Cell specification.

- All cells differentiate from embryonic stem cells.
  - Differentiated cells have different patterns of protein expression and distribution, and different patterns of gene expression - different jobs.

- Almost all cells contain the same genes, proven by reproductive cloning. DNA in a cell can express proteins to make whole organisms. But some turned off

- Different cell-types express the same proteins. Common proteins and enzymes include tubulin, RNA polymerase, and histones.

  - 'Housekeeping genes' are expressed in all cells.

- Proteins expressed only by one or other tissue = specialised gene

Differentiation process:

- Stem cell → progenitors → terminally differentiated cells.

Gene expression

- Most cells express 10,000-15,000 genes.

- Not all genes are expressed at an equal rate - some are abundant and some are scarce.

- Genes can be either: 1) Constitutively expressed always on
  2) Conditionally expressed inducible switches on in right condition.

- Controlling gene expression:

  - DNA → transcribed → RNA → mRNA → translation → protein

- The predominant level of control

Diagram:

- DNA (transcription control) → RNA (RNA processing control) → mRNA (RNA transport and localization control) → Protein (posttranslational control)