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| Division | 12th |
| Subject | Biology |
| Chapter | Biotechnology and its Application |
| Author | Anand |
| Category | 1 |

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| Transposons can be used during which one of the following |
| Polymerase Chain Reaction |
| Gene silencing |
| Autoradiography |
| Gene sequencing |
| B |
| It is the regulation of gene expression in a cell to prevent the expression of a certain gene. |
| The correct answer is Gene silencing. Transposons or mobile genetic elements are used in gene silencing for the source of the complementary RNA. They are also called as jumping genes. |
| Application of Biotechnology |

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| BT cotton variety that was developed by the introduction of toxin gene of Bacillus thuringiensis (BT) is resistant to  2020 |
| insect pests |
| fungal diseases |
| plant nematodes |
| insect predators |
| A |
| Cotton bollworm |
| The correct answer is insect pests.BT cotton is resistance to cotton bollworm infestation. The genes cry I Ac and IIAb control cotton bollworms, thus acts as bio-pesticide. |
| Biotechnological application in agriculture: BT Cotton |

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| What triggers activation of protoxin to active toxin of Bacillus thuringiensis in bollworm?  2019 |
| Acidic of stomach |
| Body temperature |
| Moist surface of midgut |
| Alkaline of gut |
| D |
| The toxin is produced because of sporulation |
| The correct answer is Alkaline of gut. These protoxins are inactive after ingestion by the insect, changing the environment, which has to have high pH of the gut or alkaline pH, making them active. This activated toxin binds to the surface of epithelial cells and makes pores causing swelling and lysis leading to the death of bollworm. |
| Biotechnological application in agriculture: genetic modification benefits |

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| Which of the following is true for Golden rice?  2019 |
| It has yellow grains, because of a gene introduced from a primitive variety of rice. |
| It is vitamin A enriched, with a gene from daffodil. |
| It is pest resistant, with a gene from Bacillus thuringiensis |
| It is drought tolerant, developed using Agrobacterium vector. |
| B |
| It cures night blindness |
| The correct answer is It is vitamin A enriched, with a gene from daffodil. Rice is a staple food in many countries, particularly in Asia, but does not contain vitamin A or its immediate precursors. By inserting two genes from daffodil and one gene from a bacterial species into rice plants, Swiss researchers have produced rice capable of synthesising -carotene, the precursor of vitamin A. Vitamin A is required by all individuals as it is present in retina of eyes. Deficiency of vitamin A causes night blindness and skin disorders. This rice is called 'Golden rice' because of yellow colour of rice grains due to the presence of -carotene. |
| Biotechnological application in agriculture: Genetic modification benefits |

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| In RNAi, the genes are silenced using  Odisha NEET 2019 |
| ds-RNA |
| ss-DNA |
| ss-RNA |
| ds-DNA |
| A |
| RNA interference is the process of silencing protein translation. It helps in the regulation of protein synthesis. Translation involves synthesis of proteins from RNA |
| The correct answer is ds-RNA. RNAi involves the silencing of a specific mRNA by a complementary dsRNA molecule that binds to and prevents translation of mRNA (silencing). So the respective protein is no longer synthesized. |
| Biotechnological Application in Agriculture: RNA interference |

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| Which part of the tobacco plant is infected by Meloidogyne incognita?  NEET- 2016 |
| Stem |
| Root |
| Flower |
| Leaf |
| B |
| Meloidogyne incognita live in the soil. |
| The correct answer is Root; Meloidogyne incognita is a nematode which infects the roots of the tobacco plants and causes a great reduction in the yield. |
| Biotechnological application in agriculture: Nematode free tobacco plant |

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| Golden rice is a genetically modified crop plant where the incorporated gene is meant for biosynthesis of  2015 |
| omega 3 |
| vitamin A |
| vitamin B |
| vitamin C |
| B |
| It cures night blindness |
| The correct answer is Golden rice. Golden rice is a transgenic variety of rice (Oryza sativa) which contains good quantities of -carotene (provitamin A - inactive state of vitamin ). -carotene is a principal source of vitamin A. Since the grains of this rice is yellow in colour due to -carotene, it is commonly called golden rice. |
| Biotechnological application in agriculture: Genetic modification benefits |

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| In BT cotton, the BT toxin present in plant tissue as protoxin is converted into active toxin due to  2015 Cancelled |
| action pf gut microorganisms |
| presence of conversion factors in insect gut |
| alkaline pH of the insect gut |
| acidic pH of the insect gut |
| C |
| The toxin is in crystal form |
| The correct answer is alkaline pH of the insect gut; 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 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. |
| Biotechnological application in agriculture: BT Cotton |

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| The crops engineered for glyphosate are resistant/ tolerant to  2015 Cancelled |
| insects |
| herbicides |
| fungi |
| bacteria |
| B |
| Organophosphorus compound |
| The correct answer is herbicides. Glyphosate is a broad-spectrum herbicide which especially kills broad leaved herbs. Crop plants may also get affected by the herbicide, thus now crop plants are genetically engineered for glyphosate resistance. So, when glyphosate herbicide is applied, only weeds and no crop plants get harmed. |
| Biotechnological application in agriculture: Genetic Modified Organisms. |

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| Which of the following BT crops is being grown in India by the farmers?  2013 |
| Brinjal |
| Soybean |
| Maize |
| Cotton |
| D |
| To control bollworms |
| The correct answer is Cotton; BT toxin genes were isolated from Bacillus thuringiensis and incorporated into the several crop plants such as cotton. The choice of genes depends upon the crop and targeted pest, as most BT toxins are insect-group specific. The toxin is coded by a gene named cry. The genetically modified crop is called BT cotton as it contains BT toxin genes against cotton bollworms. |
| Biotechnological application in agriculture: BT Cotton |

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| RNA interference involves  Karnataka NEET 2013 |
| synthesis of cDNA and RNA using reverse transcriptase |
| silencing of specific mRNA due to complementary RNA |
| interference of RNA in synthesis of DNA |
| synthesis of RNA from DNA. |
| B |
| Inhibitory activity of genes |
| The correct answer is silencing of specific mRNA due to complementary RNA. RNA interference (RNAi) is the phenomenon of inhibiting activity of a gene through production of both sense and antisense RNA. RNAi takes place in all eukaryotic organisms as a method of cellular defence. This method involves a specific RNA silencing. It is due to a complementary RNA molecule which binds to and prevents translation of the causing its silencing. |
| Biotechnological application in agriculture: RNA Interference |

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| Consumption of which one of the following foods can prevent the kind of blindness associated with vitamin ' ' deficiency?  2015 |
| 'Flavr Savr' tomato |
| Golden rice |
| Canolla |
| BT-Brinjal |
| B |
| It is rich in vitamin A |
| The correct answer is Golden rice. Golden rice is a variety of *Oryza sativa* produced through genetic engineering to biosynthesize beta-carotene, a precursor of vitamin A, in the edible parts of rice. The research was conducted with the goal of producing a fortified food to be grown and consumed in areas with a shortage of dietary vitamin A. Being rich in vitamin A, Golden rice can prevent the blindness associated with vitamin A deficiency. |
| Biotechnological application in medicine: ADA deficiency |

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| Tobacco plants resistant to a nematode have been developed by the introduction of DNA that produces (in the host cells)  Mains 2012 |
| Both sense and anti-sense RNA |
| a particular hormone |
| an antifeedant |
| a toxic protein |
| A |
| RNA interference |
| The correct answer is Both sense and antisense RNA. Many nematodes live in plants and animals including human beings. A nematode Meloidogyne incognita infests the roots of tobacco plants and causes a great reduction in yield. A novel strategy was adopted to prevent this infection that was based on the process of RNA interference (RNAi). RNA interference (RNAi) is the phenomenon of inhibiting activity of a gene by synthesis of RNA molecules complementary to the mRNA. The normal (in vivo synthesized) mRNA of a gene is said to be "sense" because it carries the codons that are "read" during translation. Normally, the complement to the mRNA "sense" strand will not contain a sequence of codons that can be translated to produce a functional protein; thus, this complementary strand is called "anti-sense RNA". The antisense RNA and mRNA molecules will anneal to form duplex RNA molecules (or double stranded RNA) and the duplex RNA molecules cannot be translated. Thus, the presence of antisense RNA will block translation of the mRNA of the affected gene. |
| Biotechnological application in agriculture: Nematode free tobacco plant |

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| The process of RNA interference (RNAi) has been used in the development of plants resistant to  2011 |
| nematodes |
| fungi |
| viruses |
| insects |
| A |
| It involves dsRNA |
| The correct answer is nematodes. RNAi has also been exploited in plants to develop resistance against nematodes and this approach has appeared as a novel tool to control plant parasitic nematodes. dsRNAs can be produced through engineered plants that have the ability to silence target genes in nematode body. The delivery of dsRNAs from plant to nematode occurs by the ingestion process of plant cytoplasm and after its ingestion into the nematode body, accelerates the RNAi, that results in inactivation of targeted genes through dsRNA. |
| Biotechnological application in agriculture: RNA interference |

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| Bacillus thuringiensis forms protein crystals which contain insecticidal protein. This protein  Mains 2011 |
| binds with epithelial cells of midgut of the insect pest ultimately killing it |
| is coded by several genes including the gene cry |
| is activated by acid of the foregut of the insect pest |
| does not kill the carrier bacterium which is itself resistant to this toxin. |
| A |
| Creates pores and lysis |
| The correct answer is binds with epithelial cells of midgut of the insect pest ultimately killing it. B. thuringiensis forms some protein crystals. These crystals contain a toxic inactive insecticidal protein. When an insect ingests it, it is converted into an active form of toxin. 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. |
| Biotechnological application in agriculture: BT cotton |

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| Silencing of mRNA has been used in producing transgenic plants resistant to  Mains 2011 |
| boll worms |
| nematodes |
| white rusts |
| bacterial blights. |
| B |
| It involves dsRNA |
| The correct answer is nematodes.RNA interference is the process in which the gene expression is inhibited by RNA molecules by neutralizing the targeted mRNA molecules. Nematode-specific gene was introduced into tobacco plant via Agrobacterium vector. The introduced DNA produced both sense and antisense RNA which were complementary to each other and formed dsRNA.This RNA interference caused the silencing of nematode-specific mRNA and was lethal for the survival of nematode in tobacco root cells.Transgenic tobacco plants were nematode-resistant due to RNA interference. |
| Biotechnological application in agriculture: Steps in RNA interference |

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| The genetically-modified (GM) brinjal in India has been developed for  2010 |
| insect-resistance |
| enhancing shelf life |
| enhancing mineral content |
| drought -resistance |
| A |
| It act as a bioinsecticide |
| The correct answer is insect-resistance. The genetically modified (GM) BT brinjal in India has been developed mainly for insect resistance. Through genetic engineering toxin genes were isolated from Bacillus thuringiensis and incorporated into the several crop plants such as cotton, brinjal, etc. |
| Biotechnological application in agriculture: Increasing food production |

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| Some of the characteristics of BT cotton are  2010 |
| long fibre and resistance to aphids |
| medium yield, long fibre and resistance to beetle pests |
| high yield and production of toxic protein crystals which kill dipteran pests |
| high yield and resistance to bollworms. |
| D |
| It acts as a bioinsecticide |
| The correct answer is high yield and resistance to bollworms. BT toxin genes were isolated from Bacillus thuringiensis and incorporated into cotton plant. The genetically modified crop is called BT cotton. BT cotton has the following useful characteristics: pest resistance, herbicide tolerance, high yield and resistance to boll worm infestation. |
| Biotechnological application in agriculture: BT cotton |

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| An improved variety of transgenic basmati rice  2010 |
| does not require chemical fertilizers and growth hormones |
| gives high yield and is rich in vitamin |
| is completely resistant to all insect pests and diseases of paddy |
| gives high yield but has no characteristic aroma. |
| B |
| It cures night blindness |
| The correct answer is gives high yield and is rich in vitamin . Golden rice is an improved variety of transgenic basmati rice, which gives high yield and rich in vitamin A. It is produced by the genetic modification of biosynthesize beta-carotene (precursor of vitamin A). |
| Biotechnological application in agriculture: Increasing food production |

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| What is true about BT toxin?  2009 |
| BT protein exists as active toxin in the Bacillus. |
| The activated toxin enters the ovaries of the pest to sterilise it and thus prevent its multiplication. |
| The concerned Bacillus has antitoxins |
| The inactive protoxin gets converted into active form in the insect gut. |
| D |
| This toxin gets activated in alkaline pH |
| The correct answer is The inactive protoxin gets converted into active form in the insect gut,BT toxin has to be eaten to cause mortality. The BT toxin dissolve in the high pH insect gut and become active. The toxins then attack the gut cells of the insect, punching holes in the lining. The BT spores spills out of the gut and germinate in the insect causing death within a couple of days. |
| Biotechnological application in agriculture: Steps in making BT cotton |

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| Transgenic plants are the ones  2009 |
| generated by introducing foreign DNA into a cell and regenerating a plant from that cell |
| produced after protoplast fusion in artificial medium |
| grown in artificial medium after hybridization in the field |
| produced by a somatic embryo in artificial medium |
| A |
| It involves recombinant DNA technology |
| The correct answer is generated by introducing foreign DNA into a cell and regenerating a plant from that cell. Genes of one species can be modified or genes can be transplanted from one species to another. The transgenic plants, usually normal in appearance and character, differ from the parent only with respect to the function and influence of the inserted gene. This directed genetic engineering of plants requires that the gene be introduced into plant cells capable of regenerating into intact plants. The transformed plant cell must retain its capacity to regenerate. |
| Biotechnological application in agriculture: Advantage of Green revolution |

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| The bacterium Bacillus thuringiensis is widely used in contemporary biology as  2009 |
| insecticide |
| agent for production of dairy products |
| source of industrial enzyme |
| indicator of water pollution |
| A |
| *Bacillus thuringiensis* is a type of bacterium with great scientific interest. They can kill a large variety of species. And they are generally endospore forming bacteria. |
| The correct answer is insecticide. It can produce toxins to kill the natural pesticide. The gene responsible for this toxin is incorporated in to plants thus making it resistant against pesticides. |
| Biotechnological application in agriculture: Pest resistant plants |

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| What is antisense technology?  2009 |
| When a piece of RNA that is complementary in sequence is used to stop expression of a specific gene |
| RNA polymerase producing DNA |
| A cell displaying a foreign antigen used for synthesis of antigens |
| Production of soma clonal variants in tissue cultures |
| A |
| Gene Expression Inhibition |
| The correct answer is When a piece of RNA that is complementary in sequence is used to stop expression of a specific gene. Antisense technology is a tool used for gene expression inhibition.  The principle associated with antisense technology is that an antisense nucleic acid sequence base pairs with a complementary sense RNA strand. This pairing prevents it from being translated into a protein which is a macromolecule. |
| Research areas of Biotechnology |

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| CryI endotoxins obtained from Bacillus thuringiensis are effective against  2008 |
| nematodes |
| bollworms |
| mosquitoes |
| flies |
| B |
| Larval disease |
| The correct answer is bollworms. A bollworm is a common term for any larva of a moth that attacks the fruiting bodies of certain crops, especially cotton. B. thuringiensis (commonly known as BT) is an insecticidal bacterium, marketed worldwide for control of many important plant pests - mainly caterpillars of the Lepidoptera (butterflies and moths) but also mosquito larvae. During sporulation, many BT strains produce crystal proteins (proteinaceous inclusions), called as endotoxins or cry proteins, that have insecticidal action. This has led to their use as insecticides, and more recently to genetically modified crops using BT genes. |
| Transgenic animals: Study of disease |

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| A transgenic food crop which may help in solving the problem of night blindness in developing countries is  2008 |
| BT soybean |
| Golden rice |
| Flavr Sayr tomatoes |
| Starlink maize |
| B |
| It is rich in vitamin A |
| The correct answer is Golden rice. Night blindness is caused by the deficiency of vitamin A. In the developing countries, golden rice, which is a genetically modified rice engineered with elevated levels of beta carotene, a precursor of Vitamin A, is considered to provide a solution. The elevated levels of beta carotene gives its golden colour. |
| Transgenic animals: Biological Products |

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| Main objective of production/use of herbicide resistant GM crops is to  2008 |
| encourage eco-friendly herbicides |
| reduce herbicide accumulation in food articles for health safety |
| eliminate weeds from the field without the use of manual labour |
| eliminate weeds from the field without the use of herbicides |
| B |
| Residues of herbicides |
| The correct answer is reducing herbicide accumulation in food articles for health safety. As of 1999 the most prevalent GM trait was glyphosate-resistance (pesticide). This herbicide used on grain and grass crops were highly toxic and not effective against narrow-leaved weeds. Thus, developing crops that could withstand spraying with glyphosate would both reduce environmental and health risks. Tobacco plants have been engineered to be resistant to the herbicide bromoxynil. Crops have been commercialized that are resistant to the herbicide glufosinate also. The main objective of this herbicide resistant GM crops is that it reduces the accumulation of herbicides in the food articles for health safety. |
| Biotechnological Application in agriculture: Pest resistant plants |

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| Golden rice is a promising transgenic crop. When released for cultivation, it will help in  2006 |
| producing a petrol-like fuel from rice |
| alleviation of vitamin A deficiency |
| pest resistance |
| herbicide tolerance |
| B |
| It cures night blindness |
| The correct answer is alleviation of vitamin A deficiency. Golden rice is a transgenic variety of rice (Oryza sativa) which contains good quantities of -carotene. -carotene is a principal source of vitamin , so it will help in alleviation of vitamin A deficiency. |
| Biotechnological application in agriculture: advantage of green revolution |

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| Bacillus thuringiensis ( strains have been used for designing novel  2005 |
| biofertiliser |
| bio-metallurgical techniques |
| bio-mineralization processes |
| bioinsecticidal plants. |
| D |
| Strains of this bacterium produce proteins that are toxic to insects and specific Bt toxin genes are cloned in many varieties of plants these days, the most important of which is cotton to develop cotton plants that are resistant to insects and to ensure their growth. |
| The correct answer is bio insecticidal plants. Bacillus thuringiensis is the bacterium which produces an endotoxin. The bacterium contains a gene called as cry gene which produces crystal proteins. These proteins get activated in the alkaline pH of the gut of the pests. This protein causes pores in the gut which results in the bursting of the cells and death of the insects. These are considered as biopesticides because of this property. This gene from the bacterium can be used for designing plants which are resistant to pests. |
| Biotechnological application in agriculture: Genetic modification benefits |

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| Golden rice is a transgenic crop of the future with the following improved trait  2005 |
| insect resistance |
| high lysine (essential amino acid) content |
| high protein content |
| high vitamin-A content. |
| D |
| It cures night blindness |
| The correct answer is high vitamin-A content. Golden rice is a genetically improved variety of rice. It contains more amount of beta-carotene than normal rice varieties. It increases the nutritive value of rice since beta-carotene is converted into vitamin A, which is essential for good vision. The rice grains here, are yellow in colour due to the presence of beta-carotene. Hence, it is known as golden rice. |
| Biotechnological application in agriculture: Pest resistant plants |

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| The first transgenic crop was  1999 |
| tobacco |
| cotton |
| pea |
| flax |
| A |
| It has a property of disease resistant, pest resistant, environmental change-resistant and etc. |
| The correct answer is tobacco. In 1982, the first transgenic plants were produced in tobacco plants (Nicotiana tabacum) which expressed antibiotic resistance. |
| Transgenic animals: Biological products |

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| In gene therapy of Adenosine Deaminase (ADA) deficiency, the patient requires periodic infusion of genetically engineered lymphocytes because  2022 |
| retroviral vector is introduced into these lymphocytes. |
| gene isolated from marrow cells producing ADA is introduced into cells at embryonic stages |
| lymphocytes from patient's blood are grown in culture, outside the body, |
| genetically engineered lymphocytes are not immortal cells. |
| D |
| Gene Therapy |
| The correct answer is genetically engineered lymphocytes are not immortal cells. In gene therapy of ADA deficiency, the patient requires periodic infusion of genetically engineered lymphocytes because they are not immortal cells. |
| Biotechnological application in medicine: ADA deficiency |

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| Statements related to human insulin are given below. Which statement(s) is/are correct about genetically engineered insulin?  (A) Pro-hormone insulin contains extra stretch of C-peptide  (B) A-peptide and B-peptide chains of insulin were produced separately in E.coli, extracted and combined by creating disulphide bond between them.  (C) Insulin used for treating diabetes was extracted from cattle and pigs.  (D) Pro-hormone insulin needs to be processed for converting into a mature and functional hormone.  (E) Some patients develop allergic reactions to the foreign insulin.  Choose the most appropriate answer from the options given below: |
| (A), (B) and (D) only |
| (B) only |
| (C) and (D) only |
| (C), (D) and (E) only |
| B |
| Production of insulin |
| The correct answer is B only. Chains A and B are produced separately, extracted, and combined by creating disulphide bonds to form human insulin through genetic engineering. Insulin extracted from cattle and pigs is not genetically engineered. Genetically engineered insulin is produced by combining chain A and chain B, without the production of proinsulin. Patients do not develop allergic reaction to genetically engineered insulin. |
| Biotechnological application in medicine: Genetic engineered insulin |

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| When gene targeting involving gene amplification is attempted in an individual's tissue to treat disease, it is known as  2021 |
| safety testing |
| biopiracy |
| gene therapy |
| molecular diagnosis |
| C |
| Modification of genes |
| The correct answer is gene therapy; Gene therapy is a collection of methods which allows genes to be inserted into a person's cells and tissues to treat a disease. |
| Ethical issues: Biopiracy |

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| Now a days it is possible to detect the mutated gene causing cancer by allowing radioactive probe to hybridise its complimentary DNA in a clone of cells, followed by its detection using autoradiography because |
| mutated gene does not appear on photographic film as the probe has complementarity with it |
| mutated gene partially appears on a photographic film |
| mutated gene completely and clearly appears on a photographic film |
| mutated gene does not appear on a photographic film as the probe has no complementarity with it. |
| D |
| Undetected genes |
| The correct answer is mutated gene does not appear on a photographic film as the probe has no complementarity with it. PCR is used to detect mutations in gene in suspected cancer patients. A single stranded DNA or RNA tagged with a radioactive molecule (probe) is allowed to hybridise to its complementary DNA in a clone of cells followed by detection using autoradiography. The clone having the mutated gene will hence not appear on the photographic film, because the probe will not have complementarity with the mutated gene. |
| Biotechnological application in medicine: Gene therapy |

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| For effective treatment of the disease, early diagnosis and understanding its pathophysiology is very important. Which of the following molecular diagnostic techniques is very useful for early detection? |
| Hybridization Technique |
| Western Blotting Technique |
| Southern Blotting Technique |
| ELISA Technique |
| D |
| It is used to study the concentration of antigens |
| The correct answer is ELISA Technique. Enzyme Linked Immuno-Sorbent Assay (ELISA) is one of the techniques that serve the purpose of early diagnosis of disease. |
| Biotechnological Applications in Medicine: ELISA |

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| With regard to insulin choose correct options.  (A) C-peptide is not present in mature insulin.  (B) The insulin produced by rDNA technology has C-peptide.  (C) The pro-insulin has C-peptide.  (D) A-peptide and B-peptide of insulin are interconnected by disulphide bridges.  Choose the correct answer from the options given below.  2021 |
| (A) and (D) only |
| (B) and (D) only |
| (B) and (C) only |
| (A), (C) and (D) only |
| D |
| Production of insulin |
| The correct answer is (A), (C) and (D) only. The insulin produced by rDNA technology does not contain C peptide. |
| Biotechnological Applications in Medicine: Maturation of Pro insulin |

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| The Adenosine deaminase deficiency results into  2021 |
| addison’s disease |
| dysfunction of immune system |
| parkinson's disease |
| digestive disorder |
| B |
| SCID |
| The correct answer is dysfunction of immune system. Adenosine deaminase deficiency (ADA) caused due to deletion of the gene for enzyme adenosine deaminase causes SCID which results in dysfunctioning of immune system. |
| Biotechnological Applications in Medicine: ADA Deficiency |

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| Which of the following statements is not correct?  2020 |
| In man insulin is synthesised as a proinsulin. |
| The proinsulin has an extra peptide called C-peptide. |
| The functional insulin has A and B chains linked together by hydrogen bonds. |
| Genetically engineered insulin is produced in E.Coli. |
| C |
| Linkage of chains |
| The correct answer is The functional insulin has A and B chains linked together by hydrogen bonds; Insulin consists of two short polypeptide chain. Chain and chain , that are linked together by disulphide bridges. |
| Biotechnological Applications in Medicine: Maturation of Pro insulin |

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| Which kind of therapy was given in 1990 to a four-year-old girl with adenosine deaminase (ADA) deficiency?  NEET-II-2016 |
| Gene therapy |
| Chemotherapy |
| Immunotherapy |
| Radiation therapy |
| A |
| It involves of replacement of a faculty gene by normal gene |
| The correct answer is Gene therapy. Gene therapy is a technique of genetic engineering which involves replacement of a faulty/disease causing gene by a normal healthy functional gene. The first clinical gene therapy was given in 1990 to a 4-year old girl with adenosine deaminase deficiency. This enzyme is very important for the immune system to function. The deficiency of this enzyme can lead to severe combined immune deficiency (SCID). |
| Biotechnological Applications in Medicine: Gene Therapy |

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| The two polypeptides of human insulin are linked together by  NEET-I 2016 |
| covalent bond |
| disulphide bridges |
| hydrogen bonds |
| phosphodiester bond |
| B |
| Proteins bridges |
| The correct answer is disulphide bonds. Human insulin is made up of 51 amino acids arranged in two polypeptide chains. Chain A has 21 amino acids and chain B has 30 amino acids. The two polypeptide chains are interconnected by disuiphide bridges or S-S-linkages. |
| Biotechnological Applications in Medicine: Genetic engineered insulin |

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| The first human hormone produced by recombinant DNA technology is |
| insulin |
| estrogen |
| thyroxin |
| progesterone |
| A |
| Diabetes mellitus |
| The correct answer is insulin. 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 Lily, 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 disulphide bonds to form human insulin (humulin). |
| Biotechnological Applications in Medicine: Advance of molecular diagnosis |

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| Which one of the following vectors is used to replace the defective gene in gene therapy?  Karnataka NEET 2013 |
| Adenovirus |
| Cosmid |
| Ri plasmid |
| Ti plasmid |
| A |
| It is a viral vector |
| The correct answer is Adenovirus. Gene therapy is a corrective therapy that is given to patients with diseases caused by some gene defects. Here, genes are inserted into a person's cells and tissues to treat disease by replacing the defective gene. The normal gene delivered into the individual or embryo takes over the function and compensate for the non-functional gene. Viral vectors like adenovirus are generally used to deliver the normal gene. |
| Biotechnological Applications in Medicine: Advance of Molecular diagnosis |

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| The first clinical gene therapy was given for treating  Mains 2012 |
| diabetes mellitus |
| chicken pox |
| rheumatoid arthritis |
| adenosine deaminase deficiency. |
| D |
| This therapy was done by bone marrow transplantation |
| The correct answer is adenosine deaminase deficiency. Gene therapy is a collection of methods that allows correction of a gene defect that has been diagnosed in a child/ embryo. Here genes are inserted into a person's cells and tissues to treat a disease. Correction of a genetic defect involves delivery of a normal gene into the individual or embryo to take over the function of and compensate for the non-functional gene. The first clinical gene therapy was given in 1990 to a 4 - year old girl with adenosine deaminase (ADA) deficiency. This enzyme is very important for the immune system to function. SCID is caused due to defect in the gene for the enzyme adenosine deaminase. In some children ADA deficiency can be cured by bone marrow transplantation. Here, the isolated gene from bone marrow cells producing ADA is introduced into cells at early embryonic stages, it can be a permanent cure. |
| Transgenic animals: Vaccine safety |

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| Which one of the following is now being commercially produced by biotechnological procedures?  Mains 2010 |
| Nicotine |
| Morphine |
| Quinine |
| Insulin |
| D |
| It is synthesised as a prohormone which contains an extra stretch called the C-peptide |
| The correct answer is Insulin. Insulin is now being commercially produced by genetic engineering. Insulin consists of two short polypeptide chains: chain A and chain , that are linked together by disulphide bonds. Insulin, in mammal is synthesised as a prohormone which contains an extra stretch called the C-peptide. During maturation this C-peptide is removed. The major problem for production of insulin using rDNA technique was getting insulin assembled in mature form.This problem was solved in 1988 by Eli Lilly, an American company which prepared functionable insulin from two DNA sequences corresponding to and chains of human insulin and introduced them in plasmids of E.coli to produce insulin chains. In this way, chains A and B were produced separately which was extracted and combined by creating disulphide bonds to get human insulin. |
| Biotechnological Applications in Medicine: Biological products |

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| The genetic defect-adenosine deaminase (ADA) deficiency may be cured permanently by  2009 |
| administering adenosine deaminase activators |
| introducing bone marrow cells producing ADA into cells at early embryonic stages |
| enzyme replacement therapy |
| periodic infusion of genetically engineered lymphocytes having functional ADA cDNA. |
| B |
| ADA (adenosine deaminase) is an enzyme present on ADA gene. It is an autosomal recessive disorder. It can diagnose by checking ADA levels in the blood. Isolation of genes from embryos and bone transplantation can be used to treat this disorder. |
| The correct answer is introducing bone marrow cells producing ADA into cells at early embryonic stages; : ADA deficiency can be permanently cured if the isolated gene from bone marrow cells producing ADA is introduced into cells at early embryonic stages |
| Biotechnological Applications in Medicine: ADA deficiency |

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| Human insulin is being commercially produced from a transgenic species of  2008 |
| Rhizobium |
| Saccharomyces |
| Escherichia |
| Mycobacterium |
| C |
| Coliform Bacterium |
| The correct answer is Escherichia; Insulin is now being commercially produced by genetic engineering with the help of E.coli bacteria. |
| Biotechnological Applications in Medicine: Genetic engineered insulin |

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| ELISA is used to detect viruses where the key reagent is  2004,2003 |
| alkaline phosphatase |
| catalase |
| DNA probes |
| RNase |
| A |
| It is the most important enzyme used in ELISA. |
| The correct answer is alkaline phosphatase. ELISA (enzyme linked immunosorbent assay) screening test is the initial test to diagnose AIDS. The test works by detecting antibodies/substances or protein which are produced in the blood when virus is present. Alkaline phosphatase and peroxidases are commonly used enzymes as key reagent to perform the ELISA test. These enzymes are used to provide antibody-antigen complex in a specialised ELISA plate or tray. In ELISA test for detecting a particular antigen, its antibody is buffered and a drop of serum (supernatant of centrifuged blood) poured over it. If the latter contains antigen, it will produce antigen-antibody complex. A second enzyme labelled antibody is added. It forms enzymeantigen-antibody complex, if the antigen is present. Substrate is now added. It produces a stain if the antigen is present. |
| Biotechnological Applications in Medicine: ELISA |

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| Maximum application of animal cell culture technology today is in the production of  2003 |
| insulin |
| interferons |
| vaccines |
| Edible proteins. |
| C |
| Immunization |
| The correct answer is vaccines. Maximum application of animal cell culture technology is in the production of vaccines. Vaccines are chemical substances prepared from the proteins of other animals which confer immunity to a particular virus. Some of the vaccines synthesized biologically through genetic engineering are vaccines for hepatitis- virus, vaccines for rabies virus, vaccines for poliovirus and vaccines for small pox virus, etc. |
| Transgenic animals: Biological products |

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| --- |
| The term 'humulin' is used for  1999 |
| hydrolytic enzyme |
| powerful antibiotic |
| human insulin |
| isoenzyme |
| C |
| It is the first genetically engineered medication produced using recombinant DNA technique. |
| The correct answer is human insulin; Human insulin (humulin) is the first therapeutic product produced by means of recombinant DNA technology by Eli lilly and Co. on July 5, 1983. |
| Biotechnological Applications in Medicine: Genetic engineered insulin |

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| Hybridoma cells are  1999 |
| only cells having oncogenes |
| product of spore formation in bacteria |
| nervous cells of frog |
| hybrid cells resulting from myeloma cells. |
| D |
| Hybridoma is a hybrid cell used as the basis for the production of antibodies in large amounts for diagnostic or therapeutic use. This type of cells multiplies indefinitely in laboratory and can be used to produce innumerable quantities of a specific antibody. The spleen cells are fused with cancerous white blood cells of humans to form the hybridoma cells which divide indefinitely. |
| The correct answer is hybrid cells resulting from myeloma cells. Hybridoma is hybrid cell resulting from the artificial fusion of an antibody-producing lymphocyte and a myeloma cell from a lymphoid tumour. Such cells can produce a clone that may be maintained in tissue culture and used for the continuing production of monoclonal antibody. |
| Biotechnological Applications in Medicine: Advance in molecular diagnosis |

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| --- |
| Maximum number of existing transgenic animals is of  2011 |
| fish |
| mice |
| cow |
| pig |
| B |
| High resemblance of Human genome |
| The correct answer is mice; Transgenesis is the process of insertion of a foreign gene into the genome of selected organism to improve its quality. The first transgenic experiments in mammals were performed in mice. Most of the transgenic experiments are still carried out with mice and hence they exists in maximum number. The mouse is a very suitable model for these studies because they provide much information about the genome, inbred strains with specific genetic and phenotypic characteristics are available, mice are easy to handle and have a short generation interval, as well as they, shares most metabolic pathways and physiological processes with the human species. |
| Transgenic Animals: Normal physiology and development |

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| Read the following four statements (I-IV) about certain mistakes in two of them.  (I) The first transgenic buffalo, Rosie produced milk which was human alpha-lactalbumin enriched.  (II) Restriction enzymes are used in isolation of DNA from other macromolecules.  (III) Downstream processing is one of the steps of rDNA technology.  (IV) Disarmed pathogen vectors are also used in transfer of DNA into the host.  Which of the two statements have mistaken?  Mains 2011 |
| and |
| and |
| I and III |
| I and II |
| D |
| Recombinant technology |
| The correct answer is A and B. Rosie was the first transgenic cow and its milk was rich in human alpha-lactalbumin protein. Restriction enzymes are used in the isolation of the specific segment of DNA from the DNA of the organism because these enzymes are capable of cutting the DNA at the specific location. Downstream processing is one of the steps in the r-DNA technology. It involves the extraction and purification of the desired product. Disarmed pathogens like Agrobacterium tumefaciens, phage viruses are also used in the transfer of r-DNA into the host. |
| Transgenic Animals: Normal physiology and development |

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| Genetic engineering has been successfully used for producing  2010 |
| transgenic mice for testing safety of polio vaccine before use in humans |
| transgenic models for studying new treatments for certain cardiac diseases |
| transgenic cow-Rosie which produces high fat milk for making ghee |
| animals like bulls for farm work as they have super power. |
| A |
| Immunization |
| The correct answer is transgenic mice for testing safety of polio vaccine before use in humans. Genetic engineering has the potential to cure genetic disorders in humans by changing the defective gene with normal functional genes. Many transgenic animals are designed to increase our understanding of how genes contribute to the development of diseases. These are specially made to serve as models for human diseases so that investigation of new treatments for diseases is made possible. Today transgenic models exist for many human diseases such as cancer, cystic fibrosis, rheumatoid arthritis and Alzheimer's. Transgenic mice are being developed for use in testing the safety of vaccines before they are used on humans. Transgenic mice are being used to test the safety of the polio vaccine |
| Transgenic Animals: Chemical safety testing |

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| Production of a human protein in bacteria by genetic engineering is possible because  2005 |
| the human chromosome can replicate in bacterial cell |
| the mechanism of gene regulation is identical in humans and bacteria |
| bacterial cell can carry out the RNA splicing reactions |
| the genetic code is universal. |
| D |
| Genetic engineering refers to the direct manipulation of the DNA to alter the organism's characteristics. In this, one of the base pairs (A-T or C-G) is deleted from a region of DNA or there is introduction of a copy of a gene. Human protein that is produced by bacteria is insulin. |
| The correct answer is the genetic code is universal. Genetic code may be defined as the sequence of nucleotides in polynucleotide chain which determines the sequence of amino acids in a polypeptide chain. The genetic code is universal. It means that each codon codes for the same amino acid in all organisms including bacteria, plants and animals. |
| Transgenic animals: Biological products |

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| In transgenics, expression of transgene in target tissue is determined by  2004 |
| enhancer |
| transgene |
| promotor |
| reporter |
| D |
| A transgene is a gene which has been transferred naturally or by other genetic engineering techniques from one organism to another. |
| The correct answer is reporter; The plants, in which a functional foreign gene has been incorporated by any biotechnological methods that generally is not present in plant, are called transgenic plants. When plant cell is transformed by any of the transformation methods it is necessary to isolate the transformed cells/tissue. There are certain selectable marker genes present in vectors that facilitate the selection process. In transformed cells the selectable marker genes are introduced through vector. There is a number of marker genes which are commonly described as reporter genes screenable genes. Some of the reporter genes which are most commonly used in plant transformation are: cat, gus, lux, nptII., etc. |
| Transgenic Animals: Study of disease |

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| The transgenic animals are those which have  1995 |
| foreign RNA in all its cells |
| foreign DNA in some of its cells |
| foreign DNA in all its cells |
| foreign RNA in all its cells and Foreign DNA in some of its cells |
| C |
| Transgenic animals are animals in which foreign genes are deliberately inserted into the genome of an organism. The insertion is carried out through pronuclear microinjection and then further the cells divide mitotically forming a complete individual. |
| The correct answer is foreign DNA in all its cells. Transgenic organism is one that has become transformed following the introduction of novel genes into its genome. It is most frequently achieved by integration of cloned DNA sequences following their injection into the fertilized egg. This fertilized egg divides mitotically to form the whole organism so that all the cells of the organism will carry the transferred gene. The transferred genes are known as transgenes. Transgenesis can be done by microinjection and somatic cell nuclear transfer or cloning. Transgenic animals produced by this technology include mice, Drosophila, Xenopus and some of the fish species. |
| Transgenic Animals: Normal physiology and development |

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| A 'new' variety of rice was patented by a foreign company, though such varieties have been present in India for a long time. This is related to  2018 |
| Co-667 |
| Sharbati Sonora |
| Lerma Rojo |
| Basmati |
| D |
| Rice is the staple food of Indian subcontinent. India had more than 100000 species of rice till 1970. India is the second largest producer of rice after China. |
| The correct answer is Basmati. In 1997, a Texas company got patent rights on Basmati rice through the US Patent and Trademark Office. This allowed the company to sell a 'new' variety of Basmati, in the US and abroad. This new variety of Basmati had actually been derived from Indian farmers' varieties. Indian Basmati was crossed with semi-dwarf varieties and claimed as an invention or a novelty. It caused a brief diplomatic crisis between India and United States with India threatening to take the matter to WTO (World Trade Organisation) as a violation of TRIPS (Trade Related Aspects of Intellectual Property Rights). Both voluntarily and due to review decisions by United States patent office, Rice Tec lost most of the claims of the patent. |
| Ethical Issues: Patents |

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| In India, the organisation responsible for assessing the safety of introducing genetically modified organisms for public use is  2018 |
| Indian Council of Medical Research (ICMR) |
| Council for Scientific and Industrial Research (CSIR) |
| Research Committee on Genetic Manipulation (RCGM) |
| Genetic Engineering Appraisal Committee (GEAC). |
| D |
| Genetically modified organisms ( GMOs) are living organisms whose genetic material has been artificially altered by genetic modification in the laboratory. This produces combinations of plant , animal, bacterial and virus genes that do not occur in nature or by conventional crossbreeding methods. |
| The correct answer is Genetic Engineering Appraisal Committee (GEAC). Indian government has set up organisation such as GEAC (Genetic Engineering Appraisal Committee) which makes decisions regarding the validity of GM research and safety of introducing GM organisms for public services. |
| Ethical Issues: Importance of regulations |

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| Use of bioresources by multinational companies and organisations without authorisation from the concerned country and its people is called  2018 |
| bio-infringement |
| biopiracy |
| biodegradation |
| bioexploitation. |
| B |
| Bioresources of an area are the most important wealth and the people of that area or country are the ones who are authorized to use it. Some multinational companies use them without proper authorization which leads to violation of laws. |
| The correct answer is biopiracy2 Some organisations and multinational companies exploit or patent biological resources or bioresources of other nations without proper authorisation from the countries concerned. This is called biopiracy. |
| Ethical Issues: Biopiracy |

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| Which body of the Government of India regulates GM research and safety of introducing GM organisms for public services?  2015 Cancelled |
| Genetic Engineering Approval Committee |
| Research Committee on Genetic Manipulation |
| Bio-safety committee |
| Indian Council of Agricultural Research |
| A |
| The body of the Government of India that regulates GM research and the safety of introducing GM organisms for public services is a committee under the Ministry of Environment and Forests and climate change. It was formed in 1989. |
| The correct answer is Genetic Engineering Approval Committee. Genetic modification of organisms can have unpredictable results, when such organisms are introduced into the ecosystem. Therefore, the Indian Government has set up organizations such as GEAC (Genetic Engineering Approval Committee), (now, changed as Genetic Engineering Appraisal Committee) which makes decisions regarding the validity of GM research and the safety of introducing GM-organisms for public services. |
| Ethical Issues: Importance of regulations |