

**1.4 Assessment**

*Match each term on the left with the best descriptor on the right. Each descriptor may be used only once.*

| Term                                   | Descriptor                                                                                     |
|----------------------------------------|------------------------------------------------------------------------------------------------|
| 1. ____ cloning                        | A. another term for transgenic organisms                                                       |
| 2. ____ gene cloning                   | B. a plant or animal that has foreign DNA inserted into it                                     |
| 3. ____ gene therapy                   | C. a technique used to duplicate genes, cells, and organisms                                   |
| 4. ____ biotechnology                  | D. a technique used to make copies of specific segments of DNA                                 |
| 5. ____ recombinant DNA                | E. DNA that has genetic material from two or more different organisms                          |
| 6. ____ transgenic organism            | F. technology used to make genetically engineered organisms produce useful products            |
| 7. ____ genetically modified organisms | G. a technique that inserts a normal functioning gene into an organism with a genetic disorder |

*Circle the letter of the best answer for questions 8 to 24.*

8. Cloning and gene therapy are examples of

A. codominance.

C. artificial selection.

B. biotechnology.

D. recombinant DNA.

9. Which of the following describes the purpose of gene cloning?

|     |                            |
|-----|----------------------------|
| I   | to kill viruses            |
| II  | to treat genetic disorders |
| III | to make growth hormones    |

A. I and II only

C. II and III only

B. I and III only

D. I, II, and III

10. What is usually used as a vector in cloning?

A. an egg

C. a plasmid

B. a sperm

D. a bacterium

11. During cloning, what is used to cut and insert foreign DNA into the vector?

A. viruses

C. enzymes

B. gametes

D. recombinant DNA

12. Which of the following places the descriptions in the correct sequence for cloning?

|   |                                                                               |
|---|-------------------------------------------------------------------------------|
| W | Insert the foreign DNA into a vector.                                         |
| X | Isolate the desired gene that is of interest.                                 |
| Y | The host cell produces proteins from the cloned gene.                         |
| Z | Expose the host cells to the vector so that they take up the recombinant DNA. |

A.  $W \rightarrow X \rightarrow Y \rightarrow Z$

C.  $X \rightarrow Z \rightarrow Y \rightarrow W$

B.  $W \rightarrow X \rightarrow Z \rightarrow Y$

D.  $X \rightarrow W \rightarrow Z \rightarrow Y$

13. Which of the following can have foreign DNA inserted into them?

|     |             |
|-----|-------------|
| I   | a plant     |
| II  | an animal   |
| III | a bacterium |

A. I and II only

C. II and III only

B. I and III only

D. I, II, and III

14. Some transgenic plants have been genetically modified so that they can

A. produce smaller yields.

C. be resistant to herbicides.

B. be killed by insect pests.

D. be susceptible to viral infections.

15. The genetically modified golden rice has which favourable trait?

A. a more appealing colour

B. can be used to make vaccines

C. increased nutritional content

D. can secrete toxins that kill various pests

16. Which of the following is not a positive impact of genetically modified crops?

A. produces antibiotics

C. reduces world hunger

B. reduces malnutrition

D. improves agricultural output

17. Genetically modified goats are used to produce which of the following in their milk?

A. iron

C. vitamin A

B. organs

D. growth hormones

18. Which of the following describes how DNA profiles can be useful to law enforcement?
- A. They can show when the crime occurred.
  - B. They can identify how the suspect committed the crime.
  - C. They can indicate whether or not the suspect committed the crime.
  - D. They can determine whether or not the suspect was at the crime scene.
19. A female lioness shares a habitat with two male lions at the zoo. She gives birth to four lion cubs. Which of the following techniques would be used to determine paternity (that is, which lion is the father of the cubs)?
- A. cloning of the lioness' and the two lions' genes
  - B. recombinant DNA from the two male lions' genes
  - C. artificial insemination on the lioness with both the lions' sperm
  - D. DNA profiles of the female lioness, the two male lions, and the four lion cubs
20. A farmer is planning to carry out artificial insemination on his herd of sheep. Which of the following correctly describes this process?
- A. collect eggs from a female sheep and place them into the male sheep
  - B. collect sperm from a male sheep and place it into the female sheep
  - C. collect sperm and inject it directly into the egg of the sheep with a needle
  - D. collect sperm and eggs from the sheep and have fertilization occur in a lab
21. Artificial insemination and in vitro fertilization are used to help with
- A. infertility.
  - B. delivery of births.
  - C. hormone injections.
  - D. terminations of pregnancy.
22. When in vitro fertilization is used, where does fertilization take place?
- A. in the testes of the male
  - B. in the uterus of the female
  - C. in the vagina of the female
  - D. outside the body in a petri dish

23. Gene therapy is used to cure

A. sterility.

C. genetic disorders.

B. miscarriages.

D. antibiotic-resistant bacteria.

24. Which of the following describes an invasive species?

|     |                                                             |
|-----|-------------------------------------------------------------|
| I   | is not native to an area                                    |
| II  | out-competes native species                                 |
| III | has positive impacts on the native species in the ecosystem |

A. I and II only

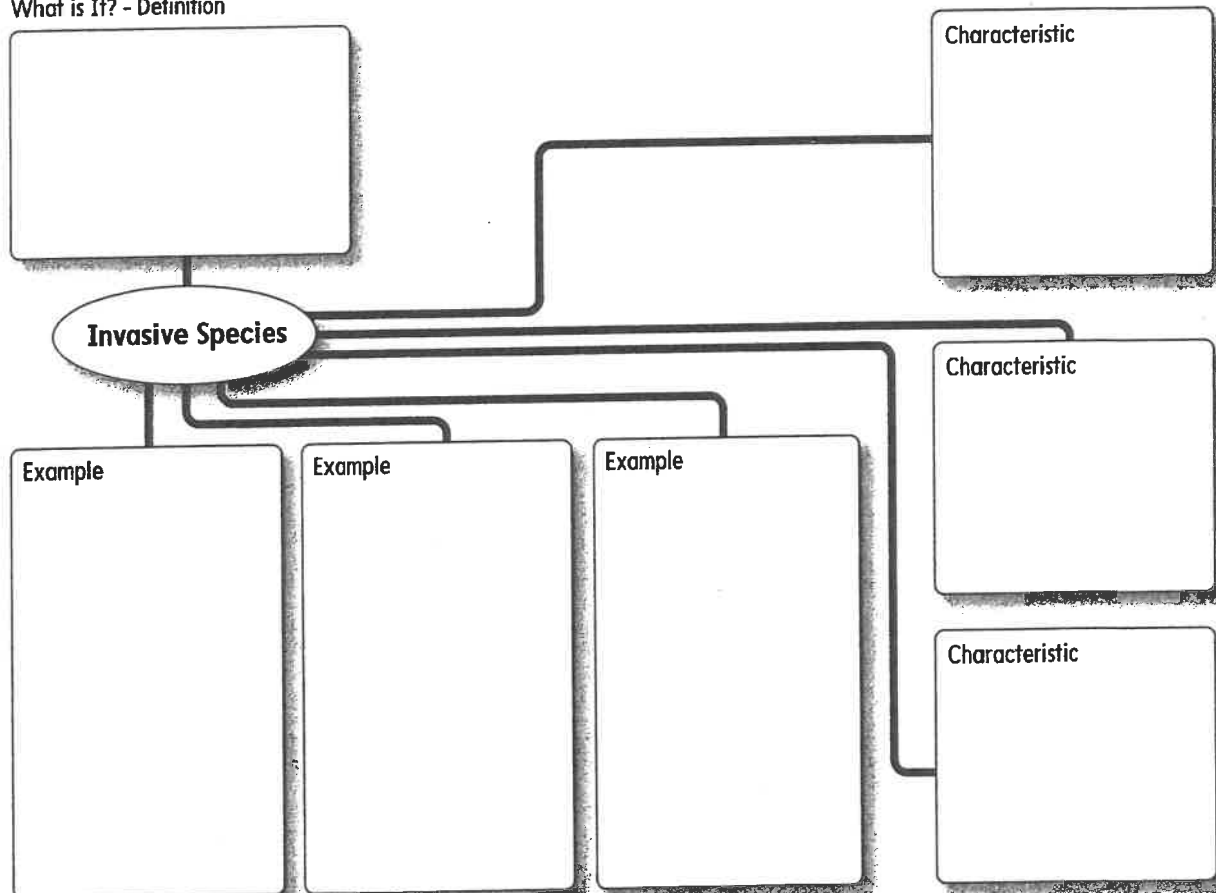
B. I and III only

C. II and III only

D. I, II, and III

25. Complete the following concept definition map to describe the concept of invasive species.

What is It? - Definition



## Should We Allow Gene Editing of Gametes and Embryos?

### What's the Issue?

Gene editing is a huge medical milestone for engineering research that involves gametes: sperm and egg cells. Gene editing uses CRISPR (pronounced “crisper”). This is a technique that locates a specific section of DNA in either egg and sperm cells or in an embryo and precisely alters or replaces the faulty gene. The resulting change is permanent and would prevent serious diseases and disabilities from being passed on to future generations. Human gene editing in gametes and embryos would help scientists to understand, treat, and prevent diseases such as sickle cell anemia, cystic fibrosis, cancer, Alzheimer's, HIV, and muscular dystrophy.

The CRISPR technique uses a cheap and fast tool called the CRISPR-Cas9. This simple yet powerful tool uses an enzyme called the Cas9 that acts like molecular scissors to cut out a targeted sequence of DNA. It can also insert and delete genetic material. CRISPR is considered precise, but there is still the possibility that a mistake could occur, resulting in the wrong DNA sequence being cut and altered. Even though CRISPR has been used with a variety of organisms since 2009, scientists have only recently begun to use it with humans. The long-term effects on and consequences for future generations are still unknown and may remain that way for many years to come.

Concern already exists that this technology would be used to produce “designer babies” with enhanced traits rather than to prevent hereditary diseases. Would scientists start to enhance embryos for intelligence, athletic abilities, artistic abilities, physical strength, and beauty? Should human embryos be genetically modified to express traits that could be passed on to future generations? How would this affect human society?

Laws and guidelines about genome editing research vary in different countries around the world. Some countries do not support gene editing in gametes and embryos, while others allow it. However, this kind of work does not exist in isolation. Research in one country can affect what is done in others. Can all scientists be expected to safeguard societal values and principles?