

***Principles of Development 6th edition Wolpert Test
Bank***

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Type: MC question

Title: Chapter 02 - Question 01

01) What is the result of the first 12 nuclear divisions of a *Drosophila* embryo where roughly 6,000 nuclei share a single cytoplasm?

a. Micropyle

@ No, a micropyle is the structure through which sperm enters the anterior end of the egg.

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b. Cellular blastoderm

@ No, the cellular blastoderm occurs only after membranes form around peripheral nuclei. A single cytoplasm is no longer shared at this point as cellularization has taken place.

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***c.** Syncytium

@ Yes, the first twelve nuclear divisions occur without cytokinesis to give rise to a single cytoplasm containing roughly 6,000 nuclei. This single cell is referred to as a syncytium.

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d. Pole cell

@ No, pole cells are a small population of individual cells that will become germ cells from which the gametes will be derived.

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Type: MC question

Title: Chapter 02 - Question 02

02) Which of the options given is not true of the *Drosophila* mesoderm?

a. It gives rise to muscle and connective tissue.

@ No, this is true. Muscle and connective tissue are important mesoderm-derived tissues in vertebrate and invertebrate embryos.

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b. Gastrulation internalizes the mesoderm.

@ No, this is true. Cellular rearrangements during gastrulation forces blastoderm cells to the interior of the embryo.

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c. The mesoderm is a primary germ layer.

@ No, this is true. The mesoderm is a primary germ layer, along with endoderm and ectoderm.

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***d.** The dorsal surface of the blastoderm gives rise to mesoderm.

@ Yes, this is not true. Gastrulation forces ventral blastoderm cells into the interior of the embryo, thus forming the mesoderm.

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Type: MC question

Title: Chapter 02 - Question 03

03) Which term is not associated with a *Drosophila* larva?

a. Instar

@ No, an instar is a larval stage with successive periods of growth, molting, and shedding.

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***b.** Metamorphosis

@ Yes, metamorphosis is a process within a pupa where a major transformation of the adult form takes place. The pupal stage occurs after the larval stage.

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c. Denticles

@ No, denticles are belts of small tooth-like outgrowths from the epidermal cuticle.

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d. Imaginal discs

@ No, imaginal discs are small sheets of epidermal cells from which adult tissues, like legs and wings, are derived. Imaginal discs undergo cell proliferation during larval stages.

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Type: MC question

Title: Chapter 02 - Question 04

04) What is the maternal anterior morphogen that controls head and thorax development?

***a.** Bicoid

@ Yes, *bicoid* mRNA translation at fertilization gives rise to an anterior to posterior gradient that is required for development of anterior structures.

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b. Nanos

@ No, *nanos* mRNA translation at fertilization gives rise to a posterior to anterior gradient that is required for development of posterior structures.

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c. Caudal

@ No, *caudal* mRNA translation at fertilization gives rise to a posterior to anterior gradient that is required for development of posterior structures.

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d. Torso

@ No, Torso is required for development of the extreme ends (acron and telson) of the embryo.

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Type: MC question

Title: Chapter 02 - Question 05

05) Which of the options given is not true of the *Drosophila* Dorsal protein?

a. Control regions of target genes differ in their affinity for the Dorsal protein.

@ No, this is true. Dorsal protein can bind with different affinity to control regions of its target genes. This characteristic adds to the complexity of target gene expression across the dorso-ventral axis of the *Drosophila* embryo.

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b. The dorsal region of the *Drosophila* embryo expresses genes that are repressed by the Dorsal protein.

@ No, this is true. Dorsal protein can act as repressor and activator of gene expression. Because Dorsal protein is high in the ventral region, repressed genes show expression within dorsal cells of the *Drosophila* embryo.

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c. The gradient of Dorsal protein divides the *Drosophila* embryo up into at least four well-defined domains.

@ No, this is true. A French flag model can be invoked to describe the patterning of the dorso-ventral axis within the *Drosophila* embryo.

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***d.** Dorsal protein levels are higher within the dorsal region of the *Drosophila* embryo.

@ Yes, this is not true. Dorsal protein levels are higher within the ventral region of the *Drosophila* embryo.

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Type: MC question

Title: Chapter 02 - Question 06

06) What class of patterning genes are expressed within seven transverse stripes in the *Drosophila* embryo?

***a.** Pair-rule genes

@ Yes, pair-rule genes are expressed in seven transverse stripes within alternating parasegments.

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b. Segmentation genes

@ No, segmentation genes are expressed in 14 transverse stripes.

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c. Gap genes

@ No, gap genes are expressed in broad regions.

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d. Hox genes

@ No, Hox genes are expressed in broad regions along the antero-posterior axis.

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Type: MC question

Title: Chapter 02 - Question 07

07) What class of patterning genes encodes members of intercellular signaling pathways?

a. Pair-rule genes

@ No, pair-rule genes encode transcription factors that function within a syncytium prior to cellularization.

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***b. Segmentation genes**

@ Yes, segmentation genes function after the blastoderm becomes cellularized. Therefore, signaling proteins and their receptors are necessary to define parasegment boundaries.

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c. Gap genes

@ No, gap genes encode transcription factors that function within a syncytium prior to cellularization.

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d. Hox genes

@ No, all Hox genes encode transcription factors that define the identity of embryonic segments.

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Type: MC question

Title: Chapter 02 - Question 08

08) Which of these segmentation genes is a transcription factor that defines parasegment boundaries?

a. Frizzled

@ No, Frizzled is the receptor for the Wingless signaling protein.

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b. Hedgehog

@ No, Hedgehog is an intercellular signaling protein.

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c. Patched

@ No, Patched is the receptor for the Hedgehog signaling protein.

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***d. Engrailed**

@ Yes, Engrailed is a transcription factor that limits the pattern of Hedgehog and Wingless signaling pathways to define parasegment boundaries.

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Type: MC question

Title: Chapter 02 - Question 09

09) What is the term that describes the relation between the order of the Hox genes along the chromosome and the order of their expression along the antero-posterior axis?

a. Homeosis

@ No, homeosis is the transformation of a whole segment into another related one.

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b. Posterior dominance

@ No, posterior dominance is the phenomenon in which Hox gene products normally expressed in anterior regions are suppressed by more posterior products.

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c. Gene cluster

@ No, Hox genes are organized into two clusters of genes that make up the HOM-C complex.

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***d. Co-linearity**

@ Yes, co-linearity refers to the correspondence between the order of Hox genes along the chromosome and the order in which they are expressed along the antero-posterior axis of the embryo.

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Type: MC question

Title: Chapter 02 - Question 10

10) What type of gene, such as a Hox gene, is sufficient to cause cells to adopt a particular fate?

***a. Selector**

@ Yes, a selector gene's activity is sufficient to cause cells to adopt a particular fate.

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b. Repressor

@ No, a selector gene's activity is sufficient to cause cells to adopt a particular fate. A repressor protein represses a gene's expression.

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c. Activator

@ No, a selector gene's activity is sufficient to cause cells to adopt a particular fate. An activator protein activates a gene's expression.

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***d. Recessive**

@ No, recessive is just a general name for any gene that only shows a normal phenotype when two copies are present in the cell.

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