

Cbse Class 12 Biology Question Papers With Answers 2017

Section-A

(1 mark each)

Q.1. Name the type of cross that would help to find the genotype of a pea plant bearing violet flowers.

A.1. Test Cross

Q.2. State two postulates of Oparin and Haldane with reference to the origin of life.

A.2. The two postulates proposed by Oparin and Haldane are:

- Life originated from pre-existing non-organic molecules.
- Diverse organic molecules were formed from these inorganic constituents by chemical evolution.

Q.3. A herd of cattle is showing reduced fertility and productivity. Provide one reason and one suggestion to overcome this problem.

A.3. Inbreeding depression results in a decrease in the productivity of cattle. Its fertility can be restored by breeding with the animals of the same breed with no common ancestors up to 5-6 generations.

Q.4. What are 'Cry genes'? In which organisms are they present.

A.4. Cry genes are present in *Bacillus thuringensis*. It codes for certain toxins that act as poison to some insects, thereby, providing resistance to the plants against them.

Q.5. An electrostatic precipitator in a thermal power plant is not able to generate a high voltage of several thousand. Write the ecological implication because of it.

A.5. It does not remove particulate matter present in the exhaust of thermal power plant, and therefore, cannot control pollution.

Section-B

(2 marks each)

Q.6. A pollen grain in the angiosperms at the time of dehiscence from an anther could be 2-celled or 3-celled. Explain. How are the cells present in the pollen grains when shedding at a two-celled stage?

A.6. The pollens are released in a 2-celled stage in most of the angiosperms. On the contrary, the generative cell divides into 2 male gametes and forms a 3-celled stage. The pollen grain has 2 unequal cells at the 2-celled stage- a bigger vegetative cell and a smaller generative cell.

Q.7. Differentiate between the genetic codes given below:

- (a) Unambiguous and Universal
- (b) Degenerate and Initiator

A.7.

- (a) An **unambiguous** code is specific, i.e., one codon codes for only one amino acid. On the contrary, the **universal** code is the same in all organisms.
- (b) A **degenerate** code is the one in which an amino acid is coded by more than one codon. Whereas, an **initiator** codon initiates the translation process. For eg., AUG is an initiator codon.

Q.8. Mention one application for each of the following:

- (a) Passive Immunization
- (b) Antihistamine
- (c) Colostrum
- (d) Cytokinin-barrier

A.8.

- (a) **Passive Immunization-** In passive immunization, ready-made antibodies are introduced in the body. It provides a quick immune response in the body.
- (b) **Antihistamine-** These are chemicals gives against allergic reactions.
- (c) **Colostrum-** It is the yellow fluid secreted during the initial days of lactation after childbirth. It develops resistance in a newborn baby as it is highly rich in antibodies.
- (d) **Cytokinin-barrier-** Cytokinin barriers are glycoproteins which protect the non-infected cells from further viral infection. Interferons are cytokinin barriers.

Q.9. Name the microbes that help production of the following products commercially.

- (a) Statin
- (b) Citric acid
- (c) Penicillin
- (d) Butyric acid

A.9.

- (a) **Statin-** *Monascus purpureus* (fungi)
- (b) **Citric acid-** *Aspergillus niger* (fungi)
- (c) **Penicillin-** *Penicillium notatum* (fungi)
- (d) **Butyric acid-** *Clostridium butylicum* (bacteria)

Q.10. List four benefits to human life by eliminating the use of CFCs.

OR

Suggest two practices giving one example of each that help protect rare or threatened species.

A.10. By eliminating the use of CFCs, the following four benefits can be observed:

- Prevention of ozone depletion
- Control of greenhouse effect
- Control of global warming
- Control in the rise in temperature thereby preventing climatic control.

OR

Ans. The rare or threatened species can be protected by:

- Using cryopreservation technique (-196°C), the sperm, eggs, tissues, and embryos can be preserved for a long period of time in gene banks, seed banks, etc.
- Micropropagation of plants in-vitro using tissue culture techniques.

Section-C

(3 marks each)

Q.11.

(a) Can a flowering plant in Mumbai be pollinated by pollen grains of same species growing in New Delhi? Provide explanations for your answer.

(b) Draw the diagram of a pistil where pollination has successfully occurred. Label the parts involved in reaching the male gametes to its desired destination.

A.11.

- (a) This is possible by Artificial Hybridization. Here, pollen grain of one flower is introduced on the stigma of another flower artificially. But they should be self-compatible

For this, the anthers are removed from one flower and the flower is then bagged. The bag is then removed after some time and the desired pollens are introduced on the stigma.

(b) Diagram

Q.12. Both Haemophilia and Thalassemia are blood-related disorders in humans. Write their causes and difference between the two. Name the category of genetic disorder they both come under.

A.12. Both Haemophilia and Thalassemia are Mendelian disorders.

Differences between Haemophilia and Thalassemia	
Haemophilia	Thalassemia
Sex-linked recessive disorder.	Autosomal-linked recessive disorder.
There is no blood clotting and a person might bleed to death even on a minor injury.	Inadequate amount of haemoglobin is formed.
The gene for haemophilia is located on the X-chromosome.	It occurs due to mutation or deletion of a gene.
The mother is the carrier of the disease.	Inherited by families.

Q.13.

(a) List two methodologies which were involved in the human genome project. Mention how were they used.

(b) Expand 'YAC' and mention what it was used for.

A.13.

(a) The two methodologies of human genome project are as follows:

- **Expressed Sequence Tags (EST)**- This method identifies all the genes expressed as RNA.

- **Sequence Annotation-** In this method, the whole set of genomes containing all the coding and non-coding sequences is sequenced.

(b) YAC-Yeast Artificial Chromosome

It is used as a cloning vector for cloning DNA fragments in a suitable host to facilitate DNA sequencing.

Q.14. Write the characteristics of Ramapithecus, Dryopithecus, and Neanderthal man.

A.14. Ramapithecus

- It evolved around 15 million years ago.
- They walked erect, looked vaguely like a modern human, and had teeth similar to that of the modern man.

Dryopithecus

- It evolved around 25 million years ago.
- They looked like apes, walked like gorillas, had hairy arms and legs of the same length, ate soft fruits and leaves, and had a large brain.

Neanderthal man

- It evolved around 1,00,000-40,000 years ago.
- They had a brain size of 1400 cc, buried their dead, and used hides to protect their bodies.
- The fossils are found in east and central Asia.

Q.15. Name a human disease, its causal organism, symptoms (any three) and vector, spread by intake of water and food contaminated by human faecal matter.

OR

(a) Why is there a fear amongst the guardians that their adolescent wards might get trapped in drug/alcohol abuse?

(b) Explain “addiction” and “dependence” in respect of drug/alcohol abuse in youth.

A.15. Amoebic dysentery (Amoebiasis)

Causal Organism- a protozoan, *Entamoeba histolytica*

Symptoms: Abdominal pain, Constipation, Cramps

Vector: Housefly

OR

(a) Reasons for alcohol abuse in adolescents:

- Social Pressure
- Curiosity and need for excitement, adventure, and experiment.
- Escape from frustration, stress, and depression.
- Unstable or unsupportive family structure.
- Overcome the hardships of life.

(b) Addiction is the psychological attachment to certain effects such as euphoria and a temporary feeling of well-being associated with drugs and alcohol. **Dependence** is the tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome on abrupt discontinuation of a regular dose of drug/alcohol.

Q.16. (a) Write the desirable characters a farmer looks for in his sugarcane crop.

(b) How did plant breeding techniques help north Indian farmers to develop cane with desired characteristics?

A.16.

(a) The desirable characters a farmer looks for in his sugarcane crop are:

- It should have a high yield.
- It should possess thick stem.
- The sugar content should be high.
- It should have the ability to grow in north India.

(b) Two varieties of sugarcane, *Saccharum barberi* (North Indian sugarcane) and *Saccharum officinarum* (South Indian sugarcane) were crossed by the north Indian farmers to obtain sugarcane with desired characteristics. Thus, the plant breeding technique helped to develop good quality sugarcane with desired characteristics.

Q.17. Secondary treatment of sewage is also called Biological treatment. Justify this statement and explain the process.

A.17.

- In the secondary treatment, the primary effluents are passed into large aeration tanks with constant air supply and mechanical agitation.
- This results in the growth and flocculation of aerobic microbes.
- These flocs of microbes consume the organic matter and reduce the Biochemical Oxygen Demand (BOD).
- After the reduction of BOD, the effluent is passed into the settling tank.

- The microbial flocs settle down. This sediment is called activated sludge.
- A part of the sludge is inoculated in the aeration tank and the remaining sludge is passed into the anaerobic sludge digesters.
- The digesters are composed of heterotrophic microbes which anaerobically digest bacteria and fungi present in the sludge thereby producing a mixture of gases like methane, H₂S, and CO₂. This mixture of gases forms the biogas.

Q.18.

(a) Explain the significance of palindromic nucleotide sequence in the formation of recombinant DNA.

(b) Write the use of restriction endonuclease in the above process.

A.18.

(a) When the orientation of reading is kept the same, the sequence of base pairs read the same on both strands of DNA. these sequences are the palindromic sequences.

For eg:

5'-GAATTC-3'

3'-CTTAAG-5'

All the endonucleases look for the palindromic recognition sequence on the entire DNA sequence.

(b) The restriction endonuclease binds to the palindromic sequence on detecting the palindromic site. It makes a cut between the same bases on both strands of DNA and forms sticky ends. The enzyme DNA ligase acts on the sticky ends and helps in the formation of recombinant DNA.

Q.19. Describe the role of heat, primers, and the bacterium *Thermus aquaticus* in the process of PCR.

A.19.

Role of Heat: Heat helps in the denaturation of double-stranded DNA into single-stranded DNA. A temperature of 95 °C is applied to the DNA for denaturation.

Role of Primers: Primers are small oligonucleotides of about 10-18 nucleotides synthesised chemically, and are complementary to the template DNA. It helps in the extension of a new chain of DNA.

Role of *Thermus aquaticus*: A thermostable DNA polymerase, Taq Polymerase is isolated from this bacterium. This bacterium provides the polymerase with the ability to survive at very high temperatures.

Q.20. Explain the steps involved in the production of artificial insulin.

A.20. The various steps involved in the production of artificial insulin are:

- Insulin has two short polypeptide chains linked together by disulphide bonds: chain A and chain B.
- The plasmid of E.coli is isolated and removed.
- The isolated plasmid is cut by a restriction enzyme.
- The DNA sequence that codes for human insulin are inserted into the plasmid
- The plasmid is then ligated. This is known as a recombinant plasmid.
- This recombinant plasmid is inserted into the E.coli host cells.
- These E.coli cells are now capable of producing human insulin.
- These bacteria are cultured in large fermenters to obtain a large amount of insulin.
- The manufactured insulin is extracted and purified.

Q.21.

(a) “Organisms may be conformers or regulators.” Explain this statement and give one example of each.

(b) Why are there more conformers than regulators in the animal world?

A.21.

(a) Regulators are the organisms that possess the ability to maintain homeostasis by physiological or behavioural means. For eg., birds and mammals maintain homeostasis by thermoregulation and osmoregulation.

Conformers are the organisms that do not have the ability to regulate their body temperature according to the surroundings. For eg., fish, frogs.

(b) There are more conformers than regulators in the animal world because of thermoregulation. Small animals have a large surface area, so their body loses heat quickly when it is cold outside. Thus, more energy is generated to maintain body heat through metabolism.

Q.22. Describe the inter-relationship between productivity, gross primary productivity, and net productivity.

A.22. Productivity is defined as the rate of biomass production per unit area by the plants over a certain time period during photosynthesis. It is expressed as $(\text{kcal m}^{-2})\text{yr}^{-1}$ or $\text{g/m}^2/\text{yr}$ or $\text{g m}^{-2} \text{y}^{-1}$.

Gross Primary Productivity	Net Primary Productivity
It is the rate of production of organic matter	It is the weight of the organic matter stored by

during photosynthesis.	the produces per unit area/volume per unit time.
Some of it is utilized in respiration.	NPP=GPP-R R=Respiration loss

Section-D

(4 marks each)

Q.23. It is commonly observed that parents feel embarrassed to freely discuss with their adolescent children about sexuality and reproduction. The result of this parental inhibition is that the children go astray sometimes.

- Explain the reasons that you feel are behind such embarrassment among some parents to freely discuss such issues with their growing children.
- By taking one example of a local plant and animal how would help these parents overcome such inhibitions about reproduction and sexuality.

A.23.

- Due to the narrow-mindedness of the Indian society, the parents feel shy talking to their children about sexuality and reproduction. Therefore, it is important that the parents are friendly with their child so that the child does not feel scared or embarrassed to share such issues with them. The right information and guidance will protect the child from going astray.
- An example of a male honey bee and ophyrys flower is the best explanation for sexual reproduction. The honey bee is attracted to the ophyrys flower. It assumes its petal to be a female and pseudo copulates with it. This natural phenomenon can be mentioned by the parents to their children to explain sexual reproduction.

Section-E

(5 marks each)

Q.24.

(a) When the seed of orange is squeezed, many embryos, instead of one are observed. Explain how is it possible.

(b) Are these embryos genetically similar or different? Comment

OR

(a) Explain the following phases in the menstrual cycle of a human female.

- (i) Menstrual Phase (ii) Follicular Phase (iii) Luteal Phase

(b) A proper understanding of the menstrual cycle can help immensely in family planning. Do you agree with the statement? Provide reasons for your answer.

A.24.

- (a) Many embryos are observed due to polyembryony. In orange, the nucellar cells, synergid, or integument cells develop into a number of embryos of different sizes. Also, the fertilization of more than one egg in the embryo sac can lead to polyembryony.
- (b) These are genetically similar because in these parental characters are maintained. There is no segregation of characters in the offspring.

OR

Ans.

(a) (i) **Menstrual Phase**

- The uterine lining degenerates which result in bleeding.
- It lasts for 3-5 days.
- The soft tissues and unfertilized eggs are discharged.

(ii) **Follicular Phase**

- It lasts for about 10-14 days.
- The primary follicles mature into a Graafian follicle.
- Regeneration of endometrium takes place.

(iii) **Luteal Phase**

- It lasts for about 15-28 days.
- The ruptured follicle changes into corpus luteum and starts secreting hormone progesterone.
- The endometrium starts to thicken.
- If there is no fertilization, the corpus luteum degenerates which causes shedding of the endometrium.

(b) A proper understanding of the menstrual cycle helps in family planning. The period between 10-17 days of the menstrual cycle is the fertile period. Coitus during this period increases the chances of pregnancy in the female. To prevent pregnancy, coitus should be abstained during this period.

Q.25.

(a) Compare giving reasons, the J-shaped and S-shaped models of population growth of species.

(b) Explain “fitness of a species” as mentioned by Darwin.

OR

(a) What is an ecological pyramid? Compare the pyramids of energy, biomass, and numbers.

(b) Write any two limitations of ecological pyramids.

A.25.

(a) There are two models of population growth:

- Exponential growth model
- Logistics growth model

Exponential Growth Model

This kind of growth is observed when resources such as food and space are unlimited. It is represented as:

$$dN/dt = (b - d) * N$$

Where N = Population size

N_t = Population density after time t

N_0 = Population density after time 0

r = growth rate

b = birth rate

d = death rate

Where r is the intrinsic rate of natural increase

Then, $dN/dt = rN$

Or $N_t = N_0 e^{rt}$

When N is plotted in relation to time t, the curve is J-shaped.

Logistics Growth Model

This model is observed when the resources become limited after a certain point. This is a realistic approach.

J-shaped curve- Exponential Growth

S-shaped curve- Logistics Growth

There are limited resources in an ecosystem to support the maximum carrying capacity (K). The S-shaped curve is also called Verhulst Pearl logistic growth. The equation can be given as:

$$\frac{dN}{dt} = rN \left(\frac{K-N}{K} \right)$$

N = Population density at time t

K = Carrying capacity

R = Growth rate

(b) According to Darwin, “fitness of species” means reproductive fitness. All the organisms have a varying degree of reproductive potential after reaching the reproductive age. Some organisms produce more offsprings than others. This is known as “Differential Reproduction”.

The organisms which have more reproductive potential are selected by nature.

OR

Ans.

(a) The relation between producers and consumers is represented graphically in the form of a pyramid. This is called the **ecological pyramid**.

Pyramid of Number	Pyramid of Biomass	Pyramid of Energy
The relationship between	The relationship between	The relationship between

producers and consumers is represented in the form of a pyramid in terms of numbers. Hence, it is called the pyramid of numbers.	producers and consumers is represented as a pyramid in terms of biomass known as the pyramid of biomass.	producers and consumers is represented as a pyramid in terms of the flow of energy known as the pyramid of energy.
The pyramid is upright.	The pyramid is upright or inverted.	The pyramid is always upright.

(b) Limitations of ecological pyramids:

- It assumes a simple food chain which does not exist in nature.
- The same species belonging to two or more trophic levels are never taken into account.

Q.26.

(a) Describe the structure and function of a tRNA molecule. Why is it referred to as an adapter molecule?

(b) Explain the process of splicing of hnRNA in a eukaryotic cell.

OR

Write the different components of a Lac-operon in E.coli. Explain its expression while in an “open” state.

A.26.

(a) t-RNA is the transfer RNA. One hand of the t-RNA reads the genetic code while the other hand transfers amino acid. Therefore, it is called as adapter molecule.

Structure

- t-RNA has five arms or loops:
- Anticodon loop- It has bases complementary to the code.
- Amino acid acceptor end- Amino acids bind here
- T loop- It helps in ribosome binding
- D loop- It helps in binding amino-acyl synthetase

(b) The primary transcript formed in the eukaryotes are:

- Non-functional
- Contains both, the exon (coding) and the intron (non-coding)

This primary transcript is called hnRNA or heterogenous RNA. In hnRNA, there is a process where the introns are spliced and the exons are joined to form m-RNA.

OR

Ans. The concept of lac-operon was first introduced by Jacob and Monad in the year 1961.

Components of an operon:

Lac-operon consists of three structural genes- z, y, and a, operator (o), promoter (p) and a regulatory gene (i).

Gene z codes for β -galactosidase, y for permease, and a for enzyme transacetylase.

- **Structural genes-** It is that fragment of DNA that transcribes mRNA to proteins.
- **Promoter-** The RNA Polymerase binds to this DNA sequence and initiates transcription.
- **Operator-** An operator is adjacent to the promoter.
- **Regulator gene-** This gene codes for a repressor protein. It binds to the operator and switches off the operon.
- **Inducer-** The inducer gene switches on the operon. Lactose is an inducer.

Gene Expression:

When lactose is absent-

- In the absence of lactose, the repressor protein is produced by the gene.
- The repressor protein binds to the operator and prevents RNA polymerase from binding to the operon.
- The operon is thus switched off.

When lactose is present-

- In the presence of lactose, It acts as an inducer and binds to the repressor resulting in the inactivation of a repressor.
- Now, the repressor cannot bind to the operator.
- The RNA polymerase binds to the operator and transcribes Lac mRNA.
- Lac mRNA produces all three enzymes- β -galactosidase, permease, and trans-acetylase
- The operon is switched on in this case.

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