Sample Paper 5

ANSWER KEYS																			
1	(a)	**7**	(c)	**13**	(d)	**19**	(d)	**25**	(c)	**31**	(b)	**37**	(a)	**43**	(a)	**49**	(c)	**55**	(b)
2	(a)	**8**	(a)	**14**	(d)	**20**	(b)	**26**	(c)	**32**	(a)	**38**	(b)	**44**	(d)	**50**	(b)	**56**	(c)
3	(b)	**9**	(b)	**15**	(b)	**21**	(b)	**27**	(c)	**33**	(d)	**39**	(b)	**45**	(d)	**51**	(b)	**57**	(b)
4	(c)	**10**	(d)	**16**	(a)	**22**	(c)	**28**	(c)	**34**	(b)	**40**	(d)	**46**	(d)	**52**	(a)	**58**	(b)
5	(c)	**11**	(d)	**17**	(d)	**23**	(a)	**29**	(c)	**35**	(a)	**41**	(b)	**47**	(d)	**53**	(d)	**59**	(b)
6	(c)	**12**	(d)	**18**	(c)	**24**	(b)	**30**	(b)	**36**	(a)	**42**	(d)	**48**	(a)	**54**	(c)	**60**	(a)

SOLUTIONS

1. **(a)** Megaspore mother cell (MMC) undergoes meiosis to form four haploid cells (called megaspores) and the process of formation is known as megasporogenesis. The MMC undergoes meiotic division results in the production of four megaspores 100 functional megaspores are produced by 100 MMC, since three out of four megaspores degenerate in each case.

2. **(a)** In the given figure of LS of flower, the structure marked as A, B, C, D and E are respectively antipodal cells, polar nuclei, stigma, style and chalaza.

3. **(b)** The development of the male gametophyte in angiosperms is called as microgametogenesis. Pollen grain is the first cell of a male gametophyte. This cell undergoes only two divisions, with the result of first division two cells are formed – a large vegetative cell and a small generative cell. The second division is concerned with generative cell only. This division may take place either in pollen grain or in the pollen tube and gives rise to two male gametes.

4. **(c)** By the end of 12 weeks (first trimester), most of the major organ systems are formed, for example, the limbs and external genital organs are well-developed.

5. **(c)**

6. **(c)** P_1-Autogamy; P_2-Geitnogamy; P_3-Xenogamy. If the pollen grains are transferred from an anther to the stigma of the same flower, or different flowers of the same plant is called self-pollination or autogamy.
When the pollen grains are transferred to the stigma of other flower of the same species is called cross- pollination or allogamy. It takes place in between two different flowers.
Cross-pollination is of two types – Geitonogamy and Xenogamy.
Geitonogamy : When pollination takes place in between the two flowers of the same plant then it is called geitonogamy.
When the pollination takes place in between the two different flowers of two different plants of the same species then it is called xenogamy.

7. **(c)**

8. **(a)** Meiosis-II does not complete until fertilization occurs in females (in human being).

9. **(b)** The vas deferens is a continuation of the cauda epididymis. It is about 40 cm long and enters the abdominal cavity through the inguinal canal.
Then, it passes over the urinary bladder, curves round the ureter and joins a duct from seminal vesicle and opens into urethra as the ejaculatory duct. These ducts store and transport the sperms from the testis to the outside through urethra.

10. **(d)** In the given figure of monocot embryo, the structure marked as A, B, C and D are respectively scutellum, coleoptile, epiblast and coleorhiza.
Scutellum is the large shield like cotyledon of the embryo of certain monocots. It is specialized for the absorption of food from the endosperm. Coleoptile is the first leaf above the ground, forming a protective sheath around the stem tip. It surrounds the plumule. Epiblast is the outermost layer of an embryo before it differentiates into ectoderm and mesoderm. Coleorhiza is the sheath that envelops the radicle in certain plants (grass or cereal grain) and that is penetrated by the root in germination.

11. **(d)** In the cytoplasm of the synergid, pollen tube releases the two male gametes. One of two male gametes fuses with egg to form diploid zygote (2n) while the other uses with two polar nucles of the central cell to produce triploid primary endosperm nucleus (3n).

12. **(d)** Mutation is the process by which genetic variations are created through changes in the base sequence within genes. It is possible to induce mutations artificially through use of chemicals or radiations (like gamma radiations).

13. **(d)** mRNA provides the template for synthesis of proteins. A segment of DNA coding for polypeptide is called exon.

14. **(d)** When one amino acid is coded by more than one codons, then such type of codons are called as degenerate codons.

15. **(b)**

16. **(a)** The inducer for *Lac* operon of *Escherichia coli* is lactose (actually allolactose or metabolite of Lactose). This *lac* operon normally remains inactive. When *lac* operon contacts with lactose, the lactose acts as an inducer and combines with the repressor, and the repressor is detached from operator gene. Thus RNA polymerase enzyme gets its passage and reaches to the structural genes and starts the transcription.

17. **(d)**

18. **(c)** In incomple dominace, F_1 hybrids are not related to either of the parents but exhibited a blending of characters of two parents. E.g. 4'o clock plant (Mirabilis jalapa), and dog flower (*Antirrhinum majus*).

19. **(d)**

20. **(b)** The inheritance pattern of a particular trait shown in the given picture results in haemophilia. Haemophilia is a group of inherited blood disorders in which the blood does not clot properly. It is caused by a fault in one of the genes that determine how the body makes blood clotting factor VIII or IX. These genes are located on the X-chromosome. Haemophilia appears only in human male which can be transferred to their grandson through their carrier daughter (Criss-cross inheritance).

21. **(b)** ABO system is one of the most important human "blood group systems". The system is based on the presence or absence of antigens A and B on the surface of red blood cells and antibodies against these in blood serum. A person whose blood contains either or both of these antibodies cannot receive a transfussion of blood containing the corresponding antigens as this would cause the red blood cells to clump.

22. **(c)**

23. **(a)** In certain insects, such as cockroach, and some roundworms, the Y-chromosome is missing so that the male has only one sex chromosome, *i.e.* 'X' condition in the male is XO (O means absence of one sex chromosome) and in the female it is XX., thus males showing 17 chromosome while females show 18 chromosome.

24. **(b)**

25. **(c)** Assertion is true but Reason is false.
Family planning was initiated in India in 1951. It increased awareness regarding prevention of unwanted pregnancies by adopting safe methods.

26. **(c)** Assertion is true but Reason is incorrect.
Saheli is a non-steroidal contraceptive pill that is taken once a week. It has high contraceptive value and is well accepted as it has very few side effects.

27. **(c)** Assertion is correct but Reason is incorrect.
Sickle cell anaemia is a classic example of mis-dense point mutation.

28. **(c)** Assertion is true but Reason is false.
Fertilisation does not guarantee the establishment of pregnancy. But pregnancy is guaranteed by implantation.

29. **(c)** A–Umbilical cord with its vessels, B–Placental villi, C–Yolk sac, D–Plug of mucus in cervix

30. **(b)**

31. **(b)** Artificial hybridization is one of the major approaches of crop improvement programme. The correct sequence in artificial hybridization experiment in bisexual flower is:
Emasculation → Bagging → Cross-pollination → Rebagging
Emasculation is the removal of the anthers of a flower in order to prevent self-pollination or the undesirable pollination of neighbouring plants. After that emasculated male and female plants are kept in isolation by enclosing them in a bag in a process called bagging. When the stigma of bagged flowers attains receptivity, mature pollen grains collected from anthers of the male parent are dusted on the stigma, and the flowers are rebagged and the fruits allowed develop.

32. **(a)** Vasa efferentia are fine ciliated ductules that arise from the seminiferous tubules of testis (where sperms are formed) and Open into epididymis which in a man of long narrow closely coiled tubule lying along the inner side of testis. Epididymis stores the sperms. Then, if vasa efferentia get blocked, sperms will not be from perted from tenter to epididymis.

33. **(d)** AIDS, genital herpes and hepatitis B are sexually transmitted diseases which are not completely curable.

34. **(b)** Lactational amenorrhoea is the absence of menstruation. It is the breast sucking of mother by her child for a long time which is considered to contribute a gap for pregnancy. It is based on the fact that ovulation and the menses do not occur during the period of intense lactation following parturition.

35. **(a)** Parents having genotype I^Ai and I^Bi have children of the following blood group type – O, AB, and B.

36. **(a)**

37. **(a)** Sickle cell anaemia is a biochemical disorder in which shape of RBCs become sickle-shaped due to the defective haemoglobin. Haemoglobin becomes useless for oxygen transport.
Huntington Chorea is a disease in which atrophy of brain occurs resulting to respiratory irregulations, articulation of speech and irregular limbs movements take place. They both are genetic disease present in any person since birth hence congenital diseases.

38. **(b)** The genes for such traits are recessive and located on the X chromosome. The character appears more often in males in hemizygous condition, but also in females in homozygous condition. Affected males receive their defective gene from carrier mothers who may have affected father. These exhibit criss-cross inheritance.

39. **(b)** The example of codominance is ABO blood grouping in humans. ABO blood groups are controlled by gene I. Gene I consists three alleles I^A, I^B and I^A and I^B are the dominant alleles. When I^A and I^B are present together, both express equally and produce the surface antigens A and B, whereas i is the recessive allele and does not produce any antigen.
The genetic effect of a single gene on multiple phenotypic traits is pleiotropy. Incomplete dominance a genetic term in which does not completely dominate another allele.
The separation of allele during the process of gametogenesis is known as Segregation. This is the basis of reappearance of recessive character in F_2-generation.

40. **(d)** In ZZ/ZW case, the female has heteromorphic (ZW) sex chromosomes. Thus peacock shows ZZ/ZW sex determination type.

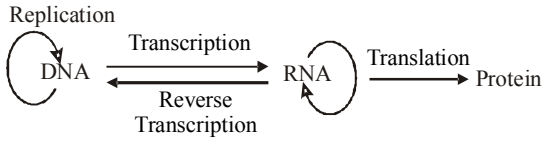
41. **(b)** Clover leaf secondary structure of *t*RNA has a loop for three unpaired bases (triplet of base) whose sequence is complementary with a codon in mRNA.

42. **(d)** During the activation of amino acids, in the presence of Mg^{2+} and ATP an amino acid gets attached to a specific enzyme aminoacyl t-RNA synthetase. Pyrophosphate is released which breaks up to release energy. During translocation, in the presence of the enzyme translocase and energy from GTP the ribosome moves in such a way that the peptidyl bearing t-RNA of A - site comes to lie on the P-site, exposing a new codon at A - site. In the peptidyl transferase reaction energy is provided by GTP.

43. **(a)** A, B and C represent the pitch (a complete turn) of helix, distance between a base pair in a helix and distance between two strand of DNA molecule respectively.

44. **(d)** Hershey & Chase (1962) discovered that DNA is the genetic material of bacteriophage. They experimented with T_2 phage which attacks the bacterium *E. coli*. Some virus made to grow on culture containing radioactive sulphur and some on radioactive phosphorus. Findings indicated that protein did not enter the bacteria from the viruses but DNA from the virus particle enters bacteria as genetic material.

45. **(d)** Central dogma term was proposed by Crick (1958). It proposes unidirectional or one way flow of information from DNA to RNA and then to protein (polypeptide).



46. **(d)** The first effect of any signal molecule must involve the binding of the molecule to a receptor.

47. **(d)** **48.** **(a)** **49.** **(c)** **50.** **(b)** **51.** **(b)**

52. **(a)** **53.** **(d)**

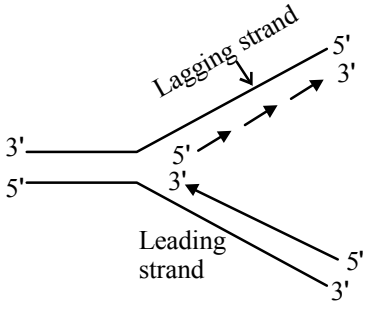
54. **(c)** In biology, antrum is a general term for a cavity or chamber, which may have specific meaning in reference to certain organs or sites in the body. Tertiary follicle of ovary contains a fluid filled cavity called antrum and a secondary oocyte ready for ovulation.

55. **(b)** The presence or absence of tryptophan determines whether the genes that code the necessary enzymes in tryptophan synthesis will even be transcribed.

56. **(c)**

57. **(b)** The percentage of recombinants produced in cross I and cross II are respectively 1.3% and 37.2%.

58. **(b)** The figure below is the replicating fork of DNA. The DNA replication takes place in 5' → 3' direction always. On the leading strand, DNA replication is continuous while on lagging strand, DNA replication is discontinuous. The polarity of lagging strand is incorrect in the given figure. The correct figure should be:



Both the strands are antiparallel. In one strand, carbon of sugar are in 3' → 5' direction and in other, the carbon of sugar are in 5' → 3' direction.

59. **(b)**

60. **(a)** GC content is usually calculated as a percentage value and sometimes called G + C ratio or GC ratio. It is calculated as G + C/count (A + T + G + C) × 100%.