

Class: XII
Biology-044
Sample Question Paper 2018-19

MM: 70

TIME: 3HOURS

General Instructions:

1. All questions are compulsory.
2. The question paper consists of four sections A, B, C and D.
3. Internal choice is given in all the sections. **A student has to attempt only one of the alternatives in such questions.**
4. Section–A contains 5 questions of 1 mark each.
5. Section–B has 7 questions of 2 marks each.
6. Section–C is of 12 questions of 3 marks each
7. Section–D has 3 questions of 5 marks each.
8. Wherever necessary, the diagrams drawn should be neat and properly labelled.

SECTION- A

1. How many pollen grains and ovules are likely to be formed in the anther and the ovary of an angiosperm bearing 25 microspore mother cells and 25 megaspore mother cells respectively? 1

OR

In case of polyembryony, an embryo A develops from the synergids and the embryo B develops from the nucellus. State the ploidy of embryo A and B.

2. Give the scientific name of the source organism from which the first antibiotic was produced. 1
3. The prophase I stage of meiosis plays a vital role in r-DNA formation. Justify with reason. 1
4. Name the technique by which Gene expression can be controlled with the help of RNA molecule. 1
5. Define Diapause 1

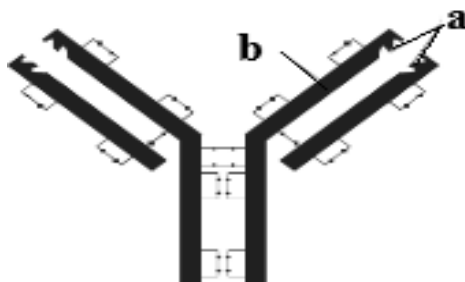
OR

Define Standing Crop

SECTION- B

6. The figure given below represents a molecule present in the body of a mammal -

2



- a) Name the parts labelled 'a' and 'b' in the molecule shown above.
b) Name the type of cells that produce this molecule.

OR

Life style diseases are increasing alarmingly in India. We are also dealing with large scale malnutrition in the population. Suggest a process by which we can address both these problems. Give any three examples to support your answer.

7. Why does the lac operon shut down some time after the addition of lactose in the medium where *E.coli* was growing? Why low level expression of lac operon is always required? 2
8. a) While cloning vectors, which of the two will be preferred by biotechnologists - bacteriophages or plasmids. Justify with reason. 2
b) Name the first transgenic cow developed and state the improvement in the quality of the product produced by it.
9. Explain the impact of removal of thymus gland on the immune system of a human body. 2

OR

A farmer maintained beehives in his *Brassica* field during its flowering season. How will he be benefitted?

10. How do automobiles fitted with catalytic converters reduce air pollution? Suggest the best fuel for such vehicles. 2
11. State the Mendelian principle which can be derived from a dihybrid cross and not from monohybrid cross. 2
12. Comment upon the mode of pollination in *Vallisneria* and *Eichhornia* which have emergent flowers. 2

SECTION- C

13. Alien species are highly invasive and are a threat to indigenous species. Substantiate this statement with any three examples. 3
14. The embryo sac in female gametophyte is seven celled and eight nucleated structure. Justify the statement with the help of a labelled diagram. 3

OR

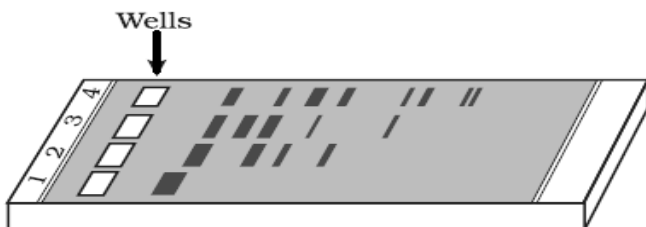
List the changes that occur when an ovule matures into seed.

15. Compare and contrast the theories of evolution proposed by Darwin and Hugo De Vries. 3
16. Explain the different steps involved in the secondary treatment of sewage. 3

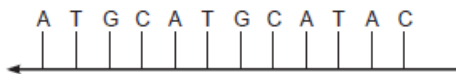
OR

Microbes can be used to decrease the use of chemical fertilizers. Explain how this can be accomplished.

17. a) How do DNA fragments migrate and resolve in a Gel electrophoresis? 3
b) How lane one is different from lane 2, 3 and 4 in the Gel electrophoresis set up?
c) How pure DNA fragments are made observable in the visible light?



18. Suggest and explain the assisted reproductive techniques which will help a couple to have children, where the female had a blockage in the fallopian tube and the male partner had a low sperm count. 3
19. a) Construct a complete transcription unit with promoter and terminator on the basis of the hypothetical template strand given below: 3



- b) Write the RNA strand transcribed from the above transcription unit along with its polarity.

OR

- a) Mention two events in which DNA is unzipped.
- b) Predict the consequences when both the template and the coding strands of a DNA segment participate in transcription process?

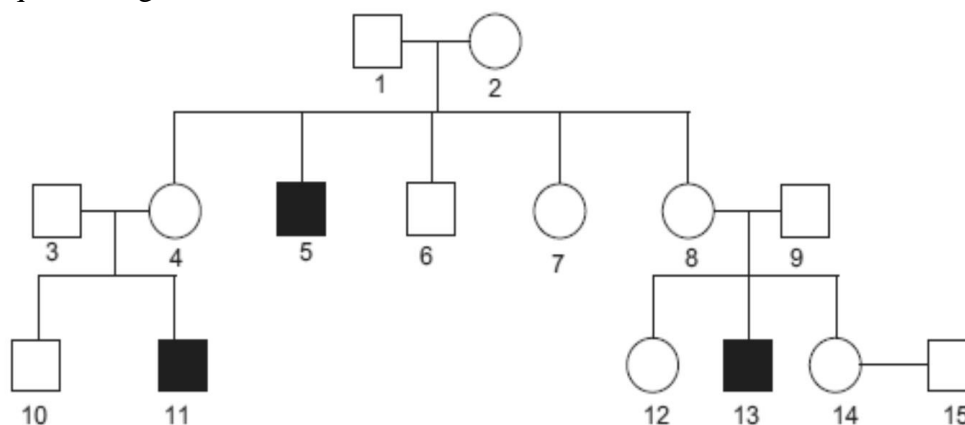
20. As a biologist explain the technique to a dairy farmer for increasing the yield of herd size of cattle in a short time. 3
21. The Indian Government refuted the attempt by a multinational company (MNC) to patent the antiseptic property of curcumin derived from Turmeric. Analyze the unethical practice adopted by the MNC, state its implications and suggest provisions in the Indian Law to prevent such malpractices. 3
22. A 17-year old boy is suffering from high fever with profuse sweating and chills. Choose the correct option from the following diseases which explains these symptoms and rule out the rest with adequate reasons. 3
- (a) Typhoid (b) Viral Fever(c) Malaria
23. Study the given pedigree chart and answer the questions that follow: 3



- (a) Is the trait recessive or dominant?
 (b) Is the trait sex-linked or autosomal?
 (c) Give the genotypes of the parents shown in generation I and their third child shown in generation II and the first grandchild shown in generation III.

OR

Haemophilia is a sex linked recessive disorder of humans. The pedigree chart given below shows the inheritance of Haemophilia in one family. Study the pattern of inheritance and answer the questions given.



- (a) Give all the possible genotypes of the members 4, 5 and 6 in the pedigree chart.
 (b) A blood test shows that the individual 14 is a carrier of haemophilia. The member numbered 15 has recently married the member numbered 14. What is the probability that their first child will be a haemophilic male.? Show with the help of Punnett square.

24. a) In a pond there were 200 frogs. 40 more were born in the year. Calculate the birth rate of the population. 3
 b) Population in terms of number is not always a necessary parameter to measure population density. Justify with two examples.

SECTION- D

25. People living in the coastal areas are forced to evict their dwelling units as the sea has inundated into the land areas. State the possible reasons and suggest measures that could be taken to reduce the deleterious changes in the environment. 5

OR

A young sperm whale, 33-foot long was found dead off the coast. It had a large amount of human trash like trash bags, polypropylene sacks, ropes, net segments etc. amounting to 29 kilograms in its digestive system. The whale died because of inflammation of the abdominal lining. Analyze the possible reasons for such mishaps and suggest measures that can be taken to reduce such incidents.

26. Aneuploidy of chromosomes in human beings results in certain disorders. Draw out the possibilities of the karyotype in common disorders of this kind in human beings and its consequences in individuals. 5

OR

In a dihybrid cross, white eyed, yellow bodied female *Drosophila* was crossed with red eyed, brown bodied male *Drosophila*. The cross produced 1.3 percent recombinants and 98.7 progeny with parental type combinations in the F₂ generation. Analyze the above observation and compare with the Mendelian dihybrid cross.

27. Differentiate between spermatogenesis and oogenesis. 5

OR

‘Parturition is induced by a complex Neuro endocrine mechanism’. Justify

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Marking Scheme-2018-19

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SECTION-A

1. Microspore mother cells $25 \times 4 = 100$ pollen grains and from megaspore mother cells 25 ovules respectively. 1
 $\frac{1}{2} + \frac{1}{2}$ a mark each

OR

A-Haploid ; B-Diploid

$\frac{1}{2} + \frac{1}{2}$ mark

2. *Penicillium notatum* 1

3. The prophase I stage of meiosis plays vital role in r-DNA formation because crossing over occurs at this stage which helps in recombination. 1

4. RNA interference 1

5. Diapause is a stage of suspended development in zooplanktons species under unfavourable conditions. 1

OR

Each trophic level has a certain mass of living material at a particular time called as the standing crop. $\frac{1}{2} + \frac{1}{2}$ mark

SECTION-B

6. a) 2
a–Antigen binding site
b–Light chain $\frac{1}{2} + \frac{1}{2}$ a mark each

- b) B-lymphocytes (B-cells).

1 mark

OR

Biofortification

$\frac{1}{2}$ a mark

a) Enhancing food quality with respect to protein -

- Maize hybrids that had twice the amount of the amino acids, lysine and tryptophan, compared to existing maize hybrids were developed.

OR

- Wheat variety, Atlas 66, having a high protein content, has been used as a donor for improving cultivated wheat.

OR

- Protein enriched beans – broad, lablab, French and garden peas.

(any one $\frac{1}{2}$ mark)

b) Vitamin Enriched -

- Vitamin A Enriched Carrots, Spinach, Pumpkin;

OR

- Vitamin C enriched bitter gourd, bathua, mustard, tomato.

(any one $\frac{1}{2}$ mark)

c) **Enrichment of Micro Nutrient And Mineral Content-**

- Iron and calcium enriched spinach and *bathua* ½ a mark

7. After addition of lactose, complete breakdown of lactose to glucose and galactose takes place. Therefore, there is no more lactose to bind to the repressor protein and the lac operon shuts down. 2
1 mark
A very low level of expression of *lac* operon has to be present in the cell all the time, otherwise lactose cannot enter the cells. 1 mark
8. a) Bacteriophages, because they have very high copy numbers of their genome within the bacterial cells whereas some plasmids may have only one or two copies per cell and others may have 15-100 copies per cell. 2
1 mark
b) Rosie, it produced human protein-enriched milk (2.4 Gms per litre). 1 mark
9. The thymus provides micro-environments for the development and maturation of T-lymphocytes. The T-cells themselves do not secrete antibodies but, they help B cells produce them. Therefore, the immunity will be reduced. 2
½ x 4 = 2 marks

OR

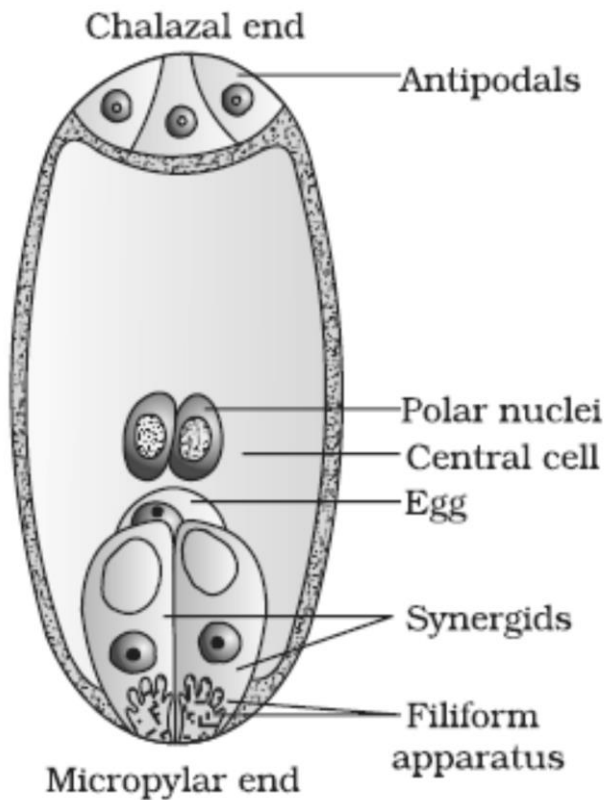
Keeping beehives in crop fields during flowering period increases pollination efficiency and improves the yield— crop yield and honey yield. 1 + 1 marks

10. • Catalytic converters have expensive metals like platinum–palladium and rhodium as catalysts. 2
½ a mark
• As the exhaust emission passes through the catalytic converter, unburnt hydrocarbons are converted into carbon dioxide and water. ½ a mark
• Carbon monoxide and nitric oxides are changed to carbon dioxide and nitrogen gas respectively. ½ a mark
• Unleaded petrol is the best fuel. ½ a mark
11. From the dihybrid cross, law of independent assortment can be derived which states that, when two pairs of traits are combined in a hybrid, segregation of one pair of characters is independent of the other pair of characters. 2
1 + 1 mark
12. In *Eichhornia* the flowers emerge above the level of water and are pollinated by insects or wind. 2
1 mark
In *Vallisneria*, the female flower reaches the surface of water by the long stalk and the male flowers or pollen grains are released on to the surface of water. They are carried passively by water currents some of them eventually reach the female flowers and the stigma. 1 mark

SECTION-C

13. (i) Nile perch introduced into Lake Victoria in East Africa led to the extinction of Cichlids fish. 3
1 mark
(ii) *Parthenium/Lantana/Eichhornia* are invasive plants and pose a threat to indigenous species. 1 mark
(iii) Introduction of African catfish (*Clarias gariepinus*) to aquaculture is a threat to Indian catfishes. 1 mark

14. The typical **female gametophyte** or **embryo sac** has three cells that are grouped together at the micropylar end and constitute the **egg apparatus**. The egg apparatus, in turn, consists of two **synergids** and one **egg cell**. 3
 Three cells are at the chalazal end and are called the **antipodals**. 1 mark
 The large central cell, has two polar nuclei. ½ a mark
 Thus, a typical angiosperm embryo sac, at maturity is 8-nucleate is 7-celled.



1 mark

OR

- Integuments of ovules harden as tough protective seed coats
- The micropyle remains as a small pore in the seed coat
- As the seed matures, its water content is reduced
- Seeds become relatively dry (10-15 per cent moisture by mass).
- The general metabolic activity of the embryo slows down.
- The embryo may enter a state of inactivity called dormancy (½ X6=3)

15. 3

S.No.	Darwin's Theory of Natural Selection	De Vries Theory of Mutation
1.	Minor variations cause evolution	Mutation causes evolution
2.	Darwinian variations are small and directional.	Mutations are random and directionless.
3.	Evolution is gradual.	Sudden mutations cause evolution.

1+1+1 mark

16. 3

- Primary effluent is passed into large aeration tanks with constant mechanical agitation and air supply. Useful aerobic microbes grow rapidly and form flocs. 1 mark
- Flocs while growing consume organic matter and thus reduce the biochemical oxygen demand (BOD), the effluent is passed into settling tank. 1 mark
- The bacterial flocs settle at the bottom of the tank and it forms activated sludge, a small part this is used as an inoculum in the aeration tank and the remaining part is passed into large tanks called anaerobic sludge digesters. 1 mark

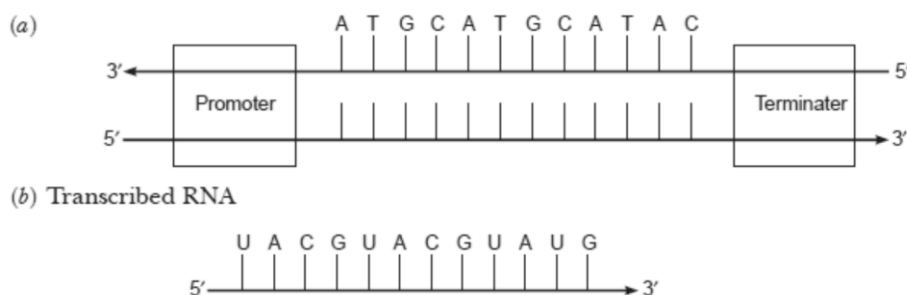
OR

- *Rhizobium* bacteria present in the root nodules of leguminous plants forms a symbiotic association and fixes atmospheric nitrogen into organic forms, which is used by the plant as nutrient.
- Free-living bacteria in the soil *Azospirillum* and *Azotobacter* can fix atmospheric nitrogen thus enriching the nitrogen content of the soil.
- Many members of the genus *Glomus* (Fungi) form mycorrhizal symbiotic associations with higher plants in these, the fungal symbiont absorbs phosphorus from soil and passes it to the plant.
- Cyanobacteria like *Anabaena*, *Nostoc*, *Oscillatoria* are autotrophic microbes widely distributed in aquatic and terrestrial environments, which can fix atmospheric nitrogen, also add organic matter to the soil and increase its fertility. (any three 1 mark each 1x3=3)

17. 3
- a) The DNA fragments resolve according to their size through sieving effect provided by the agarose gel. Hence, the smaller the fragment size, the farther it moves. 1 mark
 - b) The given agarose gel electrophoresis shows migration of undigested DNA fragments in lane 1 and digested set of DNA fragments in lane 2 to 4. 1 mark
 - c) The separated DNA fragments can be visualized only after staining the DNA with a compound known as ethidium bromide followed by exposure to UV radiation. 1 mark

18. 3
- As the male partner is suffering from low sperm count, Intracytoplasmic sperm injection technique should be used to directly inject sperm into the ovum.
 - As the female partner is having blockage in the fallopian tube, In vitro fertilization, followed by embryo transfer (ET) will help her conceive.
 - In this case, sperms from the male partner will be collected and injected into the ovum of the female partner to form zygote under simulated conditions in the laboratory and embryo with more than 8 blastomeres will be transferred into the uterus IUT – intra uterine transfer, to complete its further development. (1 x 3 = 3)

19. 3



2+1 marks

OR

- a) Replication and Transcription . ($\frac{1}{2} + \frac{1}{2}$ a mark each)
b) If both the strands take part in transcription.
 • one segment of DNA would be coding for two different proteins which will complicate the genetic information machinery
 • Two RNA molecules will be produced, complementary to each other, hence form a double stranded RNA. (1+1 =2 marks)
20. Multiple Ovulation Embryo Transfer Technology (MOET) will help the dairy farmer for increasing the yield of herd size of cattle in a short time. 3
1 mark
 • In this method, a cow is administered hormones, with FSH-like activity, to induce follicular maturation and super ovulation – instead of one egg, which they normally yield per cycle, they produce 6-8 eggs. 1 mark
 • The animal is either mated with an elite bull or artificially inseminated. $\frac{1}{2}$ a mark
 • The fertilized eggs at 8–32 cells stages, are recovered non-surgically and transferred to surrogate mothers. $\frac{1}{2}$ a mark
21. 3
 • MNC wanted to encash on our rich legacy by bio piracy. 1 mark
 • It leads to injustice, inadequate compensation and unauthorized exploitation of traditional knowledge of the country. 1 mark
 • Second amendment of the Indian Patents Bill takes into consideration issues related with patent terms, emergency provisions, and research & development initiative. 1 mark
22. (a) If the boy is suffering from Typhoid, then, he should have sustained high fever (39° to 40°C), weakness, stomach pain, constipation and headache. So It cannot be typhoid. 3
1 mark
(b) If the boy is suffering from Viral Fever he will suffer from high fever, joint pain, weakness, and headache, So It cannot be Viral Fever. 1 mark
(c) If the boy is suffering from Malaria he should have high fever recurring with profuse sweating every three to four days associated with chills and headache. There is a possibility that he is suffering from Malaria because high fever associated with chills is possible with malaria. 1 mark
23. (a) Dominant. $\frac{1}{2}$ a mark
(b) Autosomal. $\frac{1}{2}$ a mark
(c) Genotype of parents in generation I – Female – aa and Male – Aa. ($\frac{1}{2} + \frac{1}{2}$ mark each)
Genotype of third child in generation II - Aa.
Genotype of first grandchild in generation III - Aa. ($\frac{1}{2} + \frac{1}{2}$ a mark each)
OR
(a) Genotypes of member 4 – XX or XX^h $\frac{1}{2}$ a mark each
Genotypes of member 5 – X^hY $\frac{1}{2}$ a mark each
Genotypes of member 6 – XY $\frac{1}{2}$ a mark each
(b) The probability of first child to be a haemophilic male is 25%. 1 mark for punnett square + $\frac{1}{2}$ for probability
24. a) Birth rate = No. of individuals born/Total no. of individuals = $40 / 200 = 0.5$ frogs per year. 3
1 mark
b) Number is not always a necessary parameter to measure population density. Example –

1. If there are 200 *Parthenium* plants but only a single huge banyan tree with a large canopy, the population density of banyan is low relative to that of *Parthenium* which amounts to underestimating the enormous role of the Banyan in that community. In such cases, the per cent cover or biomass is a more meaningful measure of the population size.
2. In a dense laboratory culture of a microbial population in a petri dish, the total number of microbes is again not an easily adoptable measure because population is huge, counting is impossible and time-consuming. (1 +1 mark)

SECTION-D

25. Increase in the level of greenhouse gases has led to considerable heating of Earth leading to global warming, the temperature of Earth has increased by 0.6 °C most of it during the last three decades. 1½ marks

El Nino effect is leading to increased melting of polar ice caps as well as of other snow caps. This has resulted in a rise in sea level that can submerge many coastal areas. 1½ marks

The measures include

- Cutting down use of fossil fuel,
- improving efficiency of energy usage
- reducing deforestation and planting trees
- Slowing down the growth of human population.
- Reduce the emission of greenhouse gases into the atmosphere.

(any four points; ½ a mark each x 4=2)

OR

- We are increasing the use of non-biodegradable products. At least one layer of plastic is there in most of the products we buy.
- We have started packaging even our daily use products like milk and water in polybags.
- In cities, fruits and vegetables are packed in polystyrene and plastic packaging and we contribute heavily to environmental pollution.

(any two 1+1 mark)

Measures that could be taken to reduce such mishaps are:

- We can support government's initiative across the country by reducing the use of plastics and use of eco-friendly packaging.
- We can do our bit by carrying cloth or other natural fibre carry-bags when we go for shopping and by refusing to take the polythene bags from shopkeepers.
- It is important that all garbage generated is sorted. The biodegradable materials can be put into deep pits in the ground and be left for natural breakdown. It leaves only the non-biodegradable to be disposed of, the quantity of which should be minimized. The need to reduce our garbage generation should be a prime goal. (any three 1+ 1+1 mark)

26. Down's syndrome, Turner's syndrome, Klinefelter's syndrome are common examples of Aneuploidy of chromosomes in human beings. 5

- Down's syndrome results in the gain of extra copy of chromosome 21- trisomy. ½ + ½ a mark each
- Turner's syndrome results due to loss of an X chromosome in human females- XO monosomy. ½ a mark
- Klinefelter's Syndrome is caused due to the presence of an additional copy of X-chromosome resulting into XXY condition. ½ a mark

Down's Syndrome:

The affected individual is

- short statured with small round head
- furrowed tongue and partially open mouth
- Palm is broad with characteristic palm crease
- Physical, psychomotor and mental development is retarded.

(any two $\frac{1}{2} + \frac{1}{2}$ a mark each)

Klinefelter's Syndrome: The affected individual is

- a male with development of breast, i.e., Gynecomastia
- Such individuals are sterile. $\frac{1}{2} + \frac{1}{2}$ a mark each

Turner's Syndrome: The affected individual shows following characters-

- Females are sterile as ovaries are rudimentary
- lack of other secondary sexual characters $\frac{1}{2} + \frac{1}{2}$ a mark each

OR

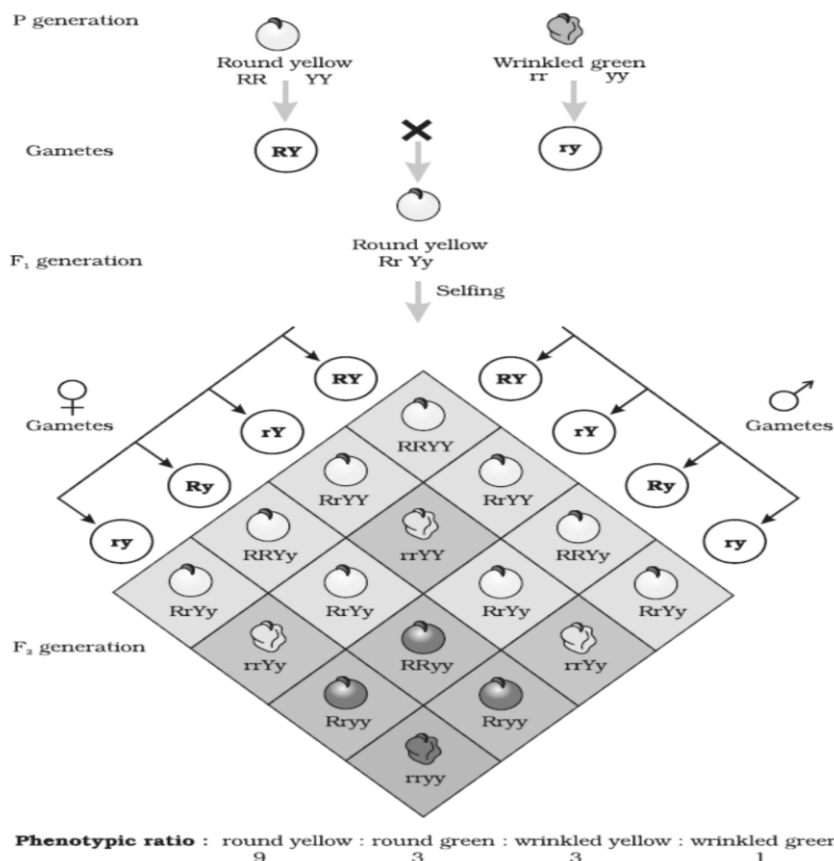
Morgan observed that the two genes did not segregate independently of each other and the F₂ ratio deviated very significantly from the 9:3:3:1 ratio. 1 mark

He attributed this to physical association or linkage of two genes and coined the term linkage and the term recombination to describe the generation of non-parental gene combinations. 1 mark

Morgan and his group found that even when the genes are grouped on the same chromosome, some genes are very tightly linked (show very low recombination) while others were loosely linked (showed higher recombination). 1 mark

In the Mendelian dihybrid cross, the phenotypes round, yellow; wrinkled, yellow; round, green and wrinkled, green appeared in the ratio 9:3:3:1. OR cross (given below). 1 mark

Wrinkled, yellow and round, green is possible because the distance between two genes are more. Therefore, recombination of parental type is possible. 1 mark



27. Oogenesis is different from that of spermatogenesis in the following ways: -

5

- In spermatogenesis, continuous production of sperms takes place from puberty to old age. Whereas, in oogenesis, the oocytes are generated before birth/ in the foetus.
1 mark
- A large number of these oocytes degenerate during the phase from birth to puberty. The oocytes continuously decrease in number, and it gets completely exhausted at menopause.
1 mark
- A primary spermatocyte completes the first meiotic division leading to formation of two equal sized secondary spermatocytes whereas, Primary oocyte divides unequally by the first meiotic division resulting in the formation of a large haploid secondary oocyte and a tiny first polar body.
1 mark.
- Meiotic division of secondary oocyte gets temporarily arrested at Prophase-I stage. It is completed only when a sperm comes in contact with the *zona pellucida* layer of the ovum. There is no such event in spermatogenesis.
1mark
- Spermatogonium produces 4 functional spermatozoa whereas an oogonium produces one functional ovum and 3 non-functional polar bodies.
1 mark

OR

- Parturition is a process where vigorous contraction of the uterus at the end of pregnancy causes expulsion/delivery of the foetus.
1 mark
- The signals for parturition originate from the fully developed fetus and the placenta which induce mild uterine contractions called foetal ejection reflex.
1 mark
- This triggers release of oxytocin from the maternal pituitary. Oxytocin acts on the uterine muscle and causes stronger uterine contractions, which in turn stimulates further secretion of oxytocin.
1 mark
- The stimulatory reflex between the uterine contraction and oxytocin secretion continues resulting in stronger and stronger contractions.1 mark
- This leads to expulsion of the baby out of the uterus through the birth canal – parturition, after the infant is delivered; the placenta is also expelled out of the uterus.
1 mark