (4) the plasma membranes of daughter cells do not separate.

119. The fate of various future parts has already been laid down even in the egg of Amphioxus so that the removal of a few blastomeres will result in the loss of a part in the future embryo and hence the blastomeres have limited potency; such an egg is termed

- (1) regulation egg
- (2) mosaic egg
- (3) parthenogenetic egg
- (4) macrolecithal egg

120. Match List-I (Foetal membrane in chick) with List-II (function) and select the correct answer using the codes given below lists:

List I (Foetal membrane in chick)	List II (Function)
A. Amnion	1. Excretion
B. Chorion	2. Protection against mechanical shock
C. Yolk sac	3. Nutrition
D. Allantois	4. Protection from desiccation
	5. Absorption of water and albumen

Codes	A	B	C	D
-------	---	---	---	---

121. The chromosome number in gynoecium of hexaploid wheat is 42, then the number of endosperm and egg cell will be

- (1) 21 and 7 respectively
- (2) 126 and 21 respectively
- (3) 63 and 21 respectively
- (4) 63 in each

122. Dicot embryo consists of

- (1) radicle and plumule
- (2) radicle, plumule and cotyledons, sometimes endosperm
- (3) radicle, plumule, cotyledons and tegmen
- (4) radicle, plumule, cotyledons, tegmen and testa.

123. In angiosperms normally after fertilization

- (1) the zygote divides earlier than the primary endosperm nucleus
- (2) the primary endosperm nucleus divides earlier than the zygote
- (3) both the zygote and primary endosperm nuclei divide simultaneously
- (4) both the zygote and primary endosperm nuclei undergo a resting period

124. Which one of the following pairs is not correctly matched?

- (1) Neem :Azadirachtin
- (2) PEG :Protoplast fusion
- (3) Gynogenesis :Haploids
- (4) Wheat :2-celled pollen

125. If more than one pollen tubes discharge their contents inside an embryo sac and the sperm fusing with the egg is derived from one tube and the one fusing with the secondary nucleus from another tube, it is called

- (1) Heterofertilization
- (2) Polyspermy
- (3) Heterospermy
- (4) Polygamy

126. Which one of the following statements is not correct regarding vegetative propagation?

- (1) Vegetative propagation produces clonal population
- (2) Micropropagation is the fastest technique of vegetative propagation
- (3) Vegetative propagation can go on round the year
- (4) Vegetative propagation helps to eliminate the virus

127. Which one of the following statements is not correct regarding vivipary?

- (1) Seeds germinate within the fruit while still attached to the mother plant
- (2) It usually occurs under highly saline conditions
- (3) It occurs in the mangrove plants
- (4) It involves a dormancy period for the seed

128. Which of the following combinations of features is true for sporophytic self-incompatibility ?

- (1) 3-celled pollen; dry stigma and rejection reaction in the style.
- (2) 2-celled pollen, short pollen viability, rejection reaction on the stigma
- (3) 2-celled pollen, wet stigma, rejection reaction in the style
- (4) Short pollen viability, dry stigma, rejection reaction on the stigma

129. Heteroblastic development means

- (1) Juvenile plants differ morphologically from adult
- (2) Juvenile plant doesn't differ morphologically from adult
- (3) Juvenile plant differs genetically from adult
- (4) None of the above

130. Which of the following statements regarding endosperm is are false?

1. Primary endosperm nucleus divides along with zygotic division
 2. All types of endosperm produce haustorial appendages
 3. Usually the endosperm is a triploid tissue.
 4. Ruminant endosperm is of common occurrence in Compositae and Gramineae
- (1) 1 and 2 (2) only 4
(3) 1 and 4 (4) None of the above

131. Consider the following statements : Apomixis is a phenomenon in which

1. fertilization occurs regularly
 2. fertilization does not occur at all
 3. embryo is formed directly from an egg or male gamete
 4. formed embryo may be haploid or diploid
- Which of the above statements is/are correct ?

Codes:

- (1) 1 alone (2) 1 and 3
(3) 1,2 and 3 (4) 2,3 and 4

132. In a comparison of plant and animal development, it is found that:

- (1) animals evolved from plants, and animal developmental strategies are derived from those of plants.
- (2) fully differentiated cells of plants are still totipotent, and will readily form a complete fertile plant, whereas the differentiated state of animal cells is difficult to reverse.
- (3) gene regulation evolved later than the split between plants and animals, and is executed differently in the two kingdoms.
- (4) basic metabolic pathways and intracellular structures evolved separately in plants and animals and are fundamentally different

133. One of the earliest events in Arabidopsis development is formation of the _____ axis, in response to a gradient of _____.

- (1) apical-basal, auxin

- (2) dorsal-ventral, miRNA
(3) apical-basal, Pin-1 and Pin-7
(4) adaxial-abaxial, cytokinins
(5) animal-vegetal, nodal

134. Maintenance of the shoot meristems in adult Arabidopsis plants relies on which of the following mechanisms?

- (1) A transcription factor encoded by the SHOOT MERISTEMLESS gene is expressed in shoot meristem cells and maintains them in their undifferentiated state.
- (2) A homeobox transcription factor encoded by the WUSCHEL gene is expressed in the organizing center and initiates a signal to the overlying cells to behave as stem cells.
- (3) Shoot meristem cells secrete proteins encoded by the CLAVATA family that antagonize WUSCHEL expression, thereby restricting the size of the shoot meristems.
- (4) All of the above are involved in specification and maintenance of shoot meristems.

135. Which of the following cells would be considered differentiated?

- (1) Blastomere
- (2) Spemann organizer
- (3) Myotome of the somite
- (4) Muscle cell

136. Differentiated cells express the genes and proteins characteristic of their final identity in the adult, and that identity can be altered only under special circumstances. How does the concept of differentiation, as described here, differ from the concept of determination?

- (1) Determined cells have begun to differentiate, but are not fully differentiated.
- (2) Determined cells are embryonic cells that will give rise to all the cell types of the adult organism, but have not yet begun to express the genes and proteins characteristic of their final fates.
- (3) Determined cells will continue to follow their fate if grafted into a different place in a host embryo, even though they do not yet express the genes and proteins characteristic of their final fate.
- (4) Determined cells are embryonic cells that will form certain cell types and structures if development is allowed to proceed normally, but will alter their development in response to their location if transplanted to a different place in a host embryo.

138. What is the role of stem cells with regard to the function of adult tissues and organs?

- (1) Stem cells are undifferentiated cells that divide asymmetrically, giving rise to one daughter that remains a stem cell and one daughter that will differentiate to replace damaged and worn out cells in the adult tissue or organ.
- (2) Stem cells are embryonic cells that persist in the adult, and can give rise to all of the cell types in the body.

(3) Stem cells are determined cells that reside in fully differentiated tissues and can, when needed, differentiate to supply new cells for growth of the tissue.

(4) Stem cells are differentiated cells that have yet to express the genes and proteins characteristic of their differentiated state, and do so when needed for repair of tissues and organs.

139. In chicks, the formation of the neural tube relies on what cell biological processes?

(1) Changes in cell shape in the neural plate are the only process required for neural tube formation.

(2) Changes in adhesiveness between the prospective neural tube cells and the prospective epidermis in the ectoderm are the only changes required for neural tube formation.

(3) Both changes in cell shape in the neural plate and changes in adhesion molecule expression in the neural tube are required during formation of the neural tube.

(4) Prospective neural tube cells in the ectoderm undergo medio-lateral intercalation, then involute and form the neural tube.

140. Neural crest cells will become:

(1) medullary cells of the adrenal gland

(2) neurons in the sympathetic ganglia of the autonomic nervous system

(3) neurons in the dorsal root ganglia of the peripheral nervous system

(4) all of the above are derived from neural crest cells

141. Why is meiosis required for germ cell formation, yet is never used by somatic cells?

(1) Meiosis is the cell division process that produces haploid products.

(2) Meiosis is a process that produces one sperm and one egg from each dividing germ cell.

(3) Meiosis is a specialized, highly efficient process of cell division, which is used because of the large numbers of germ cells required by an organism.

(4) Meiosis is a specialized form of cell division that produces four diploid cells instead of just two, facilitating the production of large numbers of germ cells.

142. Two human disorders, Prader-Willi syndrome and Angelman syndrome, occur when a small deletion in a specific region of chromosome 15 is contributed by either the father or mother, respectively. Why does this small deletion not behave as a recessive allele for either syndrome, that is, why is its loss not made up for by the good copy of the region on chromosome 15 contributed by the other parent?

(1) This portion of chromosome 15 is invariably mutated, so the other parent contributes recessive alleles that are thus homozygous and perturb development.

(2) The copy of chromosome 15 from the other parent has genes in the region of the deletion that are imprinted, and thus inactive; in the absence of any

active copies of these genes, development cannot proceed normally.

(3) The genes in this portion of chromosome 15 are special in that they are required in two copies for normal development, and so the loss of one set does not allow normal development.

(4) Two copies of every gene in the genome are required for development, so loss of one of the copies from this region perturbs development.

143. What is the "acrosomal reaction"?

(1) The acrosomal reaction is a repulsive interaction between the sperm and the egg.

(2) The acrosomal reaction is the digestion of the acrosome by the sperm when it encounters an egg.

(3) The acrosomal reaction is the digestion of the zona pellucida, permitting the sperm to contact the egg.

(4) The acrosomal reaction is the fusion of the sperm and egg plasma membranes.

(5) The acrosomal reaction is the entry of the sperm nucleus into the egg.

144. What is the cortical reaction, and why is it important?

(1) The cortical reaction is the fusion of the egg cortex with the egg plasma membrane, which allows the sperm to enter.

(2) The cortical reaction is the entry of Ca^{2+} ions into the egg, which initiates development.

(3) The cortical reaction is the exocytosis of the cortical granules during egg maturation, which contain the components of the zona pellucida.

(4) The cortical reaction is the release of the cortical granules after sperm entry, which converts the vitelline membrane into the fertilization membrane which blocks polyspermy.

145. Secretion of Müllerian-inhibiting substance by Sertoli cells:

(1) causes the Müllerian ducts to develop into the oviducts

(2) causes the Müllerian ducts to develop into Wolffian ducts

(3) causes the Wolffian duct to develop into the vas deferens

(4) causes the Müllerian duct to regress by apoptosis in males

Unit test 5-II; Developmental Biology. Answers

1	3	26	3	51	3	76	2	101	4	126	4
2	4	27	1	52	3	77	2	102	4	127	4
3	2	28	1	53	1	78	1	103	4	128	4
4	2	29	2	54	3	79	4	104	2	129	1
5	3	30	2	55	3	80	4	105	2	130	3
6	2	31	2	56	2	81	2	106	3	131	4
7	2	32	2	57	4	82	3	107	2	132	2
8	1	33	3	58	4	83	4	108	3	133	1
9	4	34	1	59	2	84	1	109	2	134	4
10	4	35	3	60	2	85	1	110	1	135	4
11	4	36	2	61	4	86	1	111	1	136	3
12	3	37	4	62	3	87	2	112	1	137	3
13	1	38	4	63	1	88	3	113	1	138	1
14	2	39	2	64	3	89	2	114	3	139	3
15	3	40	4	65	1	90	3	115	4	140	4
16	4	41	4	66	1	91	1	116	2	141	1
17	2&4	42	2	67	2	92	4	117	1	142	2
18	2	43	1	68	1	93	2	118	2	143	3
19	3	44	1	69	4	94	1	119	2	144	4
20	2	45	3	70	1	95	1	120	4	145	4
21	4	46	1	71	2	96	2	121	3		
22	4	47	2	72	4	97	3	122	2		
23	1	48	4	73	3	98	1	123	2		
24	3	49	2	74	1	99	3	124	3		
25	3	50	4	75	1	100	4	125	1		