



BIOLOGY

BOOKS - CENGAGE BIOLOGY

BIOTECHNOLOGY

Manadatory Exercise

1. ___ is the technology to alter the genome of viruses, bacteria, and other cells for medical or agricultural purposes.



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2. Define Genetic engineering



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3. DNA fingerprinting



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4. Callus.



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5. Define Hybridoma technology



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6. ___DNA contains DNA from 2 or more different sources.



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7. If two organisms have identical DNA, they are said to be _____



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8. In order to insert a human gene into a bacterial plasmid, first a _____ enzyme is used to cut up the DNA and form 'sticky' ends on the gene and the plasmid. Then, the enzyme DNA _____ is used to seal the human gene into the plasmid. They can now be allowed to

reproduce, cloning the DNA, or the bacteria can be caused to _____ the human gene, producing pure human protein.



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9. Extrachromosomal DNA of bacteria used as vector in gene cloning is _____



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10. A gene for a particular trait that we are inserting into another strand of DNA is called the _____



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11. Which among the following is a palindromic base sequence?

A. 5' _____ CACGTA _____ 3'

3' _____ CTCAGT _____ 5'

B. 5' _____ CGTTCG _____ 3' 3' _____ ATGGTA _____ 5'

C. 5' _____ GATATG _____ 3' 3' _____

CTACTA _____ 5'

D. 5' _____ GAATTC _____ 3' 3' _____ CTTAAG

_____ 5'

Answer: D



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12. In which option the phrases are in correct order?

a. Use restriction enzyme b. Use DNA ligase c. Remove plasmid from parent bacterium d. Introduce plasmid into new bacterium

A. a, b, c, d

B. d, c, b, a

C. c, a, b, d

D. b, c, a, d

Answer: C



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13. Which of the following are transgenic organisms?

A. Holly Sheep and Flavr Savr tomato

B. Holly Sheep and Bt cotton

C. Dolly Sheep and Bt cotton

D. Flavr Savr tomato and Bt cotton

Answer: D



14. Humulin is

- A. an antibiotic
- B. a digestive enzyme in humans
- C. human insulin produced in bacteria
- D. bacterial insulin produced in humans

Answer: C



15. A GM crop is

A. irradiated crop.

B. transgenic crop.

C. raised on green manure.

D. a green manure.

Answer: B



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16. The term 'Golden rice' is given to the transgenic rice plant because of ____



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17. Bt cotton is _____ resistant.



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18. The role of agar gel in biotechnology is to

- A. combine segments of DNA into bacteria
- B. make enough copies of a DNA sequence for analysis
- C. produce a plastic that does not conduct electricity
- D. serve as a matrix for separating DNA fragments by size

Answer: D



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19. Note the relationship between the first two words and suggest a suitable word for the fourth place.

Golden rice : vitamin A and iron :: Flavr Savr
tomato : _____



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20. Note the relationship between the first two words and suggest a suitable word for the fourth place.

Haberlandt : Tissue culture : : Alec Jeffreys :



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21. Note the relationship between the first two words and suggest a suitable word for the fourth place.

Molecular scissors : Restriction endonucleases

:: Molecular stitchers : _____



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22. Note the relationship between the first two words and suggest a suitable word for the fourth place.

Organism from which common vector for cloning genes is derived : E.coli :: organism having toxic gene that kills insects : _____



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23. Match the following:

Column A	Column B
(i) Bacterial proteins that have the ability to cut both strands of the DNA molecule at certain points	(a) recombinant DNA
(ii) Contain foreign DNA	(b) vector
(iii) Is made by connecting segments of DNA from different sources	(c) restriction enzymes
(iv) General term for a carrier used to transfer a foreign DNA fragment into a host cell	(d) plasmid
(v) A small ring of DNA found in a bacterial cell	(e) transgenic organisms
(vi) The procedure for cleaving DNA from an organism into small segments, and inserting the segments into another organism	(f) genetic engineering or recombinant DNA technology



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24. Name two additional medical application of biotechnology that show promise in fighting disease.



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25. Bacteria with recombinant DNA can produce proteins useful for humans. Name three types of drugs produced by recombinant bacteria.



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Consolidated Exercise

1. Consider the two samples of DNA shown below. Single strands are shown for simplicity:

Sample #1

CAGTGATCTCGA ATTCGCTA GTA ACGTT

Sample #2

TCATGA ATTCCTGGA ATCAGCAAATGCA

If both samples are treated with a restriction enzyme (recognition sequence GAATTC) then indicate the number of fragments and the size

of each fragment from each sample of DNA.

Sample # 1

of fragments: _____

Sample # 2

of fragments: _____

List fragment size in order: largest →
smallest

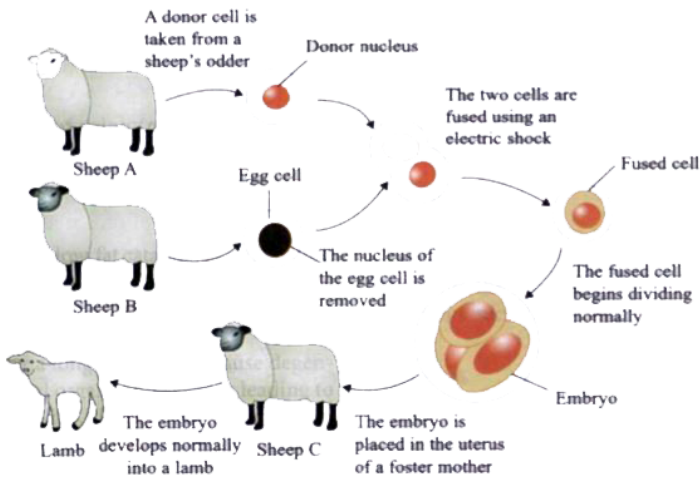
Sample # 1

Sample # 2



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2. Observe the picture and answer the questions below:

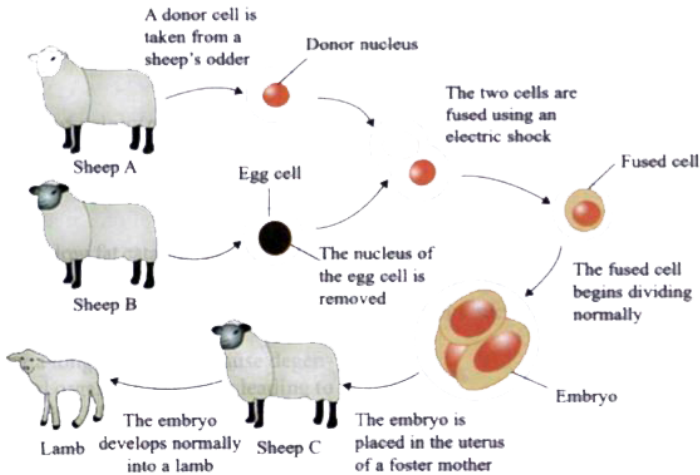


In the cloning shown above, which sheep is the source of the nucleus in the fused cell?



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3. Observe the picture and answer the questions below:

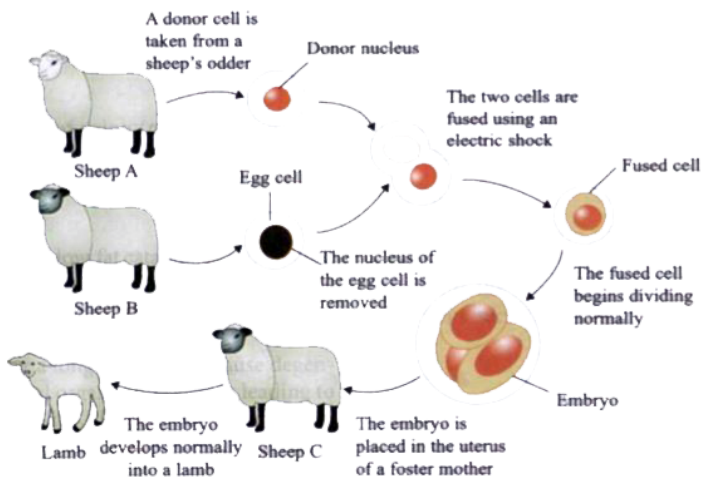


In the image, why was the nucleus removed from the egg cell?



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4. Observe the picture and answer the questions below:

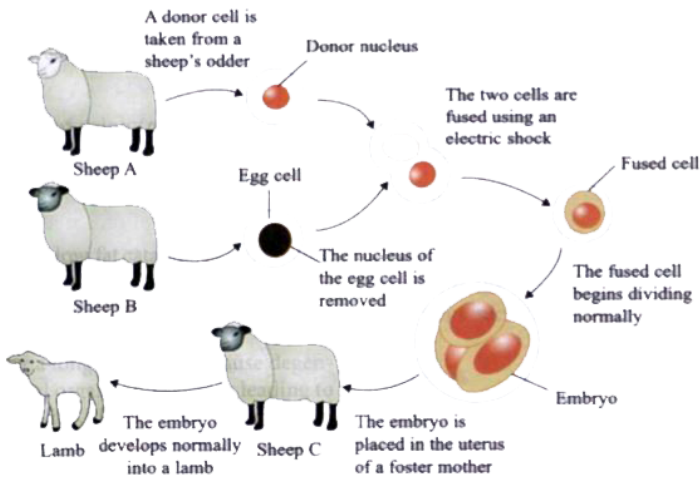


Which animal in the image is a clone?



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5. Observe the picture and answer the questions below:

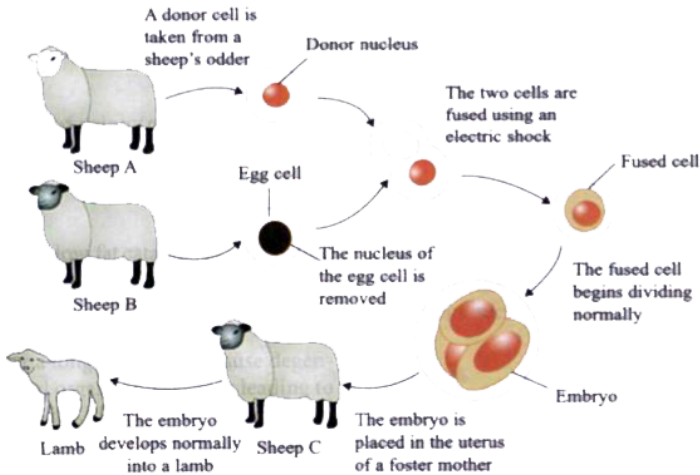


In the cloning shown above, which sheep provided an egg cell?



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6. Observe the picture and answer the questions below:

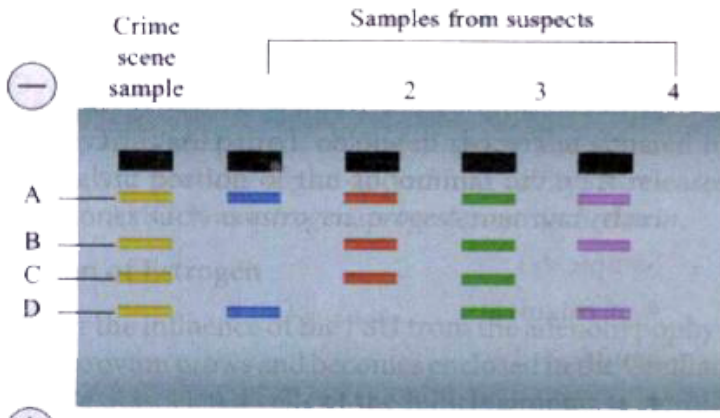


Which two animals in the image are genetically identical?



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7. Observe the diagram of results of DNA fingerprinting and answer the following



The technique being used to assess this information is called

A. human genome determination

B. karyotyping

C. electrophoresis

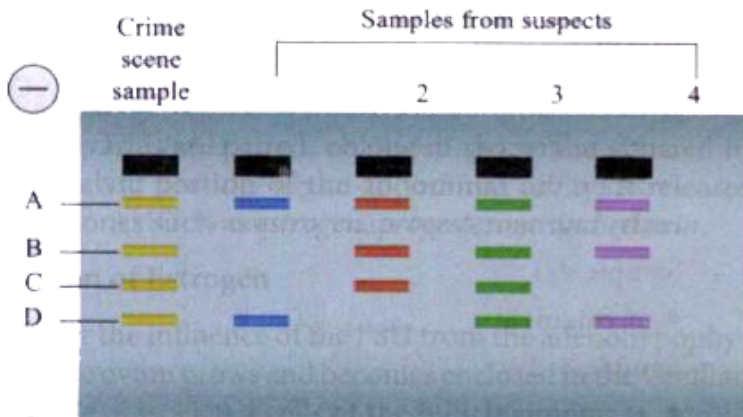
D. DNA blotting

Answer: C



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8. Observe the diagram of results of DNA fingerprinting and answer the following



Based on the indicated position of the wells, the longest DNA fragment in the crime scene sample is at position

A. A

B. B

C. C

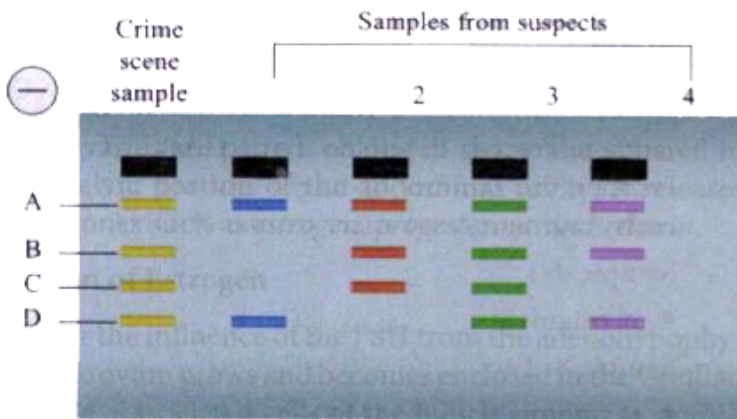
D. D

Answer: A



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9. Observe the diagram of results of DNA fingerprinting and answer the following



Based on the results of this forensic

investigation, it is likely that the guilty individual is

A. 1

B. 2

C. 3

D. 4

Answer: C



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10. Match with one or more than one correct answer.

Column A	Column B
(i) Restriction endonucleases	(p) Haberlandt
(ii) Callus	(q) Cut DNA at recognition sequence
(iii) Dolly, a sheep	(r) Molecular scissors
(iv) Totipotency	(s) Applicable to settle disputed parentage
(v) DNA fingerprinting	(t) Mass of undifferentiated cell
	(u) Ian Wilmut
	(v) First cloned organism
	(w) Used in forensic



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**Consolidated Exercise Multiple Choice Questions
With One Or More Than One Correct Answer**

1. Monoclonal antibodies are produced from hybrid cells, called hybridomas. The cells employed to obtain these hybridoma cells are:

- A. B-lymphocytes and bone marrow cells.
- B. B-lymphocytes and carcinoma cells.
- C. B-lymphocytes and myeloma cells.
- D. lymphoma cells and bone marrow cells.

Answer: C



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2. DNA fingerprinting can resolve

A. identification of a person

B. paternity dispute

C. maternity dispute.

D. land dispute

Answer: A::B::C



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3. Genetic engineering considered to be a branch of biotechnology is concerned with

A. alteration of genetic make up of cells.

B. transfer and replacement of genes

C. callus formation

D. creation of recombinant DNA

Answer: A::B::D



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4. Some of the steps involved in the production of humulin are given below.

Choose the correct sequence.

(i) synthesis of gene (DNA) for human insulin artificially (ii) culturing transformed E.coli in bioreactors. (iii) purification of humulin. (iv) insertion of human insulin gene into plasmid. (v) introduction of recombinant plasmid into E.coli. (vi) extraction of recombinant gene product from E.coli

A. i, iv, v, ii, vi, iii

B. iii, v, ii, i, vi, iv

C. ii, i, iv, iii, v, vi

D. i, iii, v, vi, ii, iv

Answer: A



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5. Which of the following are transgenic plants?

A. BT cotton

B. Golden rice

C. Flavr - Savr tomato

D. Sharabati sonara wheat.

Answer: A::B::C



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6. Stem cells may be extracted from:

A. stems of plants

B. bone marrow

C. roots of plants

D. blood

Answer: B



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7. Cultivation of Bt cotton has been much in the news. The prefix Bt means

A. barium treated cotton seeds.

B. bigger thread variety of cotton with better tensile strength.

C. produced by biotechnology using restriction enzymes and ligases.

D. carrying an endotoxin gene from *Bacillus thuringiensis*.

Answer: D



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8. The enzymes which are commonly used in genetic engineering are

A. restriction endonuclease

B. ligase

C. gyrase and polymerase.

D. helicase

Answer: A::B



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9. Tissue culturing is sometime described as:

A. techniques used for identification of fingerprints of individual.

B. a technique where individual cells are grown and divide in a bath of sterile nutrient fluid containing all required ingredients

C. a method for getting genetically similar plants

D. micropropagation

Answer: B::C::D



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10. Golden Rice is variety rich in

A. Vitamin A

B. Lysine

C. Vitamin C

D. Biotin

Answer: A



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11. Which of the following has not been synthesized by DNA technology?

A. Insulin

B. Hemoglobin

C. Somatostatin

D. Interferon

Answer: B



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12. First hormone produced artificially by culturing bacteria is

A. Insulin

B. Thyroxine

C. Testosterone

D. Adrenaline

Answer: A



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13. A technique of deliberate manipulation of genes/transfer of gene to a different organism is

A. Genetic engineering

B. Gene therapy

C. Tissue culture

D. None

Answer: A



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14. In plant biotechnology, root tumours are induced by

A. Rhizobium

B. Agrobacterium

C. Bacillus

D. Spirillum

Answer: B



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15. Salt tolerant transgenic has been developed for

A. Brinjal

B. Potato

C. Tomato

D. Grape

Answer: C



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16. Restriction enzyme was discovered by

A. Fleming

B. Smith and Nathans

C. Berg

D. Waksman

Answer: B



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17. Bt toxin is

A. Protein

B. Carbohydrate

C. Lipid

D. Enzyme

Answer: A



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18. Which is used in recombinant DNA technology ?

A. Virus

B. Capsid of Virus

C. Cell wall of virus

D. All of the above

Answer: B



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19. Flavr Savr Tomato has increased

A. Productivity

B. Vigour

C. Self life

D. Flavouring period

Answer: C



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20. DNA or RNA segment tagged with a radioactive molecule is called

A. Probe

B. Clone

C. Plasmid

D. Vector

Answer: A



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21. The ends of DNA fragments are sticky due to

A. Unpaired bases

B. Free methylation

C. Endonuclease

D. Calcium ions

Answer: A



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22. Which is used in gene cloning

A. Lomasome

B. Mesosome

C. Plasmids

D. Nucleotide

Answer: C



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23. Vaccines prepared through recombinant DNA technology are called:

A. First generation vaccines

B. Second generation vaccines

C. Third generation vaccines

D. None of the above

Answer: C



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24. Construction of first recombinant DNA was done by using plasmid of

A. Salmonella

B. E. coli

C. Yeast

D. Bacillus thuringiensis

Answer: B



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25. Which one is a cloning plasmid, not an expression plasmid?

A. PBAD-18-cam

B. PBCSK

C. PUC18

D. PET

Answer: C



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26. Somaclonal variations are the ones

A. caused by mutations

B. produced during tissue culture

C. caused by Gamma rays

D. through sexual embryogeny

Answer: B



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27. Plant developed in vitro culture from pollen grains are

A. Androgenic haploids

B. Pollen plants

C. Male plant

D. Sterile plant

Answer: A



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28. Anther culture was discovered by

A. Guha and Maheshwari

B. Skoog and Millar

C. Steward

D. K.C. Kashyap

Answer: A



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29. Somatic hybridization is achieved through

- A. Grafting
- B. Protoplast fusion
- C. Conjugation
- D. RDT

Answer: B



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30. Differentiation of callus into plant parts is

- A. Embryogenesis
- B. Embryoid formation
- C. Morphogenesis
- D. Totipotency

Answer: C



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31. Virus free culture is obtained through

- A. Pollen culture
- B. Meristem culture
- C. Shoot culture
- D. Stem culture

Answer: B



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32. The structure employed by white for first successful tissue culture was

- A. Root of carrot
- B. Root of tomato
- C. Leaf cells
- D. Apical meristem

Answer: B



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33. Explant is required to be disinfected before placing in culture. This is done by

- A. Autoclaving
- B. UV-rays
- C. X-rays
- D. Hypochlorite

Answer: D



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34. Cell wall of a plant removed with the help of enzyme is

A. Cellulase and pectinase

B. Ribozyme

C. Chitinase

D. Lysozyme

Answer: A



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35. Removal of cell wall from plant is called

A. Tonoplast

B. Protoplast

C. Protoplasm

D. None

Answer: B



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36. Haploid plant cultures are got form

A. Leaves

B. Root tip

C. Pollen grain

D. Buds

Answer: C



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37. Pomato formed through

A. Potato and Tomato

B. Potato and Rice

C. Potato and Maize

D. Tomato and Brinjal

Answer: A



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38. Bomato formed through

A. Potato and tomato

B. Brinjal and Tomato

C. Potato and Maize

D. All of the above

Answer: B



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39. Somatic embryo develops in tissue culture from

A. Somatic cell

B. Single germline cell

C. Any fertilized cell

D. Anther

Answer: A



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40. Somatic cell hybrids are produced with the help of

A. Polyhydroxy glycol

B. Polyethylene glycol

C. Polyvinyl glycol

D. Polypropylene glycol

Answer: B



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41. In callus culture, root can be induced by the supply of

A. Ethylene

B. Gibberellin

C. Cytokinin

D. Auxin

Answer: D



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42. Technique that was employed to produce haploids of *Datura* was

A. Meristem culture

B. Anther culture

C. Protoplast culture

D. Callus culture

Answer: B



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43. Branch of biology dealing with improvement of plant variety is

A. Plant breeding

B. Agrology

C. Eugenics

D. None

Answer: A



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44. Father of Biotechnology is

A. Paul Berg

B. Mendel

C. Fleming

D. Guha

Answer: A



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45. Humulin is also called

A. Insulin

B. Human insulin

C. Enzyme

D. Blood supply

Answer: B



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46. It is not possible to breed plants and animals of desired characters through

- A. Tissue culture
- B. Genetic engineering
- C. Hormone
- D. All of the above

Answer: B



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47. DNA segment cleaved by restriction enzymes are

A. Palindromic DNA

B. B-DNA

C. D-DNA

D. A-DNA

Answer: A



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48. In RDT, DNA fragments are joined through

A. Ligase

B. Polymerase

C. Helicase

D. Gyrase

Answer: A



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49. An abnormal gene is replaced by Normal gene. It is called

- A. Gene therapy
- B. Cloning
- C. Mutation
- D. None of the above

Answer: A



Olympiad And Ntse Level Exercises

1. Introduction of one or more genes into an organism which are normally not possessed by them or their deletion by using artificial means (not by breeding) comes under

- A. molecular biology
- B. genetic hybridisation
- C. cytogenetics

D. genetic engineering

Answer: B



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2. Which of the following yeasts is used in the preparation of beer and wine?

A. *Schizomyces ludwigii*

B. *Saccharomyces*

C. *Schizosaccharomyces*

D. Ashbya

Answer: B



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3. Raghu is married to Radha, who was previously married to Varun, now deceased. Varun and Radha conceived one child together and adopted one child. Raghu and Radha have also conceived one child. All members of Radha's current family have had DNA

fingerprinting done. Unfortunately the sheet that identified each child has been misplaced. Identify which fingerprint in each lane corresponds to each child.

Size standard	Raghu	Radha	Varun	Child 1	Child 2	Child 3

_____		_____			_____	_____
_____		_____	_____			_____
_____	_____		_____			
_____	_____			_____	_____	

A. 1-child of Radha and Raghu, 2-adopted child, 3-child of Radha and Varun

B. 1-adopted child, 2-child of Radha and Raghu, 3-child of Radha and Varun

C. 1-adopted child, 2-child of Radha and

Varun, 3-child of Radha and Raghu

D. 1-child of Radha and Varun, 2-child of

Radha and Raghu, 3-adopted child

Answer: B



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4. A piece of foreign DNA was inserted into a plasmid with an antibiotic resistance gene and lactose Z gene. The plasmid DNA was cut with

a restriction enzyme, which splits the lactose Z gene and opens the circle. The foreign DNA was next inserted into the open restriction site of the plasmid. When the recombinant plasmid was introduced into bacterial cells and grown in the presence of antibiotic, some of the colonies turned blue in the presence of gene. The blue colonies contained

A. plasmid only

B. foreign DNA only

C. both foreign DNA and plasmid

D. neither plasmid nor foreign DNA

Answer: A



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5. From the below list, which of the following is the most logical sequence of steps for splicing foreign DNA into a plasmid and inserting the plasmid into a bacterium?

(i) Transform bacteria with recombinant DNA molecule. (ii) Cut the plasmid DNA using

restriction enzymes. (iii) Extract plasmid DNA from bacterial cells. (iv) Hydrogen-bond the plasmid DNA to non plasmid DNA fragments. (v) Use ligase to seal plasmid DNA to non plasmid DNA.

A. (iv), (v), (i), (ii), (iii)

B. (iii), (ii), (iv), (v), (i)

C. (iii), (iv), (v), (i), (ii)

D. (ii), (iii), (v), (iv), (i)

Answer: B



6. In genetic engineering, a DNA segment (gene) of interest is transferred to the host cell through a vector. Consider the following four agents (i-iv) in this regard and select the correct option about which one or more of these can be used as a vector/vectors?

(i) bacterium (ii) plasmid (iii) Plasmodium (iv) enzyme

A. (ii) only

B. (i) and (ii) only

C. (i), (iii) and (iv)

D. (iv) only

Answer: A



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7. Two couples had a dispute of parentage over a child and had filed a case. The judge had asked both the couples along with the child to go for DNA fingerprinting. The results

of electrophoresis are as shown below. Which of the couple is the right parents of the child?

F_1	F_2	M_1	M_2	C
_____		_____		
	_____		_____	

_____				_____
		_____		_____

A. F_1, M_1

B. F_1, M_2

C. F_2, M_2

D. F_2, M_1

Answer: A





8. This question consists of two statements:
Assertion and Reason.

Assertion: Genetically modified tomato Flavr Savr has increased shelf life and better nutrient quality.

Reason: This is achieved by reducing the degrading enzymes responsible for spoilage of food and refrigeration.

Mark your response from the following options:

A. Both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.

B. Both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion.

C. Assertion is true statement but Reason is false.

D. Both Assertion and Reason are false statements.

Answer: C



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9. DNA fingerprinting technique was first developed by

- A. Boysen and Jensen
- B. Jeffrey, Wilson and Thien
- C. Schleiden and Schwann
- D. Edward and Steptoe

Answer: B



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10. Genetic engineering is possible because

A. the phenomenon of transduction in bacteria is well understood

B. we can see DNA by electron microscope

C. we can cut DNA at specific sites by endonucleases such as DNAase I

D. restriction endonucleases purified from bacteria can be used in vitro

Answer: D



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11. Restriction enzyme was discovered by

A. Waksman

B. Alexander Fleming

C. Berg

D. A. Werner, H. Smith and Nathans

Answer: D



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Challenging Exercise

1. Using special enzymes, scientists have successfully removed the gene that controls the production of interferon and have inserted this gene into the DNA of certain

bacteria. These bacteria can now produce interferon. What is this technique known as?



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2. What are the latest issues surrounding biotechnology?



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