

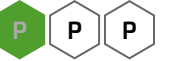


Physics. *You work it out.*

[Home](#)   [Gameboard](#)   [Biology](#)   [Cell Biology](#)   [Tissues](#)   [Reproduction and Development](#)

# Reproduction and Development

A Level



## Part A   Fertilisation

During fertilisation, two   combine to form a  . This process requires a liquid medium for the sperm cells to swim through.

In some animals (including all mammals), fertilisation occurs inside the mother's body. This is called  fertilisation. In other animals, fertilisation occurs in the environment. This is called  fertilisation.

Items:

Part B    Sex determination

In mammals, sex is determined by the presence/absence of the Y chromosome. Other animals have different mechanisms of sex determination.

The sex of one species of fruit fly is determined by the number of X chromosomes relative to the number of non-sex chromosomes (A) in a cell. This is called the X : A ratio. A fruit fly will be male if  $X : A = 0.5 : 1$ , and female if  $X : A = 1 : 1$ . The Y chromosome contains genes necessary for making sperm. Match the sex to the fruit fly genotype in the table below.

Fruit fly genotype	Fruit fly sex
XAA	<input type="text"/>
XYAA	<input type="text"/>
XXAA	<input type="text"/>
XXYAA	<input type="text"/>
XXYYAA	<input type="text"/>

Items:

- female
- male

Part C    Embryonic development

After fertilisation, the  undergoes many rounds of  to form a multicellular embryo. Initially, all of the cells are  but, throughout development, cells  into the different cell types of the organism.

Items:

- differentiate
- gamete
- dedifferentiate
- differentiated
- zygote
- mitosis
- undifferentiated
- meiosis



# Stem cells

## Part A Characteristics

A stem cell is  cell that has the ability to  into multiple cell types and has the ability to divide indefinitely to produce more stem cells.

The number of cell types that the stem cell can  into is described as the  of the stem cell.

When a stem cell divides to produce more stem cells, this is called .

Items:

dedifferentiate

differentiate

self-renewal

a differentiated

redundancy

potency

an undifferentiated

Part B    Potency

Match the level of potency and example to the definition.

Potency	Definition	Example
<div></div>	Able to differentiate into all cell types, including extra-embryonic cells (e.g. placenta cells).	<div></div>
<div></div>	Able to differentiate into any cell type except extra-embryonic cells (e.g. placenta cells)	<div></div>
<div></div>	Able to differentiate into several cell types, but not all cell types	<div></div>

Items:

zygote

Totipotent

embryonic stem cells (ESCs)

haematopoetic stem cells in bone marrow

Pluripotent

Multipotent

Part C    Differentiation

Which of the following may occur as part of the differentiation process? Select all that apply.

- ☐ activation of some genes to produce proteins
- ☐ deactivation of some genes to stop producing proteins
- ☐ changes in cell shape/structure
- ☐ an increase in the potency of the cell
- ☐ a decrease in the potency of the cell
- ☐ mutations of genes to alter the proteins they produce



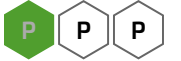
Physics. *You work it out.*

[Home](#) [Gameboard](#) [Biology](#) [Cell Biology](#) [Tissues](#) [Multicellular Organisation](#)

# Multicellular Organisation

---

A Level



## Part A Tissues

---

What is the definition of a tissue?

- ☐ the smallest unit of multicellular organisation
  - ☐ a group of identical cells
  - ☐ a group of similar cells and their extracellular matrix
  - ☐ one structural unit, composed of one type of tissue, that performs a specific function
  - ☐ one structural unit, composed of different tissue types, that performs a specific function
  - ☐ a group of organs and/or tissues that work together to perform one or more functions
  - ☐ all of the organs in the body
-

---

## Part B    Organs

What is the definition of an organ?

- ☐ the smallest unit of multicellular organisation
  - ☐ a group of identical cells
  - ☐ a group of similar cells and their extracellular matrix
  - ☐ one structural unit, composed of one type of tissue, that performs a specific function
  - ☐ one structural unit, composed of different tissue types, that performs a specific function
  - ☐ a group of organs and/or tissues that work together to perform one or more functions
  - ☐ all of the organs in the body
- 

---

## Part C    Systems

What is the definition of a system?

- ☐ the smallest unit of multicellular organisation
  - ☐ a group of identical cells
  - ☐ a group of similar cells and their extracellular matrix
  - ☐ one structural unit, composed of one type of tissue, that performs a specific function
  - ☐ one structural unit, composed of different tissue types, that performs a specific function
  - ☐ a group of organs and/or tissues that work together to perform one or more functions
  - ☐ all of the organs in the body
-

Part D    Extracellular matrix

A tissue is composed of a group of similar cells which are connected by extracellular matrix (ECM). Match the ECM component(s) to the tissue.

Tissue	ECM component(s)
blood	<div></div>
bone	<div></div>
artery smooth muscle	<div></div>

Items:

- erythrocytes

plasma

osteoblasts and osteocytes

collagen and calcium phosphate

squamous epithelium

elastin and collagen

Part E    Plant growth

Plants contain tissues of ~~totipotent~~ stem cells, which produce new roots, shoots, and flowers. What is the name of this type of tissue in plants?



# Animal Tissue Types



Tissues in animals can be loosely categorized into four main types: epithelial, connective, muscle, and nervous.

## Part A   Tissue functions

Match the tissue type to its function.

Tissue type	Function
<input type="text"/>	transmits electrical signals between tissues
<input type="text"/>	holds tissues together or acts as a transport system between tissues
<input type="text"/>	covers the internal and external surfaces of organs
<input type="text"/>	contracts to cause movement of other tissues/fluids/objects

Items:

- epithelial
- connective
- nervous
- muscle



---

## Part B    Epithelial tissue

Which of the following are examples of epithelial tissue? Select all that apply.

- ☐ external lining of alveoli
  - ☐ tendons
  - ☐ cartilage
  - ☐ spinal cord
  - ☐ cardiac muscle
  - ☐ blood
  - ☐ internal lining of the small intestine
  - ☐ epidermis (external lining of the skin)
- 

---

## Part C    Connective tissue

Which of the following are examples of connective tissue? Select all that apply.

- ☐ tendons
  - ☐ cartilage
  - ☐ spinal cord
  - ☐ ligaments
  - ☐ blood
  - ☐ epidermis
  - ☐ bone
  - ☐ cardiac muscle
-

---

## Part D    Nervous tissue

Which of the following are examples of nervous tissue? Select all that apply.

- ☐ spinal cord
  - ☐ tendons
  - ☐ blood
  - ☐ cardiac muscle
  - ☐ cerebrum
  - ☐ ligaments
  - ☐ epidermis
  - ☐ skeletal muscle
- 

---

## Part E    Muscle tissue

Which of the following **contain** muscle tissue? Select all that apply.

- ☐ heart
  - ☐ intestines
  - ☐ epidermis
  - ☐ bones
  - ☐ uterus
  - ☐ spinal cord
  - ☐ stomach
  - ☐ bladder
-



# Plant Tissue Types

Tissues in plants can be loosely categorized into four main types: epidermis, ground tissue, vascular tissue, and meristematic tissue.

## Part A   Tissue descriptions

Match the tissue type to its description.

Tissue type	Description
<input type="text"/>	transports water and nutrients throughout the plant
<input type="text"/>	contains stem cells that differentiate to form the other three tissue types
<input type="text"/>	the outer layer of cells
<input type="text"/>	the tissues between the vascular tissues and the epidermis

Items:

- meristematic tissue
- vascular tissue
- epidermis
- ground tissue

---

## Part B    Vascular tissue

Which of the following are examples of vascular tissue?

- ☐ roots
  - ☐ flowers
  - ☐ spongy mesophyll
  - ☐ xylem
  - ☐ leaves
  - ☐ palisade mesophyll
  - ☐ phloem
- 

---

## Part C    Ground tissue

Which of the following are examples of ground tissue?

- ☐ roots
  - ☐ flowers
  - ☐ spongy mesophyll
  - ☐ xylem
  - ☐ leaves
  - ☐ palisade mesophyll
  - ☐ phloem
- 

Created for isaacphysics.org by Lewis Thomson

Gameboard:

**STEM SMART Biology Week 13**



# Blood Cell Production

A Level



Erythrocytes (mature red blood cells) are produced by stem cells in the bone marrow. A  $1 \text{ mm}^3$  sample of blood from a healthy person was found to contain  $4 \times 10^6$  erythrocytes. The person has a consistent average total blood volume of  $0.006 \text{ m}^3$ . Their total erythrocyte count does not change and, on average, erythrocytes have a lifespan of 100 days.

## Part A Rate of production

What is the average rate of production of erythrocytes per hour?

---

## Part B Cell statements

Which of the following statements are true? Select all that apply.

- ☐ Stem cells produce erythrocytes by meiosis.
- ☐ Stem cells produce erythrocytes by differentiation.
- ☐ The stem cells in the blood marrow that produce erythrocytes are pluripotent.
- ☐ The stem cells that produce erythrocytes do not have nuclei.
- ☐ Erythrocytes cannot produce other erythrocytes by mitosis because they do not have nuclei.
- ☐ Erythrocytes do not have nuclei.

---

Adapted with permission from NSAA 2021 Section 1 Q77