

CHAPTER 5

- 1) Outline transplantation experiments and formation of a second body axis. Include discussion of extent of axis duplication.
- 2) Include extent of egg yolkiness—*Xenopus* < zebrafish < chick, cleavage effects of yolk, early generation of extraembryonic tissues for placenta in mammals.
- 3) See also glossary; spinal cord develops from the neural tube in the body. Use diagrams for the second part of the answer.
- 4) FGF-8 gradient from posterior to anterior with high point at the node, degradation of *Fgf8* mRNA, clock and wavefront model, Wnt signaling, retinoic acid.
- 5) See colour coding in figure for help. Gene duplication to give paralogs - see examples of paralogous genes in the different Hox clusters in mouse (they have same number), cluster duplication- the four Hox clusters in mouse, loss of genes – see for example the 5' region of Hoxb cluster in mouse. See further discussion in Chapter 14.
- 6) Need to read off the genes that highly expressed – indicated by red ends of the bars- in each region. Note that genes from more than one cluster are expressed in the same region. 3' genes in each cluster are expressed earliest and in the more anterior positions.
- 7) Transformations toward anterior identities. Include spatial and temporal colinearity, Hox genes acting in a combinatorial manner. See also glossary for homeotic transformation.
- 8) Need to consider primary body formation, the maintenance of a caudal stem zone and how gradients of FGF and RA signaling control the generation of the axial tissues.
- 9) Sclerotome rather than dermomyotome is induced by transplanted notochord, also affects dorso-ventral pattern of the neural tube – further discussed in Chapter 11. Include the production of the signaling molecule Sonic hedgehog by the notochord, activity of the Pax3 transcription factor committing cells to form muscle. See further discussion of muscle cell differentiation in Chapter 8.
- 10) See also definition in glossary. Position in which primitive streak arises marking posterior end of embryo. Include rotational forces as egg passes down oviduct, breaking of radial symmetry of blastoderm, Vg-1, Wnt-8C.
- 11) The main points to be included in your answer are indicated in the last sentence of the question. It is worth noting which model organism you base your account on.
- 12) Chick-quail chimeras have been used to make fate maps of the neural crest – quail neural tube with neural crest grafted in place of chick neural tube. See Chapter 3 for methods of recognizing quail cells. Include cell clonal analysis in discussion of culture experiments. See also definition of clone in the Glossary.