Stem Cells

1. Which row in the table shows the type of stem cell that has the potential to form the greatest variety of specialised cells?

	Type of stem cell	*State of differentiation*
A	embryonic	differentiated
B	tissue	differentiated
C	embryonic	undifferentiated
D	tissue	undifferentiated

2 Embryonic stem cells can be used therapeutically to differentiate and replace **any** damaged or diseased tissue.

This is because they are

A multipotent and specific genes are switched on

B pluripotent and all genes are switched on

C multipotent and specific genes can be switched on

D pluripotent and all genes can be switched on.

3. Which row in the table describes research and therapeutic uses of stem cells?

	Research use	**Therapeutic use**
A	To provide information on cell differentiation	To test drugs
B	To test drugs	To provide information on cell differentiation
C	To study how diseases develop	To repair damaged tissue
D	To repair damaged tissue	To regenerate damaged skin

4. The following list shows some procedures in which stem cells can be used:

1. Corneal repair
2. Drug testing
3. Skin regeneration.

Which procedures involve the therapeutic use of stem cells?

A 1 only

B 2 only

C 1 and 3 only

D 1, 2 and 3

5. Each type of human cell has a different structure and function because

A they contain different genes

B different genes are expressed in each

C some genes are lost during differentiation

D some genes are gained during differentiation.

6. Which row in the table describes meristems?

	Found in	Type of cell present
A	animal	specialised
B	animal	unspecialised
C	plant	specialised
D	plant	unspecialised

Stem Cells & Cancer

7. The list describes some uses of stem cells.

1 Studying how cells differentiate
2 Researching the development of Parkinson's disease
3 Producing skin for skin grafts
4 Bone marrow transplants

Which of these uses are **not** therapeutic?

A 1 only
B 1 and 2 only
C 2 and 4 only
D 3 and 4 only

8. Each type of human cell has a different structure and function because

A only some of their genes are expressed
B they contain different genes
C some genes are lost during differentiation
D some genes are gained during differentiation.

9. Which row in the table describes research and therapeutic uses of stem cells?

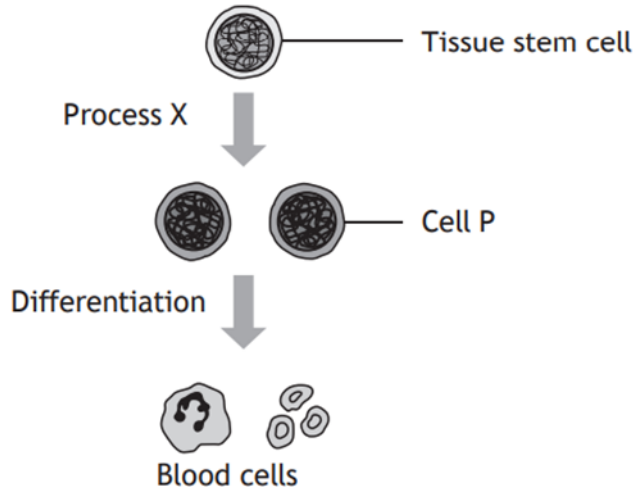
	Research use	Therapeutic use
A	to repair damaged tissue	to study how diseases develop
B	to test drugs	to provide information on cell differentiation
C	to study how diseases develop	to repair damaged tissue
D	to provide information on cell differentiation	to test drugs

10. Which of the following is **not** a use of stem cells?

A Skin grafts
B Drug testing
C IVF treatment
D Bone marrow transplant

Stem Cells

1. The diagram shows some stages in the development of blood cells.



(a) Name process X.

_____

(b) Explain why red blood cells contain haemoglobin after differentiation but white blood cells do not. **1**

_____

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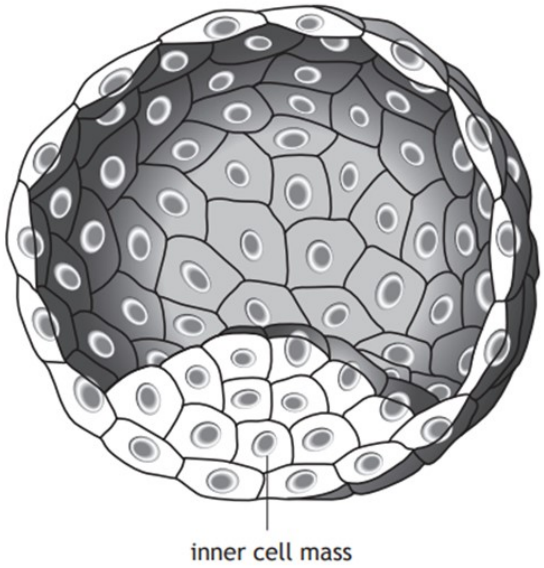
_____

2 The diagram below represents an embryo in the early stages of development and identifies the inner cell mass which is made up of stem cells.



(a) State one feature of stem cells. **1**

_____

_____

(b) Stem cells are also found in tissues throughout the adult body.

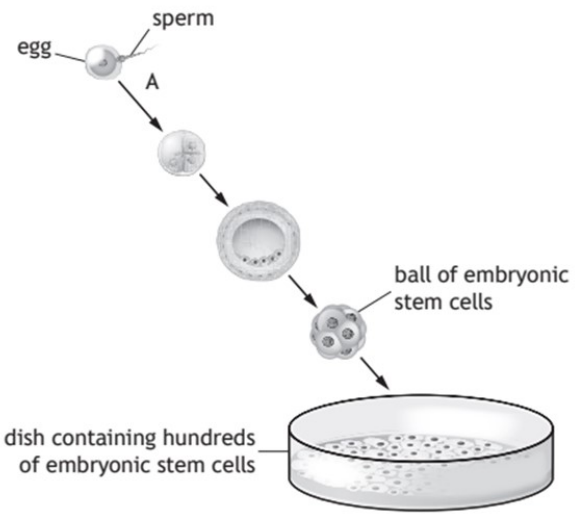
Explain how the function of tissue stem cells differs from that of the stem cells found in the inner cell mass of an embryo. **1**

_____

_____

Stem Cells & Cancer

3 The diagram shows some of the stages involved in the formation of embryonic stem cells for use in a laboratory.



(a) Explain why embryonic stem cells are described as being pluripotent. **1**

(b) Explain how differentiation of tissue stem cells leads to the production of specialised cells such as red blood cells. **1**

(c) Research has developed a type of stem cell that can be cultured in a laboratory directly from a patient's own somatic cells.

Suggest a benefit to the patient of using these stem cells in therapeutic treatments. **1**

4 Stem cells are used in research to study how diseases develop.

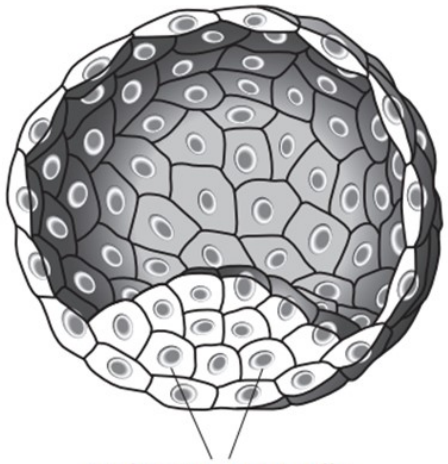
(a) (i) State one other research use of stem cells. **1**

(ii) Describe a property of embryonic stem cells, which makes them useful for research. **1**

(iii) Suggest an ethical reason why medical research may involve the use of embryonic stem cells. **1**

Stem Cells & Cancer

5. The diagram shows an early stage in the development of a human embryo.



(a) (i) The embryonic stem cells shown can differentiate into all body cell types.

State the term that describes this feature of these cells. **1**

_____

(ii) Explain why embryonic stem cells can differentiate into all cell types. **1**

_____

_____

b) Stem cells can be cultured in the laboratory for research purposes.

State **one** way in which stem cells are used in research. **1**

_____

_____

c) Scientists have recently found a way of converting skin cells into embryonic stem cells.

Suggest why this is an advantage from an ethical viewpoint. **1**

_____

_____

Stem Cells & Cancer

6. The human body contains many specialised cells, all of which have developed from embryonic stem cells.

nerve cells

liver cells

cardiac muscle cells

(a) Name the process by which a stem cell develops into a specialised body cell and explain how this process occurs. **2**

Process _____

Explanation _____

_____

b) A company has developed a drug that could be used to treat the symptoms of an inherited disease. Before proceeding to clinical trials using volunteers, the company decides to carry out additional tests in the laboratory using embryonic stem cells.

Suggest **one** ethical consideration that might have influenced this decision to use embryonic stem cells. **1**

_____

_____

7. Stem cells have uses in both therapy and research.

(i) It has been proposed that tissue cells could be used to repair severely damaged muscle tissue.

Suggest how this might be done. **1**

_____

_____

_____

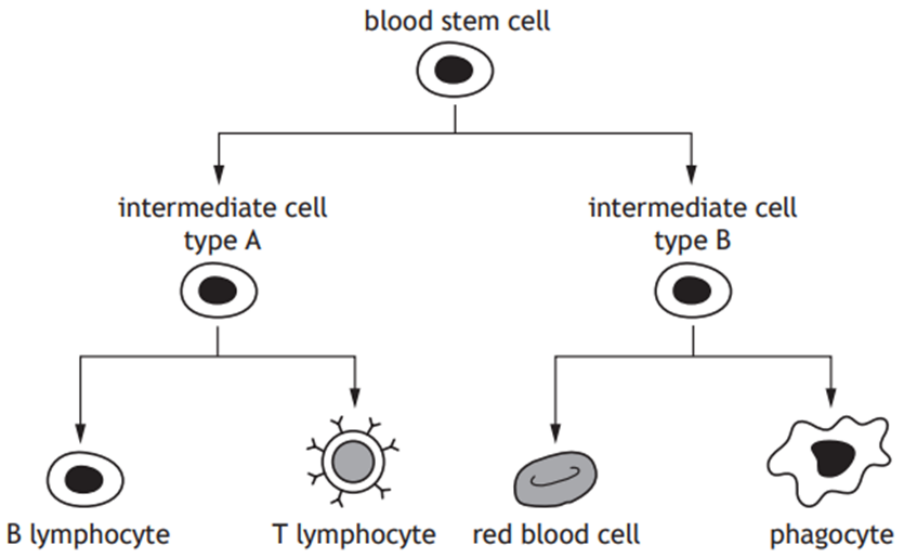
(ii) State how stem cells can be used as model cells in medical research. **1**

_____

_____

Stem Cells & cancer

8. The diagram shows a range of cell types produced by blood stem cells.



(a) State the location of blood stem cells in the body.

_____

(b) Use information in the diagram to explain why blood stem cells are described as tissue stem cells. **1**

_____

_____

(c) Describe one therapeutic use and one research use of stem cells. **2**

Therapeutic use _____

_____

Research use _____

_____

9. (i) Describe how tissue (adult) stem cells differ from embryonic stem cells. **1**

_____

_____

(ii) Describe how the heart cells produced by the patients as a result of the stem cell treatment in this investigation developed their specialised functions. **1**

_____

_____

(d) Much stem cell research is related to the therapeutic value of stem cells.

Give **one other** reason for carrying out stem cell research. **1**

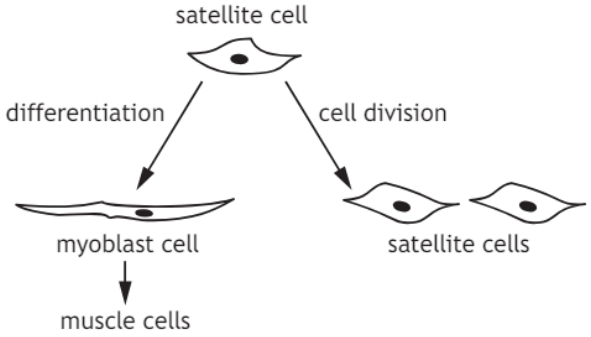
_____

_____

Stem Cells

10 (a) Human muscles contain satellite cells within the muscle tissue.

The diagram illustrates the division and differentiation of satellite cells.



(i) Using information from the diagram explain why satellite cells are an example of tissue (adult) and not embryonic stem cells. **1**

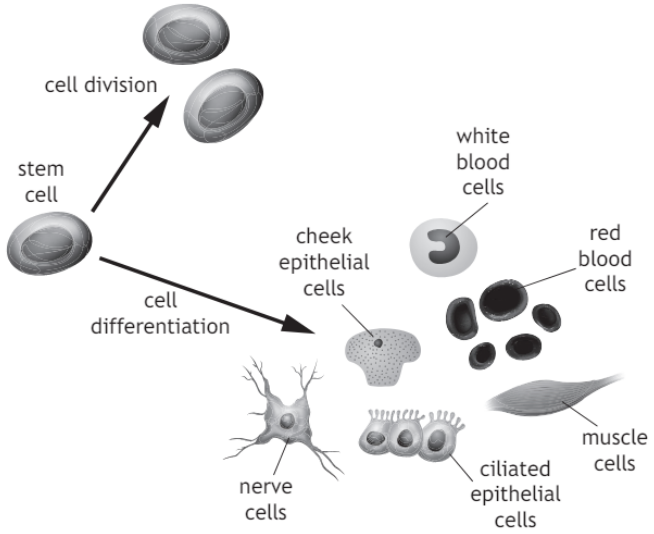
(ii) State **one** benefit to the human body of satellite cells differentiating into myoblast cells. **1**

(iii) Satellite cells could be used to treat muscle diseases.

Give **one** ethical reason for using satellite cells instead of embryonic stem cells in order to treat such diseases. **1**

(b) Give **one** example of how stem cells are used as model cells in medical research. **1**

11. Stem cells are unspecialised cells which can be found in embryonic and adult tissue.



(a) Explain how the diagram above indicates that the stem cell shown is an embryonic and not a tissue (adult) stem cell. **1**

(b) After a stem cell differentiates, only certain genes are expressed.

Explain how this results in different cell types. **1**

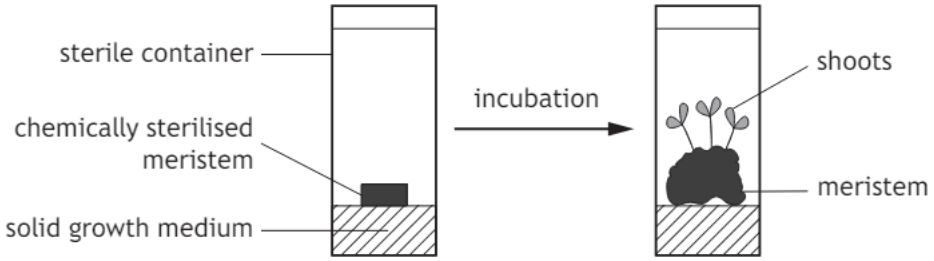
(c) Give **one** therapeutic use of stem cells. **1**

(d) State **one** ethical issue relating to the use of embryonic stem cells. **1**

Stem Cells

12. Plant tissue culture is a technique used to produce plants, which is carried out under sterile conditions to prevent growth of microorganisms.

In an investigation to study root and shoot formation a meristem was placed on solid growth medium as shown and left to incubate.



(a) Shoots were produced as a result of cellular differentiation.

(i) Describe how unspecialised cells in the meristem differentiate into specialised cells. **1**

_____

_____

(ii) New meristem cells would form in addition to shoots.

Name the cell process responsible for this. **1**

_____

Stem Cells

1. C
2. D
3. C
4. C
5. B
6. D
7. B
8. A
9. C
10. C

1a) Mitosis (self renewal)

1b) certain genes ON & others genes OFF to make specific protein (haemoglobin) in RBC.

2. a) pluripotent/produce all cell types

B) tissue only differentiate into certain cell types

3a). can differentiate into any cell type

B) certain genes On & other genes off to produce specific proteins

C) don't need to wait for a donor to get an organ transplanted.

4a (i) for drug testing

(ii) pluripotent OR any gene can be switched ON.

(iii) prevents animal testing

5a (i) pluripotent

(ii) embryo needs to make all cells of human body

b) drug testing/learn more about disease processes/cell growth OR differentiation

c) prevents destruction of embryos

6a) differentiation

Certain genes are turned ON & others OFF to make specific proteins for that cell type.

C) prevents animal testing

7a (i) Tissue stem cells can differentiate into muscle cells in lab which form muscle tissue that can be grafted into damaged muscle.

(ii) for drug testing/to learn more about disease processes

8a) bone marrow

B) only differentiate into cells of the blood.

C) therapeutic—corneal transport OR grow skin for skin transplant

Research—model cells for drug testing/learn more about diseases

To learn more about cell growth/differentiation

9. a (i) embryonic stem cells differentiate into all types of cells (pluripotent) OR tissue stem cells differentiate into only a few types of cells (multipotent)

(ii) certain genes switched On & other genes turned OFF to produce specific proteins

10 a (i) only produce one tissue type

(ii) can produce muscle cells for growth or repair of muscles.

(iii) embryos are not destroyed when using satellite cells

B) for drug testing OR to study disease processes

11 a) produces different types of cells

B) only certain proteins produces specific to cell.

C) corneal repair OR to grow skin for skin regeneration

D) embryo is destroyed

12. a (i) certain genes ON and others OFF to produce specific proteins

(ii) self renewal/mitosis