

## CHAPTER 4

- 1) The main points to be included in answer are indicated in the last sentence in the question.
- 2) Base your answer about the ventralizing effect of UV irradiation on disruption of microtubules. Lithium has a dorsalizing effect. Base your answer on the ability of Lithium to block GSK-3 $\beta$  activity – check the Wnt signalling pathway.
- 3) a) Two dorsal cells give dorsalized embryo; two ventral cells ventralized embryo; b) notochord and muscle; c) formation of second axis. Discuss how these results led to definition of the Nieuwkoop center.
- 4) Twinned embryo with second axis having a head and complete dorso-ventral axis. Include discussion of the contribution of the grafted tissue to the formation of the second axis.
- 5) Dorsal-most mesoderm expressing goosecoid specified experimentally by high threshold concentrations of activin (probably in vivo by nodal); goosecoid expression is a marker of organizer at the early dorsal lip of the blastopore; cells that internalize first at the dorsal lip give rise to anterior structures, anterior endoderm and prechordal plate mesoderm.
- 6) Include experiments culturing isolated epidermis and disaggregated epidermal cells, BMP antagonists e.g. chordin and noggin, BMPs, effects of manipulating BMP signaling. FGF signaling should also be discussed as indicated in the question.
- 7) The Summary Table at the end of the Chapter provides most of the information needed to answer this question. Include developmental roles of VegT in both endoderm specification and in combination with Wnt signaling in activation of expression of mesoderm inducers.
- 8) The future mesoderm lies in a band around the equator of the blastula rather than being confined to a region underlying the blastopore. For further details of the cell movements during gastrulation in *Xenopus* see Chapter 7.
- 9) For definitions of specification and determination see the Glossary. See further details about the mechanisms involved in differentiation in Chapter 8.
- 10) For definition of mid-blastula transition see the Glossary. Include egg-timer model in your answer.
- 11) Mesoderm patterning along the dorso-ventral axis – include Wnt signaling, TGF- $\beta$  signaling, animal cap experiments with different concentrations of activin.
- 12) Dorsal side; include expression of siamois and formation of Nieuwkoop center, Nodal signaling, expression of goosecoid.
- 13) BMP4 specifies ventral structures in mesoderm; in ectoderm BMP4 specifies epidermis versus neural tissue. Include local production of BMP antagonists and how they act.
- 14) Include dorso-ventral patterning, axis inversion, BMP gradient formation by shuttling, actions of Chordin/Sog and metalloproteinases. See further discussion of this comparison in Chapter 14.
- 15) Include named mutants for genes involved in signaling - ichabod, squint and cyclops, headless; mutant for a gene encoding a transcription factors- no tail. Need to indicate the phenotypes of the mutants and the gene that is mutated in each case.
- 16) Both have organizer activity. Include details of transplantation experiments, contribution of grafted tissue, changes in organizer activity over time.