

# Previous Year Paper

10<sup>th</sup> June 2023 (Shift 3)

- Q1. What amount of energy would be at the producer level if it is 50 KJ at third trophic level?  
(a) 5 KJ  
(b) 50 KJ  
(c) 500 KJ  
(d) 5000 KJ

- Q2. Match List-I with List-II:

List-I		List-II	
(A)	Eyes	(I)	Ginger
(B)	Rhizome	(II)	Potato
(C)	Offset	(III)	Agave
(D)	Bulbil	(IV)	Water hyacinth

Choose the **correct** answer from the options given below:

- (a) (A)-(II), (B)-(III), (C)-(I), (D)-(IV)  
(b) (A)-(II), (B)-(I), (C)-(III), (D)-(IV)  
(c) (A)-(II), (B)-(III), (C)-(I), (D)-(IV)  
(d) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)
- Q3. Copying genetic information from one strand of DNA into mRNA is:  
(a) Transcription  
(b) Translation  
(c) Transformation  
(d) Replication
- Q4. Transfer of pollen grains from anther of one flower to the stigma of a flower of different plant is called as:  
(a) Fertilisation  
(b) Geitonogamy  
(c) Xenogamy  
(d) Cleistogamy

- Q5. Match List-I with List-II:

List-I		List-II	
(A)	Homozygosity	(I)	Cross breeding
(B)	Out breeding	(II)	Over comes inbreeding depression
(C)	Hisardale	(III)	Cross between different breeds
(D)	Outcross	(IV)	Pure lines

Choose the **correct** answer from the options given below:

- (a) (A)-(IV), (B)-(I), (C)-(II), (D)-(III)  
(b) (A)-(IV), (B)-(III), (C)-(I), (D)-(II)  
(c) (A)-(I), (B)-(III), (C)-(IV), (D)-(II)  
(d) (A)-(IV), (B)-(II), (C)-(I), (D)-(III)

- Q6. How many episodes of mass extinctions of species have occurred on earth since the origin and diversification of life?  
(a) Two  
(b) Three  
(c) Five  
(d) SIX

- Q7. Arrange the steps of Polymerase chain reaction in proper sequence-  
A. Selection of desired fragment of DNA  
B. Annealing  
C. Amplification  
D. Extension  
E. Denaturation

Choose the **correct** answer from the options given below:

- (a) A, E, B, D, C  
(b) A, B, C, E, D  
(c) A, D, B, C, E  
(d) E, A, B, C, D
- Q8. The process of evolution of different species in a given geographical area starting from a point and dispersing to other areas is called as:  
(a) Natural Selection  
(b) Adaptive radiations  
(c) Disruptive selection  
(d) Convergent evolution
- Q9. Identify the mammals which live wholly in water:  
A. Dolphins  
B. Seals  
C. Sea Horse  
D. Sea cow

Choose the **correct** answer from the options given below:

- (a) A, B and C only  
(b) B, C and D only  
(c) A, C and D only  
(d) A, B and D only
- Q10. Human protein  $\alpha$ -1 antitrypsin is used to treat \_\_\_\_\_.  
(a) Phenylketonuria  
(b) Emphysema  
(c) Haemophilia A  
(d) Hepatitis B

- Q11. In a laboratory population of 80 fruit flies, 8 died in a week, then the death rate of fruit flies is:  
(a) 0.3 individuals per fruit fly per week  
(b) 0.2 individuals per fruit fly per week  
(c) 0.1 individuals per fruit fly per week  
(d) 0.01 individuals per fruit fly per week

- Q12.** The A and B polypeptides chains in insulin are linked together by which bond?  
 (a) Diester  
 (b) Disulphide  
 (c) Hydrogen  
 (d) Peptide
- Q13.** The karyotype in Klinefelter's syndrome is:  
 (a) 2.44 + XO  
 (b) 44 + XXX  
 (c) 44 + XXY  
 (d) 44 + YO
- Q14.** In some species of Asteraceae and grasses, seeds are produced without fertilisation. This phenomenon is known as:  
 (a) Apomixis  
 (b) Parthenogenesis  
 (c) Embryogenesis  
 (d) Gametogenesis
- Q15.** Fine powder of recycled modified plastics is:  
 (a) Polythene  
 (b) Polybag  
 (c) Polyblend  
 (d) Polystyrene
- Q16.** Arrange the following steps for replication of HIV in a correct sequence:  
 A. Production of new viral RNA by infected cell  
 B. Infection of normal cell by virus  
 C. Production of viral DNA  
 D. Production of new viruses  
 Choose the **correct** answer from the options given below:  
 (a) B, C, D, A  
 (b) A, B, C, D  
 (c) D, C, B, A  
 (d) B, C, A, D
- Q17.** Identify the free-living nitrogen fixing bacteria  
 A. *Rhizobium*  
 B. *Mycorrhiza*  
 C. *Azospirillum*  
 D. *Azotobacter*  
 Choose the **correct** answer from the options given below:  
 (a) A and B only  
 (b) A and C only  
 (c) C and D only  
 (d) B and D only
- Q18.** The backbone of a polynucleotide chain is formed by:  
 (a) Sugar and nitrogenous base  
 (b) Nitrogenous base and phosphates  
 (c) Sugar and phosphates  
 (d) Sugar: nitrogenous base and phosphates
- Q19.** Chromosomes in meiocytes of butterfly are:  
 (a) 00  
 (b) 208

- (c) 308  
 (d) 380

- Q20.** The enzyme which is used to remove nucleotides from the ends of DNA fragment is-  
 (a) DNA ligase  
 (b) Restriction endonuclease  
 (c) Restriction exonuclease  
 (d) DNA Polymerase
- Q21.** Spermiogenesis is the process of formation of:  
 (a) Sperms from spermatids  
 (b) Spermatids from secondary spermatocytes  
 (c) Secondary from primary spermatocytes  
 (d) Primary spermatocytes from spermatogonia

- Q22.** Match List-I with List-II:

List-I (Disease)		List-II (Causative agent)	
(A)	Typhoid	(I)	Rhino viruses
(B)	Pneumonia	(II)	<i>Salmonella typhi</i>
(C)	Common cold	(III)	<i>Haemophilus influenzae</i>
(D)	Elephantiasis	(IV)	<i>Wuchereria malayi</i>

Choose the **correct** answer from the options given below:

- (a) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)  
 (b) (A)-(IV), (B)-(III), (C)-(II), (D)-(I)  
 (c) (A)-(IV), (B)-(II), (C)-(I), (D)-(III)  
 (d) (A)-(II), (B)-(III), (C)-(I), (D)-(IV)

- Q23.** Colostrum secreted by mother is rich in:  
 (a) Ig D antibodies  
 (b) Ig E antibodies  
 (c) Ig A antibodies  
 (d) Ig M antibodies
- Q24.** Identify the common Sexually Transmitted Infections (STIs):  
 (a) Chlamydiasis, Trichomoniasis, Influenza  
 (b) Elephantiasis, Chlamydiasis, Syphilis  
 (c) Trichomoniasis, Elephantiasis, Ascariasis  
 (d) Chlamydiasis: Trichomoniasis, Syphilis
- Q25.** What kind of IUD is Lippes loop?  
 A. Non-medicated  
 B. Copper releasing  
 C. Zinc releasing  
 D. Hormone releasing  
 E. Medicated IUDs  
 Choose the **correct** answer from the options given below:  
 (a) A only  
 (b) A and B only  
 (c) C only  
 (d) A and D only

**Q26.** Signals of parturition originate from which of the following?

- A. Human Placental Lactogen
- B. Parturition hormone
- C. Fully developed foetus
- D. Placenta

Choose the **correct** answer from the options given below:

- (a) A and B only
- (b) A, B and C only
- (c) B, C and D only
- (d) C and D only

**Q27.** Match **List-I** with **List-II**:

List-I		List-II	
(A)	Phenylketonuria	(I)	Incomplete dominance
(B)	Haemophilia	(II)	9:3:3:1
(C)	Snapdragon	(III)	Pleiotropy
(D)	Dihybrid cross	(IV)	Sex-linked

Choose the **correct** answer from the options given below:

- (a) (A)-(IV), (B)-(III), (C)-(II), (D)-(I)
- (b) (A)-(IV), (B)-(III), (C)-(I), (D)-(II)
- (c) (A)-(III), (B)-(I), (C)-(II), (D)-(IV)
- (d) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

**Q28.** Which of the following is NOT a technique of genetic engineering?

- (a) Creation of recombinant DNA
- (b) Use of gene cloning
- (c) Gene transfer
- (d) Grafting

**Q29.** The yellow mosaic virus resistant variety Parbhani Kranti is the new variety of \_\_\_\_\_

- (a) Okra
- (b) Flat bean
- (c) Chilli
- (d) Cowpea

**Q30.** In which ecosystem, a large fraction of energy flows more through DFC than through GFC?

- (a) Pond Ecosystem
- (b) River Ecosystem
- (c) Estuary Ecosystem
- (d) Forest Ecosystem

**Q31.** Diseases caused by fungi are:

- A. Tobacco mosaic
- B. Brown rust of wheat
- C. Black rot of crucifers
- D. Red rot of sugarcane
- E. Late blight of potato

Choose the **correct** answer from the options given below.

- (a) A, C and E only
- (b) B, D and E only

(c) A, C and D only

(d) B, C and D only

**Q32.** Match **List-I** with **List-II**:

List-I		List-II	
(A)	Molecular diagnosis	(I)	GEAC
(B)	Human therapeutics	(II)	Alpha - 1 - Antitrypsin
(C)	Transgenic 'Roise'	(III)	ELISA
(D)	Validity of GM research	(IV)	Human alpha lactalbumin

Choose the **correct** answer from the options given below:

- (a) (A)-(III), (B)-(II), (C)-(IV), (D)-(I)
- (b) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)
- (c) (A)-(I), (B)-(II), (C)-(IV), (D)-(III)
- (d) (A)-(I), (B)-(IV), (C)-(II), (D)-(III)

**Q33.** Match **List-I** with **List-II**:

List-I		List-II	
(A)	Alec Jeffreys	(I)	Operon model
(B)	Jacob and Monod	(II)	X-ray diffraction data DNA
(C)	Erwin Chargaff	(III)	DNA Fingerprinting
(D)	Wilkins and Franklin	(IV)	$\frac{A+G}{T+C} = 1$

Choose the **correct** answer from the options given below:

- (a) (A)-(II), (B)-(III), (C)-(IV), (D)-(I)
- (b) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)
- (c) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)
- (d) (A)-(II), (B)-(IV), (C)-(I), (D)-(III)

**Q34.** Bone structure of forelimbs of vertebrates like whale, bat, cheetah and human is evidence of:

- (a) Convergent evolution
- (b) Divergent evolution
- (c) Disruptive selection
- (d) Directional selection

**Q35.** What of the following team refers to the confinement of the species to a specific area and also the same species are not found anywhere

- (a) Pandemism
- (b) Endemism
- (c) Epidemic
- (d) Botanical Garden

**Q36.** "Jhum cultivation" in the north-eastern states of India has contributed to:

- (a) Reforestation
- (b) Plantation
- (c) Deforestation
- (d) Habitat Construction



**Q37.** Match **List-I** with **List-II**:

List-I		List-II	
(A)	Anaerobic sludge digester	(I)	Secondary treatment
(B)	Primary sludge	(II)	Activated sludge
(C)	Change in BOD	(III)	Primary treatment
(D)	Bacterial flocs	(IV)	Biogas

Choose the **correct** answer from the options given below:

- (a) (A)-(IV), (B)-(II), (C)-(III), (D)-(I)
- (b) (A)-(I), (B)-(III), (C)-(IV), (D)-(II)
- (c) (A)-(IV), (B)-(III), (C)-(I), (D)-(II)
- (d) (A)-(I), (B)-(II), (C)-(IV), (D)-(III)

**Q38.** Which of statements are correct about Thalassemia?

- A. In  $\beta$  Thalassemia, production of  $\alpha$  globulin chain is affected and in  $\alpha$  Thalassemia production of  $\beta$  globulin chain is affected.
- B.  $\alpha$  Thalassemia is controlled by two closely linked genes HBA1 and HBA2
- C. The genes HBA1 and HBA2 are located on chromosome 11 of each parent.
- D.  $\beta$  Thalassemia is controlled by a single gene HBB
- E. The gene HBB is located on chromosome 16 of each parent.

Choose the **correct** answer from the options given below:

- (a) A and C only
- (b) C and D only
- (c) B and D only
- (d) B and E only

**Q39.** The organism responsible for large holes in 'Swiss cheese' is:

- (a) *Saccharomyces cerevisiae*
- (b) *Lactobacillus lactobacter*
- (c) *Trichoderma polysporum*
- (d) *Propionibacterium sharmanii*

**Q40.** The interaction between two species where one species is benefitted and the other is neither benefitted nor harmed is known as:

- (a) Commensalism
- (b) Amensalism
- (c) Predation
- (d) Parasitism

Direction for the question 41 to 45: **Read the passage carefully. Attempt the questions.**

In our body, cell growth and differentiation is highly controlled and regulated. In cancer cells, there is breakdown of these regulatory mechanisms. Cancerous cells just continue to divide giving rise to masses of cells called tumors. Benign tumors normally remain confined to their original

location. The malignant tumors, on the other hand are a mass of proliferating cells. These cells actively divide and starve the normal cells by competing for vital nutrients. Cells sloughed from such tumors reach distant sites through blood and wherever they get lodged in the body, they start a new tumor there. This property is called metastasis. Transformation of normal cells into cancerous cells may be induced by physical, chemical or biological agents called carcinogens.

**Q41.** The statement which is correct for cancer cells:

- (a) These cells grow very slowly invade and damage the blood cells
- (b) These cells grow very rapidly, invade and damage the normal tissue
- (c) These cells grow very slow, invade and manufacture the plasma cells
- (d) These cells grow very rapidly invade and damage the liver cells only

**Q42.** Cancer is caused by:

- A. Carcinogens
- B. Protein rich foods
- C. Primary lymphocytes
- D. Oncogenes

Choose the **correct** answer from the options given below:

- (a) B and C only
- (b) D and E only
- (c) A and D only
- (d) A and B only

**Q43.** Normal cells show a property that does not allow their uncontrolled growth. This property is known as:

- (a) Contact inhibition
- (b) Contact selection
- (c) Metastasis
- (d) Contact promotion

**Q44.** Benign tumors are normally remain confined to:

- (a) Blood and later spread to other parts of body.
- (b) Original location and do not spread to other parts of the body.
- (c) Original location and later spread to all the body parts.
- (d) Original location and cause heavy damage to the body parts.

**Q45.** Tobacco smoke been identified as a major cause of:

- (a) Skin Cancer
- (b) Blood Cancer
- (c) Lung Cancer
- (d) Brain Cancer

Direction for the question 46 to 50: **Read the passage carefully. Attempt the questions.**

An overwhelming majority (99 per cent) of animals and nearly all plants cannot maintain a constant internal environment. Their body temperature changes with the ambient temperature. In aquatic animals, the osmotic concentration of the body fluids change with that of the ambient air and water osmotic concentration. These animals and plants are simply conformers. Considering the benefits of a constant internal environment to the organism, we must ask why these conformers had not evolved to become regulators. Recall the human analogy we used above; much as they like, how many people can really afford an air conditioner? Many simply 'sweat it out' and resign themselves to suboptimal performance in hot summer months. Very small animals are rarely found in polar regions. During the course of evolution, the costs and benefits of maintain in a constant internal environment are taken into consideration. Some species have evolved the ability to regulate, but only over a limited range of environmental conditions, beyond which they simply conform.

If the stressful external conditions are localised or remain only for a short duration, the organism has five other alternatives for survival.

**Q46.** Conformers have not evolved to become regulators because:

- (a) Conformers are generally small sized organisms.
- (b) Cost of becoming a regulator is very low.
- (c) Their anatomical structure is simple,
- (d) Cost of becoming a regulation is very high.

**Q47.** Identify the animal which is NOT a conformer.

- (a) Humming bird
- (b) Shrew

- (c) Polar Bear
- (d) Lizard

**Q48.** Conformers are the animals whose body temperature:

- (a) Remain constant
- (b) Change with the surrounding temperature.
- (c) Remain quite lower than the surrounding temperature
- (d) Remain quite higher than the surrounding temperature

**Q49.** Identify the set of aquatic animals whose osmotic concentration is not constant.

- (a) Whale and Fish
- (b) *Amoeba* and *Paramecium*
- (c) Whale and Dolphin
- (d) Dolphin and Fish

**Q50.** Identify the statements which support the reason why small animals are rarely found in polar regions.

- A. Small animals have larger surface area relative to their volume
- B. Small animals have larger volume relative to their surface area
- C. Shrews and humming birds are not found in polar region
- D. Small animals have smaller surface area relative to their volume

Choose the **correct** answer from the options given below:

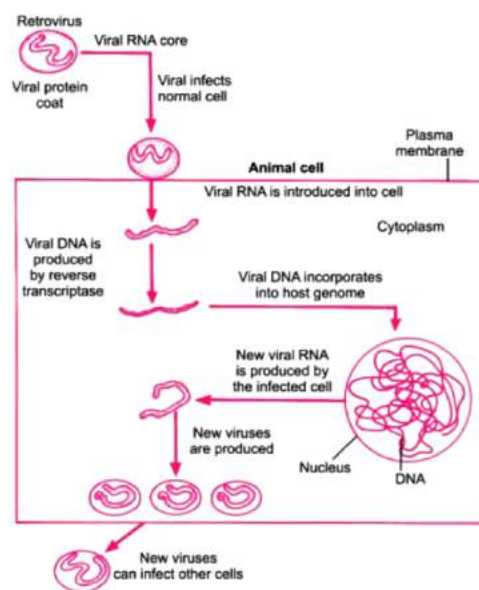
- (a) A and B only
- (b) B and D only
- (c) A and C only
- (d) A and D only



## SOLUTIONS

- S1. Ans. (d)**  
**Sol.** The energy at the producer level is 5000 kJ, because only 10% of energy is transferred to next higher trophic level, above producers.
- S2. Ans. (d)**  
**Sol.** In plants, the units of vegetative propagation such as runner, rhizome (ginger), sucker, tuber, offset (*water hyacinth*), bulbil (*Agave*) are all capable of giving rise to new offspring.
- S3. Ans. (a)**  
**Sol.** The process of copying genetic information from one strand of DNA into mRNA is termed as transcription.
- S4. Ans. (c)**  
**Sol.** Transfer of pollen grains from anther to the stigma of a different plant is called xenogamy. This is the only type of pollination which during pollination brings genetically different types of pollen grains to the stigma.
- S5. Ans. (b)**  
**Sol.** Hisardale is a cross-breed of sheep developed in Punjab by crossing Bikaneri ewes and Marino rams. Out-breeding is the breeding of the unrelated animals, which may be between individuals of the same breed but having no common ancestors for 4-6 generations (out-crossing) or between different breeds (cross-breeding) or different species (inter-specific hybridisation). A single outcross often helps to overcome inbreeding depression. Inbreeding is necessary if we want to evolve a pureline in any animal.
- S6. Ans. (c)**  
**Sol.** During the long period (> 3 billion years) since the origin and diversification of life on earth there were five episodes of mass extinction of species.
- S7. Ans. (a)**  
**Sol.** Correct sequence of steps in a PCR (Polymerase Chain Reaction) are denaturation, annealing and extension.
- S8. Ans. (b)**  
**Sol.** The process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography (habitats) is called adaptive radiation. Darwin's finches represent one of the best examples of this phenomenon.
- S9. Ans. (d)**  
**Sol.** Dolphins, seals and sea cow are mammals that live in water, sea horse that is Hippocampus is not a mammal.
- S10. Ans. (b)**  
**Sol.** Transgenic animals that produce useful biological products can be created by the introduction of the portion of DNA (or genes) which codes for a particular product such as human protein ( $\alpha$ -1-antitrypsin) used to treat emphysema.
- S11. Ans. (c)**

- Sol.** If 8 individuals in a laboratory population of 80 fruitflies died during a week, then death rate in the population during that period is  $8/80 = 0.1$  individuals per fruitfly per week.
- S12. Ans. (b)**  
**Sol.** Insulin composed of two peptide chains namely the A chain and B chain that are linked together by two disulfide bonds.
- S13. Ans. (c)**  
**Sol.** Klinefelter's Syndrome is a genetic disorder caused due to the presence of an additional copy of X-chromosome resulting into a karyotype of 47, XXY.
- S14. Ans. (a)**  
**Sol.** Some seeds, in general are the products of fertilisation, a few flowering plants such as some species of Asteraceae and grasses, have evolved a special mechanism, to produce seeds without fertilisation, called apomixis.
- S15. Ans. (c)**  
**Sol.** Polyblend is a fine powder of recycled modified plastic. It was developed by the company of Ahmed Khan who was a plastic sack manufacturer in Bangalore.
- S16. Ans. (d)**  
**Sol.**



**Replication of Retrovirus**

- S17. Ans. (c)**  
**Sol.** Some bacteria can fix atmospheric nitrogen while free-living in the soil (examples *Azospirillum* and *Azotobacter*), thus enriching the nitrogen content of the soil.
- S18. Ans. (c)**

**Sol.** DNA is made of two polynucleotide chains, where the backbone is constituted by sugar-phosphate, and the bases project inside.

**S19. Ans. (d)**

**Sol.** Chromosomes in meiocytes of butterfly is 380.

**S20. Ans. (c)**

**Sol.** Exonucleases are the enzymes that cut the double stranded or single stranded DNA and remove the nucleotides from the 5' or 3' ends.

**S21. Ans. (a)**

**Sol.** The spermatids are transformed into spermatozoa (sperms) by the process called spermiogenesis.

**S22. Ans. (d)**

**Sol.** Bacteria like *Streptococcus pneumoniae* and *Haemophilus influenzae* are responsible for the disease pneumonia in humans which infects the alveoli (air filled sacs) of the lungs. Rhino viruses represent one such group of viruses which cause one of the most infectious human ailments – the common cold. *Salmonella typhi* is a pathogenic bacterium which causes typhoid fever in human beings.

**S23. Ans. (c)**

**Sol.** Colostrum is very essential for a newborn as it supplies plentiful immunoglobulin A (IgA) that provides immunity.

**S24. Ans. (d)**

**Sol.** Gonorrhoea, syphilis, genital herpes, chlamydiasis, genital warts, trichomoniasis, hepatitis-B are common STDs.

**S25. Ans. (a)**

**Sol.** Intra Uterine Devices are presently available as the non-medicated IUDs (e.g., Lippes's loop), copper releasing IUDs (CuT, Cu7, Multiload 375) and the hormone releasing IUDs (Progestasert, LNG-20).

**S26. Ans. (d)**

**Sol.** The signals for parturition originate from the fully developed foetus and the placenta which induce mild uterine contractions called foetal ejection reflex.

**S27. Ans. (d)**

**Sol.** Haemophilia is sex linked recessive disease, when a single gene can exhibit multiple phenotypic expression. Such a gene is called a pleiotropic gene. E.g phenylketonuria. 9:3:3:1 is a ratio obtained in dihybrid cross. The inheritance of flower colour in the dog flower (snapdragon or *Antirrhinum* sp.) is a good example to understand incomplete dominance.

**S28. Ans. (d)**

**Sol.** Grafting is a method of asexual plant propagation that joins plant parts from different plants together so they will heal and grow as one plant.

**S29. Ans. (a)**

**Sol.** Resistance to yellow mosaic virus in bhindi (*Abelmoschus esculentus*) was transferred from a wild species and resulted in a new variety of *A. esculentus* called *Parbhani kranti*.

**S30. Ans. (d)**

**Sol.** in a terrestrial ecosystem, a much larger fraction of energy flows through the detritus food chain than through the GFC.

**S31. Ans. (b)**

**Sol.** Some of the diseases caused by fungi are rusts, e.g., brown rust of wheat, red rot of sugarcane and late blight of potato; by bacteria – black rot of crucifers; and by viruses – tobacco mosaic, turnip mosaic, etc.

**S32. Ans. (a)**

**Sol.** Polymerase Chain Reaction (PCR) and Enzyme Linked Immuno-sorbent Assay (ELISA) are some of the techniques that serve the purpose of early diagnosis. Transgenic animals that produce useful biological products can be created by the introduction of the portion of DNA (or genes) which codes for a particular product such as human protein ( $\alpha$ -1-antitrypsin) used to treat emphysema. In 1997, the first transgenic cow, Rosie, produced human protein-enriched milk (2.4 grams per litre). The milk contained the human alpha-lactalbumin and was nutritionally a more balanced product for human babies than natural cow-milk.

**S33. Ans. (b)**

**Sol.** in 1953 that James Watson and Francis Crick, based on the X-ray diffraction data produced by Maurice Wilkins and Rosalind Franklin, proposed a very simple but famous Double Helix model for the structure of DNA. One of the hallmarks of their proposition was base pairing between the two strands of polynucleotide chains. However, this proposition was also based on the observation of Erwin Chargaff that for a double stranded DNA, the ratios between Adenine and Thymine and Guanine and Cytosine are constant and equals one. DNA Fingerprinting was initially developed by Alec Jeffreys. The elucidation of the lac operon was also a result of a close association between a geneticist, Francois Jacob and a biochemist, Jacques Monod.

**S34. Ans. (b)**

**Sol.** Whales, bats, Cheetah and human (all mammals) share similarities in the pattern of bones of forelimbs. Though these forelimbs perform different functions in these animals, they have similar anatomical structure – all of them have humerus, radius, ulna, carpals, metacarpals and phalanges in their forelimbs. Hence, in these animals, the same structure developed along different directions due to adaptations to different needs. This is divergent evolution and these structures are homologous.

**S35. Ans. (b)**



**Sol.** Endemism is the state of being a species found in a single defined geographic location, such as an island, state, nation, country or other defined zone; organisms that are indigenous to a place are not endemic to it if they are also found elsewhere.

**S36. Ans. (c)**

**Sol.** Slash and burn agriculture, commonly called as Jhum cultivation in the north-eastern states of India, has also contributed to deforestation. In slash and burn agriculture, the farmers cut down the trees of the forest and burn the plant remains. The ash is used as a fertiliser and the land is then used for farming or cattle grazing. After cultivation, the area is left for several years so as to allow its recovery. The farmers then move on to other areas and repeat this process.

**S37. Ans. (c)**

**Sol.** During primary treatment, the grit (soil and small pebbles) are removed by sedimentation. All solids that settle form the primary sludge, and the supernatant forms the effluent. During secondary treatment, the primary effluent is passed into large aeration tanks where it is constantly agitated mechanically and air is pumped into it. This allows vigorous growth of useful aerobic microbes into flocs. While growing, these microbes consume the major part of the organic matter in the effluent. This significantly reduces the BOD (biochemical oxygen demand) of the effluent. Once the BOD of sewage or waste water is reduced significantly, the effluent is then passed into a settling tank where the bacterial 'flocs' are allowed to sediment. This sediment is called activated sludge. A small part of the activated sludge is pumped back into the aeration tank to serve as the inoculum. The remaining major part of the sludge is pumped into large tanks called anaerobic sludge digesters. Here, other kinds of bacteria, which grow anaerobically, digest the bacteria and the fungi in the sludge. During this digestion, bacteria produce a mixture of gases such as methane, hydrogen sulphide and carbon dioxide. These gases form biogas.

**S38. Ans. (c)**

**Sol.** In  $\alpha$  Thalassemia, production of  $\alpha$  globin chain is affected while in  $\beta$  Thalassemia, production of  $\beta$  globin chain is affected.  $\alpha$  Thalassemia is controlled by two closely linked genes HBA1 and HBA2 on chromosome 16 of each parent and it is observed due to mutation or deletion of one or more of the four genes. The more genes affected, the less alpha globin molecules produced. While  $\beta$  Thalassemia is controlled by a single gene HBB on chromosome 11 of each parent and occurs due to mutation of one or both the genes.

**S39. Ans. (d)**

**Sol.** the large holes in 'Swiss cheese' are due to production of a large amount of CO<sub>2</sub> by a bacterium named *Propionibacterium sharmanii*.

**S40. Ans. (a)**

**Sol.** Depending on the outcome, interactions between two species are classified as competition (both species

suffer), predation and parasitism (one benefits and the other suffers), commensalism (one benefits and the other is unaffected), amensalism (one is harmed, other unaffected) and mutualism (both species benefit).

**S41. Ans. (b)**

**Sol.** In our body, cell growth and differentiation is highly controlled and regulated. In cancer cells, there is breakdown of these regulatory mechanisms. These cells grow very rapidly, invading and damaging the surrounding normal tissues. As these cells actively divide and grow they also starve the normal cells by competing for vital nutrients.

**S42. Ans. (c)**

**Sol.** Transformation of normal cells into cancerous neoplastic cells may be induced by physical, chemical or biological agents. These agents are called carcinogens. Cancer causing viruses called oncogenic viruses have genes called viral oncogenes. Furthermore, several genes called cellular oncogenes (c-onc) or proto oncogenes have been identified in normal cells which, when activated under certain conditions, could lead to oncogenic transformation of the cells.

**S43. Ans. (a)**

**Sol.** Normal cells show a property called contact inhibition by virtue of which contact with other cells inhibits their uncontrolled growth.

**S44. Ans. (b)**

**Sol.** Benign tumors normally remain confined to their original location and do not spread to other parts of the body and cause little damage.

**S45. Ans. (c)**

**Sol.** Smoking is associated with increased incidence of cancers of lung, urinary bladder and throat, bronchitis, emphysema, coronary heart disease, gastric ulcer, etc.

**S46. Ans. (d)**

**Sol.** Small animals have a large surface area to volume ratio, so a lot of energy has to be spent to regulate temperature. To conserve energy conformers have not evolved into regulators.

**S47. Ans. (c)**

**Sol.** Polar bear is not a conformer.

**S48. Ans. (b)**

**Sol.** Conformers have little homeostasis and are ectothermic, their body temperature changes according to their environment.

**S49. Ans. (b)**

**Sol.** In Amoeba and paramecium, the osmoregulation occurs through Contractile vacuole.

**S50. Ans. (c)**

**Sol.** Small animals have larger surface area relative to their volume, they tend to lose body heat very fast when it is cold outside; therefore they have to expend much energy to generate body heat through metabolism. This is the reason why polar regions are not a suitable habitat for tiny humming birds.