Question Paper Code 57/1

SECTION – A

Q. Nos. 1 - 5 are of one marks each

1. How many chromosomes do drones of honeybee possess? Name the type of cell division involved in the production of sperms by them.

Ans. 16, Mitosis = ½ + ½

[1 Mark]

2. What is a cistron ?

Ans. A segment of DNA , Coding for a polypeptide = ½ + ½

[1Mark]

3. Retroviruses have no DNA. However, the DNA of the infected host cell does possess viral DNA. How is it possible?

Ans. Reverse transcription of viral RNA into viral DNA, then integrates/ incorporates with the host DNA = ½ + ½

[1 Mark]

4. Why do children cured by enzyme-replacement therapy for adenosine deaminase deficiency need periodic treatment ?

Ans. As this therapy does not cure the disease completely = 1

[1 Mark]

5. List two advantages of the use of unleaded petrol in automobiles as fuel .

Ans. (i) Allows the catalytic convertor to remain active = ½

(ii) Reduces air pollution = ½

[1 Mark]

SECTION B

Q Nos. 6-10 are of two marks each

6. Why do moss plant produce very large number of male gametes? Provide one reason. What are these gametes called ?

Ans. To compensate the loss of male gametes during their transport(to the non-motile female gamete) through water/ to increase chances of fertilisation , antherozoids = 1 + 1

[2 Marks]

7. (a) Select the homologous structure from the combinations given below:

(i) Forelimbs of whales and bats

(ii) Tuber of potato and sweet potato

(iii) Eyes of octopus and mammals

(iv) Thorns of *Bougainvillea* and tendrils of *Cucurbita*

(b) State the kind of evolution they represent.

Ans. (a) (i) Forelimbs of whales and bats = ½

(iv) Thorns of *Bougainvillea* and tendrils of *Cucurbita* = ½

(b) Divergent Evolution = 1

[2 Marks]

8. (a) Why are the plants raised through micropropagation termed as somaclones ?

(b) Mention two advantages of this technique.

Ans. (a) Genetically identical = 1

(b) Large number of plants in short duration, Virus free plants = ½ + ½

[2 Marks]

9. Explain the different steps involved during primary treatment phase of sewage.

Ans. Physical removal of particles (large and small), by filtration and sedimentation, forming primary sludge/sedimented solids, forming effluent (supernatant) for secondary treatment = ½ ×4

[2 Marks]

10. What is mutualism? Mention any two examples where the organisms involved are commercially exploited in agriculture.

Ans. Interaction between two species in which both are benefitted =1

i. *Rhizobium* in the roots (nodules) of legumes = ½

ii. *Mycorrhiza / Glomus* with the roots of higher plants = ½

[2 Marks]

OR

List any four techniques where the principle of ex-situ conservation of biodiversity has been employed.

Ans. Cryopreservation , in vitro fertilisation, micro propagation / tissue culture , sperm bank/ seed bank / gene bank = ½ ×4

[2 Marks]

SECTION C

Q Nos. 11-22 are of three marks each

11. State what is apomixis. Comment on its significance. How can it be commercially used?

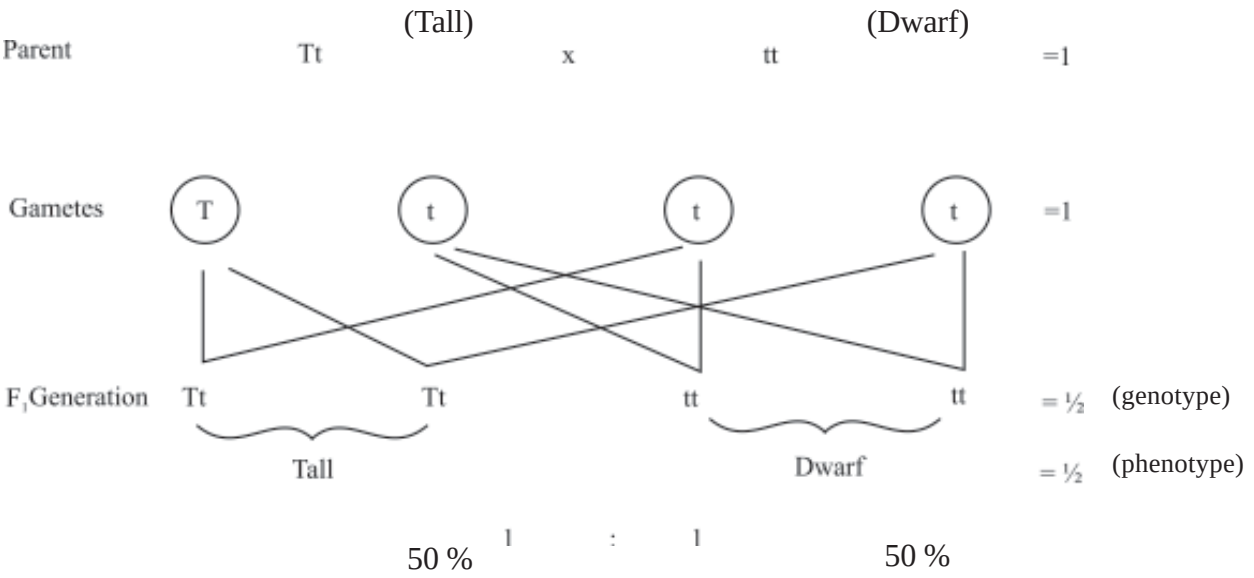
Ans. Form of asexual reproduction producing seeds without fertilisation/type of asexual reproduction that mimics sexual reproduction to form seeds without fertilisation =1

Parental characters are maintained in the progeny/offspring (as there is no meiosis/segregation of characters) =1

If desired hybrid seeds are made apomictics the farmers can keep on using the hybrid seeds to raise new crops year after year =1

[3 Marks]

12. During a monohybrid cross involving a tall pea plant with a dwarf pea plant, the offspring populations were tall and dwarf in equal ratio. Work out a cross to show how it is possible.



Note:(Similar cross shown in a Punnett square to be accepted)

[3 Marks]

13. Explain the significance of satellite DNA in DNA fingerprinting technique.

Ans. (i) They do not code for any proteins ,

(ii) They form large part of the human genome ,

(iii) They show high degree of polymorphism / Specific to each individual =1 × 3

[3 Marks]

14. What does the following equation represent ? Explain.

$p^2 + 2pq + q^2 = 1$

Ans. Hardy Weinberg's Principle / allele frequencies in a population are stable and is constant from generation to generation, 1 represents stable allelic frequency in a population,indicating no evolution occuring, p^2 frequency of homozygous dominant /AA, 2 pq frequency of heterozygous/Aa,q^2 frequency of homozygous recessive /aa = ½×6

Note : (if AA,Aa,aa have been indicated using any other alphabet correctly can be accepted)

[3 Marks]

15. A heavily bleeding and bruised road accident victim was brought to a nursing home. The doctor immediately gave him an injection to protect him against a deadly disease.

(a) Write what did the doctor inject into the patient's body .

(b) How do you think this injection would protect the patient against the disease ?

(c) Name the disease against which this injection was given and the kind of immunity it provides.

Ans. (a) Tetanus antitoxins/Tetanus toxoid =1

(b) The preformed antibody injected , act on the pathogen immediately to provide protection = ½×2

(c) Tetanus, passive immunity = ½×2

[3 Marks]

16. Enumerate any six essentials of good, effective Dairy Farm Management Practices.

Ans. Selection of high yielding and diseases resistant breeds,housedwell,adequate water supply,maintained disease free,feeding in a scientific manner,regular visits by veteranary doctors,regular inspection and record keeping,cleanliness and hygiene while milking and transport

(any six) = ½×6

[3 Marks]

17. State the medicinal value and the bioactive molecule produced by *Streptococcus, Monascus* and *Trichoderma.*

Ans. *Streptococcus* ; Streptokinase , clot buster / remove clot from the blood vessels = ½ + ½

Monascus ; Statin , blood cholesterol lowering agent / it inhibits the enzymes responsible for synthesis of cholesterol = ½ + ½

Trichoderma ; cyclosporin A , immunosuppressive agents used in organ transplantation = ½ + ½

[3 Marks]

OR

What are methanogens? How do they help to generate biogas?

Ans. Anaerobic, methane producing bacteria = ½ × 2

methanogens generate biogas, when act on cellulose rich biowaste (anerobically) = 1 + 1

[3 Marks]

18. Rearrange the following in the correct sequence to accomplish an important biotechnological reaction:

(a) *In vitro* synthesis of copies of DNA of interest

(b) Chemically synthesized oligonucleotide

(c) Enzyme DNA-polymerase

(d) Complementary region of DNA

(e) Genomic DNA template

(f) Nucleotides provided

(g) Primers

(h) Thermostable DNA-ploymerase (from *Thermus aquaticus)*

(i) Denaturation of ds-DNA

Ans. Correct sequence is

$$\underbrace{i \rightarrow e \rightarrow b/g}_{=1} \rightarrow \underbrace{g/b \rightarrow c/h \rightarrow h/c}_{=1} \rightarrow \underbrace{f \rightarrow d \rightarrow a}_{=1}$$

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$$\underbrace{a \rightarrow i \rightarrow e}_{=1} \rightarrow \underbrace{b/g \rightarrow g/b \rightarrow c/h}_{=1} \rightarrow \underbrace{h/c \rightarrow f \rightarrow d}_{=1}$$

Note: (Stop Marking where the sequence goes wrong)

[3 Marks]

19. Describe any three potential applications of genetically modified plants.

Ans. More tolerant to abiotic stress, less dependence on chemical pesticides, reduces post harvest losses,increase efficiency of mineral usage by plants,enhance nutritional value of food. eg. Vitamin A enriched rice (any three) = 1+1+1

[3 Marks]

20. How did an American company ,Eli Lilly use the knowledge of r-DNA technology to produce human insulin ?

Ans. Two chains of DNA sequence corresponding to A & B chains of human insulin prepared, introduced them into plasmids of *E.coli* to produce separate A & B chains, A & B chains extracted combined by creating disulphide bonds = 1 × 3

[3 Marks]

21. How do snails, seeds, bears, zooplanktons, fungi and bacteria adapt to condition unfavorable for their survival ?

Ans. Snail-aestivation = ½

Seeds-dormancy/suspended metabolic activities = ½

Bear-Hibernation = ½

Zooplankton- diapause/suspended development = ½

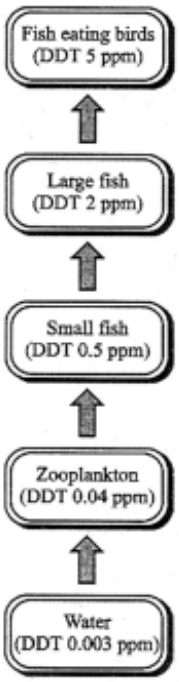
Fungi-Spore/Zygospore = ½

Bacteria-Cyst/spore = ½

[3 Marks]

22. With help of a flow chart ,show the phenomenon of biomagnifications of DDT in an aquatic food chain.

Ans.



5 stages- ½ Mark each (½ × 5) the flow chart should show arrows in correct direction with increasing levels of DDT = (½ **)**

[3 Marks]

SECTION D

Q No. 23 is of four mark

23. Your School has been selected by the Department of Education to Organize and host an interschool seminar on "Reproductive Health-Problems and Practices". However, many parents are reluctant to permit their wards to attend it. Their argument is that the topic is "too embarrassing".

Put forth four arguments with appropriate reasons and explanation to justify the topic to be very essential and timely.

Ans. 1. The issue of puberty and adolescence need to be addressed effectively with the respective age group because many changes take place in the body during adolescence of which they are supposed to be aware of = 1

2. To bring in awareness about their reproductive health and its effect on their physical, emotional and social being = 1

3. To address the increase in sex abuse and sex crimes in our country = 1

4. Myths and misconceptions related to reproductive issues =1

Note: (any other related or relevant argument with reasons may be accepted)

[4 Marks]

SECTION E

Q Nos. 24-26 are of five marks each

24. (a) Plan an experiment and prepare a flow chart of the steps that you would follow to ensure that the seeds are formed only from the desired sets of pollen grains. Name the type of experiment that you carried out.

(b) Write the importance of such experiments.

Ans. (a) Selection of flowers from desired plants → emasculation → bagging → dusting of the pollens on the stigma of the flowers that were bagged → flower rebagged → fruit formed

= ½ × 6

Artificial Hybridisation =1

(b) Production of superior/ improved varieties of plants = 1

[5 Marks]

OR

Describe the roles of pituitary and ovarian hormones during the menstrual cycle in a human female.

Ans. Pituitary hormones :

(When levels of FSH is high) FSH, induces follicular growth, secretion of estrogen by follicles, (when LH surge is there in the mid of the cycle) lutinising hormones/LH, along with FSH leads to ovulation , and then formation of corpus luteum = ½ ×6

Ovarian hormone:

Estrogen , repair/proliferation of endometrium,

Progesterone,maintains endometrium for implantation = ½ ×4

(Low level of progesterone leads to menstrual flow)

[5 Marks]

25. (a) Why are thalassemia and haemophilia categorized as Mendelian disorders? Write the symptoms of these diseases .Explain their pattern of inheritance in humans.

(b) Write the genotypes of the normal parents producing a hemophilic son.

Ans. (a) Both are caused due to alteration/mutation, in a single gene and follow Mendelian pattern of inheritance = ½ × 2

symptoms

thalassemia -anaemia (caused due to defective/abnormal Hb),

haemophilia -non stop bleeding even in minor injury = ½ ×2

pattern of inheritance-

thalassemia autosomal recessive inheritance pattern, inherited from heterozygous/parent carrier =½×2

haemophilia- X linked recessive inheritance, inherited from a haemophilic father/carrier mother (females are rarely haemophilic) = ½ ×2

(b) X^hX-Mother = ½

XY-Father = ½ [5 Marks]

OR

How do m-RNA , t-RNA and ribosomes help in the process of translation?

Ans. mRNA provides a template,with codons for specific amino acids to be linked to form a polypeptide/ protein = ½ + ½

tRNA brings amino acid to the ribosomes, reads the genetic code with the help of its anti-codons, initiator tRNA is responsible for starting polypeptide formation in the ribosomes, tRNAs are specific for each amino acid = ½×4

Ribosomes-(Cellular factories for proteins synthesis) its smaller sub unit binds with mRNA to initiate protein synthesis at the start codon/AUG , in its larger sub unit there are two sites present which brings two amino acids close to each other helping them to form peptide bond, ribosomes moves from codon to codon along mRNA, amino acids are added one by one to form polypeptide/protein =½×4

[5 Marks]

26. (a) List the different attributes that a population has and not an individual organism.

(b) What is population density? Explain any three different ways the population density can be measured, with the help of an example each.

(a) Attributes of population

Birth rate , Death Rate , sex ratio,age pyramids/age distribution (any two) = ½ × 2

(b) Population density -

Number of individuals per unit area at a given time / period = 1

1. Biomass / % Cover **,** e.g Hundred *Parthenium* plants and 1 huge banayan tree = ½×2
2. Relative Density , e.g Number of fish caught per trap from a lake =½×2
3. Numbers , e.g Human population = ½ × 2

4. Indirect estimation , e.g without actually counting/seeing them e.g tiger census based on pugmarks and fecal pellets = ½ × 2

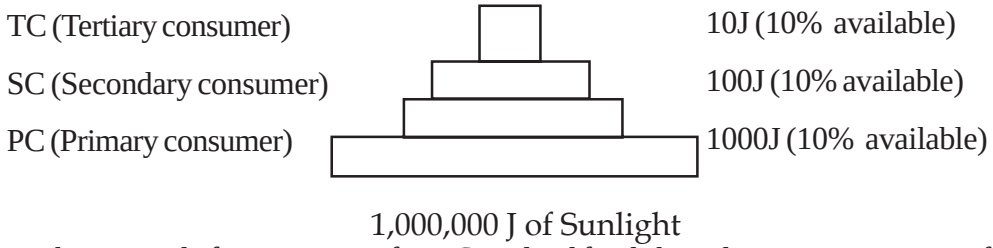
(Any three)

[5 Marks]

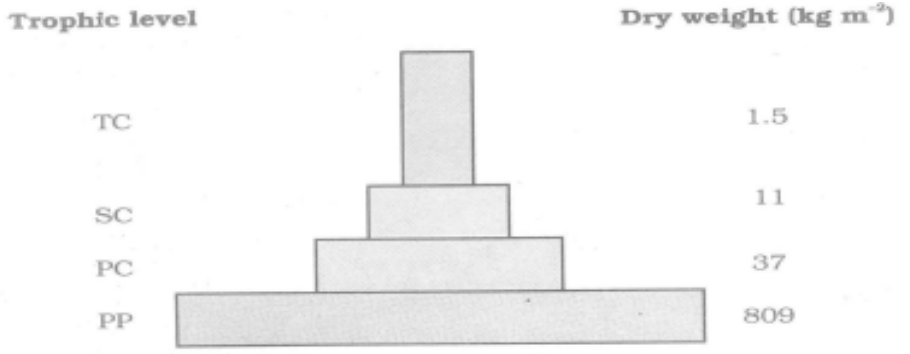
OR

"It is often said that the pyramid of energy is always upright .On the other hand , the pyramid of biomass can be both upright and inverted."Explain with the help of examples and sketches.

Ans.



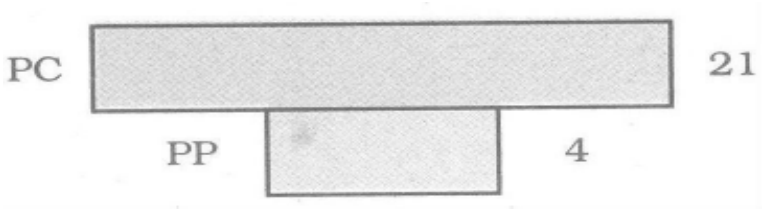
Upright Pyramid of Energy : e.g of any Grassland food chain depicting energy transfer at each trophic level = 1+1



Upright Pyramid of Biomass : e.g grassland food chain-grass ⟶ rabbit ⟶ fox ⟶ Tiger

(Any other relevant example) = 1 for Diagram + ½ for example

Note:(If only two trophic levels are drawn with dry weight mentioned correctly can be accepted)



Inverted Pyramid of Biomass: e.g aquatic ecosystem where small standing crop of phytoplanktons supports large standing crop of zooplanktons =1 for Diagram + ½ for example

[5 Marks]