

# Previous Year Paper

30<sup>th</sup> May 2023 (Shift 2)

- Q1.** Which of the following structures have  $3n$  (triploid) number of chromosomes?  
(a) Zygote  
(b) Megaspore mother cell  
(c) Primary endosperm cell  
(d) Synergids
- Q2.** The mathematical expression that represents the Exponential growth in a population is:  
(a)  $\frac{dN}{dt} = rN$   
(b)  $\frac{dN}{dt} = \left(\frac{K}{K-N}\right)$   
(c)  $\frac{dN}{dt} = rN \left(\frac{K-N}{K}\right)$   
(d)  $\frac{dN}{dt} = rN(K - N)$
- Q3.** Which of the following is **NOT** a copper releasing IUDs?  
(a) CuT  
(b) Multiload 375  
(c) Cu7  
(d) LNG-20
- Q4.** Write the steps in sequential order from fertilisation to implantation -  
(A) Mitosis in zygote  
(B) Embedding of blastocyst in endometrium  
(C) Formation of blastocyst from morula  
(D) Male gamete and secondary oocyte fuses to form zygote  
(E) Formation of morula  
Choose the **correct** answer from the options given below:  
(a) (A), (E), (D), (B), (C)  
(b) (D), (E), (A), (C), (B)  
(c) (A), (B), (E), (D), (C)  
(d) (D), (A), (E), (C), (B)
- Q5.** *Java* and *Ratna* are high yielding semi-dwarf varieties of  
(a) Wheat  
(b) Maize  
(c) Rice  
(d) Millet
- Q6.** Which is **NOT** a major characteristic feature of biodiversity 'Hot Spot'?  
(a) High degree of endemism  
(b) Large number of species  
(c) Mostly located in the polar region  
(d) Located in the tropical region
- Q7.** Skin colour in human being is an example of:  
(a) Incomplete dominance  
(b) Co-dominance  
(c) Polygenic inheritance  
(d) Multiple allelism
- Q8.** Down's syndrome is a genetic disorder. It is due to:  
(a) The presence of an additional copy of the chromosome number 21  
(b) The absence of one of the X chromosome.  
(c) The presence of an additional copy of X chromosome resulting into karyotype of 47 chromosomes.  
(d) Inborn error of metabolism
- Q9.** Which of the following is correct in the context of haemophilia?  
(a) It is a sex-linked recessive disease.  
(b) It is a sex-linked dominant disease.  
(c) It is an autosome linked recessive disease.  
(d) It is an autosome linked dominant disease.
- Q10.** In malignant tumor, the cells proliferate, grow very rapidly and move to other parts of body to form new tumors. This property is called:  
(a) Mitosis  
(b) Metagenesis  
(c) Gametogenesis  
(d) Metastasis
- Q11.** Which of the following technique(s) is/ are NOT useful in early detection of cancer?  
(A) X-rays radiography  
(B) Computed tomography  
(C) Widal test  
(D) Biopsy and histopathological studies  
(E) Magnetic Resonance Imaging  
Choose the **correct** answer from the options given below:  
(a) (A) and (D) Only  
(b) (B) and (E) only  
(c) (A) only  
(d) (C) only
- Q12.** Montreal Protocol was signed at Montreal in 1987 to control.  
(a) Global warming  
(b) Emission of ozone depleting substances  
(c) Biological diversity  
(d) Deforestation

**Q13.** Which of the following statements is INCORRECT about Genetic Engineering Approval Committee?

- (a) It make decisions regarding the validity of GM research
- (b) It 100k about the safety of introducing GM-organisms for public services
- (c) It is an Indian Government set up organisation
- (d) It look for marketing of the useful GM products for public services

**Q14.** Which of the following is/are NOT the way(s) to introduce alien DNA into the host cell?

- (A) Using vectors like *Agrobacterium tumifaciens*
- (B) Injecting directly into the nucleus of animal cell
- (C) Using ethylene dibromide
- (D) Using vectors like retroviruses
- (E) Using biolistics or gene gun

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

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

**Q15.** Limit of particulate size according to Central Pollution Control Board which can cause great harm to human being is:

- (a) 2.5 micrometer or less diameter (PM 2.5)
- (b) 2.5 millimetre
- (c) 2.5 centimetre
- (d) 25 millimetre

**Q16.** The first isolated restriction endonuclease was:

- (a) *BamH I*
- (b) *Hind II*
- (c) *EcoR I*
- (d) *Hind III*

**Q17.** The Mediterranean orchid *Ophrys* employs 'sexual deceit' mechanism to get pollination done by

- (a) Fruit fly
- (b) Wasp
- (c) Species of bee
- (d) Butterfly

**Q18.** Homologous structures have:

- (a) Similar origin and dissimilar function.
- (b) Dissimilar origin but similar function.
- (c) Structurally as well as functionally similar.
- (d) Normally non-functional.

**Q19.** The large holes in 'Swiss cheese' are due to -

- (a) Production of a large amount of carbon dioxide by a bacterium
- (b) A machine
- (c) Methane gas produced by a bacterium
- (d) A fungus that release a lot of gases during its metabolic activities

**Q20.** Match **List-I** with **List-II**:

List-I		List-II	
(A)	Ovulatory phase	(I)	Proliferative phase
(B)	Follicular phase	(II)	Both LH and FSH attain a peak level
(C)	Luteal phase	(III)	Breakdown of endometrial lining of uterus and its blood vessels
(D)	Menstrual phase	(IV)	Secretory phase

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

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

**Q21.** Identify the statements which are true for both RNA and DNA.

- (A) Two nucleotides are linked through 3'-5' phosphodiester linkage.
- (B) Nitrogenous bases are linked to the sugar moiety.
- (C) Additional -OH is present at 2'-position in the sugar.
- (D) 5-methyl uracil is present.

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

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

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

List-I		List-II	
(A)	Heroin	(I)	<i>Atropa belladonna</i>
(B)	Marijuana	(II)	<i>Erythroxylum coca</i>
(C)	Cocaine	(III)	<i>Cannabis sativa</i>
(D)	Hallucinogenic properties	(IV)	<i>Papaver somniferum</i>

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

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

**Q23.** Which of the following bond in DNA strand is broken by the action of restriction enzyme?

- (a) Phosphodiester bond only
- (b) N-glycosidic bond only
- (c) Hydrogen bond only
- (d) Phospho-diester as well as hydrogen bond



**Q24.** What is the correct sequence of steps involved in treating SCID (ADA deficiency) through Biotechnology.

- (A) A functional ADA-cDNA introduced in lymphocytes.
- (B) Lymphocytes returned to the body of the patient.
- (C) Lymphocytes from the blood of the patient are grown in culture outside the body.
- (D) Periodic infusion of such genetically engineered lymphocytes required.

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

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

**Q25.** "Bt toxin gene has been cloned from *Bacillus thuringiensis* and has been expressed in plants." This in effect created which of the following?

- (a) Biopesticide
- (b) Biofertiliser
- (c) Bio-fortification
- (d) Biolistics

**Q26.** Match List-I with List-II:

List-I		List-II	
(A)	The primates which were more ape-like	(I)	<i>Dryopithecus</i>
(B)	Probably lived in East African grasslands	(II)	<i>Homo sapiens</i>
(C)	The primates which were more man-like	(III)	<i>Ramapithecus</i>
(D)	First human-like being, the hominid	(IV)	<i>Australopithecines</i>
		(V)	<i>Homo habilis</i>

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

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

**Q27.** Water hyacinth can propagate vegetatively through:

- (a) Adventitious buds
- (b) Rhizome
- (c) Offset
- (d) Bulbil

**Q28.** Match List-I with List-II:

List-I		List-II	
(A)	Gobar gas	(I)	Citric acid

(B)	<i>Aspergillus niger</i>	(II)	Methane
(C)	<i>Saccharomyces cerevisiae</i>	(III)	Antibiotic
(D)	<i>Penicillium notatum</i>	(IV)	Ethanol

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

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

**Q29.** Nowadays, biofertilisers are available in the market. Select the correct statements regarding biofertilisers given below:

- (A) Biofertilisers increase the soil fertility.
- (B) Biofertilisers kill the pathogenic microbes
- (C) Biofertilisers increase the iron content in the soil
- (D) Biofertilisers increase the crop production.
- (E) Excess use of biofertilisers causes water and soil pollution.

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

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

**Q30.** Match List-I with List-II:

List-I (Molecule)		List-II (Function)	
(A)	DNA ligase	(I)	snRNAs
(B)	RNA polymerase II	(II)	Discontinuous synthesis
(C)	RNA polymerase III	(III)	28S RNA
(D)	RNA polymerase I	(IV)	hn RNA

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

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

**Q31.** Which of the following is NOT an Ex-situ conservation?

- (a) Zoological parks
- (b) Wildlife safari parks
- (c) Wildlife sanctuaries
- (d) Cryopreservation techniques

**Q32.** Which of the following does not show symbiotic association?

- (a) Fungi
- (b) Protozoan
- (c) Algae
- (d) Mycorrhiza

**Q33.** Motile asexual reproductive units are called \_\_\_\_\_.

- (a) Conidia
- (b) Zoospores
- (c) Buds
- (d) Gametes

**Q34.** Which of the following material takes longer time for decomposition?

- (a) Jute
- (b) Cotton
- (c) Paper
- (d) Bones

**Q35.** Following are the steps involved in Hershey and Chase experiment to prove DNA as the genetic material.

- (A) Blending the cells
- (B) Centrifugation of the cells was performed
- (C) Growing some bacteriophages on a medium containing radioactive phosphorus and other on radioactive sulfur.
- (D) Cells were infected with virus
- (E) Observation and established the inference.

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

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

**Q36.** The protoplast is used in somatic hybridisation. It is:

- (a) An animal cell
- (b) A plant cell with cell wall
- (c) A plant cell without cell wall
- (d) Other name of protoplasm

**Q37.** Given below are some statements which should be followed to avoid sexually transmitted infections. Which of the following are correct?

- (A) Avoid sex with unknown partners/ multiple partners.
- (B) Always use medicated IUDs during coitus.
- (C) In case of doubt always consult a qualified doctor and get complete treatment if diagnosed infection.
- (D) Adopt natural methods of contraception during coitus.
- (E) Use of oral pills before coitus.

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

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

**Q38.** Hardy - Weinberg principle states that:

- (a) Allele frequencies in a population are stable and is constant from generation to generation
- (b) Allele frequencies in a population are unstable and is constant from generation to generation.

(c) Allele frequencies in a population are stable and is not-constant from generation to generation.

(d) Allele frequencies in a population are unstable and is not-constant from generation to generation.

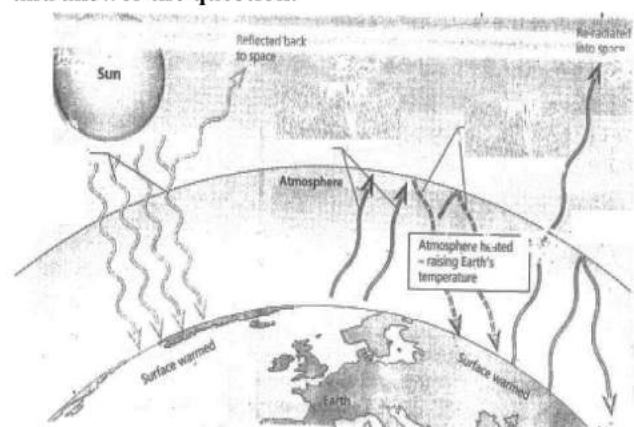
**Q39.** Which of the following equation correctly describes 'Net primary productivity'?

- (a) Net primary productivity = Gross primary productivity + Respiratory loss
- (b) Net primary productivity = Gross primary productivity - Respiratory loss
- (c) Net primary productivity = Respiratory loss - Gross primary productivity
- (d) Net primary productivity = Gross primary productivity - S.Secondary productivity

**Q40.** Which of the following is not a natural method of birth control?

- (a) Periodic abstinence
- (b) Coitus interruptus
- (c) IUDs
- (d) Lactational amenorrhea

Direction for the question 41 to 45: **Observe the diagram and answer the question:**



**Q41.** The shown diagram/ figure represents:

- (a) Biomagnification
- (b) Greenhouse effect
- (c) Ozone depletion
- (d) Climate change

**Q42.** Infrared radiations from Sun:

- (a) cannot enter troposphere
- (b) can enter troposphere
- (c) got captured in stratosphere
- (d) compete with UV rays to enter atmosphere

**Q43.** Reflected infrared radiations from earth surface are not absorbed by:

- (a) Clouds
- (b) Dust
- (c) Oxygen
- (d) Green house gases



- Q44.** Green house gases cause:
- (a) Global warming
  - (b) Depletion of Oxygen
  - (c) Formation of clouds
  - (d) Water logging and soil salinity

- Q45.** Which of the following is **NOT** a green house gas?
- (a) CO<sub>2</sub>
  - (b) Methane
  - (c) Nitrous Oxide
  - (d) Nitrogen

Direction for the question 46 to 50: **Read the passage and answer the question:**

There are thousands of varieties of rice in India alone. The diversity of rice in India is one of the richest in the world. Basmati rice is distinct for its unique aroma and flavour and 27 documented varieties of Basmati are grown in India. There is reference to Basmati in ancient texts, folklore and poetry, as it has been grown for centuries. Several attempts have also been made to patent uses, products and processes based on Indian traditional herbal medicine, e.g. turmeric, neem. There has been growing realisation of the injustice, inadequate compensation and benefit sharing between developed and developing countries. The Indian Parliament has recently cleared a Bill that takes such issues into consideration, including patent terms emergency provisions and research and development initiative.

- Q46.** One of the classical example of biopatent controversy is of -
- (a) Basmati rice
  - (b) Rose
  - (c) Potato
  - (d) Wheat
- Q47.** When a multinational company uses bio-resource of a country without proper authorisation and compensation then it is called as:

- (a) Resource sharing
- (b) Resource hacking
- (c) Biopiracy
- (d) Biopatenting

- Q48.** How many varieties of rice India has?
- (a) 2,00,000
  - (b) 27
  - (c) 1997
  - (d) 20,000

- Q49.** Identify the statements explaining biopiracy
- (A) Unauthorised exploitation of bio-resources of a country
  - (B) Adequate compensation is given to one country from where bioresource is taken
  - (C) Exploitation of traditional knowledge to develop modern applications
  - (D) Equal benefit sharing between developed and developing nations

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

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

- Q50.** The bill cleared by Indian Parliament to check unauthorised exploitation of bioresources and traditional knowledge of bio-resources is
- (a) Bill of Patent Rights
  - (b) Indian Patents Bill
  - (c) Indian Biopiracy Bill
  - (d) Bill of Traditional Knowledge of Bio-resources

## SOLUTIONS

- S1. Ans. (c)**  
**Sol.** After entering one of the synergids, the pollen tube releases the two male gametes into the cytoplasm of the synergid. One of the male gametes moves towards the egg cell and fuses with its nucleus thus completing the syngamy. The other male gamete moves towards the two polar nuclei located in the central cell and fuses with them to produce a triploid primary endosperm nucleus. The central cell after triple fusion becomes the primary endosperm cell (PEC) and develops into the endosperm, the ploidy of which is  $3n$ .
- S2. Ans. (a)**  
**Sol.** Exponential growth is represented by:  $dN/dt = rN$
- S3. Ans. (d)**  
**Sol.** LNG 20 is a hormone releasing IUD.
- S4. Ans. (d)**  
**Sol.** The secretions of the acrosome help the sperm enter into the cytoplasm of the ovum through the zona pellucida and the plasma membrane. This induces the completion of the meiotic division of the secondary oocyte. The second meiotic division is also unequal and results in the formation of a second polar body and a haploid ovum (ootid). Soon the haploid nucleus of the sperms and that of the ovum fuse together to form a diploid zygote. The mitotic division starts as the zygote moves through the isthmus of the oviduct called cleavage towards the uterus and forms 2, 4, 8, 16 daughter cells called blastomeres. The embryo with 8 to 16 blastomeres is called a morula. The morula continues to divide and transforms into blastocyst. The blastocyst becomes embedded in the endometrium of the uterus. This is called implantation and it leads to pregnancy.
- S5. Ans. (c)**  
**Sol.** Jaya and Ratna are high yielding semi dwarf varieties of rice developed in India.
- S6. Ans. (c)**  
**Sol.** Hotspots are mainly in the tropics due to high species diversity.
- S7. Ans. (c)**  
**Sol.** Human skin colour is a good example of polygenic (multiple gene) inheritance.
- S8. Ans. (a)**  
**Sol.** Down's Syndrome is a genetic disorder and is caused due to the presence of an additional copy of the chromosome number 21 (trisomy of 21). This disorder was first described by Langdon Down (1866). The affected individual is short statured with small round head, furrowed tongue and partially open mouth.
- S9. Ans. (a)**
- S10. Ans. (d)**  
**Sol.** Haemophilia is sex linked recessive disease, which shows its transmission from unaffected carrier female to some of the male progeny.
- S10. Ans. (d)**  
**Sol.** The malignant tumors are a mass of proliferating cells called neoplastic or tumor cells. 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. 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 called metastasis is the most feared property of malignant tumors.
- S11. Ans. (d)**  
**Sol.** Techniques like radiography (use of X-rays), CT (computed tomography) and MRI (magnetic resonance imaging) are very useful to detect cancers of the internal organs.
- S12. Ans. (b)**  
**Sol.** Recognising the deleterious affects of ozone depletion, an international treaty, known as the Montreal Protocol, was signed at Montreal (Canada) in 1987 (effective in 1989) to control the emission of ozone depleting substances.
- S13. Ans. (d)**  
**Sol.** Genetic modification of organisms can have unpredictable results when such organisms are introduced into the ecosystem. Therefore, the Indian Government has set up organisations such as GEAC (Genetic Engineering Approval Committee), which will make decisions regarding the validity of GM research and safety of introducing GM-organisms for public services.
- S14. Ans. (d)**  
**Sol.** Ethylene bromide is not used to deliver gene of interest into the host cell.
- S15. Ans. (a)**  
**Sol.** According to Central Pollution Control Board (CPCB), particulate size 2.5 micrometers or less in diameter (PM 2.5) are responsible for causing the greatest harm to human health.
- S16. Ans. (b)**  
**Sol.** Hind II was the first restriction endonuclease, whose functioning depended on a specific DNA nucleotide sequence.
- S17. Ans. (c)**  
**Sol.** The Mediterranean orchid *Ophrys* employs 'sexual deceit' to get pollination done by a species of bee.
- S18. Ans. (a)**  
**Sol.** Homologous organs have similar origin with dissimilar functions.



**S19. Ans. (a)**

**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*.

**S20. Ans. (d)**

**Sol.** The menstrual flow results due to breakdown of endometrial lining of the uterus and its blood vessels which forms liquid that comes out through vagina. The secretion of gonadotropins (LH and FSH) increases gradually during the follicular phase, and stimulates follicular development as well as secretion of estrogens by the growing follicles. Both LH and FSH attain a peak level in the middle of cycle (about 14th day). Rapid secretion of LH leading to its maximum level during the mid-cycle called LH surge induces rupture of Graafian follicle and thereby the release of ovum (ovulation). Follicular phase is also called as proliferative phase and luteal phase is also called as secretory phase.

**S21. Ans. (c)**

**Sol.** A nitrogenous base is linked to the OH of 1' C pentose sugar through a N-glycosidic linkage to form a nucleoside, such as adenosine or deoxyadenosine, guanosine or deoxyguanosine, cytidine or deoxycytidine and uridine or deoxythymidine. When a phosphate group is linked to OH of 5' C of a nucleoside through phosphoester linkage, a corresponding nucleotide (or deoxynucleotide depending upon the type of sugar present) is formed. Two nucleotides are linked through 3'-5' phosphodiester linkage to form a dinucleotide. A polymer thus formed has at one end a free phosphate moiety at 5' -end of sugar, which is referred to as 5'-end of polynucleotide chain. Similarly, at the other end of the polymer the sugar has a free OH of 3' C group which is referred to as 3' -end of the polynucleotide chain. In RNA, every nucleotide residue has an additional -OH group present at 2' -position in the ribose. Also, in RNA the uracil is found at the place of thymine (5-methyl uracil, another chemical name for thymine).

**S22. Ans. (b)**

**Sol.** *Atropa belladonna* and *Datura* have hallucinogenic properties. The flower tops, leaves and the resin of cannabis plant are used in various combinations to produce marijuana, hashish, charas and ganja. Heroin, commonly called smack is chemically diacetylmorphine which is a white, odourless, bitter crystalline compound. This is obtained by acetylation of morphine, which is extracted from the latex of poppy plant *Papaver somniferum*.

**S23. Ans. (a)**

**Sol.** Restriction enzymes break phosphodiester bonds between the phosphate and the pentose sugar in sugar-phosphate backbone at the specific site.

**S24. Ans. (c)**

**Sol.** As a first step towards gene therapy, lymphocytes from the blood of the patient are grown in a culture outside the body. A functional ADA cDNA (using a retroviral vector) is then introduced into these lymphocytes, which are subsequently returned to the patient. However, as these cells are not immortal, the patient requires periodic infusion of such genetically engineered lymphocytes. However, if the gene isolate from marrow cells producing ADA is introduced into cells at early embryonic stages, it could be a permanent cure.

**S25. Ans. (a)**

**Sol.** Biopesticides are living organisms that are sprayed on crop plants to kill pests. The scientists have introduced *B. thuringiensis* toxin genes into plants. Such plants are resistant to attack by insect pests. E.g Bt cotton.

**S26. Ans. (c)**

**Sol.** About 15 mya, primates called Dryopithecus and Ramapithecus were existing. They were hairy and walked like gorillas and chimpanzees. Ramapithecus was more man-like while Dryopithecus was more ape-like. Australopithecines probably lived in East African grasslands. Evidence shows they hunted with stone weapons but essentially ate fruit. Some of the bones among the bones discovered were different. This creature was called the first human-like being the hominid and was called Homo habilis.

**S27. Ans. (c)**

**Sol.** In water hyacinth, the process of vegetative propagation occurs by offsets.

**S28. Ans. (c)**

**Sol.** *Aspergillus niger* (a fungus) is used in the commercial production of citric acid. *Penicillium* in production of antibiotic, Yeast (*Saccharomyces cerevisiae*) is used for commercial production of ethanol and biogas is a mixture of gases (containing predominantly methane) produced by the microbial activity and which may be used as fuel.

**S29. Ans. (d)**

**Sol.** Biofertilisers are organisms that enrich the nutrient quality of the soil. The main sources of biofertilisers are bacteria, fungi and cyanobacteria. They enrich the soil, they are better suited than chemical fertilizers, not harmful to the plants.

**S30. Ans. (b)**

**Sol.** The RNA polymerase I transcribes rRNAs (28S, 18S, and 5.8S), whereas the RNA polymerase III is responsible for transcription of tRNA, 5srRNA, and snRNAs (small nuclear RNAs). The RNA polymerase II transcribes precursor of mRNA, the heterogeneous nuclear RNA (hnRNA).

**S31. Ans. (c)**

**Sol.** India now has 14 biosphere reserves, 90 national parks and 448 wildlife sanctuaries that are in-situ methods of biodiversity conservation.

**S32. Ans. (b)**

**Sol.** Fungi are also known to form symbiotic associations with plants (mycorrhiza). Lichen is the symbiotic relationship between algae and fungi.

**S33. Ans. (b)**

**Sol.** zoospores are microscopic motile structures.

**S34. Ans. (d)**

**Sol.** Bone has the highest inorganic content among the four options so it takes longest time for decomposition.

**S35. Ans. (d)**

**Sol.** Hershey and Chase grew some viruses on a medium that contained radioactive phosphorus and some others on medium that contained radioactive sulfur. Radioactive phages were allowed to attach to *E. coli* bacteria. Then, as the infection proceeded, the viral coats were removed from the bacteria by agitating them in a blender. The virus particles were separated from the bacteria by spinning them in a centrifuge. Then observations were made.

**S36. Ans. (c)**

**Sol.** Scientists have even isolated single cells from plants and after digesting their cell walls have been able to isolate naked protoplasts (surrounded by plasma membranes). Isolated protoplasts from two different varieties of plants – each having a desirable character – can be fused to get hybrid protoplasts, which can be further grown to form a new plant. These hybrids are called somatic hybrids while the process is called somatic hybridisation.

**S37. Ans. (b)**

**Sol.** One could be free of STDs by following the simple principles given below: (i) Avoid sex with unknown partners/multiple partners. (ii) Always try to use condoms during coitus. (iii) In case of doubt, one should go to a qualified doctor for early detection and get complete treatment if diagnosed with infection.

**S38. Ans. (a)**

**Sol.** Hardy Weinberg principle says that allele frequencies in a population are stable and is constant from generation to generation. The gene pool (total genes and their alleles in a population) remains a constant. This is called genetic equilibrium. Sum total of all the allelic frequencies is 1.

**S39. Ans. (b)**

**Sol.** Gross primary productivity minus respiration losses ( $R$ ), is the net primary productivity (NPP).  
$$GPP - R = NPP$$

**S40. Ans. (c)**

**Sol.** Natural methods work on the principle of avoiding chances of ovum and sperms meeting. Periodic abstinence is one such method, other methods are

withdrawal or coitus interruptus and lactational amenorrhea.

**S41. Ans. (b)**

**Sol.** The greenhouse effect is a naturally occurring phenomenon that is responsible for heating of Earth's surface and atmosphere.

**S42. Ans. (a)**

**Sol.** About 36% of the sun's infrared does bounce back into space, about 64% is absorbed into dust in the atmosphere, clouds, gas, dirt, water, or plants. Some is absorbed into greenhouse gasses in the air.

**S43. Ans. (c)**

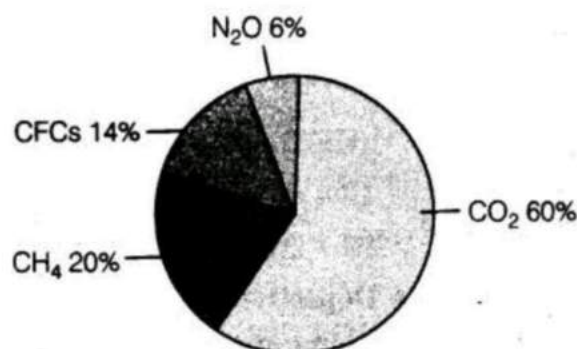
**Sol.** About 36% of the sun's infrared does bounce back into space, about 64% is absorbed into dust in the atmosphere, clouds, gas, dirt, water, or plants. Some is absorbed into greenhouse gasses in the air.

**S44. Ans. (a)**

**Sol.** Increase in the level of greenhouse gases has led to considerable heating of Earth leading to global warming.

**S45. Ans. (d)**

**Sol.** Major greenhouse gases are



**S46. Ans. (a)**

**Sol.** In 1997, an American company got patent rights on Basmati rice through the US Patent and Trademark Office. This allowed the company to sell a 'new' variety of Basmati, in the US and abroad. This 'new' variety of Basmati had actually been derived from Indian farmer's varieties. Indian Basmati was crossed with semi-dwarf varieties and claimed as an invention or a novelty.

**S47. Ans. (c)**

**Sol.** Biopiracy is the term used to refer to the use of bio-resources by multinational companies and other organisations without proper authorisation from the countries and people concerned without compensatory payment.



**S48. Ans. (a)**

**Sol.** There are an estimated 200,000 varieties of rice in India alone. The diversity of rice in India is one of the richest in the world.

**S49. Ans. (b)**

**Sol.** Most of the industrialised nations are rich financially but poor in biodiversity and traditional knowledge. In contrast the developing and the underdeveloped world is rich in biodiversity and traditional knowledge related to bio-resources. Traditional knowledge related to bio-resources can be exploited to develop modern applications and can also be used to save time, effort and expenditure during their commercialisation. There has been growing

realisation of the injustice, inadequate compensation and benefit sharing between developed and developing countries. Therefore, some nations are developing laws to prevent such unauthorised exploitation of their bio-resources and traditional knowledge.

**S50. Ans. (b)**

**Sol.** The Indian Parliament has recently cleared the second amendment of the Indian Patents Bill, that takes such issues into consideration, including patent terms emergency provisions and research and development initiative.