

## Stem Cells

1. State the definition of a stem cell.

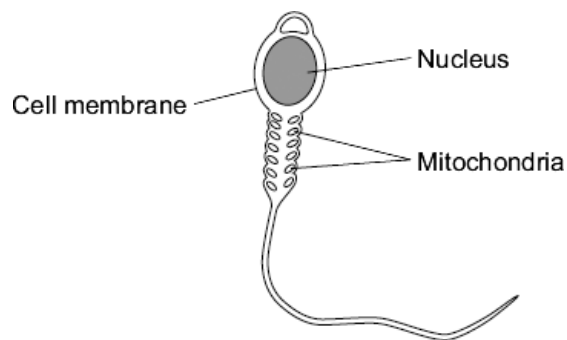
**A cell that is capable of differentiating into different cell types.**

2. Describe where stem cells can be found.

- **Embryos from IVF fertilised eggs**
- **Adult bone marrow**
- **Meristems in plants**

3. Cells in the human body are specialised to carry out their particular function.

The diagram shows a sperm cell.



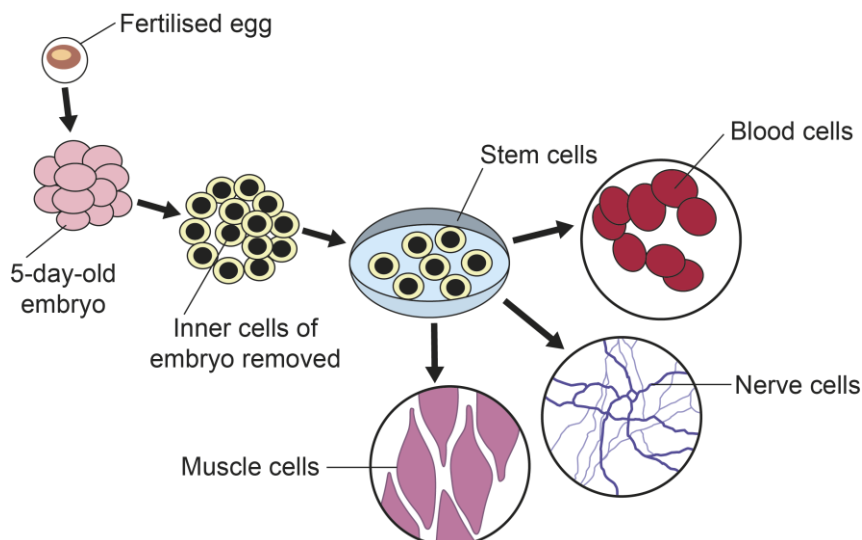
- a. Describe and explain how the sperm cell is adapted for its function.

- **It has a tail to help it swim to reach the egg.**
- **It has lots of mitochondria to provide it with energy through aerobic respiration.**

- b. Describe how the nucleus of the sperm cell is different to the nucleus of a body cell.

**It contains half the number of chromosomes/half the genetic material**

The diagram shows one way that stem cells can be produced from human embryos.



- c. Embryonic stem cells can be used to treat a condition such as paralysis.

Explain why.

**Stem cells can differentiate to form motor neurons to take the place of lost or damaged ones in the nervous system so messages can be passed from receptors to the brain and from the brain to the effectors.**

- d. During pregnancy, an umbilical cord and a placenta join the embryo to the mother. At birth the umbilical cord is cut. Stem cells can be obtained from the umbilical cord.

Many people think that the stem cells for treating human conditions should be obtained from umbilical cords rather than human embryos.

Suggest a reason why.

**There are ethical issues with using human embryos, as they could be developed into a foetus if inserted back into a uterus, whereas the placenta would not form a new foetus.**

4. Meristems can be used to clone plants that are at risk of extinction. Explain why this may be important for ecosystems.

**(Green) plants are the producers so the first level of any food web. If a plant became extinct it could remove a food supply for consumers, which would have a knock on effect on the survival of various consumer species.**

5. Complete the table to show the advantages and disadvantages of embryonic stem cells and adult bone marrow stem cells.

	Advantages	Disadvantages
Embryonic Stem Cells	<ul style="list-style-type: none"> <li>• <b>Can differentiate to form any type of human cell</b></li> <li>• <b>Would be wasted from IVF otherwise</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Results in loss of embryo</b></li> <li>• <b>'embryo rights'</b></li> </ul>
Adult Bone Marrow Stem Cells	<ul style="list-style-type: none"> <li>• <b>no ethical issues – patients can give permission</b></li> <li>• <b>does not kill donor</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>can only differentiate to form few types of blood cell</b></li> <li>• <b>can only be used to treat a few diseases</b></li> </ul>

Stretch Activity:

During George W. Bush's Presidency of the United States embryonic stem cell research was prohibited. Discuss the possible effects of this on Scientific research.

**Suggested points:**

- **No research into embryonic stem cells during this time**
- **No stem cell therapy treatment for paralysis, diabetes, organ replacement, Parkinson's, heart disease, cancer etc**
- **No research into efficacy of stem cell therapy, possibly increasing danger of stem cell treatments that have also been applied**