

Task 1 glossary

Antibody: A protein produced by the immune system that is used to identify and neutralize foreign substances in the body.

cDNA: Complementary DNA, a type of DNA that is synthesised from messenger RNA (mRNA) for RNA detection in assays such as RT-PCR and RNA-sequencing.

Cell (or tissue) culture: The process of growing cells in a laboratory setting using [cell culture media](#) and specialised equipment.

Cloning (molecular cloning): a laboratory technique used to assemble DNA molecules (such as [viral vectors](#)) from different fragments.

Differentiation: A process by which cells become specialised and assume a specific form and functions within an organism. Note that strictly speaking, this task is concerned with *transdifferentiation*, whereby an already specialised cell is “reprogrammed” to convert to a different specialised cell type.

ELISA: An enzyme-linked immunosorbent assay, is a laboratory technique used to measure the presence or concentration of a specific protein or [antibody](#) in a sample.

Fibroblasts: Cells found in connective tissue that are responsible for synthesising and secreting the extracellular matrix, which provides structural support to tissues, as well as tissue repair and regeneration.

In vitro: Performed in a laboratory setting, rather than inside a living organism.

Lentivirus: A genus of viruses that can infect both dividing and non-dividing cells and can be used to deliver genetic material into human cells. Lentiviruses are a subtype of retroviruses, and as such, the lentiviral genome is RNA-based but is converted into DNA and integrated into the host cell genome upon infection. Lentiviruses include Human Immunodeficiency Virus (HIV) causing AIDS, and it is the HIV (modified to remove key replicating and regulatory proteins from its genome) that is used as a basis for many human lentiviral [vectors](#).

Media (cell/tissue culture media): A liquid nutrient solution that is used to support the growth and maintenance of cells in a laboratory setting. It is composed of various nutrients, such as amino acids, sugars, vitamins, and minerals, that are required for the survival and proliferation of cells.

Multiplicity of infection (MOI): The ratio of virus particles to cells in a sample.

Nociceptor neurons: A type of [sensory neuron](#) that detects and transmits signals related to pain.

Sensory neurons: Nerve cells that detect stimuli and transmit signals to the central nervous system.

Serum (cell/tissue culture serum): A component of [cell culture media](#) derived from animal blood and used to support the growth and maintenance of cells in a laboratory setting. The serum contains a variety of proteins, hormones, growth factors, and other substances that are required for the survival and proliferation of cells, and it is often used in conjunction with other components of tissue culture media such as amino acids, sugars, and vitamins.

Stem cells: Cells that can self-renew (divide to produce more stem cells) and differentiate into a variety of specialised cell types. Stem cells can be *pluripotent* if they can theoretically generate all cell types in the adult organism or *multi/unipotent* if the range of the cell types they can generate is more restricted. Pluripotent stem cells can be derived either from embryo tissues (in which case they are known as *embryonic stem* cells; ESCs) or transdifferentiated from adult cell types (in which case they are known as *induced pluripotent stem cells*; iPSCs).

Tetracycline operator (tetO): A DNA sequence that is recognized by a family of [transcription factors](#) called Tet proteins that prevent the transcription of genes that are located downstream of the tetO sequence.

Transcription factor: A type of protein that regulates gene expression by binding to specific DNA sequences and activating or repressing the transcription of particular genes.

Transduction: The process of introducing genetic material (such as DNA or RNA) into a cell using a [virus vector](#).

Transfection: The process of introducing foreign DNA into a cell using a chemical or physical method.

Transduction Units (TU): Unit of measurement for [virus titres](#), used to estimate the amount of virus in a sample.

Virus titre: A measure of the concentration of virus particles in a given volume of a virus suspension.

Virus vector: A virus that has been genetically modified to carry and deliver genetic material into cells. Vectors are often used in molecular biology and gene therapy experiments to introduce specific genes into cells.

Reagents used in the differentiation protocol

B27: A mix of components including many antioxidants, often added to cell culture media to support the growth and survival of neural cells.

BDNF: Brain-derived neurotrophic factor, a protein that promotes the growth and survival of nerve cells.

BRN3A: A transcription factor involved in the development of [sensory neurons](#).

DMEM: Dulbecco's Modified Eagle Medium, a type of [cell culture media](#) used to grow cells in a laboratory setting.

DMEM/F12: A type of [cell culture media](#) made from a mixture of Dulbecco's Modified Eagle Medium and Ham's F12 nutrient mixture.

Doxycycline: An antibiotic that can be used to induce gene expression in cells that have been genetically modified to contain a [tetracycline operator](#) (TetO).

Foetal Bovine Serum (FBS): A type of animal [serum](#) used in cell culture media to provide nutrients and growth factors for cells.

GDNF: Glial cell line-derived neurotrophic factor, a protein that promotes the survival and differentiation of nerve cells.

NGF: Nerve growth factor, a protein that promotes the survival and differentiation of nerve cells.

NGN1: A transcription factor promoting the development of [sensory neurons](#).

Neurobasal media: A type of [cell culture media](#) specifically formulated for the growth and maintenance of neural cells.

NT3: Neurotrophin-3, a protein that promotes the survival and differentiation of nerve cells.

N3: A type of neural induction [medium](#) containing various nutrients and hormones that support the development of neural cells.

Penicillin/streptomycin: Antibiotics used to prevent the growth of bacteria in [cell culture media](#).