Annexure - ' G '

BIOLOGY (044)
Class -XII (2012-13)

Syllabus - Biology (XII) (180 Periods)

One Paper **Time : 3 Hours** **Max. Marks : 70 Marks**

Unit	Title	Marks
6.	Reproduction	14
7.	Genetics and evolution	18
8.	Biology and human welfare	14
9.	Biotechnology and its applications	10
10.	Ecology and environment	14
	Total	**70**

The question paper will include value based question(s) to the extent of 3-5 marks.

1. Reproduction

Reproduction in organisms: Reproduction, a characteristic feature of all organisms for continuation of species; Asexual reproduction Modes of reproduction-Asexual and sexual reproduction; Modes-Binary fission, sporulation, budding, gemmule, fragmentation; vegetative propagation in plants.

Sexual reproduction in flowering plant: Flower structure; Development of male and female gametophytes; Pollination-types, agencies and examples; Outbreedings devices; Pollen-Pistil interaction; Double fertilization; Post fertilization events-Development of endosperm and embryo, Development of seed and formation of fruit; Special modes-apomixis, parthenocarpy, polyembryony; Significance of seed and fruit formation.

Human Reproduction: Male and female reproductive systems; Microscopic anatomy of testis and ovary; Gametogenesis-spermatogenesis & oogenesis; Menstrual cycle; Fertilisation embryo development upto blastocyst formation, implantation; Pregnancy and placenta formation (Elementary idea); Parturition (Elementary idea); Lactation (Elementary idea).

Reproductive health: Need for reproductive health and prevention of sexually transmitted diseases (STD); Birth control – Need and Methods, Contraception and Medical Termination of Pregnancy (MTP); Amniocentesis; Infertility and assisted reproductive technologies – IVF, ZIFT, GIFT (Elementary idea for general awareness).

II. Genetics and Evolution (45 Periods)

Heredity and variation: Mendelian Inheritance; Deviations from Mendelism-Incomplete dominance, Co-dominance, Multiple alleles and Inheritance of blood groups, Pleiotropy; Elementary idea of polygenic inheritance; Chromosome theory of inheritance; Chromosomes and genes; Sex determination - in humans, birds, honey bee; Linkage and crossing over; Sex linked inheritance - Haemophilia, Colour blindness; Mendelian disorder in humans - Thalassemia; chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.

Molecular Basis of Inheritance: Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; Transcription, genetic code, translation; Gene expression and regulation - Lac Operon; Genome and human ganeome project; DNA finger printing.

Evolution: Origin of life; Biological evolution and evidences for biological evolution (Paleontological, comparative anatomy, embryology and molecular evidence); Darwin's contribution, Modern Synthetic theory of Evolution; Mechanism of evolution - Variation (Mutation and Recombination) and Natural Selection with examples, types of natural selection; Gene flow and genetic drift; Hardy - Weinberg's principle; Adaptive Radiation; Human evolution.

III. Biology and Human Welfare (35 Periods)

Health and Disease: Pathogens; parasites causing human diseases (Malaria, Filariasis, Ascariasis, Typhoid, Pneumonia, common cold, amoebiasis, ring worm); Basic concepts of immunology - vaccines; Cancer, HIV and AIDs; Adolescene, drug and alcholol abuse.

Improvement in food production : Plant breeding, tissue culture, single cell protein, Biofortification, Apiculature and Animal husbandry.

Microbes in human welfare: In household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers.

IV. Biotechnology and Its Applications (30 Periods)

Principles and process of Biotechnology: Genetic engineering (Recombinant DNA technology).

Application of Biotechnology in health and agriculture: Human insulin and vaccine production,

gene therapy; Genetically modified organisms-Bt crops; Transgenic Animals; Biosafety issues-Biopiracy and patents.

V. Ecology and Environment

Organisms and environment: Habitat and niche, Population and ecological adaptations; Population interactions-mutualism, competition, predation, parasitism; Population attributes-growth, birth rate and death rate, age distribution.

Ecosystems: Patterns, components; productivity and decomposition; Energy flow; Pyramids of number, biomass, energy; Nutrient cycling (carbon and phosphorous); Ecological succession; Ecological Services-Carbon fixation, pollination, oxygen release.

Biodiversity and its conservation: Concept of Biodiversity; Patterns of Biodiversity; Importance of Biodiversity; Loss of Biodiversity; Biodiversity conservation; Hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, National parks and sanctuaries.

Environmental issues: Air pollution and its control; Water pollution and its control; Agrochemicals and their effects; Solid waste management; Radioactive waste management; Greenhouse effect and global warning; Ozone depletion; Deforestation; Any three case studies as success stories addressing environmental issues.

Practicals

60 Periods

A. List of Experiments

1. Study pollen germination on a slide.
2. Collect and study soil from at least two different sites and study them for texture, moisture content, pH and water holding capacity of soil. Correlate with the kinds of plants found in them.
3. Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organisms.
4. Study the presence of suspended particulate matter in air at the two widely different sites.
5. Study of plant population density by quadrate method.
6. Study of plant population frequency by quadrate method.
7. Prepare a temporary mount of onion root tip to study mitosis.
8. To study the effect of the different temperatures and three different pH on the activity of salivary amylase on starch.

Study/observation of the following (Spotting)

1. Flowers adapted to pollination by different agencies (wind, insect).
2. Pollen germination on stigma through a permanent slide.
3. Identification of stages of gamete development i.e. T.S. testis and T.S. ovary through permanent slides (from any mammal).

4. Meiosis in onion bud cell or grass hopper testis through permanent slides.
5. T.S. of blastula through permanent slides.
6. Mendelian inheritance using seeds of different colour/sizes of any plant.
7. Prepared pedigree charts of genetic traits such as rolling of tongue, blood groups, widow's peak, colour blindness.
8. Exercise on controlled pollination - Emasculation, tagging and bagging.
9. Identification of common disease causing organisms like Ascaris, Entamoeba, Plasmodium, ringworm through permanent slides or specimens. Comment on symptoms of disease that they cause.
10. Two plants and two animals found in xerophytic conditions. Comment upon their morphological adaptations.
11. Plants and animals found in aquatic conditions. Comment upon their morphological adaptations.

DESIGN OF QUESTION PAPER
BIOLOGY (044)
Class -XII (2012-13)

Time : 3 hrs. **MM.: 70**

Type of question	Marks / Question	Total number of Questions	Total marks
VSA	**1**	**8**	**8**
SA I	**2**	**10**	**20**
SA II	**3**	**9**	**27**
LA (v*)	**5**	**3**	**15**
Total		**30**	**70**

S.No.	Unit No.	Unit Name	Weightage of marks
1	I	Reproduction	14
2	II	Genetics and Evolution	18
3	III	Biology in human welfare	14
4	IV	Biotechnology and its application	10
5	V	Ecology and environment	14
Total			70

The question paper will include value based question(s) to the extent of 3-5 marks.

SAMPLE QUESTION PAPER
BIOLOGY (044)
Class -XII (2012-13)

BLUE PRINT

UNIT No.	Weightage	LA (no. of questions)	SA II (no. of questions)	SA I (no. of questions)	VSA (no. of questions)
I (Reproduction)	14	5 (1)	3 (2)	2 (1)	1 (1)
II (Genetics and Evolution)	18	5 (1)	3 (2)	2 (3)	1 (1)
III (Biology in human welfare)	14	5(1)*	3 (2)	2 (1)	1 (1)
IV (Biotechnology and its application)	10		3 (1)	2 (2)	1 (3)
V (Ecology and environment)	14		3 (2)	2 (3)	1 (2)
Total	70	5 (3)=15	3 (9)=27	2 (10)=20	1 (8)=8

*** Value based question**

NOTE :

- **Value Based Question may be asked from any unit / chapter / topic.**
- **It will consist of 3 – 5 marks.**

SAMPLE QUESTION PAPER
BIOLOGY (044)
Class -XII (2012-13)

Time : 3 hrs. **MM.: 70**

General Instructions:

i. All questions are compulsory.
ii. This question paper consists of four Sections **A, B, C** and **D**. Section **A** contains **8** questions of **one** mark each, Section **B** is of **10** questions of **two** marks each, Section **C** is of **9** questions of **three** marks each and Section **D** is of **3** questions of **five** marks each.
iii. There is no overall choice. However, an internal choice has been provided in one question of 2 marks, one question of **3** marks and **two** questions of **5** marks weightage. A student has to attempt only one of the alternatives in such questions.
iv. Wherever necessary, the diagrams drawn should be neat and properly labelled.

Section A **(1×8 = 8)**

1. **The following statements describe the wind-pollinated plants. Which one of these statements is incorrect?**

   (i) The pollen grains are sticky.

   (ii) Stamens are well exposed.

   (iii) Flowers often have a single ovule.

2. Write the formula to calculate allele frequency in future generations according to Hardy - Weinberg genetic equilibrium.

3. "Pranay suffered from measles at the age of 10 years. There are rare chances of his getting infected with the same disease for the rest of his life." Give reason for the statement.

4. Give the name of the carcinogenic dye which is used to stain gel to make the DNA visible under UV light.

5. Which main technique and instrument is used to isolate DNA from a plant cell?

6. How is the action of normal endonuclease enzymes different from that of restriction endonucleases?

7. 'Eutrophication' is the natural aging of a lake. Mention another feature which defines this term.

8. How are standing crop and biomass related to each other?

Section B

(2 × 10 = 20)

9. What do you understand by amniocentasis? Why is there a statutory ban on this? Give reason.

10. A non-haemophilic couple was informed by their doctor that there is possibility of a haemophilic child being born to them. Draw a checker board and find out the percentage of possibility of such a child among the progeny.

11. How do Darwin's finches illustrate adaptive radiation?

12. In a particular plant species, majority of the plants bear purple flowers. Very few plants bear white flowers. No intermediate colours are observed. If you are given a plant bearing purple flowers, how would you ascertain that it is a pure breed for that trait? Explain.

13. Why is the introduction of genetically engineered lymphocytes into an ADA deficiency patient not a permanent cure? Suggest a possible permanent cure.

14. In which technique do we use Taq polymerase enzyme and why?

15. Differentiate between a detrivore and a decomposer giving an example of each.

16. DDT content in the water of a lake that supplies drinking water to the nearby villages is found to be 0.004 ppm. The pelicans of that area are reported to have 2.6 ppm of DDT. Why has the concentration increased in these birds? What possible harm will this cause to the bird population? Name the phenomenon.

17. The gradual and predictable change in the species composition of a given area is called ecological succession. What do you understand with the pioneer and climax community in this context?

18. Write the names of causal organisms of the following:

    a) Typhoid

    b) Pneumonia

    c) Elephantiatis (Filariasis)

    d) Amoebiasis

OR

Expand the following:

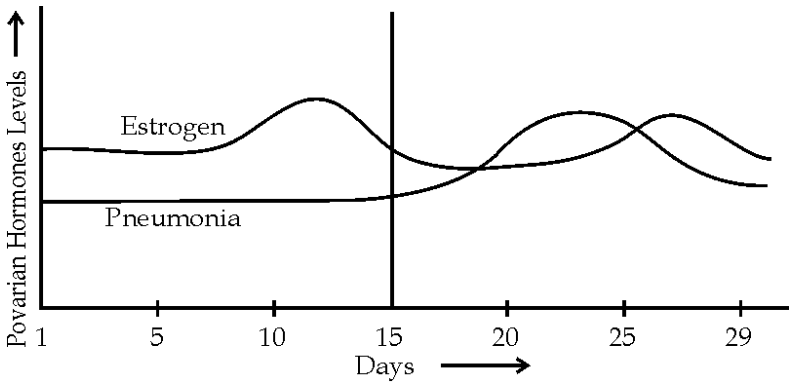
a) AIDS

b) ELISA

Section - C

(3 × 9 = 27)

19.



Study the graph given above showing the levels of ovarian hormones during menstruation and correlate the uterine events that take place according to the hormonal levels on:

(i) 6-15 days

(ii) 16 - 25 days

(iii) 26 - 28 days (if the ovum is not fertilized)

20. Expand the following and explain any one of them.

a) IVF b) ZIFT

c) IUI d) MTP

21. What is the genetic basis for proof that codon is a triplet and is read in a contiguous manner without punctuations?

22. What is satellite DNA in a genome? Explain their role in DNA fingerprinting.

23. "Microbes play a dual role when used for sewage treatment as they not only help to retrieve usable water but also generate fuel". Explain.

24. What does BOD of a water body stand for? How is it related to water pollution?

25. A vector is engineered with three features which facilitate its cloning within the host cell. List the three features and explain each one of them.

26. Interspecific interactions of two species of any population may be beneficial, detrimental or neutral. Explain each of them with the help of suitable examples.

27. Water is very essential for life. List any three features that enable plants and animals to survive in water scarce environment.

OR

(a) What would be the consequence of failure of the electrostatic precipitator of a thermal plant?

(b) Mention any four methods by which vehicular air pollution can be controlled.

Section D

(5 × 3 = 15)

28. (a) Draw a labelled diagram of sectional view of human ovary showing different stages of oogenesis.

(b) Where is morula formed in humans? Explain the process of its development from the zygote.

OR

(a) Draw a labelled diagram of the sectional view of a typical anatropous ovule.

(b) Mention the fate of all the components of the embryo sac after fertilization?

29. (a) Write what DNA replication refers to.

(b) State the properties of DNA replication model.

(c) List any three enzymes involved in the process along with their functions.

OR

Inheritance patterns of flower colour in garden pea plant and snap dragon differ. Why is the difference observed? Explain the difference with the help of crosses in their inheritance patterns.

30. Aditya participated in a group discussion in his school on "The ill effects of Tobacco on Human Health". In the evening he goes with his family for dinner and insists on sitting in the "Non-Smoking Area" to which his father (who is a heavy smoker) objects.

(a) In this situation, who wins your support - Aditya's concern for health & environment or his father's objection? Justify giving two reasons. (2)

(b) Suggest any three effective propaganda campaigns for anti-tobacco awareness. (3)

MARKING SCHEME

Sample Question Paper

Class XII

Biology - 2012-13

1. (i) the pollen grains are sticky. 1

2. $(p+q)^2 = p^2 + 2pq + q^2 = 1$ 1

3. First exposure to the infection works as vaccination, the immune system of the body gets familiar with the nature of microorganisms and specific antibodies can be produced against infection. ½+½=1

4. Ethidium bromide (EtBr) 1

5. Centrifugation and centrifuge ½+½=1

6. Normal Endonuclease : makes cut at <u>random position within</u> a DNA ½

   Restriction endonuclease: makes cut only at <u>specific position within</u> a DNA ½

7. - Depletion of dissolved oxygen in water ½

   - Nutrient enrichment ½

8. Each trophic level has a certain mass of living material at a particular time called as the standing crop. ½

   The standing crop is measured as the mass of living organisms (biomass) or the number in a unit area. The biomass of a species is expressed in terms of fresh or dry weight. ½

9. Amniocentasis – A foetal sex diagnostic test based on the chromosomal pattern in the amniotic fluid surrounding the developing embryo.

It is justified to ban the process for diagnosis of sex to legally check the increasing female foeticides.

10.

	X	Y
X	X X	X Y
$\bar{X}$	X $\bar{X}$	$\bar{X}$ Y

Phenotypes : 50% daughter normal (XX)

50% daughter carrier (X $\bar{X}$)

50% son normal (XY)

50% son haemophilic ($\bar{X}$ Y) ½ ×4=2

11. Original stock of seed eating finches migrated to different habitats (of Galapagos Islands), adapted to different feeding methods, by altered beak structure, evolved into different types of finches. ½ ×4=2

12. Testcross , Cross purple flower plant with a (homozygous) recessive plant with white flowers, if all the flowers of the progeny of the above are purple , the plant is homozygous dominant ½ ×4=2

13. Lymphocytes are not immortal but are short lived , hence patient requires periodic infusion of such genetically engineered lymphocytes , however if a gene producing ADA is isolated from marrow cells, and introduced into the cells at early embryonic stages it could be a permanent cure. ½ ×4=2

14. PCR, because it is a thermostable DNA polymerase enzyme, gets isolated from bacteria *Thermus aquaticus* from hot water springs, does not get denatured at high temperature during PCR and works as normal DNA polymerase enzyme. ½ ×4=2

15. Detrivore feeds on dead plants and animals / detritus ½

Example : Earthworm / Nematodes ½

Decomposer breaks down complex (organic) matter into simpler (inorganic) matter ½+½

Example : Fungus / Bacteria.

16. DDT neither excreted nor metabolized and keeps accumulating in the food chain, interferes with Calcium metabolism, decline in bird population / due to thinning of egg shell / premature breaking of eggs, bio-magnification. ½ ×4=2

17. Pioneer Community (Species) – Community that invades a bare area 1

Climax community – Last sustainable community that is in near equilibrium with the environment 1

18. a) *Salmonella typhi*

b) *Streptococcus pneumoniae*

c) *Wuchereria bancrofti* and *Wuchereria malayi*

d) *Entamoeba histolytica* ½×4=2

OR

a) Acquired Immuno Deficiency Syndrome

b) Enzyme Linked Immuno Sorbent Assay 1x1=2

19. (i) Regeneration of endometrium.

(ii) Uterus gets highly vascularised, ready for embryo implantation

(iii) Disintegration of the endometrium leading to menstruation 1×3=3

20. IVF – In Vitro Fertilization

ZIFT – Zygote Intra Fellopian Transfer

IUI - Intra – Uterine Insemination

MTP – Medical Termination of Pregnency ½×4=2

21. Since there are only four bases which code for twenty aminoacids, the code should be madeup of three bases i.e. (4 x 4 x 4) = 64 codons ; a number more than the required. 1

If the codon consists of four letters, only (4 x 4) only sixteen codes are possible, which is less than the required. 1

- As the ribosome moves on mRNA the codons are read in a contiguous fashion 1

22. DNA sequences which are repeated many a times, show a high degree of polymorphism, and form a bulk of DNA in a genome, called as satellite DNA 1½

DNA from every tissue from an individual, shows the same degree of polymorphism and is heritable, hence very useful in DNA finger printing 1½

23. • Microbes naturally present in the sewage are employed in the secondary treatment of the sewage.

- The effluent from the primary treatment is passed into large aeration tanks.
- This allows the rapid growth of aerobic microbes into flocs which consume the organic matter of the sewage and reduce the BOD.

- Then the effluent is passed into a settling tank, where the flocs are allowed to sediment forming the activated sludge.
- Major parts of this activated sludge is pumped into anaerobic sludge digesters, where the anaerobic bacteria digest microbes in the activated sludge.
- During this digestion bacteria produce a mixture of gases like methane, hydrogen sulphide and carbon dioxide, which form the biogas and can be used as a source of energy. The effluent is generally released into rivers and streams.

24. BOD – Biological Oxygen Demand, it refers to the amount of oxygen that would be consumed if all the organic matter in one litre of water were oxidized by Bacteria. The BOD test measures the rate of uptake of oxygen by microorganisms in a sample of water and thus, indirectly BOD is a measure of the organic matter present in the water. The greater is a measure of BOD of waste water; more is its polluting potential.

25. (i) Origin of replication / ori site – From here the replication starts (and any piece of DNA when linked, can be made to replicate within the host cell)

(ii) At least two Selectable markers – Helps in identifying and eliminating non transformants

(iii) Unique Restriction sites – The foreign DNA links to this region of the plasmid

1×3=3

26. Population interaction:

Species A	**Species B**	**Name of interaction**
+	+	Mutualism
-	-	Competition
+	-	Predation

+	-	Parasitism
+	0	Amensalism

(i) + Beneficial- Bothe species benefit in Mutualism e.g. lichens

(ii) - Detrimental – Both species loose in competition e.g. (detrimental)

- In Predation & Parasitism the predator and the parasite benefits but it is detrimental to the other species (host and prey respectively)

(iii) 0 Neutral – In commensalism one species is benefits but the other is neither harmed nor benefitted. 3

27. **Plants:** Ephemeral mode (complete life cycle in short period) / Deep tap roots / Deciduous leaves / Waxy cuticle / sunken stomata / Succulence to store water / C_4 Pathway of Photosynthesis. (Any 3) 1½

Animals: No sweating / uricotelic / deposition of fat in sub epidermal layer / burrowing nature / thick skin / body covered with scales (Any three) 1½

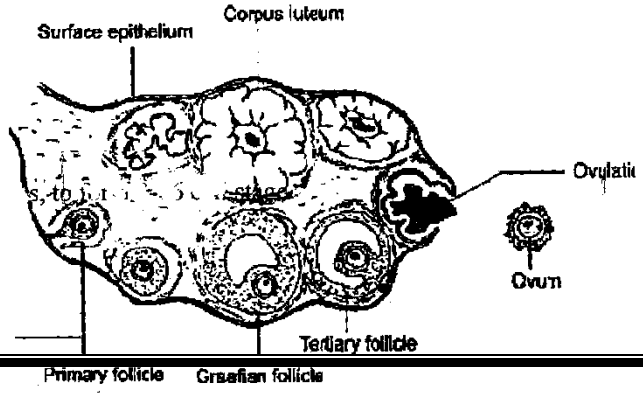
3

OR

Ans. (i) Particulate matter will pollute the air 1

(ii) Use of CNG / Phasing out of old vehicles / Use of unleaded petrol / Use of low sulphur fuel / Use of catalytic converters / Application of stringent pollution level norms (Any four) 2

28. (a)



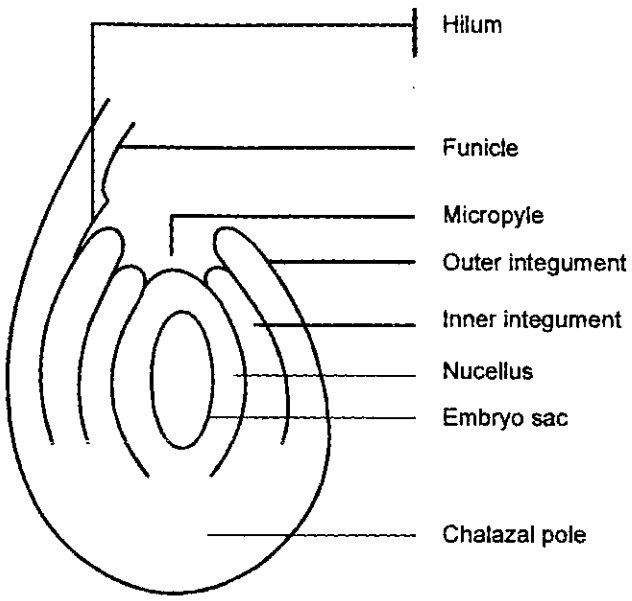
½ ×6=3

(b) Fallopian tube 1

zygote undergoes, cleavage to form, blastomeres & develop into 8-16 cell stage- the morula ½+½

OR

(a)



½×7=3½

(b) Egg cell - Forms zygote (2n)

Polar nuclei - Primary endosperm nucleus (3n)

Antipodals – Degenerates ½×3=1½

} 5

29. (a) DNA synthesis ½

(b) i) Semi conservative

ii) Semi discontinuous } 1½

iii) Unidirectional

(c) DNA polymerase III – adds nucleotides

DNA polymerase I – fills the gaps

RNA primase – brings primer

Helicase – breaks hydrogen bond

Toisomerase – Causes unwinding

Gyrase – relaxes supercoiling

DNA ligase – joins Okazaki fragments

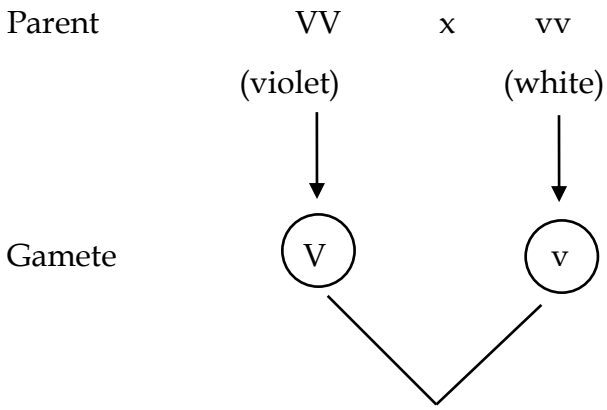
Any 3 enzymes and their function

1 x 3 = 3

OR

Inheritance of flower colour in Pisum sativum

Pea Plant

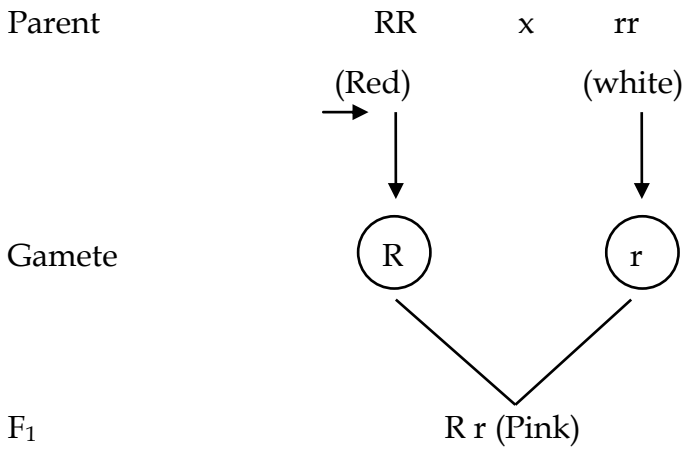


F_1 V v (violet) 1½

This inheritance pattern follows law of dominance, that is between the two alleles of the flower colour (gene) the dominant allele is expressed(phenotypically), over the recessive 1

In the case of Antirrhinum(snap dragon) the dominant flower colour is red. white in recessive ½

Antirrhinum



This is the case of incomplete dominance, it is because the allele for red colour is not completely dominant over its recessive allele, law of dominance not exhibited

1

30. (a) I will support Aditya's concern for the health of his family. Both Active as well as Passive smoking is injurious to health as smoking is associated with increased incidence of cancers of lungs, urinary bladder, throat and oral cavity, bronchitis, emphysema / coronary heart disease / gastric ulcer etc. 2

b) (i) By printing statutory warning on cigarette packets.

(ii) As advertisement in mass media such as Television, Newspaper, Internet etc.

(iii) Designating Non smoking Zones in public areas such as Restaurants, Airports etc. 3

5