

- Q1** Which one of the following bacteria has found extensive use in genetic engineering work in plants?
 (A) *Clostridium septicum*
 (B) *Xanthomonas citri*
 (C) *Bacillus coagulens*
 (D) *Agrobacterium tumefaciens*

- Q2** _____ is used for transformation of rDNA in bacterial cells.
 (A) Na^+
 (B) Ca^{2+}
 (C) K^+
 (D) NO_3^{2-}

- Q3** Go through the figure and select the option out of (a – d).



A DNA	B DNA	Enzyme recognizing palindrome	Enzyme joining the sticky ends
(a) Vector	Foreign	DAN ligase	EcoRI
(b) Vector	Foreign	EcoRI	DAN ligase
(c) Vector	Foreign	Dxonuclease	DAN ligase
(d) Vector	Foreign	DAN ligase	Exonuclease

- (A) a (B) b
 (C) c (D) d

- Q4** Which of the following cut the DNA from specific places?
 (A) Restriction endonuclease (EcoRI)
 (B) Ligase
 (C) Exonuclease
 (D) Alkaline phosphate

- Q5** In PCR, the separation of DNA strands is due to:
 (A) High temperature
 (B) Two sets of Primers
 (C) Taq DNA polymerase
 (D) Deoxynucleotides

- Q6** Plasmids are
 (A) ssDNA
 (B) dsDNA (linear)
 (C) dsDNA (circular)
 (D) denatured-DNA

- Q7** Which of the following is a palindromic sequence?
 (A) 5'-CGTATG-3' 3'-CGAATG-5'
 (B) 5'-CGAATG-3' 3'-GCATAC-5'
 (C) 5'-GAATTC-3' 3'-CTTAAG-5'
 (D) 5'-GACTAC-3' 3'-CTTAAG-5'

- Q8** What is not present in the simple stirred tank bioreactor?
 (A) Foam breaker
 (B) Temperature control system
 (C) Sampling port
 (D) Sparger

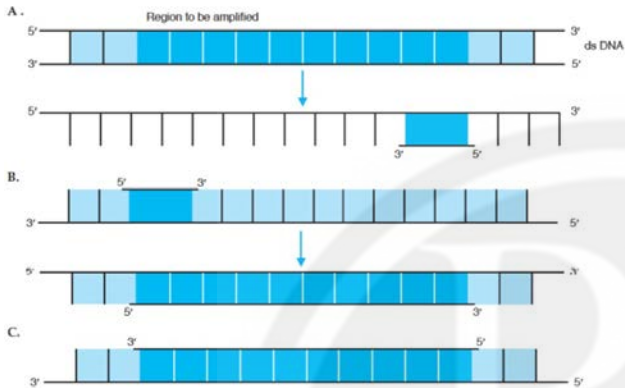
- Q9** The colonies of recombinant bacteria appear white in contrast to blue colonies of non-recombinant bacteria due to
 (A) Insertional inactivation of α -galactosidase in non-recombinant bacteria
 (B) Activation of γ -galactosidase in recombinant bacteria
 (C) Inactivation of glycosidase enzyme in recombinant bacteria
 (D) Inactivation of β -galactosidase gene in recombinant bacteria

- Q10** DNA or RNA segment tagged with a radioactive molecule is called
 (A) vector (B) probe
 (C) clone (D) plasmid.



- Q11** The fragmented DNA can be visualized by staining DNA with
 (A) NaCl
 (B) Ethidium bromide
 (C) Ethylene bromide
 (D) NaBr

- Q12** The figure below shows three steps (A, B, C) of Polymerase Chain Reaction (PCR). Select the option giving correct identification together with what it represents?



- (A) B- denaturation at a temperature of about 98°C separating the two DNA strands.
 (B) A- denaturation at a temperature of about 50°C.
 (C) C-extension in the presence of heat stable DNA polymerase.
 (D) A-annealing with two sets of primers
- Q13** A cloning vector has two antibiotic resistance genes- for tetracycline and ampicillin. A foreign DNA was inserted into the tetracycline gene. Non- recombinants would survive on the medium containing:
 (A) ampicillin but not tetracycline
 (B) tetracycline but not ampicillin
 (C) both tetracycline and ampicillin
 (D) neither tetracycline nor ampicillin

- Q14** Which of the following statements correctly describe recombinant DNA formation?
 (i) Restriction enzymes generate sticky ends that facilitate joining of DNA fragments.
 (ii) DNA ligase joins DNA fragments by forming phosphodiester bonds using ATP.
 (iii) Vector DNA and foreign DNA are commonly cut by the same restriction enzyme to produce compatible ends.
 (iv) Blunt-ended DNA fragments can never be ligated.

Choose the correct option:

- (A) (i), (ii) and (iii)
 (B) (i) and (iii)
 (C) (ii) and (iii)
 (D) (i), (iii) and (iv)
- Q15** Which of the following is not a method of introducing alien DNA into host cells?
 (A) Micro injection
 (B) Heat shock method
 (C) Gene gun method
 (D) Gel electrophoresis
- Q16** Main steps in the formation of Recombinant DNA are given below. Arrange these steps in a correct sequence.
 A. Insertion of recombinant DNA into the host cell.
 B. Cutting of DNA at specific location by restriction enzyme.
 C. Isolation of desired DNA fragment.
 D. Amplification of gene of interest using PCR.
 Choose the correct answer from the options given below:
 (A) C, A, B, D (B) C, B, D, A
 (C) B, D, A, C (D) B, C, D, A



- Q17** For transformation, microparticles coated with DNA to be bombarded with gene gun are made up of
 (A) silver or platinum
 (B) platinum or zinc
 (C) silicon or platinum
 (D) gold or tungsten
- Q18** The source of Taq polymerase used in PCR is a :
 (A) Thermophilic fungus
 (B) Mesophilic fungus
 (C) Thermophilic bacterium
 (D) Halophilic bacterium
- Q19** Corn borers are controlled by
 (A) Cry I Ab
 (B) Cry I Ac
 (C) Cry II Ab
 (D) Both (B) and (C)
- Q20** Main objective of producing herbicide resistant GM crops is
 (A) encourage ecofriendly herbicides.
 (B) reduce herbicide accumulation in food articles for health safety.
 (C) eliminate weeds from fields without the use of manual labour.
 (D) eliminate weeds from the fields without the use of herbicides.
- Q21** Which part of the tobacco plant is infected by *Meloidogyne incognita*?
 (A) Stem (B) Root
 (C) Flower (D) Leaf
- Q22** X technique is now routinely used to detect HIV in suspected AIDS patients. It is being used to detect mutations in genes in suspected cancer patients too. It is a powerful technique to identify many other genetic disorders. Identify X-
 (A) X=P C R
 (B) X= DNA fingerprinting
 (C) X= Bioinformatics
 (D) X = X-ray diffraction
- Q23** How many of the given techniques are used in early detection of a disease (defect) in our body?
 A. Recombinant DNA technology
 B. Serum analysis
 C. Urine analysis
 D. PCR
 E. ELISA
 (A) Five (B) Four
 (C) Three (D) One
- Q24** The first human hormone produced by recombinant DNA technology is
 (A) insulin (B) estrogen
 (C) thyroxin (D) progesterone.
- Q25** Assertion : 'Cry' proteins are named so because they are crystal proteins.
 Reason : 'Cry' proteins solubilise in alkaline pH of the insect's gut and activate Bt toxin.
 (A) Assertion and reason both are correct statements and reason is correct explanation for assertion.
 (B) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
 (C) Assertion is correct statement but reason is wrong statement.
 (D) Assertion is wrong statement but reason is correct statement.



Q26 In Bt cotton, the Bt toxin present in plant tissue as protoxin is converted into active toxin due to

- (A) action of gut microorganisms
- (B) presence of conversion factors in insect gut
- (C) alkaline pH of the insect gut
- (D) acidic pH of the insect gut.

Q27 It is sometimes necessary to genetically engineered mammalian cells to produce proteins because they

- (A) can produce larger quantities of protein than bacteria.
- (B) can read eukaryotic genes and bacteria cannot.
- (C) can add sugars to make glycoproteins and bacteria cannot.
- (D) are easier to grow than bacteria.

Q28 Golden rice is a genetically modified crop plant where the incorporated gene is meant for biosynthesis of

- (A) omega 3
- (B) vitamin A
- (C) vitamin B
- (D) vitamin C

Q29 Match **List-I** with **List-II**.

	List-I		List-I
(A)	Rosie	(I)	Tripling the food supply
(B)	ELISA	(II)	Protein-enriched milk
(C)	Explant	(III)	Test to detect antigen- antibody interaction
(D)	Green revolution	(IV)	Whole plants could be regenerated from this

Choose the **correct** answer from the options given below:

- (A) A-II, B-III, C-IV, D-I
- (B) A-I, B-III, C-IV, D-II
- (C) A-II, B-III, C-I, D-IV
- (D) A-IV, B-III, C-II, D-I

Q30 RNA interference gene interferes with

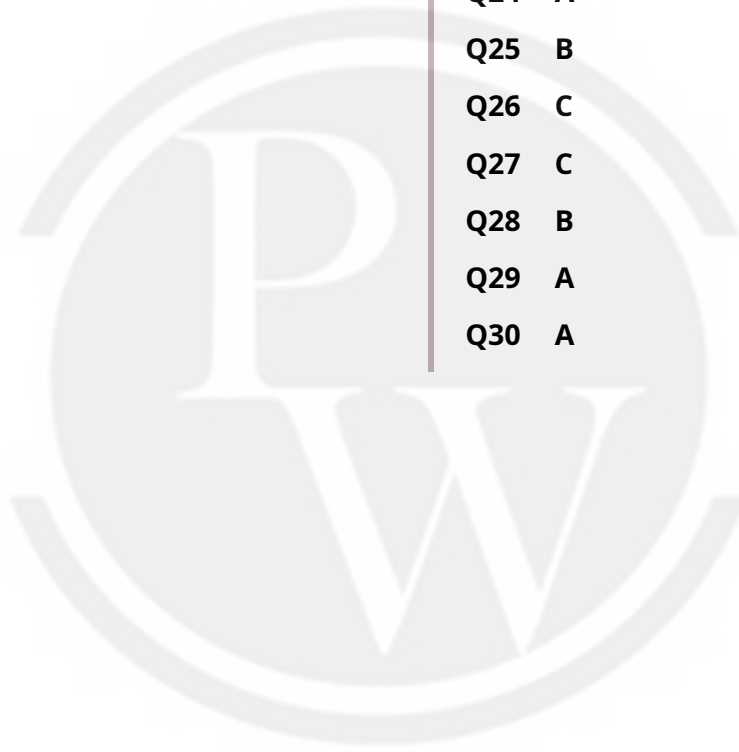
- (A) translation in nematode
- (B) transcription in nematode
- (C) both transcription and translation in nematode
- (D) synthesis of rRNA in nematode



Answer Key

Q1 D
Q2 B
Q3 B
Q4 A
Q5 A
Q6 C
Q7 C
Q8 D
Q9 D
Q10 B
Q11 B
Q12 A
Q13 C
Q14 A
Q15 D

Q16 D
Q17 D
Q18 C
Q19 A
Q20 C
Q21 B
Q22 A
Q23 C
Q24 A
Q25 B
Q26 C
Q27 C
Q28 B
Q29 A
Q30 A



Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

Agrobacterium tumefaciens has been extensively used in genetic engineering experiments.

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Video Solution:



Q2 Text Solution:

- Calcium ions (Ca^{2+}) are commonly used in the transformation process of recombinant DNA (rDNA) into bacterial cells, a technique called transformation.
- Calcium chloride (CaCl_2) is often used to make bacterial cell membranes more permeable, allowing the uptake of DNA into the cells.

Video Solution:



Q3 Text Solution:

The correct answer is **option (b)**.

In the given figure, **A DNA** represents the **vector DNA**, while **B DNA** represents the **foreign DNA**. Both DNA molecules show **complementary sticky ends** with the sequence **AATT**, which is characteristic of DNA fragments produced by the restriction enzyme **EcoRI**. EcoRI recognises a specific **palindromic sequence (GAATTC)** and cuts the DNA in such a way that sticky ends are generated. These sticky ends can easily base-pair with each other due to complementarity. After the pairing of sticky ends, the enzyme **DNA ligase** joins the sugar-phosphate backbones of the DNA fragments, forming a stable recombinant DNA molecule. Thus, EcoRI is the enzyme recognising the palindrome, and DNA ligase is responsible for joining the sticky ends, making option (b) correct.

Video Solution:



Q4 Text Solution:

Restriction endonuclease cleaves the DNA at a specific site by recognizing palindromic sequences. They make staggered cuts at or near these recognition sites.

Video Solution:



Q5 Text Solution:

In a cell, the separation of DNA strands is brought about by the enzyme DNA helicase, whereas in PCR, the separation of DNA strands is due to high temperature.

Video Solution:**Q6 Text Solution:**

Plasmids are autonomously replicating, extra chromosomal, circular double stranded DNA.

Video Solution:**Q7 Text Solution:**

5'-GAATTC-3' 3'-CTTAAG-5'

Video Solution:**Q8 Text Solution:**

The bioreactor has an agitator system, an oxygen delivery system and a foam control system, a temperature control system, pH control system and sampling ports so that small volumes of the culture can be withdrawn periodically.

Video Solution:**Q9 Text Solution:**

Inactivation of beta-galactosidase gene in recombinant bacteria

Video Solution:**Q10 Text Solution:**

probe

Video Solution:

Q11 Text Solution:

The separated DNA fragments can be visualised only after staining the DNA with a compound known as ethidium bromide followed by exposure to UV radiation. We can see bright orange coloured bands of DNA in a ethidium bromide stained gel exposed to UV light

Video Solution:**Q12 Text Solution:**

correct identification of steps in PCR is B- Denaturation and the temperature at about 98C which separate the two DNA strands. So this high temperature breaks the hydrogen bonds present between two DNA fragments.

Video Solution:**Q13 Text Solution:**

The recombinant plasmids will lose tetracycline resistance due to insertion of foreign DNA but can still be selected out from non-recombinant ones by plating the transformants on ampicillin containing medium. The transformants growing on ampicillin containing medium are then transferred on a medium containing tetracycline.

The recombinants will grow in ampicillin containing medium but not on that containing tetracycline. But, non-recombinants will grow on the medium containing both the antibiotics.

Video Solution:

Q14 Text Solution:

- (i) Correct — NCERT states that restriction enzymes produce sticky ends which facilitate joining of DNA fragments.
- (ii) Correct — NCERT clearly mentions DNA ligase forms phosphodiester bonds using ATP.
- (iii) Correct — NCERT explains that vector and foreign DNA are commonly cut with the same restriction enzyme to produce compatible ends.
- (iv) Incorrect — NCERT does not say blunt-ended fragments can *never* be ligated.
 - Blunt ends: Can also be ligated, but less efficiently because there's no base-pairing to hold them together.
 - Requires high concentration of DNA and ligase, sometimes special ligases (like T4 DNA ligase) to improve efficiency.

So the correct option is: A

Video Solution:**Q15 Text Solution:**

Gel electrophoresis is a method for separation and analysis of macromolecules and their fragments based on their size using gel medium.

Video Solution:**Q16 Text Solution:**

B, C, D, A

Video Solution:**Q17 Text Solution:**

A gene or a biolistic particle delivery system, originally designed for plant transformation, is a device for injecting cells with genetic information. The payload is an elemental particle of a heavy metal such as gold or tungsten coated with plasmid DNA. The device is used to transform almost any type of cell including plants, and is not limited to genetic material of the nucleus. It can also transform organelles, including plastids

Video Solution:**Q18 Text Solution:**

The source of taq polymerase used in PCR is thermophilic bacterium which live in extreme high temperature and with stand high temperature.

Video Solution:**Q19 Text Solution:**

The toxin is coded by a gene named cry.



There are a number of them, for example, the proteins encoded by the genes cryI Ac and cryII Ab control the cotton bollworms, and that of cryIAb controls corn borer.

Video Solution:



Q20 Text Solution:

eliminate weeds from fields without the use of manual labour.

Video Solution:



Q21 Text Solution:

Root

Video Solution:



Q22 Text Solution:

X=P C R

Video Solution:



Q23 Text Solution:

Using conventional methods of diagnosis (serum and urine analysis, etc.) early detection is not possible. Recombinant DNA technology, Polymerase Chain Reaction (PCR) and Enzyme Linked Immuno-sorbent Assay (ELISA) are some of the techniques that serve the purpose of early diagnosis.

Video Solution:



Q24 Text Solution:

The recombinant DNA technological processes have made great impact in the area of health care by mass production of safe and more effective therapeutic drugs. In 1983, Eli Lilly, an American company, first prepared two DNA sequences corresponding to A and B chains of human insulin and introduced them in plasmids of Escherichia coli to produce insulin chains. Chains A and B were produced separately, extracted and combined by creating disulfide bonds to form human insulin (humulin).

Video Solution:



Q25 Text Solution:

The cry gene of *Bacillus thuringiensis* produces a protein, which forms crystalline inclusions (i.e., is crystal in bacterial spores. These proteins are named 'cry' proteins due to their crystal nature and are responsible for the insecticidal activities of the bacterial strains. It is an inactive protoxin that requires an alkaline medium to solubilize and proteases for activation. Once activated it binds to specific receptors located in the insect midgut epithelial cells and creates pores that eventually lead to the death of the insect

Video Solution:**Q26 Text Solution:**

Soil bacterium *Bacillus thuringiensis* produces proteins that kill certain insects like lepidopterans (tobacco budworm, armyworm), coleopterans (beetles) and dipterans (flies, mosquitoes). *B. thuringiensis* forms some protein crystals. These crystals contain a toxic insecticidal protein. This toxin does not kill the *Bacillus* (bacterium) because it exists as inactive protoxins in them. But, once an insect ingests it, it is converted into an active form of toxin due to the alkaline pH of the alimentary canal. The activated toxin binds to the surface of midgut epithelial cells and create pores that cause swelling and lysis and finally cause death of the insect.

Video Solution:**Q27 Text Solution:**

Only mammalian cells can correctly attach these sugars to proteins.

Video Solution:

Q28 Text Solution:

Golden rice is a transgenic variety of rice (*Oryza sativa*) which contains good quantities of b-carotene (provitamin A - inactive state of vitamin A). b-carotene is a principal source of vitamin A. Since the grains of this rice is yellow in colour due to b-carotene and commonly called golden rice.

Video Solution:**Q29 Text Solution:**

Rosie- Protein enriched milk

ELISA- Test to detect antigen or antibody

Explant- Whole plants could be regenerated from this

Green revolution - Tripling the supply

Video Solution:**Q30 Text Solution:**

RNA interference gene interferes with translation in nematode.

Video Solution:[Android App](#)[iOS App](#)[PW Website](#)