

1. SEXUAL REPRODUCTION IN FLOWERING PLANTS

I. MULTIPLE CHOICE Q'S (MCQ)

OMQ'S

1×1= 1 Mark

1. Identify the correct sequence of anther wall layers from inside to the outside of an anther lobe. [3]
 - 1) the epidermis – endothecium – middle layers – tapetum
 - 2) the epidermis – middle layers – endothecium – tapetum
 - 3) the tapetum — middle layers – endothecium— epidermis
 - 4) the tapetum — endothecium – middle layers — epidermis
2. The male gametophyte in flowering plants is represented by [4]
 - 1) anther
 - 2) microspore mother cell
 - 3) stamen
 - 4) pollen grain
3. Which of the following organic materials make up the inner wall of pollen grains? [4]
 - 1) sporopollenin only
 - 2) cellulose and sporopollenin
 - 3) sporopollenin and pectin
 - 4) cellulose and pectin
4. The protective envelope of an ovule is called [2]
 - 1) funicle
 - 2) integument
 - 3) chalaza
 - 4) micropyle
5. In flowering plants, the female gametophyte is [1]
 - 1) embryo sac
 - 2) embryo
 - 3) nucellus
 - 4) egg apparatus only
6. Filiform apparatus is present in [2]
 - 1) egg cell
 - 2) synergids
 - 3) antipodals
 - 4) the large central cell
7. What kind of pollination occurs in the flowers that do not open at all ? [4]
 - 1) xenogamy
 - 2) chasmogamy
 - 3) geitonogamy
 - 4) cleistogamy
8. Consider the following statements regarding wind pollination: [1]
 - I. Amongst abiotic pollinations, pollination by wind is more common.
 - II. Wind pollination is quite common in grasses.
 - III. Wind pollinated flowers often have many ovules in each ovary.

Which of the above statements are correct.

 - 1) I and II only
 - 2) I and III only
 - 3) II and III only
 - 4) I, II and III
9. Waterlily is pollinated by [3]
 - 1) wind
 - 2) water
 - 3) insects
 - 4) birds
10. Among the insects, which are particularly the dominant biotic pollinating agents? [4]
 - 1) butterflies
 - 2) wasps
 - 3) flies
 - 4) bees
11. The portion of embryonal axis above the level of cotyledons is [2]
 - 1) hypocotyl
 - 2) epicotyl
 - 3) scutellum
 - 4) coleoptile
12. In some seeds, the residual persistent nucellus is called [3]
 - 1) endosperm
 - 2) pericarp
 - 3) perisperm
 - 4) proembryo

II. FILL IN THE BLANKS(FIB)

1. The number of pollen sacs developed from each microsporangium of a dithecous anther is **1 (one)**.
2. The outer hard layer of pollen wall is made up of **Sporopollenin**.
3. In pollen banks, pollen grains are stored in **liquid nitrogen**.
4. Only functional megaspore develops into the **female** gametophyte.
5. Transfer of pollen grains from anther to the stigma of a different plant is known as **xenogamy / allogamy / cross pollination**.
6. In artificial hybridization programme, the removal of anthers from the flowers in female parent is known as **emasculation**.
7. In an embryo sac, triple fusion occurs in **central** cell.
8. In the grass family, the large, single cotyledon is called **scutellum**.
9. The final product of sexual reproduction in flowering plants is **the seed**.
10. In banana, fruit develops without fertilization. Such a fruit is called **parthenocarpic** fruit.

III. ONE WORD ANSWER Q'S

1. What is the number of microsporangia in each lobe of a ditheous anther?

A: 2 (two)

2. In which layer of a pollen grain, prominent apertures are formed?

A: Exine

3. At what stage, pollen grains are shed in majority of flowering plants?

A: 2 – celled stage

4. At what temperature, pollen grains are stored in pollen banks for years in liquid nitrogen?

A: -196° C

5. Which part of the pistil serves as a landing platform for pollen grains?

A: The stigma

6. Which part represents the junction between ovule and funicle?

A: Hilum

7. In which region of the nucellus, ovules generally differentiate a single Megaspore Mother Cell (MMC)?

A: Micropylar region

8. What is the main function of filiform apparatus present in synergids?

A: Guiding the pollentube

9. Which type of pollination is genetically similar to autogamy?

A: Geitonogamy

10. What kind of pollen grains are formed in many marine sea-grass species such as *Zostera*?

A: long, ribbon like

11. Which structure encloses the embryonal axis at its lower end including the radical and root cap?

A: Coleorrhiza

12. By which special mechanism, seeds are produced without fertilisation?

A: Apomixis

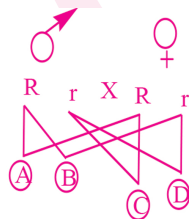
2. PRINCIPLES OF INHERITANCE AND VARIATION

I. MULTIPLE CHOICE Q'S (MCQ)

OMQ'S

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- The tendency of offsprings to resemble their parents is called [3]
 1) Variation 2) Mutation 3) **Inheritance** 4) Recombination
- The condition of dissimilar allelic pair of a gene is known as [2]
 1) homozygous 2) **heterozygous** 3) linkage 4) polyallelic
- The proportion of plants that were tall and dwarf in F_2 -generation of Mendel experiment respectively. [2]
 1) $\frac{1}{4}$ th and $\frac{3}{4}$ th 2) $\frac{3}{4}$ th and $\frac{1}{4}$ th 3) $\frac{2}{3}$ rd and $\frac{1}{3}$ rd 4) $\frac{1}{3}$ rd and $\frac{4}{3}$ rd
- When alleles of two contrasting traits are present together, one of the traits expresses itself during the cross while the other remains hidden. This is phenomenon is known as [3]
 1) Law of purity of gametes 2) Law of segregation
 3) **Law of dominance** 4) Law of independent assortment
- What is the genotype of the wrinkled phenotype of pea seeds? [1]
 1) **rr** 2) Rr 3) RR 4) Wr
- Find out the phenotype of A, B, C, D from the given cross in Snapdragon (R= Red and r = white). [1]
 1) **A-Red, B- Pink, C-Pink, D-White**
 2) A-Red, B-Red, C-White, D-White
 3) A-Pink, B-Red, C-White, D-White
 4) A-Pink, B-Red, C-Red, D-White



- How many phenotypes and genotypes are possible in ABO blood group systems?
 1) Four, five 2) **Four, six** 3) Four, seven 4) Three, four [2]
- Starch synthesis gene in pea plant is an example of [1]
 1) **single gene produce more than one effect**
 2) multiple genes produce more than one effect
 3) two genes produce more than one effect
 4) multiple genes produce less than one effect

9. Match the following columns.

[1]

Column – I

A) Test cross

B) Monohybrid cross

C) F_1 selfing

D) Dihybrid cross

Column – II

1. 9 : 3 : 3 : 1

2. $Tt \times tt$

3. $Tt \times Tt$

4. 3 : 1

A B C D

1) 2 4 3 1

3) 3 4 1 2

A B C D

2) 2 4 1 4

4) 1 4 1 3

10. The types of gametes formed by the genotype $RrYy$ are

[1]

1) RY, Ry, rY, ry

2) RY, Ry, ry, ry

3) Ry, Ry, Yy, ry

4) Rr, RR, Yy, YY

11. What is the genotypic ratio in Mendel dihybrid cross?

[1]

1) 1 : 2 : 2 : 4 : 1 : 2 : 1 : 2 : 1

2) 1 : 4 : 1 : 1 : 2 : 1 : 1 : 2 : 1

3) 1 : 4 : 2 : 1 : 1 : 1 : 2 : 1

4) 4 : 2 : 1 : 1 : 1 : 1 : 2 : 1 : 1

12. Strength of the linkage between the two genes is

[2]

1) proportionate to the distance between them

2) inversely proportionate to the distance between them

3) depending on length of the chromosomes

4) depending on size of the chromosomes

II. FILL IN THE BLANKS(FIB)

- The cross between parents, which differ in two pairs of contrasting characters is **Dihybrid cross**.
- Mendel selected **14** true breeding pea plant varieties, as pairs which were similar except for one character with contrasting traits.
- The production of gametes by the parents, the formation of the zygotes, the F_1 and F_2 plants can be understood from a diagram is called **Punnett Square or Checker board**.
- The inheritance of flower colour in **Dog flower(snapdragon or Antirrhinum)** is a good example to understand incomplete dominance.
- The first genetic map of a chromosome was constructed by **Alfred Sturtevant**.
- The phenotypic ratio of Snapdragon plant monohybrid cross in F_2 generation is **1 : 2 : 1**
- The crossing of F_1 with its recessive parent is called **Test cross**
- Linked genes are present on the **Same** Chromosome.

III. ONE WORD ANSWER Q'S

1. On which plant did Mendel carry out his experiments?

A: Garden pea- (*Pisum sativum*).

2. Who is called the Father of Genetics?

A: G.J.Mendel

3. What is the phenotypic ratio of F_2 in a dihybrid cross?

A: 9 : 3 : 3 : 1

4. What is the genotypic ratio of F_2 in a monohybrid cross?

A: 1 : 2 : 1

5. What is meant by a physically expressed external character of an individual?

A: Phenotype

6. What is known as having two similar alleles for a particular trait?

A: Homozygous

7. What is the term used for the discrete units that govern inheritance of characters?

A: Factors

8. Mention one cross in which the phenotypic ratio is the same as the genotypic ratio in the F generation.

A: Incomplete dominance or Co-dominance

4. MICROBES IN HUMAN WELFARE

I.MULTIPLE CHOICE Q'S(MCQ)

OMQ'S

1×1= 1 Mark

1. Which microbe is commonly used to convert milk into curd? [3]
 1) Acetobacter 2) Rhizobium 3) **Lactobacillus** 4) Clostridium
2. Penicillin was discovered by: [4]
 1) Robert Koch 2) Edward Jenner 3) Louis Pasteur 4) **Alexander Fleming**
3. Which enzyme is used to remove blood clots in heart patients? [3]
 1) Lipase 2) Amylase 3) **Streptokinase** 4) Cellulase
4. The bacterium that produces butyric acid is: [1]
 1) **Clostridium** 2) Acetobacter 3) Lactobacillus 4) Azotobacter
5. Swiss cheese holes are due to release of CO₂ produced by: [1]
 1) **Propionibacterium sharmanii** 2) Saccharomyces cerevisiae
 3) Lactobacillus 4) Penicillium
6. Methanogens are found in: [4]
 1) Aerobic soil 2) Vinegar 3) Cold water bodies 4) **Rumen of cattle**
7. The fungus used to produce cyclosporin A is: [2]
 1) Penicillium notatum 2) **Trichoderma polysporum**
 3) Aspergillus niger 4) Saccharomyces
8. Which of the following microbes helps in nitrogen fixation in paddy fields? [4]
 1) Acetobacter 2) Penicillium 3) Glomus 4) **Nostoc**
9. The 'clot buster' enzyme is produced by: [2]
 1) Streptomyces 2) **Streptococcus** 3) Bacillus 4) Pseudomonas
10. Which gas is predominantly present in biogas? [4]
 1) Carbon dioxide 2) Nitrogen 3) Oxygen 4) **Methane**

II. FILL IN THE BLANKS(FIB)

1. The microbe used for the commercial production of ethanol is Saccharomyces cerevisiae.
2. The puffed up appearance of dough is due to the production of CO₂ gas
3. Wine & Beer beverages are produced without distillation.
4. Penicillin antibiotic was extensively used to treat American soldiers wounded in the world war II.
5. Propionibacterium sharmanii is used in the production of Swiss cheese.
6. During biological treatment microbes significantly reduces Biochemical oxygen demand/ BOD by consuming organic matter in effluent.
7. Cyclosporin A is an immunosuppressive drug obtained from *Trichoderma polysporum*.
8. Lipases are the enzymes helpful in removing oily stains from the laundry.
9. Trichoderma is a free living fungi which is effective biocontrol agent of several plant pathogens.
10. Methanobacterium is an example of methanogen.

III. ONE WORD ANSWER Q'S

1. Which bacterium produces acetic acid?

A: Acetobacter aceti

2. Name the enzyme used as a 'clot buster' in myocardial infarction patients.

A: Streptokinase

3. Which fungus produces cyclosporin A?

A: Trichoderma polysporum

4. Name the yeast that produces statins.

A: Monascus purpureus

5. What does BOD stand for?

A: Biochemical Oxygen Demand

6. Name one methanogen found in cattle rumen.

A: Methanobacterium

7. Which bacterium is used as a biocontrol agent against butterfly caterpillars?

A: Bacillus thuringiensis

8. Name one genus of fungi that forms mycorrhiza.

A: Glomus

9. Name the genus of viruses used as biological control agents for insects.

A: Nucleopolyhedroviruses

10. Which traditional Indian drink made by fermenting palm sap?

A: Toddy

5. BIOTECHNOLOGY PRINCIPLES, PROCESSES & APPLICATIONS

I. MULTIPLE CHOICE Q'S (MCQ)

OMQ'S

1×1= 1 Mark

- Being a negatively charged molecule, DNA in Electrophoresis moves towards [1]
1) Anode 2) Cathode 3) Equator 4) None of the above
- Which of the following are used in gene cloning? [2]
1) Ribosomes 2) Plasmids 3) Mesosomes 4) Histones
- What is the function of restriction enzymes? [3]
1) Restrict the elongation of DNA 2) Amplify the DNA molecules
3) Cut the DNA at specific locations 4) Separate the DNA fragments based on length
- Agarose extracted from the sea weeds is used in [4]
1) Downstream Processing 2) DNA Isolation
3) PCR 4) Electrophoresis
- Which of the following bacterium is used for production of transgenic plants [1]
1) Agrobacterium 2) Staphylococcus 3) Pseudomonas 4) Thiobacillus
- In genetic engineering, antibiotic resistance gene is used as [2]
1) PCR 2) Selectable marker 3) Replication 4) Vector
- The technique of producing a large number of plants in a very short time is known as [3]
1) Gene transfer 2) Conventional breeding
3) Micropropagation 4) Somatic Hybridisation
- Somatic hybrids are formed by [4]
1) Meristem Culture 2) RNA interference 3) Microinjection 4) Protoplast fusion
- Which part of the plant is grown in vitro to obtain virus free plants [1]
1) Meristem 2) Ovule 3) Anther 4) Leaf
- Meloidogyne incognita which infects the roots of tobacco plants is a [4]
1) Bacterium 2) Virus 3) Algae 4) Nematode

II. FILL IN THE BLANKS(FIB)

1. Large volume of culture can be processed by using **Bioreactors**
2. Genes are located on long molecules of **DNA** intertwined with histone proteins
3. **Retrovirus** in animal cells have the ability to transform normal cells into cancerous cells.
4. The separated bands of DNA are cut out from the agarose gel and extracted from gelpiece. This step is known as **Elution**.
5. Restriction enzymes belong to a larger class of enzymes called **Nucleases**.
6. Inactive Bt toxin is converted into an active form due to the **Alkaline** pH of the insect's gut.
7. Cells in continuous culture system are maintained in **Log / Exponential** phase of growth
8. Golden rice is a genetically modified crop is enriched with **Vitamin A**.
9. The inherent capacity of a plant cell to produce a whole plant is known as **Totipotency**.

III. ONE WORD ANSWER Q'S

1. After 10 PCR cycles how many DNA molecules are formed from One DNA molecule.

A: 1024

2. In plants which enzyme is used to dissolve cell wall during DNA isolation ?

A: Cellulase

3. Agarose is a natural polymer and is extracted from?

A: Sea weeds

4. What do you call a group of letters that form the same word when read in both forward and backward directions?

A: Palindromic sequence

5. Which enzyme is commonly used to join the DNA fragments?

A: DNA ligase

6. Name the plasmid extracted from Agrobacterium and is used to deliver the gene of our interest into a variety of dicot plants?

A: Ti Plasmid

7. Which sequence is responsible for controlling the copy number of the linked DNA?

A: Origin of Replication (Ori)

8. Any part of the plant used to culture in vitro to obtain plantlets is known as ?

A: Explant

9. What do you call the plants that are genetically identical to the original plant from which they were grown?

A: Somaclones.