

## HIGH ORDER THINKING (HOTS) QUESTIONS

### CHAPTER-2

- What is Pollen Viability? How the pollen grains of different species are kept stored?
- What is monoxylous by free nuclear endosperm. Give one example.
- Name the single cotyledon found in grass family. Differentiate between coleoptile and coleorhiza?
- Production of Hybrid seed is a costly affair then why do farmers produce such seeds every year? How can this problem be solved.

### CHAPTER- 3

Q. Why cleavage is called as fractionating process?

A- Cleavage results in increase in number of blastomeres but decrease in size of blastomeres.

Q. Which factor determines the pattern and speed of cleavage?

A- Amount and distribution of yolk.

Q. Name the extra-embryonic membranes in human embryo and mention its function.

A- Yolk Sac – Vestigial, act as extra embryonic gut.

Amnion- Protect embryo, acts as shock absorber, prevents desiccation of embryo.

Allantois- Stores nitrogenous wastes, acts as extra embryonic kidney.

Chorion – Helps exchange of gases, acts as extra embryonic lung.

Q. Which type of Placenta is found in man?

A- Chorionic ( finger-like out growth ) , haemochlorial , metadiscoidal (Chorionic villi exposed like disc) and deciduate (part of uterine wall expelled during parturition ).

Q. Why testis lies outside the body cavity in scrotal sac ?

A- Scrotal sacs act as thermo regulators, keep testicular temperature 2 degrees lower than the normal body temperature for normal spermatogenesis.

Q. What happens if testes fail to descend into scrotal sac?

A- High temperature of abdomen will kill the spermatogenetic tissues of the testis and no sperm will be formed (azoospermia) causing sterility , the phenomenon called Cryptorchidism.

Q Vitellogenesis is an important phenomenon after fertilization . Give reasons .

A- After fertilization Vitelline membrane is transferred into fertilization membrane which checks polyspermy

Q Penetration of sperm is a chemical process. Illustrate.

A Sperm head i.e. acrosome contains sperm lysin / hyaluronidase enzyme which help dissolving hyaluronic acid binding the follicular cells of corona radiata from penetration of sperm nucleus to egg nucleus

Q In morula stage the cells divide without any increase in size why ?

A Since, zona pellucida of egg cell remain intact till completion of cleavage.

Q What is the importance of fertilizin–Antifertilizin reaction?

A Ovum secretes fertilizin( glycoprotein or mucopolysaccharide ) which has a number of spermophilic sites on its surface where sperm can be bound by their antifertilizin site (on sperm head containing acidic amino acid) In this process thinning out of number of sperms take place to avoid polyspermy.

## **CHAPTER-4**

### **(REPRODUCTIVE HEALTH)**

Q. Why oral contraceptive pills are called as combined pills?

Ans. Since the same medicine contains mainly Progesterone & Estrogen that shows combined action inhibiting ovulation as well as contraception.

Q. Amniocentesis is illegal for detection of sex of foetus. Why?

Ans. The method is misused for identification of female child during foetal development & aborted due to a misconception of rejection of female child by the society.

Q. Removal of gonads can not be considered as contraceptive options. Why?

Ans. Contraception basically includes preventing unwilling conception without affecting normal body function that can be disrupted by removal of gonads.

Q. What are the essential features for an ideal contraceptive?

Ans. Ideal contraceptive should be user friendly, comfortable & easy to use, without any side effect & completely effective against pregnancy.

Q. All RTIs are STDs but all STDs are not RTIs. Justify.

Ans. Reproductive tract infections are basically transferred through sexual contact & hence may be termed as sexually transmitted diseases whereas some STDs like Hepatitis-B, AIDS are not caused due to infection of reproductive tract although transmitted through sexual contact.

Q. Now a day's number of childless couples is decreasing. Why?

Ans. Various improvised scientific methods are available for infertile couples to have a child through assisted reproductive technology.

Q. How CVS technique is more advanced than Amniocentesis?

Ans. Chorionic Villi Sampling technique may be applied by 8<sup>th</sup> to 10<sup>th</sup> week of pregnancy whereas Amniocentesis is done in about 14<sup>th</sup> to 15<sup>th</sup> week. Hence, abortion is easier & less risky in CVS techniques.

Q. 'Test tube baby' has raised several legal problems. Explain.

Ans. Method used for test tube baby need artificial need artificial collection of sperm & ovum, implantation in surrogate mother in some occasions which very often discouraged by the society. Couples become selective & avoid natural process.

Q. Population explosion is the resultant effect of reproductive health awareness. Why?

Ans. Reproductive health awareness resulted in reduced infant mortality rate, discouraging early marriage, contraceptive devices, control against diseases could increase in population.

Q. What is meant by induced abortion?

Ans. It is an intentional or voluntary termination of pregnancy before full term due to unprotected intercourse or failure of effect of contraceptive during coitus or rape.

## CHAPTER 5

### Principle of inheritance and Variation:

1 If a dominant allele for tall plants is represented by the letter D, what letter should represent the corresponding recessive allele?

2 In cats, the allele (**S**) for short fur is dominant to the allele (**s**) for long fur.

- What is the genotype of a true-breeding, long-furred cat?
- What is the phenotype of a cat with the genotype **Ss**?
- In an **Ss** genotype, which allele is expressed in the phenotype?
- Which of the following genotypes is (i) heterozygous (ii) homozygous dominant?  
**SS, Ss, ss**

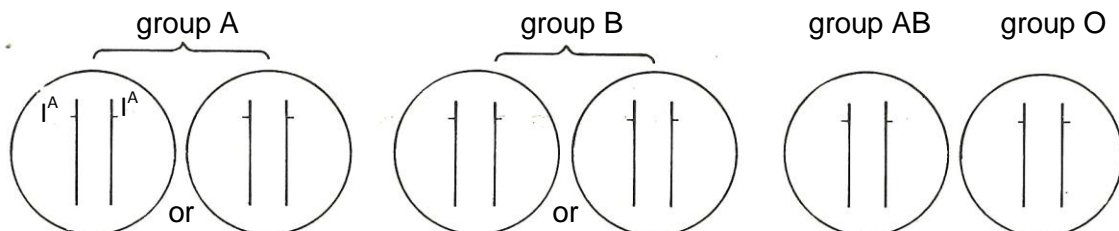
3 In rabbits, assume that the dominant allele (**B**) produces black fur. The allele (**b**) for white fur is recessive to **B**.

- What colour fur will each of the following rabbits have?

Rabbit 1	Rabbit 2	Rabbit 3	Rabbit 4
genotype <b>BB</b>		<b>BbbBbb</b>	

- Which of them will breed true?
- Which rabbits are homozygous for coat colour?
- If rabbits 1 and 4 were mated together and had 12 babies, how many of these would you expect to be black?
- If rabbits 2 and 3 are interbred and produce several litters, totalling 48 babies, how many white babies would be predicted by the laws of genetics?
- If rabbits 3 and 4 are mated together on several occasions and have 50 babies Altogether, how many of their babies would you 'expect' to be black?

4 The alleles controlling the ABO blood groups are given the letters **I<sup>A</sup>** (group A), **I<sup>B</sup>** (group B) and **i** (group O). On the drawings below, write in the alleles on the chromosomes for each of the blood groups. (clue : The first one has been done for you)



5 Give three examples of human disorders which are caused by the action of a single pair of alleles. In each case say whether the harmful allele is dominant or recessive to the non-harmful allele.

6 In humans, maleness or femaleness is determined by a pair of sex chromosomes called X and Y.

- (a) What is the genotype for males?
- (b) What is the genotype for females?
- (c) what are the symbols used for represent male and female genotype in birds?

7 (a) In humans, is it the sperm or the ovum which determines the sex of the offspring?

- (b) Give a reason for your answer.

8 When a particular gene is said to be 'sex-linked', on which chromosome is that gene usually present?

9 colour-blindness is a sex-linked inherited condition controlled by a recessive allele. Use the symbols **X** and **Y** for the sex chromosomes and **N** and **n** for the alleles for normal or defective colour vision to show the genotypes of

- (a) a normal male
- (b) a colour-blind male
- (c) a normal (non-carrier) female
- (d) a colour-blind female
- (e) a normal (carrier) female.

10 Use the genotypes you have written for your answer to question 9 to show the

Chances of (a) a son being colour blind, (b) a daughter being a carrier, resulting From a marriage between a normal man and a carrier woman.

11. In a cross between pure tall plants with green pods and a pure dwarf plant with yellow pods, how many short plants do you expect in F2 generation

- a) 9,      b) 3      c) 4      d) 1

12. Is it possible that a male with an extra X chromosome in his genome? If so how it can happen? Mention its phenotypic characters?

13. a disputed child with blood group 'O' was claimed by two couples; their blood groups are are as following:

	mother	father
Couple-I	A	B
Couple-II	O	AB

State with your knowledge of genetics which couple could be the real parent of the child? Also mention their genotypes.

Note for questions related with **pedigree refer study material pg no.54 -58**

Few hinds

- 3. b)-Rabbit 1Rabbit 4
- c) Rabbit 1Rabbit 4
- d) 12
- e) 3:1
- f) 50%

5. Haemophilia (recessive), albinism (recessive), phenylketonuria (recessive), red-green colour blindness (recessive), sickle-cell anaemia (partially recessive) (any three)
- 11) 4
12. Klinefelters syndrome.
13. couple I when both are heterozygous

## **CHAPTER 7**

**Explain the following:**

1. **Biological evolution is the sum total of genetic changes.-Substantiate.**
2. **In terms of evolution 'fittest' does not necessarily means strongest.-Explain**(the fittest are not necessarily the strongest individuals, but those individuals who are the bearers of advantageous inherited traits that allow them to survive and reproduce more than others-natural selection.)
3. **Besides, descent from common ancestor two species can share common characteristics**  
.-Explain(due to evolutionary convergence).
4. **Genetic drift affects small populations.-Explain.**
5. **The footprint of evolutionary change can be found throughout the nature- substantiate the statement highlighting predator-prey relationship in terms of natural selection.**  
(Natural selection favours individuals whose characteristics improve either their ability to consume others or their ability to avoid being consumed.)
6. **Indiscriminate use of antibiotics will jeopardize your future battle against bacteria- Justify.**(every time we use antibiotics we are applying selection pressure ,killing off any nonresistant bacteria thereby , we are actually helping to speed the evolution of resistance to antibiotics)

## **CHAPTER 8**

### **Human health and disease**

1. 1) Why do children of metro cities of India suffer from allergies and asthma?
2. Ans (Hint.-Pollution )
- 3.
4. 2) A patient has lost his immunity.
5. i) Name the diseases associated with it.
6. ii) Name the confirmatory test to diagnose the disease.
7. iii) Why did he lose his immunity.
8. Ans (Hint:-AIDS)
- 9.
10. 3) A person claimed that he has seen sounds, heard colours and smelt light.
11. i) What could be the possible reason?
12. ii) Name two chemicals responsible for these conditions.
13. iii) Mention any one source for these chemicals.
14. Ans (Hint:- Drug Abuse)

## **CHAPTER 09**

Q.1. In mung bean resistance to yellow mosaic vein was developed.(3)

- 1) Name the phenomenon used.
- 2) How it is induced?
- 3) What happens to genes in this method?

HINT: 1) Mutation breeding 2) mutations can be induced by chemicals or gamma radiations 3) base sequences within genes are changed to create variations that results in new characters .

Q.2. What is hidden hunger? what are the defects caused? Name a method of production of improved quality food that can minimize/prevent it.(3)

Hint: 3 billion people suffer from micronutrient, protein and vitamin deficiencies.

Increases risk of diseases, reduces lifespan & mental abilities.

Biofortification.

Q.3. Conventional agriculture is not able to meet demand of food for ever increasing population. SCP can serve as an alternate. Justify.(3)

**Hint: *Spirulina & Methylophilus methlotrophus*.**

Q.4. a) Following are some statements arrange them in sequence beginning from the first step(2)

1. Transferred to a surrogate mother.
2. It is either mated with an elite bull or artificially inseminated.
3. Fertilized eggs at 32 cell stage are recovered non surgically.
4. It produces 6 to 8 eggs instead of one egg which they normally yield per cycle.

b) These steps are of which method of animal breeding?(1)

Q.5. Animal protein can be used extensively for feeding growing population. However nothing much has been done in this area. Suggest some alternative ways how animal proteins can be obtained on a large scale cost effectively?(5)

## **CHAPTER 10**

Q.1. How is sewage subjected to various treatments in sewage treatment plant? (3)

Hint: explanation of primary and secondary treatment.

Q.2. Biofertilisers are preferred over chemical fertilizers - Substantiate ?

Hint: Mention the eco friendly sustainable use of biofertilisers.

Q.3. Three water samples labeled A (river water); B (untreated sewage water) and C (secondary effluent) were taken for BOD test. The BOD values were 20mg/l; 8mg/l & 400mg/l, respectively. Which water sample is most polluted? Assign the correct label to each assuming the river water is relatively clean? (3)

Hint: sample A BOD 20mg/l; sample B BOD 8mg/l & sample C 400mg/l

Q.4. A) Who gave the medicinal importance of Antibiotics? (1)

B) Give the functional importance of *Propionibacterium*. (1)

c) Name the bacterium that produces the insecticidal 'cry protein'? (1)

Q.5. Supply the scientific terms for the following (5)

- 1) The waste and waste water produced by residential and commercial sources and discharged into sewers.
- 2) An approach to farming based on biological methods that avoid the use of synthetic crop/livestock production inputs.
- 3) A group of gram positive bacteria that carry out lactic acid fermentation of sugars.
- 4) The sludge produced by primary treatment in a wastewater treatment plant.
- 5) A systems approach that combines a wide array of crop production practices with careful monitoring of pests and their natural enemies.

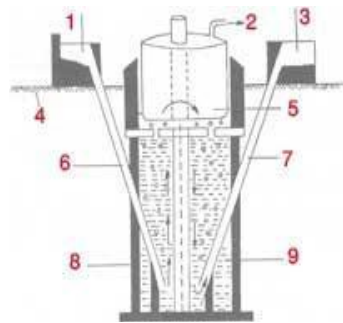
Hint: a)sewage b)organic farming c)LAB d)primary sludge e)IPM

Q.6.why should biological control of pests and pathogens be proffered to the conventional use of chemical pesticides? Explain how the following microbes act as biocontrol agents:(1+1+1)

a)*Bacillus thuringiensis* b)*Nucleopolyhedroviruses*

Q.7. During secondary treatment of the primary effluent how does the significant decrease in BOD occur?

(3)



Q.8a) Draw a labelled diagram of a typical biogas plant.

hint:5) floating gas holder 3)sludge 9) digester 1) Dung and water

b) Give the role of spent slurry

Q.9 Explain Why :

- (a) Cow dung is used in the generation of biogas.
- (b) A small amount of curd is added in fresh milk to convert it into curd.
- (c) Baculovirus are used in narrow spectrum insecticidal application.

Q.10 What are antibiotics? Give two examples. What is their significance?(3)

Q.11. Give one example and one use of the following: a) Free living fungi b) Symbiotic fungi c) Free living bacteria (3)

Q12) How is it that the Cry protein produced by *Bacillus thuringiensis* (Bt) does harm the bacteria but only killsthe insect larvae? (3)

### 5 Marks Questions

Q1)Explain how microbes are used in sewage treatment?

Q2)What do you understand by integrated pest management (IPM)? Explain with example and state its importance

Q5) Differentiate Antibodies and antibiotics Q6) How are biofertilizers different from fertilizers such as NPK that we buy in the market? Justify the role of Rhizobium as a biofertilizer

## **CHAPTER 11**

- 1) Why don't restriction enzyme digest chromosomal DNA in bacterial cells ?
  - 2) Why do bacteria have plasmids?
  - 3) Why thermostable DNA polymerase is essential in PCR?
  - 4)Eukaryotes do not have restriction endonuclease, then how they manage with normal endonuclease enzyme?
  - 5) It is advisable to use different restriction endonucleases to cut the vector DNA and source DNA.Why ?
  - 6) Uncontrolled recombinant DNA technology experiments is dangerous to mankind. Comment on it. 167
  - 4) Foreign DNA + plasmid =.....??.....
- 
- 5 ). Complete the above sequence of diagrammatic representation and name it.
    - (a) Which is the most commonly used matrix in gel electrophoresis ?
    - (b) What is the source of it?
  - 6) Find the 'odd one out and write why that is 'odd'
    - (a) Sal I, Pst I, Cla I, BamH I, pBR 322
    - (b) Bacteria, Virus, Gene-gun, Fungi
  - 7) Detect the mismatch from the following and replace the wrong match with a right one
    - (a) ECOR I –Bacteria
    - (b) Ethidium Bromide- Gel electrophoresis
    - (c) Lysozyme- Fungi
    - (d) Palindrome sequence-Restriction enzyme
  - 8). Name the enzyme involved in the following process:
    - (a) Repeated amplification of DNA fragments.
    - (b) Formation of short piece of RNA strand for annealing.
    - (c) Breaking of bacterial cell to release DNA and other macromolecules.
    - (d) Cutting and rejoining DNA fragments.
    - (e) Formation of m-RNA
    - (f) Joining of foreign DNA fragments with plasmid.
  - 9)Explain how recombinants and non- recombinants are differentiated on the basis of colour production in the presence of a chromogenic substrate. Name that procedure.



### Have some more

1. When scientist make an animal superior by view of genotype, introducing some foreign gene in it , the phenomenon is called \_\_\_\_\_.
2. Why DNA is unable to pass through cell membrane?
3. Why don't the restriction enzymes destroy the DNA of the organism in which they are produced?
4. What function the enzymes DNA ligase perform in genetic engineering?
5. What are the essential features of a vector?
6. Which property of plasmid makes them ideal vectors for gene cloning
7. Discuss the use of molecular probes in forensic science for identification of criminals.
8. What is vector less gene transfer? What are the methods used to transfer genes directly in plants?
9. Name two bacterias found to be very useful in genetic engineering?
10. *Agrobacterium tumefaciens* is known as "natural genetic engineer of plants" why?
11. What do you understand by insertion inactivation genetic engineering? State its usefulness
12. What is the significance of *ori*-gene (origin of replication) in a plasmid?
13. Name the substance used to stain DNA fragments separated in gel electrophoresis? How they are visualized

### Few clues

5. refer concept map
6. *Self replicating*
8. gene gun, microinjection etc
9. *Escherichia coli* , *Agrobacterium tumefaciens*
- 10 *the can cause Crown Gall disease by transferring Ti plasmid to higher plants naturally*
- 13 *Ethidium bromide/UV light*

### **CHAPTER12:**

1. Gene medicine refers to the use of gene manipulation technology to ameliorate or even permanently cure disease in human-Name the technique.(Gene therapy)
2. *Agrobacterium tumefaciens* are considered as natural genetic engineer.-Justify.
3. The bacterium *Bacillus thuringiensis* provides the major source of insect resistant gene-clarify.
4. 'RNAsilencing is a form of genomic defense'-elucidate the statement taking *M. incognitia* as example.

## CHAPTER 13:

Organism, population

1. When two species of *Paramecium* (*P. caudatum* and *P. aurelia*) were grown together in the laboratory, at first both the species grow in number, eventually however, *P. caudatum* declines in number while *P. aurelia* continues to increase in number. - Which type of animal interaction can substantiate the above phenomenon? (competition)

2. Plants like beech, Oak and Pine gain amino acids from fungal associations, while the fungi in return receive carbohydrates and vitamins from the tree - What type of interaction can be inferred from this? (Mutualism)

3. In the stomach of ruminants a huge number of cellulolytic bacteria are present which help the herbivores to digest the plant material, in turn, the bacteria receive Nitrogen that has been secreted or ingested into the rumen in the form of urea - Name the type of interaction.

## CHAPTER 14

1 Why is dry weight chosen for expressing the biomass of a species ?

Hint To avoid variation in weight due to seasonal moisture difference

2 In a pyramid of biomass drawn below name the members of each trophic level

1 one which is supported

2 the one which supports.

In which ecosystem such a pyramid is found?



Ans 1 zooplankton

2 phytoplankton

Aquatic ecosystem

3 Explain why ecological succession will be faster in forest devastated by fire than on bare rock? Also compare succession in case of an abandoned land after floods with that on a bare rock?

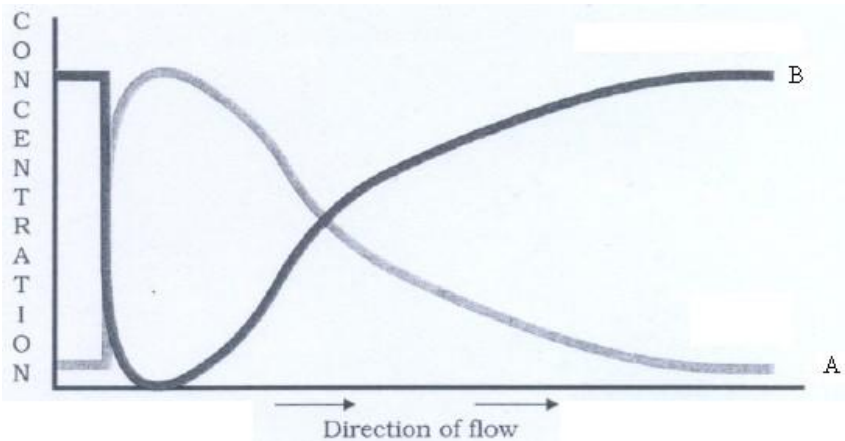
## CHAPTER 15

Explain Why ?

1. Indonesia exhibits more biological diversity than Poland. (*Mention why there is more biodiversity in tropics*)
2. National Parks is a better option for the conservation of biodiversity than zoological gardens. (*Mention about the advantages of in-situ conservation over ex-situ conservation*).
3. Loss of Key stone species from an ecosystem will be a major threat to ecosystem function. (*Give your answer on the basis of 'rivet popper hypothesis'*.)
4. India is a megadiversity country.
5. Within your sibling there are lots of variation although, all of you have the same parents (*answer on the basis of genetic diversity*).
6. India nurtures a lot greater biodiversity than Norway. (*answer the question based on greater ecosystem diversity in India than in Norway*).
7. Justify the killing of elephants at North Bengal in the light of biodiversity conservation. (*Habitat loss/fragmentation/shrinkage by the construction of rail line through the elephant corridor in North Bengal leads to man – animal conflict and resultant loss of biodiversity*).
8. 'The unique mangrove biodiversity of Sunderbans will totally wiped away ' (*Frame your answer on the basis of global climate change and subsequent biodiversity loss*)
9. Find the odd one out:  
*Eicchorniasp., Lantana sp., Partheniumsp., Oryza sativa.* (Besides, *Oryza sativa* all other are invasive species)

## CHAPTER 16

- 1) What is the norms set by Euro-II for petrol and Diesel vehicles
- 2) Name the Phenomena Which Keeps the Earth Warmer than Moon.
- 3) Name the important ozone depleting substances.
- 4) Why is thermal pollution harmful for aquatic life?
- 5) Why are cloudy, dusty & humid Nights warmer than clear dust free and dry nights?
- 6) (Fig 16.3 pg No. 274-biology text book for class xii)



In the above graph what does A & B depict?