

CBSE Class 12 Biology Question Paper Solution 2012

Question Paper Code 57/1/1

SECTION – A

Q. Nos. 1 - 8 are of one marks each

1. **Mention the unique flowering phenomenon exhibited by *Strobilanthus kunthiana* (neelakuranaji).**

Ans. It flowers once in 12 years.

[1 mark]

2. **How does smoking tobacco in human lead to oxygen deficiency in their body ?**

Ans. Smoking increases CO content in the blood / greater affinity of CO to haemoglobin / CO forms a stable bond with haemoglobin / presence of CO does not allow oxygen to bind with haemoglobin // Smoking damages alveolar walls due to which respiratory surface is decreased (Emphysema) (Leads to lesser diffusion of oxygen in blood).

[1 mark]

3. **A garden pea plant (A) Produced inflated yellow pod, and another plant (B) of the same species produced constricted green pods. Identify the dominant traits.**

Ans. Inflated , green pods = $\frac{1}{2} + \frac{1}{2}$

[1 mark]

4. **Why is *Eichhornia crassipes* nicknamed as “Terror of Bengal” ?**

Ans. It (is an invasive weed) and grows very fast , causes oxygen depletion leading to death of aquatic life or fishes // Eutrophication = $\frac{1}{2} + \frac{1}{2}$

[1 mark]

5. **Write the location and function of the Sertoli cells in humans.**

Ans. In the seminiferous tubules / testes , nourishes sperms / germ cells = $\frac{1}{2} + \frac{1}{2}$

[1 mark]

6. Name the following:

- (a) The semi-dwarf variety of wheat which is high-yielding and disease-resistant.
- (b) Any one inter-specific hybrid mammal.

Ans. (a) Kalyan Sona / Sonalika = $\frac{1}{2}$

(b) Mule / Hinny / Liger / Tigon = $\frac{1}{2}$

[1 mark]

7. Write the similarity between the wing of a butterfly and the wing of a bat. What do you infer from the above with reference to evolution ?

Ans. Similar in function (fly) / different in structure and origin / analogous organs, convergent evolution = $\frac{1}{2} + \frac{1}{2}$

[1 mark]

8. Write what do phytophagous insects feed on.

Ans. Feed on plant parts / plant sap.

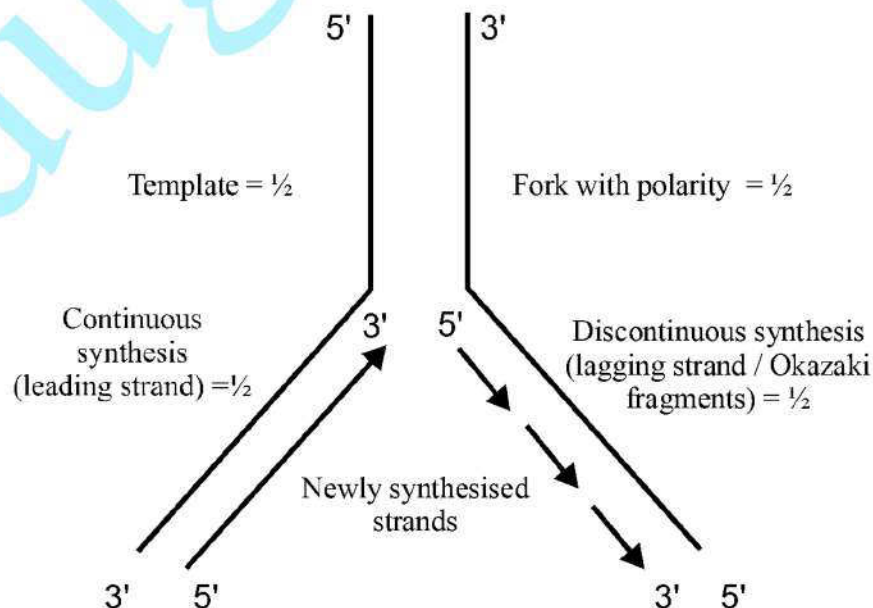
[1 mark]

SECTION - B

Q. Nos. 9 - 18 are of two marks each

9. Draw a neat labelled sketch of a replicating fork of DNA.

Ans.



Polarity of the two strands of the fork to be shown and polarity as well as arrow mark of the lagging and leading strands to be shown with correct labelings = $\frac{1}{2} \times 4$

[2 marks]

10. Where is sporopollenin present in plants ? State its significance with reference to its chemical nature.

Ans. Present in exine , of pollen / pollen grain = $\frac{1}{2} + \frac{1}{2}$

Sporopollenin is the most resistant organic material hence protects the pollen / gamete / gametophyte, provides protection to pollen from unfavourable conditions or chemicals (acids, enzymes, high temperature etc.) = $\frac{1}{2} + \frac{1}{2}$

[2 marks]

11. (a) Highlight the role of thymus as a lymphoid organ.

(b) Name the cells that are released from the above mentioned gland. Mention how they help in immunity.

Ans. Immature lymphocyte differentiate into , (mature) lymphocyte in thymus = $\frac{1}{2} + \frac{1}{2}$

T-lymphocyte = $\frac{1}{2}$

These T-cells help B-cells to produce antibodies / takes part in immunity = $\frac{1}{2}$

[2 marks]

12. Explain the work carried out by Cohen and Boyer that contributed immensely in biotechnology.

Ans. Cohen and Boyer isolated the antibiotic resistant gene , from the plasmid of a bacterium that was resistant to the antibiotic drug , and then linked this gene with the plasmid of *Salmonella typhimurium*, construction of artificial recombinant DNA molecule.
= $\frac{1}{2} \times 4$

[2 marks]

13 Why do clown fish and sea anemone pair up ? What is this relationship called ?

Ans. Clown fish gets protection from its predators by moving around the stinging tentacles of the sea anemone = 1

The sea anemone is neither helped or harmed by the interaction with the fish = $\frac{1}{2}$

Commensalism = $\frac{1}{2}$

[2 marks]

14 (a) State the difference between meiocyte and gamete with respect to chromosome number.

(b) Why is a whiptail lizard referred to as parthenogenetic ?

Ans. (a) Meiocyte - diploid / $2n = 1/2$

Gamete - haploid / $n = 1/2$

(b) It is a female and gives rise to new female reptile without fertilisation //

because it develops from unfertilised egg = 1

[1 + 1 = 2 marks]

15. Name the plant source of the drug popularly called “smack”. How does it affect the body of the abuser ?

OR

Why is *Rhizobium* categorized as a ‘symbiotic bacterium’ ? How does it act as a biofertiliser?

Ans. (Poppy) *Papaver somniferum* = 1

Depressant / slows down body functions = 1

[2 marks]

OR

(*Rhizobium* is a symbiotic bacteria) living in the root nodule of leguminous plants , it fixes atmospheric nitrogen into organic forms to be used by plants = $1/2 + 1/2$

It is a biofertilizer as it is a living organism that enriches nutrient content of the plant / soil = 1

[2 marks]

16. (a) State the role of DNA ligase in biotechnology.

(b) What happens when *Meloidegyne incognitia* consumes cells with RNAi gene ?

Ans. (a) Linking of DNA fragment is done by DNA ligase / linking of Okazaki fragments or discontinuous synthesis fragments / linking of desired gene with plasmid to form recombinant DNA. **Any one** = 1

(b) Specific mRNA of the nematode silenced , parasite dies. = $1/2 + 1/2$

[1 + 1 = 2 marks]

17. Some organisms suspend their metabolic activities to survive in unfavourable conditions. Explain with the help of any four examples.

Ans. Any four examples with their relevant conditions under which they suspend their metabolic activities such as polar bear - hibernation / during winter ,

Snails / fishes - aestivation / during summer , some species of zooplankton - diapause ,

Seeds of higher plants / spores of bacteria / fungi - dormancy /

Cyst formation as in case of amoeba = $\frac{1}{2} \times 4$

[2 marks]

18. (a) Name the Protozoan parasite that causes amoebic dysentery in humans.
 (b) Mention two diagnostic symptoms of the disease.
 (c) How is this disease transmitted to others ?

Ans. (a) *Entamoeba histolytica* = $\frac{1}{2}$

(b) Symptoms : constipation , abdominal pain , stools with mucus and blood clot
 (Any Two) = $\frac{1}{2} + \frac{1}{2}$

(c) Contaminated food / water = $\frac{1}{2}$

[2 marks]

SECTION-C

Q. Nos. 19 - 27 are of three marks each

19. It is established that RNA is the first genetic material. Explain giving three reasons.

OR

- (a) Name the enzyme responsible for the transcription of tRNA and the amino acid the initiator tRNA gets linked with.
 (b) Explain the role of initiator tRNA in initiation of protein synthesis.

Ans. Processes like metabolism , translation , splicing evolved around RNA ,
 RNA is reactive and catalyses reaction.

In some virus it is the hereditary material.

It is so unstable and hence would have mutated to lead to evolution. (Any three) = 1×3

OR

(a) RNA polymerase III , Methionine = $\frac{1}{2} + \frac{1}{2}$

(b) This tRNA (charged with amino acid Methionine) reaches the smaller subunit of ribosome, with its anticodon UAC recognises the codon AUG on mRNA and binds by forming complementary base pairs , leaves the amino acid , initiating protein synthesis = 2

[3 marks]

20. State the theory of Biogenesis. How does Miller's experiment support this theory ?

Ans. Biogenesis - A living organism arises from another living organism. = $\frac{1}{2}$

Miller's experiment - An electric discharge, was created in a closed flask containing $\text{CH}_4 - \text{H}_2 - \text{NH}_3$, and water vapour at 800°C , which resulted in the formation of amino acids, supports chemical evolution. = $\frac{1}{2} \times 5 = 2\frac{1}{2}$

// Miller's experiment does not support Theory of Biogenesis it supports chemical evolution. = $2\frac{1}{2}$

[3 marks]

21. Name the two different categories of microbes naturally occurring in sewage water. Explain their role in cleaning sewage water into usable water.

Ans. Aerobic and anaerobic // fungi, bacteria = $\frac{1}{2} \times 2$

(After primary treatment) growth of aerobic microbes into aeration tanks reduces BOD // consumes organic matter, Anaerobic bacteria decomposes the sludge (in the anaerobic sludge digesters) forming biogas etc. = $1 + 1$

[3 marks]

22. Write the function of each one of the following :

(a) (Oviducal) Fimbriae

(b) Coleoptile

(c) Oxytocin

Ans. (a) Collection of ovum released by ovary

(b) Protects the plumule of the monocot embryo

(c) Causes uterine contraction for parturition / promotes milk ejection = 1×3

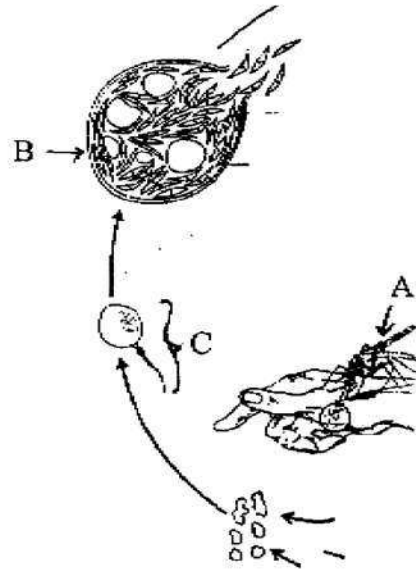
[3 marks]

23 Name the genes responsible for making Bt cotton plants resistant to bollworm attack. How do such plants attain resistance against bollworm attacks ? Explain.

Ans. Bt cotton has cry IAc / cry II Ab gene, produces crystals of protoxins. When bollworm bites the cotton fruits, it consumes the toxic insecticidal protein, In its gut it is activated by the alkaline pH - binds to mid gut epithelial cells, lysis, swelling - death of the insect = $\frac{1}{2} \times 6$

[3 marks]

24. Study a part of the life cycle of malarial parasite given below. Answer the questions that follow:

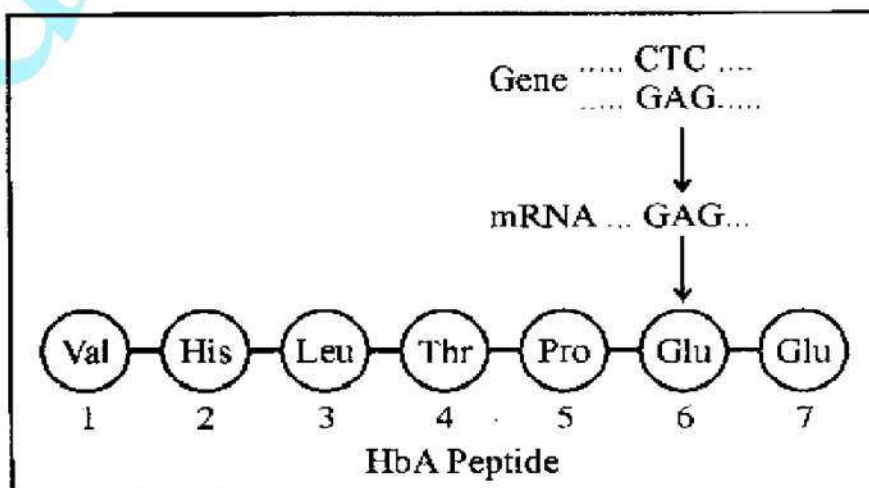


- (a) Mention the roles of 'A' in the life cycle of the malarial parasite.
 (b) Name the event 'C' and the organ where this event occurs.
 (c) Identify the organ 'B' and name the cells being released from it.

- Ans. (a) 'A' - Gametocytes of Plasmodium enter the mosquito when it bites a malaria patient and takes the blood meal. = 1
 (b) 'C' - Fertilization, intestine of the mosquito = $\frac{1}{2} + \frac{1}{2}$
 (c) 'B' - Salivary gland of the female Anopheles mosquito, Sporozoites of Plasmodium = $\frac{1}{2} + \frac{1}{2}$

[3 marks]

25. Given below is the representation of amino acid composition of the relevant translated portion of β -chain of haemoglobin, related to the shape of human red blood cells.



- (a) Is this representation indicating a normal human or a sufferer from certain related genetic disease? Give reason in support of your answer.
- (b) What difference would be noticed in the phenotype of the normal and the sufferer related to this gene?
- (c) Who are likely to suffer more from the defect related to the gene represented – the males, the females or both males and females equally? And why?

- Ans. (a) This representation (HbA peptide) indicates a normal human, because the Glutamic Acid in the sixth position is not substituted by Valine. = $\frac{1}{2} + \frac{1}{2}$
- (b) The sufferer's RBCs become elongated and sickle shaped as compared to the normal biconcave RBCs = 1
- (c) Both males and females are likely to suffer from the disease equally, as this is not a sex linked disease / It is an autosomal linked recessive trait. = $\frac{1}{2} + \frac{1}{2}$

[3 marks]

26. By the end of 2002 the public transport of Delhi switched over to a new fuel. Name the fuel. Why is this fuel considered better? Explain.

Ans. CNG / Compressed Natural Gas = 1

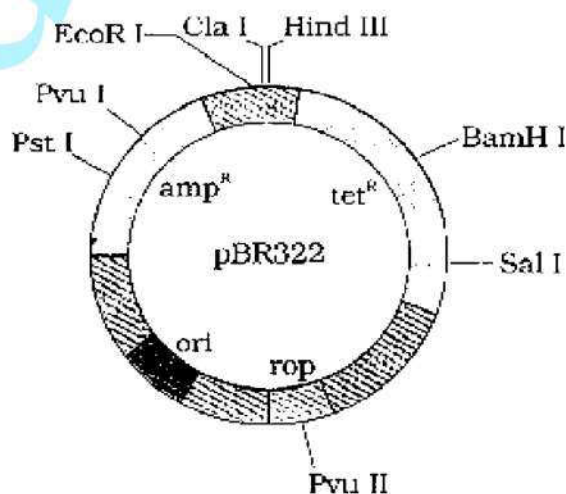
It burns more efficiently unlike diesel or petrol, very little of it is left unburnt, cannot be adulterated, cheaper than petrol or diesel = $\frac{1}{2} \times 4$

[3 marks]

27. Draw a schematic sketch of pBR 322 plasmid and label the following in it:

- (a) Any two restriction sites.
- (b) Ori and rop genes.
- (c) An antibiotic resistant gene.

Ans.



- (a) Pst I / Pvu I / EcoR I / Cla I / Hind III / BamH I / Sal I / Pvu II
(Any Two) $\frac{1}{2} + \frac{1}{2} = 1$
- (b) ori , rop = $\frac{1}{2} + \frac{1}{2}$
- (c) amp^R / tet^R = 1

[3 marks]

SECTION -D

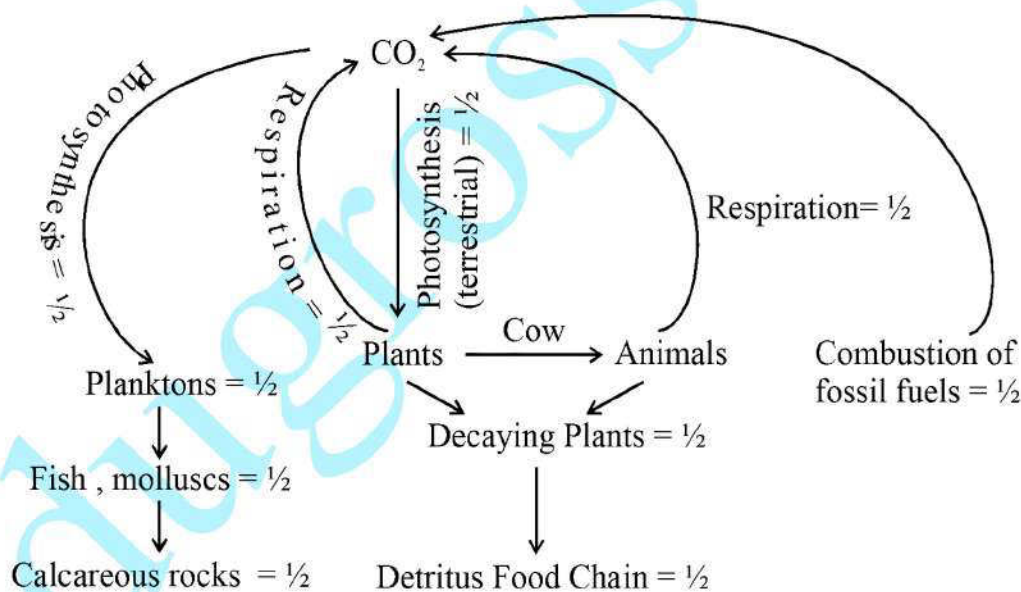
Q. Nos. 28 - 30 are of five marks each

28. Explain the carbon cycle with the help of a simplified model.

OR

Explain how does:

- (a) a primary succession start on a bare rock and reach a climax community ?
- (b) the algal bloom eventually choke the waterbody in an industrial area ?

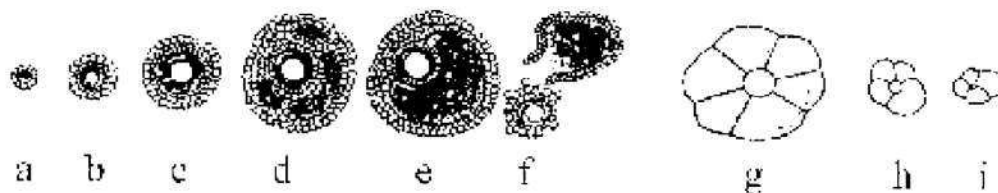


OR

- (a) Lichens on a bare rock , acids to dissolve rock , soil formation - bryophyte to hold the soil , retention of water - grass , scrubs and trees = $\frac{1}{2} \times 5 = 2\frac{1}{2}$
- (b) Effluents from the industry , minerals stimulate algal growth , depletion of oxygen content , death of other aquatic life , lake is spoilt fully / dead lake / Eutrophication = $\frac{1}{2} \times 5 = 2\frac{1}{2}$

[2½ + 2½ = 5 marks]

29. The following is the illustration of the sequence of ovarian events (a - i) in a human female.



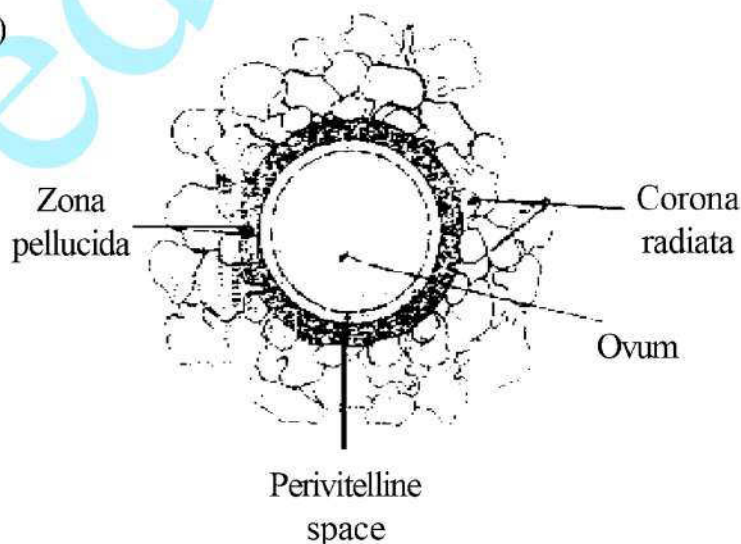
- (i) Identify the figure that illustrates ovulation and mention the stage of oogenesis it represents.
- (ii) Name the ovarian hormone and the pituitary hormone that have caused the above mentioned event.
- (iii) Explain the changes that occur in the uterus simultaneously in anticipation.
- (iv) Write the difference between 'c' and 'h'.
- (v) Draw a labelled sketch of the structure of a human ovum prior to fertilization.

OR

How does the megaspore mother cell develop into 7-celled, 8 nucleate embryo sac in an angiosperm? Draw a labelled diagram of a mature embryo sac.

- Ans. (i) f, secondary oocyte = $\frac{1}{2} + \frac{1}{2}$
- (ii) estrogen, LH = $\frac{1}{2} + \frac{1}{2}$
- (iii) Endometrium proliferate (glands become corkscrew shaped) highly vascularised, high regeneration anticipating implantation of the fertilized ovum. = $\frac{1}{2} + \frac{1}{2}$
- (iv) 'c' is developing follicle while 'h' is regressing corpus luteum = $\frac{1}{2} + \frac{1}{2}$

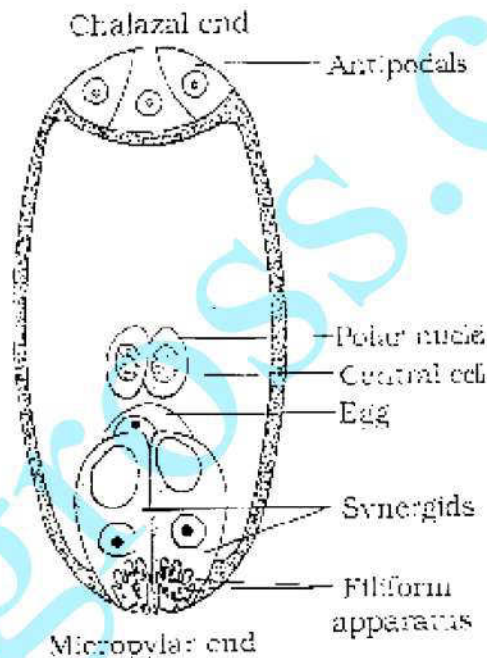
(v)



Any two labels = $\frac{1}{2} + \frac{1}{2}$

OR

Megaspore mother cell undergoes meiosis producing one functional / viable megaspore, The functional megaspore divides mitotically to produce two nuclei which move to the opposite poles, each nucleus now divides twice forming four nuclei at each pole of which one nucleus from each pole moves to the centre forming two polar nuclei, walls are formed around 6 nuclei forming 3 antipodals at the chalazal end, and a 3 celled egg apparatus (having one egg cell and two synergids) at the micropylar end, the polar nuclei are present in the large central cell = $\frac{1}{2} \times 6 = 3$



Any four correct labels = $\frac{1}{2} \times 4 = 2$

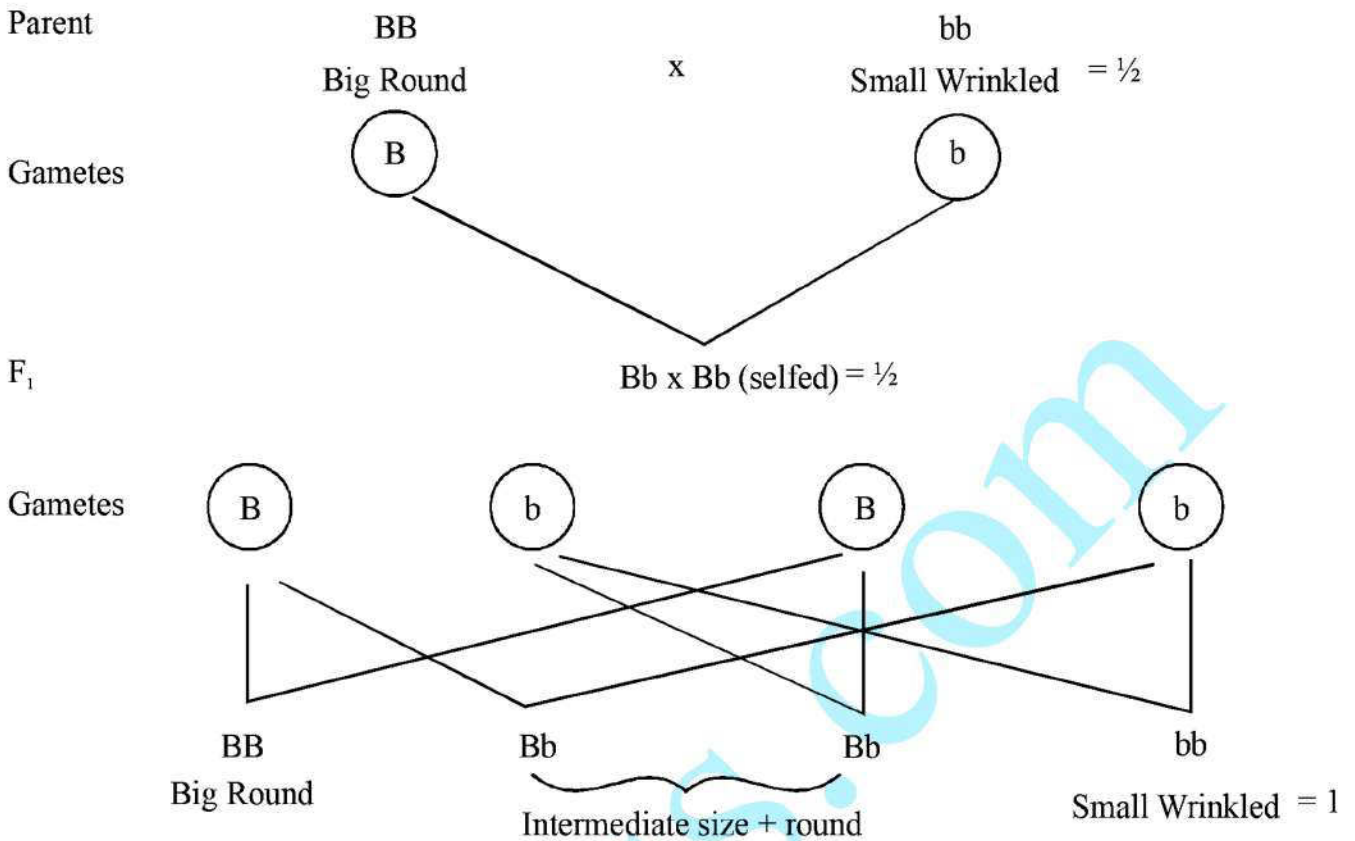
[5 marks]

30. What is the inheritance pattern observed in the size of starch grains and seed shape of *Pisum sativum*? Workout the monohybrid cross showing the above traits. How does this pattern of inheritance deviate from that of Mendelian law of dominance?

OR

State the aim and describe Messelson and Stahl's experiment.

Ans. A single gene controls the size of the starch grains and the seed shape = 1



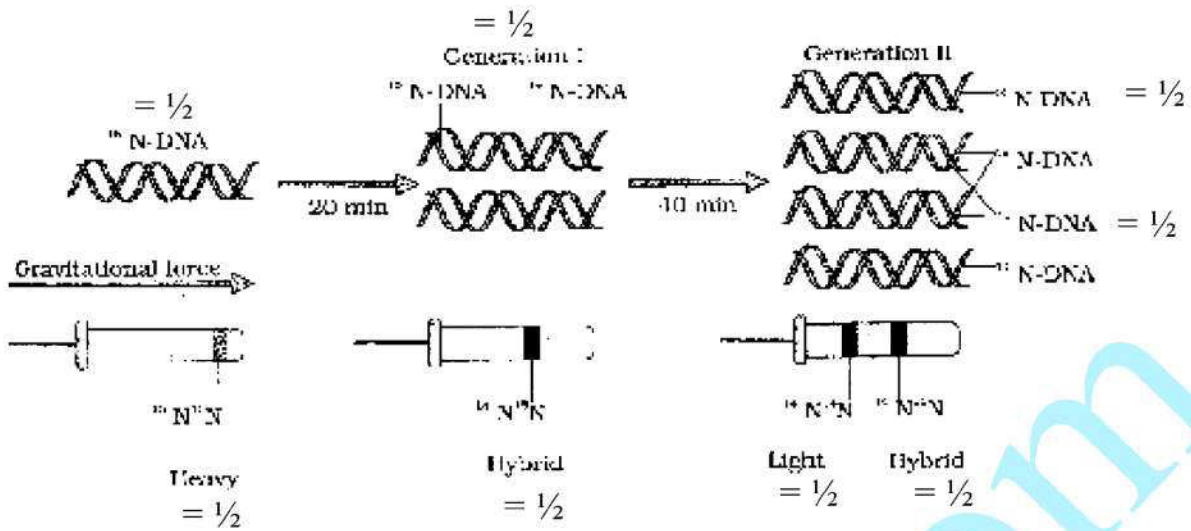
(Deviation from Mendelian Law of Dominance) : The trait of size of starch grain shows incomplete dominance. Hence in heterozygous condition the starch grain are of intermediate size = 1

The trait of seed shape follows Law of Dominance and the hybrid will show only dominant trait = 1

OR

The aim of the experiment done by Messelson and Stahl is to prove that DNA replication is semiconservative.=1

They grew *E.coli*, in $^{15}\text{NH}_4\text{Cl}$ for many generations to get ^{15}N incorporated into DNA , Then the cells are transferred into $^{14}\text{NH}_4\text{Cl}$, The extracted DNA are centrifuged in CsCl and measured to get their densities , DNA extracted from the culture after one generation (20 minutes) , showed intermediate hybrid density , DNA extracted after two generations (40 minutes) showed light DNA , and hybrid DNA = $\frac{1}{2} \times 8 = 4 //$



A correctly labelled diagrammatic representation in lieu of the explanation of experiment = 4

[5 marks]