PART 2

Read the text below and answer questions 14–26.

Gene Editing and the Future of Food: The CRISPR Revolution

Gene editing has moved from an obscure discovery in molecular biology to a practical technology that is reshaping agricultural research. While earlier genetic modification often involved inserting new genetic material into a plant, CRISPR-Cas9 is widely described as a molecular find-and-replace system. A guide molecule directs the Cas enzyme to a chosen DNA sequence, where a cut is made and the cell's repair processes are harnessed to add, remove, or adjust genetic code. Because the edit can be small and targeted, supporters argue that the technique can produce outcomes closer to accelerated breeding than to the older idea of "adding a foreign gene," although the underlying tools are undeniably laboratory-made.

Much of the excitement comes from the speed with which researchers can test ideas. Conventional breeding can take many seasons to combine traits and then stabilise them, especially when the target involves complex inheritance. With editing, scientists can change specific sequences and then evaluate whether the desired trait appears, allowing quicker iteration. Yet speed is not the same as certainty. Plant genomes are interactive systems, and altering one component may shift other traits in ways that only become visible under real field conditions. For this reason, the promise of precision is always paired—at least in serious research programmes—with an emphasis on testing in diverse environments.

Many early applications focus on practical supply-chain problems and on traits that are easy to communicate to the public. Non-browning mushrooms and potatoes designed to resist bruising aim to reduce food waste by keeping produce visually appealing and marketable for longer. In disease management, wheat is being edited to resist powdery mildew, a fungal infection that can lower yields and encourage repeated pesticide use. Another set of projects targets food safety in staple crops: cassava is being modified to reduce toxic compounds that otherwise require careful processing. Biofortification work also features prominently, with certain rice varieties being developed to increase iron and zinc to address forms of micronutrient deficiency sometimes described as "hidden hunger."

Proponents argue that gene-edited crops may be more publicly acceptable than earlier GM products for several reasons. Some outcomes can be achieved without leaving foreign DNA in the final plant, because the edit may involve a deletion or adjustment of existing sequences rather than the insertion of a gene from another species. Supporters also note

that certain results could, in theory, be reached through conventional breeding or natural mutation, just much more slowly and less predictably. This argument is not simply rhetorical: it reflects the idea that what matters is the trait itself—such as reduced browning or improved nutrient content—rather than the path used to achieve it.

Environmental claims form a second pillar of the pro-editing case. If disease resistance reduces spraying, and if improved nutrient efficiency lowers the need for fertiliser, then editing could reduce agriculture's footprint. In a warming climate, the ability to develop climate-resilient traits—such as improved tolerance to drought or heat—more quickly is presented as an adaptation strategy. However, researchers repeatedly emphasise that many desired traits are polygenic and context-dependent. Drought tolerance, for example, is not one "switch" but a suite of interacting mechanisms that can behave differently depending on soil, temperature, and farming practices. The most credible programmes therefore combine editing with improved agronomy and multi-location field trials rather than relying on laboratory performance alone.

Regulation is one reason gene editing remains politically contentious. Some jurisdictions emphasise the process used to produce a plant and group gene-edited crops with conventional GMOs. Others assess the final product and focus on whether the trait is novel, hazardous, or distinguishable from outcomes that could arise through breeding. This divergence matters because it shapes costs, timelines, and public messaging. It also affects investment: if regulatory requirements are heavy, only large firms can afford development; if they are light, critics worry that oversight will be insufficient. Meanwhile, consumer confidence can be fragile, especially in places with a history of mistrust toward agribusiness.

Critics raise several concerns that are scientific, ecological, and socio-economic. On the scientific side, they point to off-target effects, meaning unintended edits at sites other than the intended sequence. Technical improvements—better guide design, more sensitive screening, and newer enzyme variants—are intended to reduce such risks, but critics argue that even rare unintended changes deserve careful scrutiny because they can interact with ecosystems in unpredictable ways. Ecological worries extend beyond genetics. If a disease-resistant crop becomes widespread, pathogens may evolve, potentially eroding the crop's effectiveness over time. For this reason, some experts argue that editing should be paired with integrated pest management and crop diversity so the agricultural system does not become dependent on a single defensive strategy.

The socio-economic debate is just as intense as the biological one. Supporters highlight the possibility of public-sector innovation: universities and national institutes can edit locally important crops that commercial markets often neglect. Opponents counter that

intellectual property rules may still concentrate control, shaping which traits are developed and who can afford access. Even if editing becomes cheaper, ownership of key methods and seed distribution channels can influence who gains. This is why equity is frequently invoked in policy discussions—not merely as an ethical slogan, but as a practical condition for whether the technology improves food systems broadly or mainly benefits well-resourced producers.

Ultimately, gene editing is best understood as a toolset rather than a single solution. It can reduce waste, improve nutrition, and support adaptation, but it also introduces new questions about governance, transparency, and responsibility. Policymakers face a balancing act: overly strict regulation may slow potentially valuable innovations, while overly permissive rules may undermine trust if problems arise. Many proposals therefore combine proportionate oversight with labelling, post-release monitoring, and clear standards for testing. The long-term impact will depend on how societies weigh trade-offs between speed, risk, sustainability, and fairness—and on whether access is distributed in ways that align with public goals rather than only private advantage.

Questions 14–18

Select the correct answer.

14 What distinction does the writer make between CRISPR-Cas9 and older GM techniques?

A CRISPR is much slower but safer.
B Older techniques relied on natural mutation only.
C CRISPR can make small, targeted edits rather than simply inserting new genetic material.
D Older techniques were only used on wheat and rice.

15 Why are mushrooms and potatoes mentioned in the text?

A To illustrate projects aimed at reducing food waste.
B To show crops that require more nitrogen fertiliser.
C To give examples of crops that failed in field trials.
D To demonstrate the difficulty of editing fungi.

16 What argument is used by proponents to suggest gene-edited crops might be more acceptable to the public?

A They are always cheaper to produce.
B They mimic changes that could occur through conventional breeding.

C They have been approved by all international regulators.
D They are grown exclusively in greenhouses.

17 According to the text, what is a concern raised by critics regarding the environment?

A Edited crops might consume too much water.
B Pathogens might evolve, reducing the effectiveness of disease-resistant traits.
C The soil quality will degrade faster.
D Native insects will stop pollinating the crops.

18 What is the writer's conclusion about the future of gene editing?

A It will solve global hunger within a decade.
B It will be banned in most countries due to safety fears.
C Its success depends on governance, equity, and balancing trade-offs.
D It will inevitably replace traditional farming entirely.

Questions 19–22

Match each gene-edited trait with the correct crop, **A–F**, below.

List of Crops

A Soybeans

B Cassava

C Rice

D Mushrooms/Potatoes

E Tomatoes

F Wheat

19 Designed to avoid browning or bruising

20 Edited to resist powdery mildew

21 Modified to reduce toxic compounds

22 Developed to increase iron and zinc

Questions 23–26

Complete the sentences below. Choose **NO MORE THAN TWO WORDS** from the text for each answer.

23 The CRISPR-Cas9 method is compared to a molecular ..... tool.

24 Some supporters argue certain edited crops may contain no .....

25 Critics worry about unintended changes known as .....

26 Policy discussions frequently treat ..... as a practical condition for ensuring that gene-editing technology benefits food systems broadly.

Answer Key

14. C
15. A
16. B
17. B
18. C
19. D
20. F
21. B
22. C
23. find-and-replace
24. foreign DNA
25. off-target effects
26. equity