NAME _____ DATE _____

Which type of stem cell would you use?

Scenario 1 - Diabetes

Type 1 diabetes results when cells in the pancreas don't produce insulin. Without insulin, sugar builds up to toxic levels in the bloodstream, damaging the kidneys, eyes, heart, and nerves. Patients manage their diabetes by taking insulin, regulating their diet, and closely monitoring their blood sugar levels. However, the constant nature of diabetes management can be overwhelming, and it only addresses the symptoms of the disease; it is not a cure.

You are researcher who would like to develop a cure for diabetes. You want to engineer insulin-producing cells from stem cells and transplant them into diabetic patients.

Special Considerations

- The stem cells should be easy to obtain and manipulate in the lab.
- The stem cells should be able to differentiate into pancreatic beta cells that produce insulin.
- The stem cells should not trigger an immune response in the patient.

Which type of stem cell would you use?

1. In the table below, list the advantages and disadvantages of using each stem cell type to treat type 1 diabetes.
2. Indicate the stem cell type you think would be best.
3. Explain why you think the cells you chose would be best.

Stem Cell Type	Advantages	Disadvantages
Embryonic Stem (ES) Cells		
Somatic Stem Cells		
Induced Pluripotent Stem (PS) Cells		
Therapeutic Cloning to create embryonic stem cells		

Reasoning

Scenario 2 - Parkinson's Disease

Parkinson's disease is characterized by the gradual death of nerve cells in the center of the brain. As the cells die, they can no longer send out the signals that coordinate basic functions such as movement, attention, and learning. Therapy for the disease focuses on medications that mimic the chemical messengers the dying cells should be sending out. This drug therapy mainly slows the course of the disease, but it is not a cure.

You are a researcher who thinks it may be possible to devise a replacement stem cell therapy for Parkinson's disease. Your aim is to create nerve cells from stem cells, then transplant them to the midbrain where they would carry out their normal function.

Special Considerations

- The stem cells should be easy to obtain and manipulate in the lab.
- The stem cells should be able to differentiate into neurons that produce the proper chemical messenger.
- The stem cells should not trigger an immune response in the patient.

Which type of stem cell would you use?

1. In the table below, list the advantages and disadvantages of using each stem cell type to treat type 1 diabetes.

2. Indicate the stem cell type you think would be best.

3. Explain why you think the cells you chose would be best.

Stem Cell Type	Advantages	Disadvantages
Embryonic Stem (ES) Cells		
Somatic Stem Cells		
Induced Pluripotent Stem (PS) Cells		
Therapeutic Cloning to create embryonic stem cells		

Reasoning

Scenario 3 - Heart Disease

Heart disease is the leading cause of death for men and women in the United States. Most forms of Heart disease occur when too little blood flows through the heart muscle tissue, resulting in cell death and impaired function. Treatments include a wide range of medications and surgical procedures. However, if damage is severe, the patient may need a heart transplant. While a lucky few patients receive donor hearts, many die waiting. Those who do receive a new heart must take a combination of drugs for the rest of their lives to prevent the immune system from rejecting it.

You are a researcher faced with the task of repairing damaged heart tissue. You are thinking about introducing stem cells into the heart in the hope that they will grow into new, healthy heart tissue.

Special Considerations

- The stem cells should be easy to obtain and manipulate in the lab.
- The stem cells should be able to differentiate into heart muscle tissue

Which type of stem cell would you use?

1. In the table below, list the advantages and disadvantages of using each stem cell type to treat type 1 diabetes.

2. Indicate the stem cell type you think would be best.

3. Explain why you think the cells you chose would be best.

		Advantages	Disadvantages
Stem Cell Type	**Embryonic Stem (ES)** Cells		
	Somatic Stem Cells		
	Induced Pluripotent Stem (PS) Cells		
	Therapeutic Cloning to create embryonic stem cells		

Reasoning

Scenario 4 - Stem Cell Characteristics

Stem cells in the early embryo are different from any other type of cell. They are "immortal," meaning they can grow and divide indefinitely. They are also "pluripotent," meaning they can give rise to any type of cell in the body. These powerful characteristics give stem cells enormous potential for curing diseases. Before we can unlock this potential, we must first understand what is happening inside stem cells to make them different from other cell types. We know that as stem cells differentiate into other cell types, many genes are turned on and off. So an important step in understanding stem cells will be to identify which genes are active in stem cells and not in differentiated cells.

You are a researcher designing a study that will compare the gene expression in stem cells with gene expression in differentiated cells.

Special Considerations

- The stem cells should be easy to obtain and manipulate in the lab.

Which type of stem cell would you use?

1. In the table below, list the advantages and disadvantages of using each stem cell type to treat type 1 diabetes.
2. Indicate the stem cell type you think would be best.
3. Explain why you think the cells you chose would be best.

		Advantages	Disadvantages
Stem Cell Type	**Embryonic Stem (ES)** Cells		
	Somatic Stem Cells		
	Induced Pluripotent Stem (PS) Cells		
	Therapeutic Cloning to create embryonic stem cells		

Reasoning

Scenario 5 - Lupus

In a healthy person, specialized cells of the immune system recognize and attack foreign invaders such as bacteria and viruses. Lupus is a disease in which the cells of the immune system become "confused" and attack the body's own healthy cells. As the disease progresses, the immune cells attack the body faster than it can heal, causing severe damage to the patient's joints, skin, kidneys, blood cells, heart, and lungs. In an effort to stop the destruction of healthy tissue, patients take medications that suppress their immune cells. But these medications leave patients vulnerable to infections.

You are a researcher who is beginning to study stem cell treatments for lupus. One treatment that looks promising involves first destroying the patient's bone marrow, which contains the faulty immune cells, and then replacing it with properly functioning cells.

Special Considerations

- The stem cells should be easy to obtain and manipulate in the lab.
- The stem cells should be able to differentiate into immune cells.

Which type of stem cell would you use?

1. In the table below, list the advantages and disadvantages of using each stem cell type to treat type 1 diabetes.

2. Indicate the stem cell type you think would be best.

3. Explain why you think the cells you chose would be best.

		Advantages	Disadvantages
Stem Cell Type	**Embryonic Stem (ES)** Cells		
	Somatic Stem Cells		
	Induced Pluripotent Stem (PS) Cells		
	Therapeutic Cloning to create embryonic stem cells		

Reasoning