

# Section 3.1- From Cells to Systems

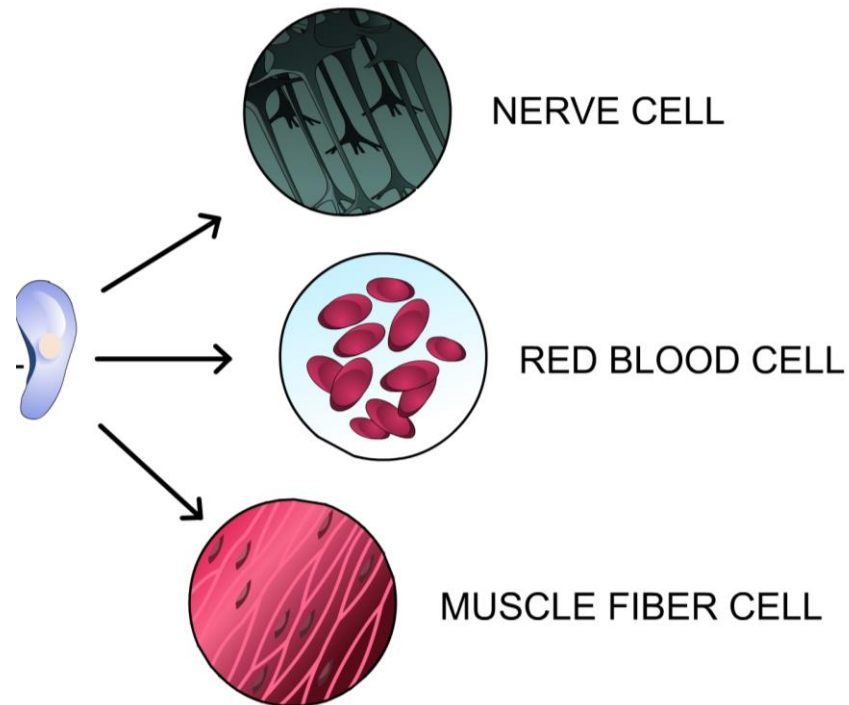
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SNC2D

MRS. FRANKLIN

# Cell Specialization

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Most of the 75-100 trillion cells that make up the human body are specialized to do certain tasks.

The three main factors that influence the differentiation of these cells are:

1. the contents of the cell's cytoplasm
2. environmental conditions, such as temperature
3. the influence of neighbouring cells

# 1) Difference in Cytoplasm

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Depending on the organism or the tissues the cells are going to form, throughout their cell cycle, the cell may produce more or less of certain organelles that will enable it to perform its function correctly.



*Differences between the cells in an amoeba and cells in a blue whale are related to differences in cytoplasm content.*

## 2) Environmental Conditions

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Certain cells may also be influenced by its \_\_\_\_\_ such as temperature, the presence of certain nutrients or cells.

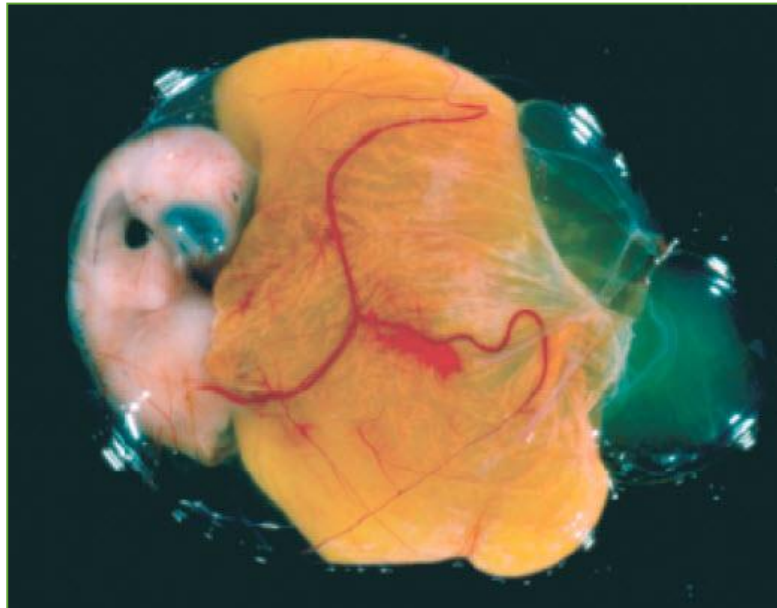


*On the cat the dark- and light-coloured hair developed when skin cells experienced warm or cool temperatures during cell differentiation.*

### 3) Neighbouring Cells

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Neighbouring cells will send \_\_\_\_\_ signals to nearby cells and provide information on what the cells should specialize into and what tissues/organs they should form.



*In this chick embryo, neighbouring cells influence the development of the eye in a specific location.*

# Disruptions in Cell Specialization

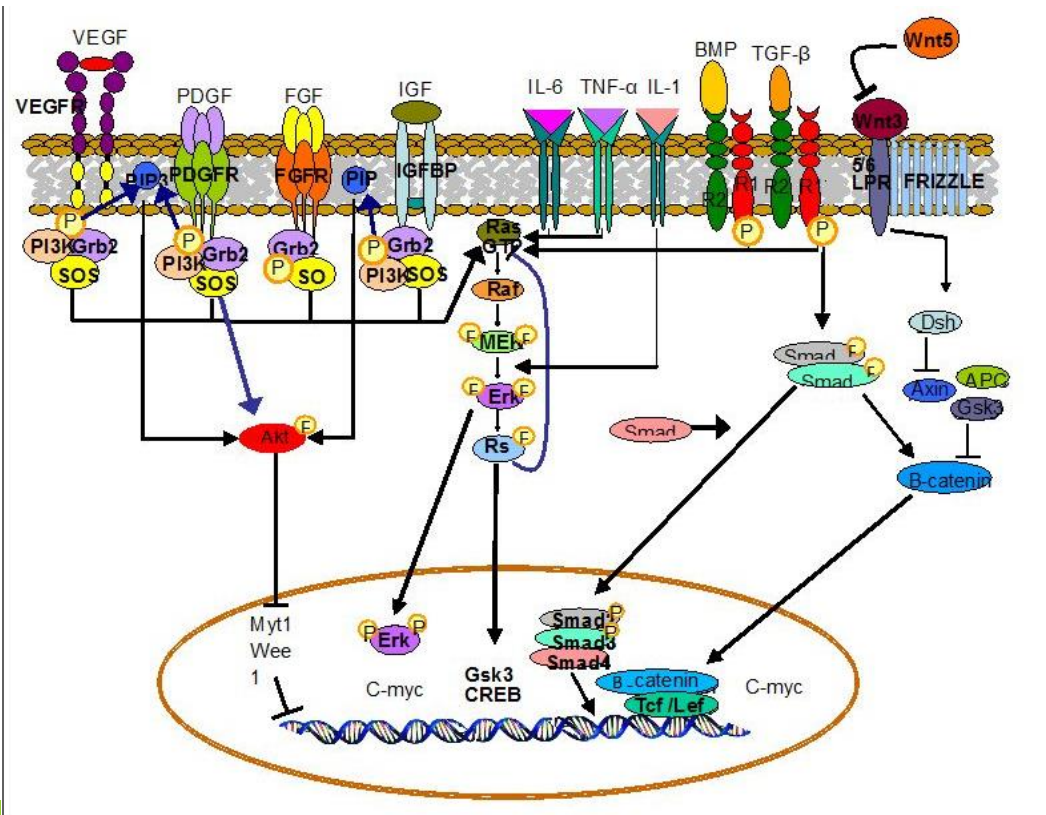
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Depending on the type of chemicals, parasites and temperature changes in the environment, the specialization of certain cells may be affected and cause an abnormal development.



# Cell Specialization

Different proteins in the cells and chemical signals in the environment will diffuse into the cells and activate/deactivate the appropriate genes that enables the cell to specialize.

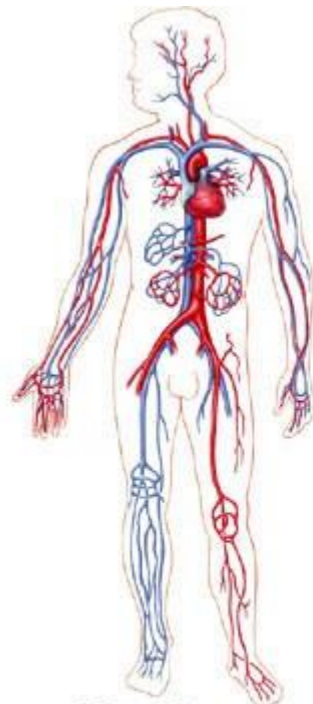


*There are many biochemical pathways in the cells that active or deactivate genes.*



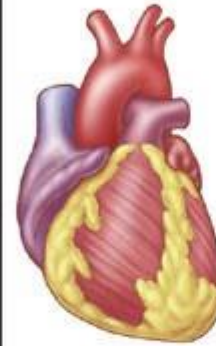
# Level of Organization

*Cells are the smallest units and will come together to form tissues. Tissues will help form organs and organs will work together to form an organ system.*



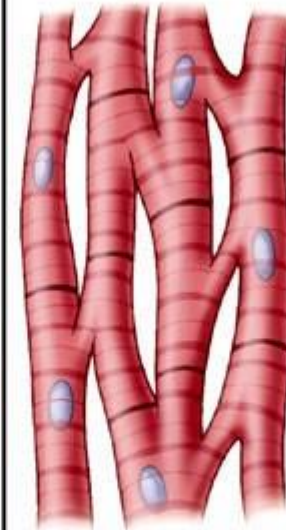
**Circulatory system**

**Organ system**



**Heart**

**Organ**



**Cardiac muscle**

**Tissue**



**Cardiac muscle cell**

**Cell**



# Types of Tissues

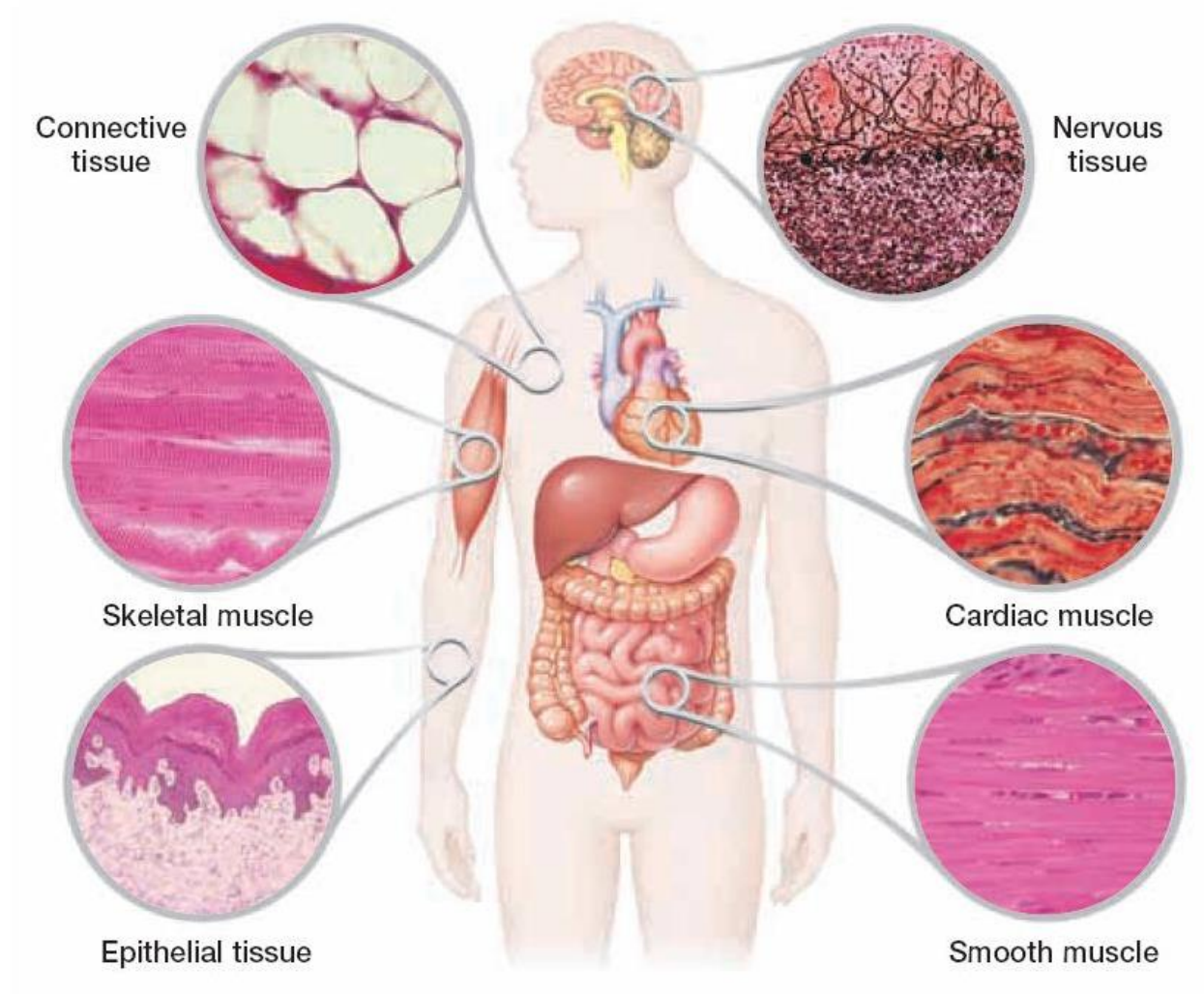
There are 4 main types of tissues that can be found in organisms:

1) Epithelial:

2) Muscle:

3) Nervous:

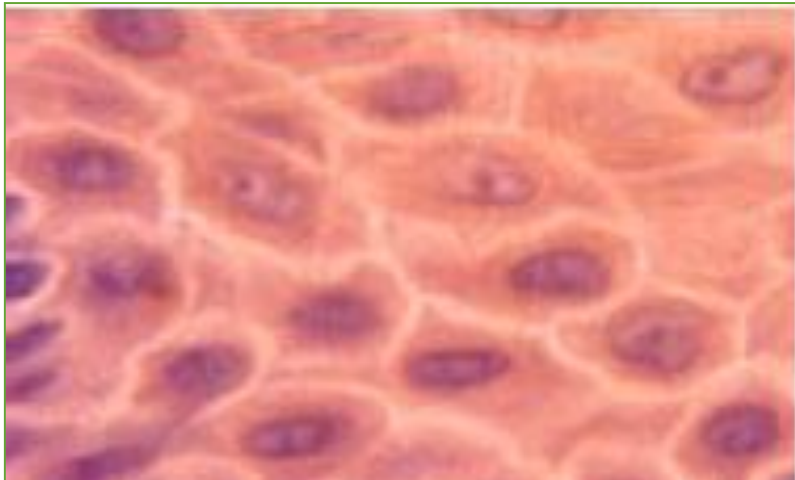
4) Connective:



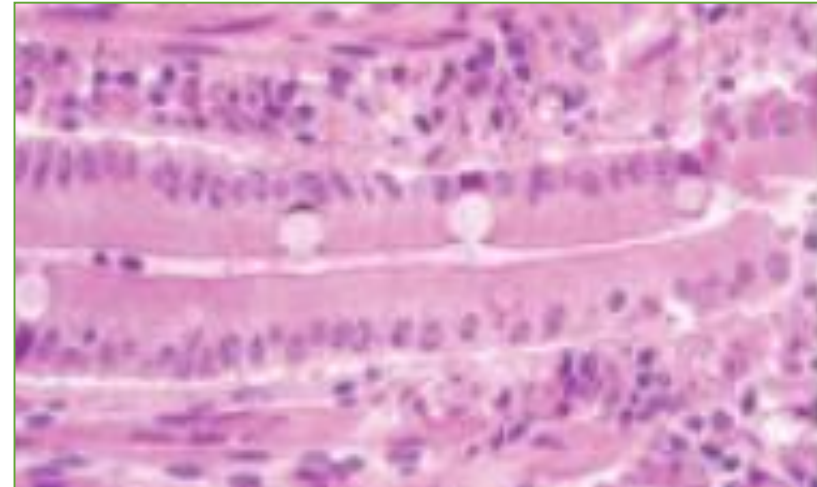
# 1) Epithelial Tissue

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Epithelial cells will line the surface of the body or internal organs.



*Skin epithelia*

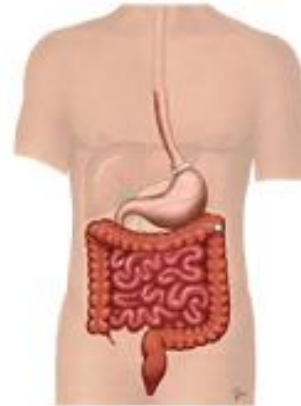
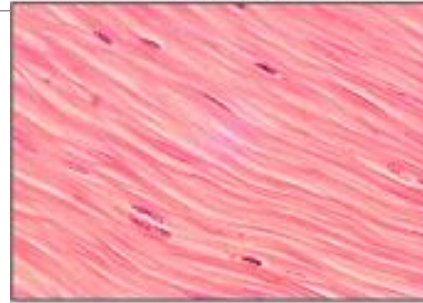


*Columnar epithelia*

## 2) Muscle

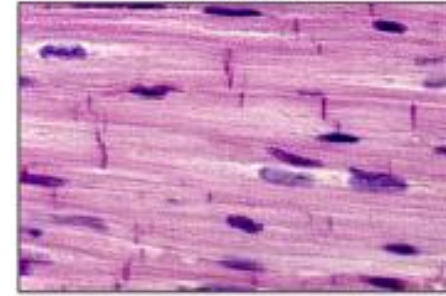
*Muscle cells are able to expand or shorten in order to move. They are designed to change their shape.*

Smooth Muscle Tissue



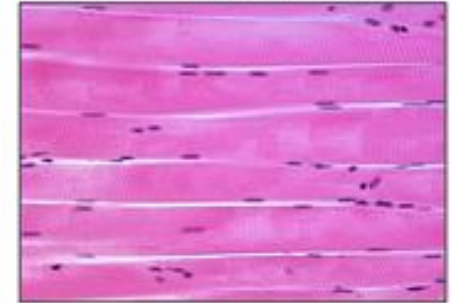
Involuntary Control

Cardiac Muscle Tissue



Involuntary Control

Skeletal Muscle Tissue

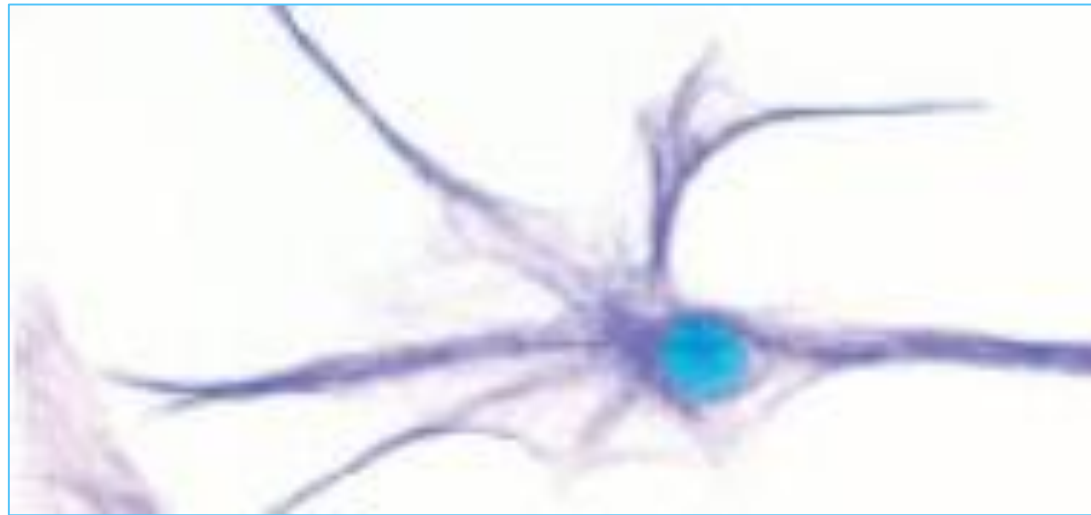


Voluntary Control

### 3) Nervous

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The cells are known as '*neurons*' and communicate with one another to transmit signals to coordinate body actions.

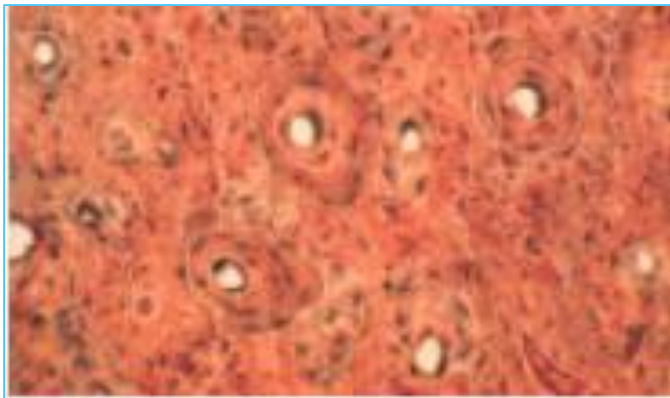


*Neurons*

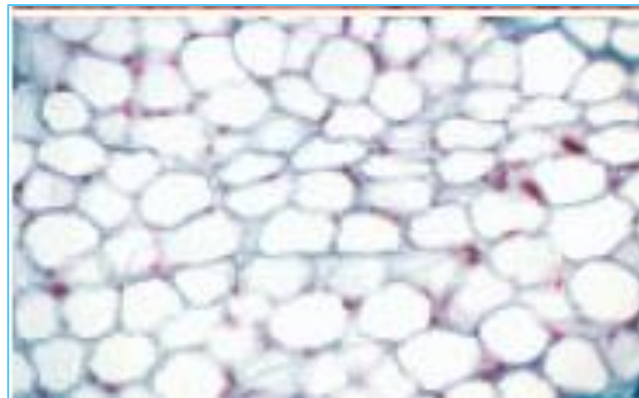
## 4) Connective

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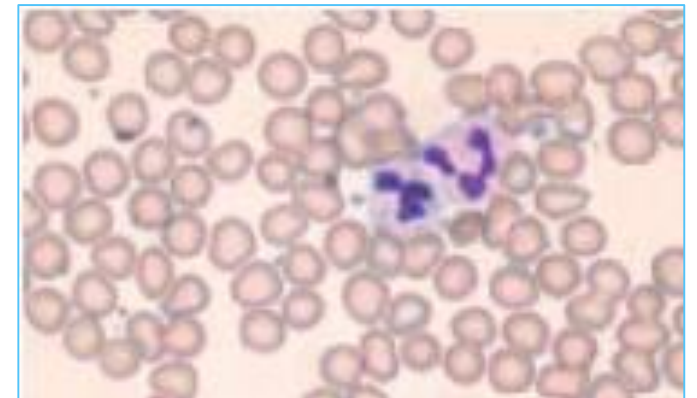
Strengthens, supports, , protects, binds and connects cells and tissues. (i.e Bone, fat, blood)



*Bone*



*Fat (adipose tissue)*



*Blood*

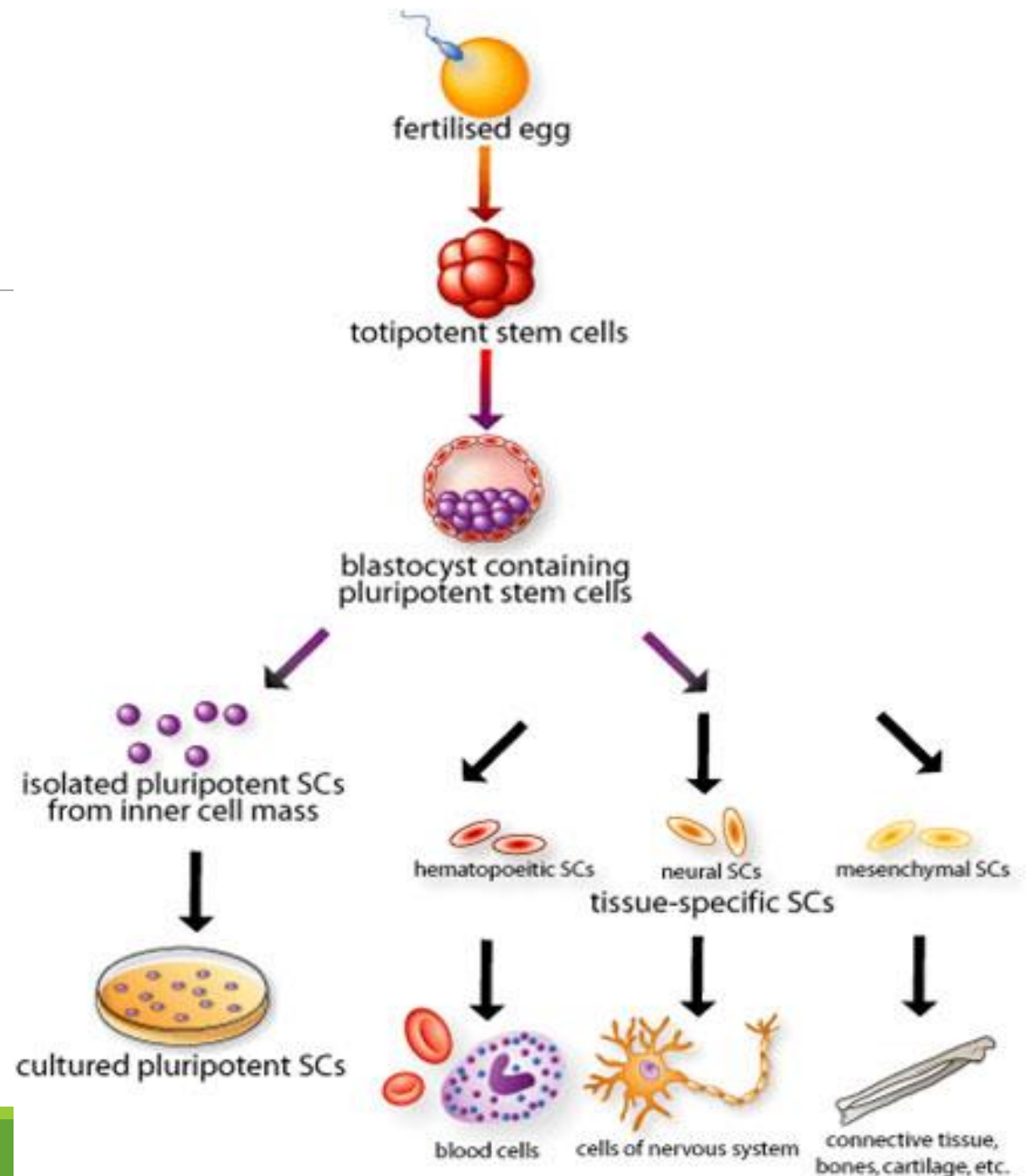


# Stem Cells

Stem Cells:

Totipotent Stem Cells:

Pluripotent Stem Cells:



# Stem Cells and Medicine

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*Embryonic stem cells* are unspecialized cells that can become any one of an organism's body cells, making them valuable for research and medical treatment.



*Embryonic stem cells are able to divide for a couple of years without differentiating. Scientists are trying to use these unspecialized cells to help treat certain diseases.*

*Scientists have also recently discovered that adult stem cells could be converted into pluripotent stem cells.*



# Homework

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Textbook: pg. 92 # 2, 3, 4, 5 & 8