Genetic Engineering: What Comes Next, Before and After Birth

Name Date Class

Reading

1 Genetic engineering in humans falls into two different categories. Somatic editing changes cells in one person, usually after birth, and the change is not passed on. Germline editing changes embryos, eggs, or sperm, so the change is **heritable** and would appear in every later generation. Many scientific societies that call for caution on germline editing support somatic therapies. Because forecasts about a young technology are easily wrong, this reading separates what has happened from what is only likely.

2 The first CRISPR therapy to reach patients was Casgevy, approved in the United Kingdom and the United States in late 2023 for sickle cell disease. It works by editing a patient's blood stem cells outside the body and returning them. Its US list price was $2.2 million, and in July 2026 the FDA extended its use to children aged two and older. Yet a 2023 Global Burden of Disease study in The Lancet Haematology estimated that about 7.7 million people were living with the disease in 2021, most of them in sub-Saharan Africa, so access is a central question.

3 A second development is the **bespoke** therapy. In 2025, doctors at Children's Hospital of Philadelphia treated an infant, known as Baby KJ, who had a liver disorder called CPS1 deficiency. They built a base editor, a tool that changes a single DNA letter, for his single mutation and delivered it to his liver inside tiny fat particles. It took about six months to build. The treating team reported early improvements. It remains a single patient, however, and only long-term follow-up can show whether the benefit lasts.

4 The regulatory **pathway** is changing to fit such cases. In November 2025, FDA leaders proposed a "plausible mechanism" route in the New England Journal of Medicine, and draft guidance followed in February 2026. The framework requires that the disease have a known biological cause and that the treatment target it directly, and it asks that each developer monitor patients' safety closely after approval. The Philadelphia team argues that positive results in as few as five to ten patients might support approval of a whole platform of related editors. Ethicists have warned that the pathway could be stretched too far. Economics may decide the outcome: a treatment for a few patients must become **scalable** and **equitable** to matter widely.

5 Before birth, the nearest technology is not editing but screening. Polygenic embryo screening adds up thousands of small genetic differences to rank embryos from in vitro fertilization (IVF) by estimated disease risk or, with some providers, traits. Genomic Prediction, a US company, launched it commercially in 2019, and another provider, Orchid, charges $2,500 per embryo on top of the cost of IVF. Its predictive value is disputed. In a 2024 simulation using data from BioBank Japan, University of Tokyo researchers found that different scoring methods often disagreed about which embryo was "best", so the rankings were not **robust**. The European Society of Human Genetics called the practice unproven and unethical in 2021 and recommended that patients be told of its limits and that a public debate take place before wider use. Because screening does not alter DNA, it faces fewer legal barriers and may spread faster than editing.

6 Editing embryos is far more **contentious**. In 2018, the Chinese scientist He Jiankui announced the birth of twin girls from edited embryos. The international summit in London in 2023 concluded that heritable editing remains unacceptable and that safety and efficacy must first be established, and in 2025 several societies urged that heritable editing be paused for ten years. A 2020 survey in The CRISPR Journal found that 75 of 106 countries prohibit it. Technical obstacles remain, notably **mosaicism**, in which an embryo's cells are edited unevenly. Money is another: by early 2026, two US start-ups that planned embryo editing had shut down, while a third, Preventive, said it would not attempt a pregnancy unless safety could be shown. A 2025 analysis in Nature suggested that editing many variants at once could **theoretically** reduce disease risk sharply, but it treated such editing as **feasible** only over the next few decades.

7 Several outcomes seem likely over the next decade, although none is certain. Personalized somatic therapies will probably grow, limited by manufacturing and cost, and screening will probably expand faster than editing. Heritable editing is likely to stay outside clinical practice while its safety is unproven, partly because its effects would be **irreversible** across generations. The **prospect** of **enhancement**, editing healthy embryos for traits such as height, has a few **proponents**, who argue that parents should be free to choose, and many critics, who fear new inequality. Legal **safeguards** also differ widely between countries. The largest uncertainties are therefore social as much as scientific. The next concrete test is whether the first platform approvals under the new FDA pathway arrive, and at what price.

Vocabulary Matching

Match each word from the reading with its meaning. Write the letter on the line.

1	**heritable**	_____	**A**	made specially for one person
2	**bespoke**	_____	**B**	improvement beyond what is normal or needed
3	**pathway**	_____	**C**	people who support an idea or plan
4	**scalable**	_____	**D**	in principle, but not yet proved in practice
5	**equitable**	_____	**E**	a mix of edited and unedited cells
6	**robust**	_____	**F**	rules or measures that protect against harm
7	**contentious**	_____	**G**	fair and available to everyone
8	**mosaicism**	_____	**H**	a route or process leading to an outcome
9	**theoretically**	_____	**I**	likely to cause strong disagreement
10	**feasible**	_____	**J**	impossible to change back to before
11	**irreversible**	_____	**K**	the possibility of something in the future
12	**prospect**	_____	**L**	able to be increased to serve more people
13	**enhancement**	_____	**M**	staying reliable when tested in different ways
14	**proponents**	_____	**N**	able to be passed on to children
15	**safeguards**	_____	**O**	possible to do in practice

Fill in the Blank

Choose a word from the box to complete each sentence. Use each word once. The words are already in the correct form.

bespoke	**contentious**	**enhancement**	**equitable**	**feasible**	**heritable**	**irreversible**	**mosaicism**
pathway	**prospect**	**robust**	**safeguards**	**scalable**	**theoretically**		

1 Eye color is a _____ trait.

2 He wore a _____ suit made only for him.

3 The new _____ could speed up approval.

4 The software is _____ for large companies.

5 The city wants an _____ share of the funds.

6 The findings stayed the same in every test, so they were _____ .

7 The proposal was a _____ issue in parliament.

8 Embryo editing is harder to check because of _____ .

9 The plan works _____ , but nobody has tried it.

10 Is the plan technically _____ ?

11 The damage to the forest was _____ .

12 There is little _____ of a quick agreement.

13 Performance _____ is banned in sport.

14 The law includes _____ for patients.

Comprehension Questions

Answer in your notebook or discuss with a partner. Questions 10 to 12 are IELTS-style.

1 Explain the difference between somatic and germline editing and why the reading organizes its argument around it.

2 What do Casgevy and its price show about the promise and the limits of gene editing?

3 Describe Baby KJ's treatment. Why does the reading call it bespoke, and what caution does it add?

4 How would the plausible mechanism pathway change approval, and what do ethicists warn?

5 What is polygenic embryo screening, and why does the reading say it may spread faster than editing?

6 Summarize the state of heritable embryo editing: the events, the positions of scientific bodies, and the technical problems.

7 The reading uses words such as theoretically, probably, and is likely to. What do they show about the strength of the evidence?

8 Which of the outcomes in the last paragraph seems most likely, and which least certain? Explain.

9 Evaluate the sources (journal reports, regulators, professional societies, journalists, companies). Which claims are best supported?

IELTS-Style Questions

10 **True, False, or Not Given:** *"Orchid offers its embryo screening in Japan."* Explain your answer using evidence from the reading.

11 **Yes, No, or Not Given:** *"The writer believes that forecasts about gene editing should be treated with caution."* Explain your answer using evidence from the reading.

12 **Author's purpose:** Why does the writer treat therapy after birth before editing before birth? What effect does this order have?

True or False

Circle T (true) or F (false) according to the reading. Write a correction for each false statement on the dotted line.

1 **T / F** Somatic editing changes cells in one person, and the change is not passed on.

2 **T / F** Casgevy was the first CRISPR therapy approved for patients.

3 **T / F** The reading says most people with sickle cell disease live in Europe.

4 **T / F** Baby KJ's therapy was built in about six months.

5 **T / F** The plausible mechanism pathway requires a known biological cause of the disease.

6 **T / F** The Philadelphia team says results in ten thousand patients are needed for a platform approval.

7 **T / F** Polygenic embryo screening edits the DNA of embryos.

8 **T / F** The 2023 London summit said that heritable editing is acceptable now.

9 **T / F** By early 2026, two US start-ups that planned embryo editing had shut down.

10 **T / F** The reading says the largest uncertainties are only technical.

Discussion Questions

Talk with a partner or in a small group. The questions move from personal to more abstract.

1 The reading separates somatic and germline editing. Is this distinction clear and stable, or could it blur in the future?

2 Casgevy costs $2.2 million and most sickle cell patients live in Africa. Who should pay for such therapies, and how should countries prioritize?

3 Baby KJ's therapy was designed for one patient. When is it right to develop a treatment for a single person?

4 The plausible mechanism pathway could approve a platform on results from five to ten patients. What are the benefits and risks of a lower evidence bar?

5 Polygenic embryo screening ranks embryos by predicted risk or traits. Where should the line be between preventing disease and choosing traits?

6 Researchers in Tokyo found that different scoring methods often disagreed about the best embryo. Should a test with such uncertain results be sold to parents?

7 The London summit said heritable editing remains unacceptable at this time. What evidence and discussion would be needed to change that view?

8 A 2020 survey found that 75 of 106 countries prohibit heritable editing. How could such rules be enforced if a company moved its work to a country without them?

9 Mosaicism is a technical obstacle to embryo editing. How should scientists and the public treat a promised technology with unsolved technical problems?

10 Proponents of enhancement stress parents' freedom to choose, while critics fear inequality. Which argument do you find stronger, and why?

11 Editing that is heritable is irreversible across generations. Does irreversibility justify a stricter standard of proof than for somatic therapy?

12 Should the public decide questions such as enhancement, or should experts? What role should each have?

13 How should journalists describe forecasts about gene editing in a way that separates evidence from hope?

14 Which single safeguard would you most want in place before any heritable editing is tried, and why?

Language Focus: The Mandative Subjunctive: Require That, Urge That

After verbs and nouns of demand, recommendation, or proposal (urge, require, insist, recommend, propose, request), formal English uses that + subject + base verb, with no -s and no auxiliary: They urged that the trials be paused. It can also be expressed with should (should be paused). The negative puts not before the verb: that the trial not proceed.

In the reading:

- "The framework **requires that the disease have** a known biological cause and **that the treatment target** it directly."
- "…and it **asks that each developer monitor** patients' safety closely after approval."
- "…**recommended that patients be told** of its limits and **that a public debate take place** before wider use."

Practice: Rewrite with a mandative subjunctive: "*The committee requires the company to publish its data.*" Begin with *The committee requires that…*

Activities and speed challenge
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Notes