12STDF ZOOLOGY

COMPLET STUDY MATERILS

1. REPRODUCTION OF ORGANISMS

1. In which type of parthenogenesis are only males produced?

a) Arrhenotoky b) Thelytoky c) Amphitoky d) Both a and b

2. Animals directly giving birth to young ones

a) Oviparous b) Ovivivіparous **c) Viviparous** d) Both a and b

3. The mode of reproduction in bacteria is by

a) Formation of gametes b) Endospore formation **c) Conjugation** d) Zoospore formation

4. In which mode of reproduction variations are seen

a) Asexual b) Parthenogenesis **c) Sexual** d) Both a and b

5. Assertion and reasoning questions:

In each of the following questions there are two statements. One is assertion a) and other is reasoning (R). Mark the correct answer as

A. If both A and R are true and R is correct explanation for A

B. If both A and R are true but R is not the correct explanation for A

C. If A is true but R is false

D. If both A and R are false.

I. Assertion: In bee society, all the members are diploid except drones.

Reason: Drones are produced by **parthenogenesis**.

a) A b) B c) C d) D

II. Assertion: Offsprings produced by asexual reproduction are genetically identical to the parent.

Reason: Asexual reproduction involves only mitosis and no meiosis.

a) A b) B c) C d) D

III. Assertion: Viviparous animals give better protection to their offsprings.

Reason: They lay their eggs in the safe places of the environment.

a) A b) B c) C **d) D**

6. Name an organism where cell division is itself a mode of reproduction.

Amoeba, Vorticella - reproduce by cell division

7. Name the phenomenon where the female gamete directly develops into a new organism with an avian example.

Phenomenon - Parthenogenesis.

In some organisms **female gamete (ovum) is directly develop into a complete individual** by physical or chemical induction. e.g., Turkey, Chicken, pigeon

8. What is parthenogenesis? Give two examples from animals

The process of development of an **egg into a complete individual without fertilization** is known as parthenogenesis.

Eg. Annelid and sea urchin eggs.

9. Which type of reproduction is effective -Asexual or sexual and why?

- Sexual reproduction is an effective method of reproduction than asexual method because **Sexual reproduction contributes to the evolution** of the species by adding variation in a population.
- Variation occurs **because of the fusion of male and female gametes** (sexual reproduction) carrying different sets of chromosomes.

10. The unicellular organisms which reproduce by binary fission are considered immortal. Justify.

Most unicellular **organisms reproduce by cell division.**

The **whole parent body act as reproductive unit** and disappears after new daughter cells are formed.

Whole parent body converted into daughter cell thus, there is no death for unicellular organisms hence they are called immortal.

11. Why is the offspring formed by asexual reproduction referred as a clone?

In Asexual reproduction **single individual can able to producing offspring**.

These offspring are **genetically and morphologically similar** to one another and also similar to their parent.

Clone is the term given to organisms that are similar in all aspects.

Thus the offspring produced by **asexual reproduction** are called clones.

12. Why are the offsprings of oviparous animal at a greater risk as compared to offsprings of viviparous organisms?

Oviparous animals laid the fertilized eggs in the **open environment without any protection.**

So the development of the zygote takes place outside the body of mother, whereas in viviparous animals, development of the zygote takes place inside the body mother.

Thus offsprings of **oviparous survial rate is very less** as compared to offspring of viviparous animals.

13. Give reasons for the following:

a. Some organisms like honey bees are called **parthenogenetic animals**

Reason :

Male Honey bee (Drones) is develop from unfertilized egg so they are called as **parthenogenetic animals.**

b. A male honey bee has **16 chromosomes** where as its female has **32 chromosomes**.

Reason :

1. A male honey bee – **Develop from unfertilized eggs**
2. Female honey bee - **Develop from fertilized eggs**

14. Differentiate between the following:

a. Binary fission in amoeba and multiple fission in Plasmodium

S. no.	Binary fission in amoeba	Multiple fission in plasmodium
1.	Produce **two daughter cell**	Produce **many daughter cell** by multiple division
2	Binary fission occur in **irregular shaped organisms**	Multiple fission occur in **regular shaped organisms**
3	**Nucleus and cytoplasm divide once**	**Nucleus and cytoplasm divide multiple time** to produce many offspring.

b. Budding in yeast and budding in Hydra

S. No.	Budding in yeast	**budding in** Hydra
1.	Bud in Yeast is **unicellular**	Bud in Hydra is a **multicellular**
2.	Bud originates from a	Bud arises due to the

	small protuberance on the parent body	**repeated mitotic division**
3.	Yeast gets its daughter nuclei and it **may or may not separate from the parent body**	In Hydra the daughter buds are multi-cellular and there is **no development of daughter buds.**

Regeneration in lizard and Planaria

S. No.	Regeneration in lizard	Regeneration in Planaria
1.	Type of generation : **Epimorphosis**	Type of generation : **Morphallaxis**
2.	In this type **replacement of lost body** parts occur.	In this type **Whole body grows** from a small fragment

15. How is juvenile phase different from reproductive phase?

S. No.	Juvenile phase	Reproductive phase
1.	It is a Time period between **birth to just before reproductive phase**	It is an actual **Reproductive phase**
2.	This phase also known as **primary growth phase or vegetative phase**	This phase is known as **secondary growth phase or sexual maturity**

16. What is the difference between syngamy and fertilization?

S. No.	Syngamy	Fertilization
1.	It is the process of **fusion of dissimilar gametes** (male and female gamets)	It is the process of **fusion of dissimilar gametes** (male and female gamets)
2.	Syngamy term is used to denote fusion of gamete occur mostly in **invertebrate or lower grade**	Fertilization term is used to denote fusion of gamete occur in **higher invertebrate and all**

organisms **vertebrates**

2. HUMAN REPRODUCTION

1. The mature sperms are stored in the

a. Seminiferous tubules b. Vas deferens **c. Epididymis** d. Seminal vesicle

2. The male sex hormone testosterone is secreted from

a. Sertoli cells **b. Leydig cell** c. Epididymis d. Prostate gland

3. The glandular accessory organ which produces the largest proportion of semen is

a. Seminal vesicle b. Bulbourethral gland c. Prostate gland d. Mucous gland

4. The male homologue of the female clitoris is

a. Scrotum **b. Penis** c. Urethra d.Testis

5. The site of embryo implantation is the

a. Uterus b. Peritoneal cavity c. Vagina d. Fallopian tube

6. The foetal membrane that forms the basis of the umbilical cord is

a. Allantois b. Amnion c. Chorion d. Yolk sac

7. The most important hormone in intiating and maintaining lactation after birth is

a. Oestrogen b. FSH **c. Prolactin** d. Oxytocin

8. Mammalian egg is

a. Mesolecithal and non cleidoic b. Microlecithal and non cleidoic **c. lecithal and non cleidoic** d. Alecithal and cleidoic

9. The process which the sperm undergoes before penetrating the ovum is

a. Spermiation b. Cortical reactio c. Spermiogenesis **d. Capacitation**

10. The milk secreted by the mammary glands soon after child birth is called

a. Mucous **b. Colostrum** c. Lactose d. Sucrose

11. Colostrum is rich in

a. Ig E **b. Ig A** c. Ig D d. Ig M

12. The Androgen Binding Protein (ABP) is produced by

a. Leydig cells b. Hypothalamus **c. Sertoli cells** d. Pituitary gland

13. Which one of the following menstrual irregularities is correctly matched?

a. Menorrhagia - excessive menstruation **b. Amenorrhoea - absence of menstruation**

c. Dysmenorrhoea - irregularity of menstruation d. Oligomenorrhoea - painful menstruation

14. Find the wrongly matched pair

a. Bleeding phase	fall in oestrogen and progesterone
b. Follicular phase	rise in oestrogen
c. Luteal phase	rise in FSH level
d. Ovulatory phase	LH surge

These questions consists of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four response.

A. If both Assertion & Reason are True & the Reason is a correct explanation of the Assertion

B. If both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.

C. If Assertion is True but the Reason is False.

D. If both Assertion & Reason are false.

15. Assertion: In human male, testes are extra abdominal and lie in scrotal sacs.

Reason: Scrotum acts as thermoregulator and keeps temperature lower by 2˚C for normal sperm production.

a. A b. B c. C d. D

16. Assertion: Ovulation is the release of ovum from the Graffian follicle.

Reason: It occurs during the follicular phase of the menstrual cycle.

a. A b. B c. C d. D **Ans: c**

17. Assertion: Head of the sperm consists of acrosome and mitochondria.

Reason: Acrosome contains spiral rows of mitochondria.

a. A b. B c. C d. D **Ans: d**

18. Mention the differences between spermiogenesis and spermatogenesis.

Spermatogenesis	Spermiogenesis
It is the process of f**ormation of haploid s s p e rma t o z o a** from germinal cells.	It is the process of **differentiation of spermatozoon** from a spermatid.
. It involves conversion of a **diploid structure into haploid structures**	It changes a **haploid structure into another haploid structure.**
i. There is **growth and divisions** during spermatogenesis.	There is **re-construction during spermiogenesis**. Divisions and growth are absent.
٧. No **organelle is lost**	**Golgi bodies are lost during spermiogenesis**.
. A spermatogonium forms four spermatozoa.	Here a spermatid forms a single spermatozoon

19. At what stage of development are the gametes formed in new born male and female?

Production and maturation of gametes will take place after puberty (Secondary sexual maturity)

20. Expand the acronyms

a. FSH - **Follicle Stimulating Hormone**

b. LH - **Lutenizing Hormone**

c. HCG – **Human Chorionic Gonadotropin**

d. HPL - **Human Placental Lactogen**

21. How is polyspermy avoided in humans?

Once fertilisation is happened **cortical granules from the cytoplasm of the ovum form a barrier** called the **fertilisation membrane** around the ovum.

This preventing **further penetration of other sperms.**

Thus **polyspermy** is prevented

22. What is colostrum? Write its significance.

Colostrum, **a nutrient rich fluid produced by the human female immediately after giving birth**, is loaded with immune, growth and tissue repair factors.

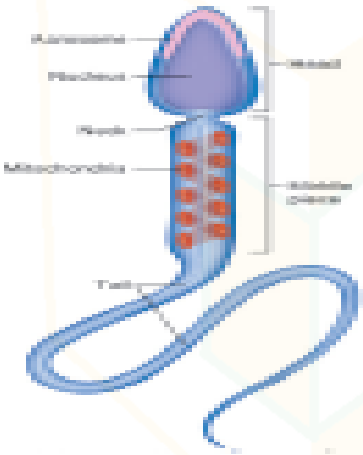
It acts as a **natural antimicrobial agent** to actively **stimulate the maturation of the infant's immune system**.

23. Placenta is an endocrine tissue. Justify.

During pregnancy, the **placenta acts as a temporary endocrine gland** and produces

1. **Human Chorionic Gonadotropin (hCG),**
2. **Human Chorionic Somatomammotropin (hCS) or human Placental Lactogen (hPL),**
3. **Oestrogens and progesterone**

24. Draw a labeled sketch of a spermatozoan



25. What is inhibin? State its functions.

Sertoli cells - elongated and pyramidal

It provide nourishment to the sperms.

They also secrete **inhibin**, a hormone (role - negative feedback control of sperm production)

26. Mention the importance of the position of the testes in humAns:

Testes present inside **scrotal sac of skin that hangs outside** the abdominal cavity.

Scrotum is placed outside the abdominal cavity to provide a temperature 2-3**o**C lower than the normal internal body temperature to produce viable sperm.

Thus, the scrotum acts as a **thermoregulator** for spermatogenesis.

27. What is the composition of semen?

It is a **milky white fluid** which contains **sperms and the seminal plasma** (secreted by **accessory glands**).

The **seminal fluid** - acts as a **transport medium, provides nutrients, contains some chemicals**

Role of chemical - **protect and activate the sperms** and also help in motility.

28. Name the hormones produced from the placenta during pregnancy.

Relaxin hormone is secreted during **pregnancy**

It helps in **relaxation of the pelvic ligaments** at the time of parturition.

hCG, hPL, Oestrogen, Progesterone and relaxin are produced only during pregnancy.

29. Define gametogenesis.

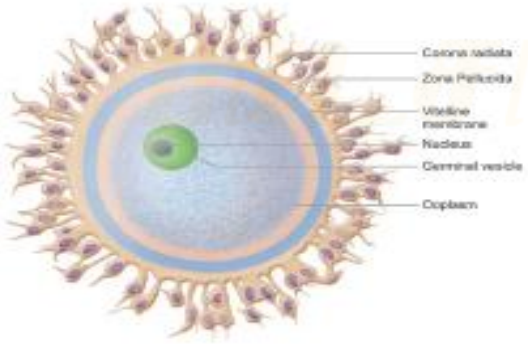
Gametogenesis is the process of **formation of gametes**

i.e., **sperms and ovum** from testes and ovary respectively

Meiosis plays the most significant role in the process of gametogenesis.

30. Describe the structure of the human ovum with a neat labelled diagram.

Structure of ovum



- Human ovum is **non-cleidoic (without shell), alecithal (no yolk)** and **microscopic** in nature.

- Its cytoplasm called **ooplasm** contains a large nucleus called the **germinal vesicle**.
- The ovum is surrounded 1. Inner thin transparent **vitelline membrane**,
- 2. Middle thick **zona pellucida**
- Outer thick coat of follicular cells called **corona radiata**.
- Between the vitelline membrane and zona pellucida there is a **narrow perivitelline space**.

31. Give a schematic representation of spermatogenesis and oogenesis in humAns:

32. Explain the various phases of the menstrual cycle. Menstrual cycle comprises of the following phases

1. **Menstrual phase**
2. **Follicular or proliferative phase**
3. **Ovulatory phase**
4. **Luteal or secretory phase**

Menstrual phase

- It is a **initial phase**
- Duration : **3-5 days -** menstrual flow occurs
- Menstrual flow is due to the **breakdown of endometrial lining of the uterus**, and **its blood vessels.**
- This is due to **decline in the level of progesterone and oestrogen.**
- Menstruation occurs only if the released **ovum is not fertilized**.
- Absence of menstruation may be an **indicator of pregnancy.**
- Menstruation also be due to **stress, hormonal disorder and anaemia.**

2. **Follicular or proliferative phase**

- **Duration :** 5th day till the time of ovulation.
- **Primary follicle in the ovary grows** to become a fully mature Graafian follicle and simultaneously, the **endometrium regenerates through proliferation**.
- These changes **due to FSH and LH hormones** increase gradually.
- It stimulates **follicular development and secretion of oestrogen** by the follicle cells.

3. **Ovulatory phase**

- Both **LH and FSH attain peak level** in the middle of the cycle (about the 14th day).

- **Maximum secretion of LH** during the mid cycle called **LH surge** induces the **rupture of the Graafian follicle** and the **release of the ovum** (secondary oocyte) from the ovary wall into the peritoneal cavity.
- This process is called as **ovulation**.

4. Luteal or secretory phase

- During luteal phase, the remaining part of the **Graafian follicle is transformed into a transitory endocrine gland** called **corpus luteum.**
- The **corpus luteum secretes large amount of progesterone** which is essential for the maintenance of the endometrium.

33. Explain the role of oxytocin and relaxin in parturition and lactation.

Relaxin

- It **promotes parturition** by relaxing the pelvic joints and by dilatation of the cervix with continued powerful contractions.
- **Oxytocin**
- It causes the "**Let-Down" reflex**-the **actual ejection of milk** from the alveoli of the mammary glands.
- During lactation, oxytocin also **stimulates the recently emptied uterus to contract**, helping it to return normal size.

34. Identify the given image and label its parts marked as a, b, c and d

The following is the illustration of the sequence of ovarian events (a-i) in a human female.

a) **Identify the figure that illustrates ovulation and mention the stage of oogenesis it represents.**

Ans : It represents the ovulatory stage of oogenesis – Ovulation

b) **Name the ovarian hormone and the pituitary hormone that have caused the above-mentioned events.**

Ovarian hormone - Progesterone

Pituitary hormone - Follicle stimulating hormone(FSH) and luteinizing hormone (LH)

c) **Explain the changes that occurs in the**

uterus simultaneously in anticipation.

The endometrium of the **uterus gets thickened and blood supply to the endometrium increases**.

It is essential for **implantation of the fertilized ovum** and other events of pregnancy

d) Write the difference between C and H.

d) Write the difference between C and H.

S. No.	C	H
1.	Secondary follicle	Corpus luteum
2.	It is Surrounded by layers of granulosa cells	Layers of granulosa cells absent
3.	Presence of theca layer	No theca layer is present

3. REPRODUCTIVE HEALTH

1. Which of the following is correct regarding HIV, hepatitis B, gonorrhoea and trichomoniasis?

a) Gonorrhoea is a STD whereas others are not.

b) Trichomoniasis is a viral disease whereas others are bacterial.

c) HIV is a pathogen whereas others are diseases.

d) Hepatitis B is eradicated completely whereas others are not.

2. Which one of the following groups includes sexually transmitted diseases caused by bacteria only?

a) Syphilis, gonorrhoea and candidiasis **b) Syphilis, chlamydiasis and gonorrhoea**

c) Syphilis, gonorrhoea and trichomoniasis d) Syphilis, trichomoniasis and pediculosis

3. Identify the correct statements from the following

a) Chlamydiasis is a viral disease.

b) Gonorrhea is caused by a spirochete bacterium, Treponema palladium.

c) The incubation period for syphilis is 2 to 14 days in males and 7 to 21 days in females.

d) Both syphilis and gonorrhoea are easily cured with antibiotics.

4. A contraceptive pill prevents ovulation by

a) blocking fallopian tube **b) inhibiting release of FSH and LH**

c) stimulating release of FSH and LH d) causing immediate degeneration of released ovum

5. The approach which does not give the defined action of contraceptive is

a.	Hormonal contraceptive	Prevents entry of sperms, prevent ovulation and fertilization
b.	Vasectomy	Prevents spermatogenesis
c.	Barrier method	Prevents fertilization
d.	Intra uterine device	Increases phagocytosis of sperms, suppresses sperm motility and fertilizing capacity of sperms

6. Read the given statements and select the correct option.

Statement 1: Diaphragms, cervical caps and vaults are made of rubber and are inserted into the female reproductive tract to cover the cervix before coitus.

Statement 2: They are chemical barriers of conception and are reusable.

a) Both statements 1 and 2 are correct and statement 2 is the correct explanation of statement 1.

b) Both statements 1 and 2 are correct but statement 2 is not the correct explanation of statement 1.

c) Statement 1 is correct but statement 2 is incorrect.

d) Both statements 1 and 2 are incorrect.

7. Match column I with column II and select the correct option from the codes given below.

Column I	**Column II**
.. Copper releasing IUD	LNG-20
. Hormone releasing	) Lippes loop IUD
. Non medicated IUD	i) Saheli
). Mini pills	') Multiload-375

a) A-(iv), B-(ii), C-(i), D-(iii) b) A-(iv), B-(i), C-(iii), D-(ii)

c) A-(i), B-(iv), C-(ii), D-(iii) **d) A-(iv), B-(i), C-(ii), D-(iii)**

8. Select the incorrect action of hormonal contraceptive pills from the following

a) Inhibition of spermatogenesis.

b) Inhibition of ovulation.

c) Changes in cervical mucus impairing its ability to allow passage and transport of sperms.

d) Alteration in uterine endometrium is to make it unsuitable for implantation.

9. What is amniocentesis? Why a statutory ban is imposed on this technique?

- **Amniocentesis** is a **prenatal technique used to detect any chromosomal abnormalities** and metabolic disorders of the foetus.
- It is being **often misused to determine the sex** of the foetus.
- Once the sex of the foetus is known, there may be a **chance of female foeticide.**
- Hence, a **legal ban on amniocentesis** is compulsory.

10. Select the correct term from the bracket and complete the given branching tree

(Barriers, Lactational amenorrhoea, CuT, Tubectomy)

A. **Barriers**

B. **Lactationalamenorrhoea**

C. **Tubectomy**

D. **CuT**

11. Correct the following statements

a) Transfer of an ovum collected from donor into the fallopian tube is called ZIFT.

b) Transferring of an embryo with more than 8 blastomeres into uterus is called GIFT.

c) Multiload 375 is a hormone releasing IUD.

Answer :

a) Transfer of an ovum collected from donor into the fallopian tube is called **GIFT**

b) Transferring of an embryo with more than 8 blastomeres into uterus is called **IUT.**

c) Multiload 375 is a **Copper releasing** IUD.

12. Which method do you suggest the couple to have a baby, if the male partner fails to inseminate the female or due to very low sperm count in the ejaculate?

- Intra-Uterine Insemination (**IUI**)
- In Vitro Fertilization, (**IVF**)
- Embryo Transfer (**ET**)

- Zygote Intra-Fallopian Transfer (**ZIFT**)
- Gamete Intra Fallopian Transfer (**GIFT**)
- Intra-Cytoplasmic Sperm Injection (**ICSI**)
- **Pre implantation** Genetic Diagnosis,
- Oocyte and sperm donation and surrogacy.

13. Expand the following

- ZIFT - **Zygote Intra-Fallopian Transfer**
- ICSI - **Intra-Cytoplasmic Sperm Injection (ICSI)**

14. What are the strategies to be implemented in India to attain total reproductive health?

- **Child immunization,**
- **Supply of nutritional food to the pregnant women,**
- **Janani Suraksha Yojana,**
- **Janani Shishu Suraksha Karyakaram,**
- **RMNCH+Aapproach** (an integrated approach for reproductive, maternal, new born, child and adolescent health),
- **Pradhan Mantri Surakshit Matritva Abhiyan**

15. Differentiate foeticide and infanticide.

S. No.	Foeticide	infanticide
1.	It is an abortion, especially **killing of a foetus**	It is the **killing of an infant**
2.	Abortion is the **legal and humane way of killing a foetus**	Infanticide is the **unlawful and inhumane murder of a foetus**

16. Describe the major STDs and their symptoms.

Disease	Symptom
Gonorrhoea	**Symptoms : Pain and pus discharge** and burning **sensation during urination**.
Genital herpes	**Symptoms :** Pain during urination, bleeding between periods. Swelling in the groin nodes.

Genital warts	**Tumour** on the external genitalia, cervix and perianal region.
Hepatitis-B	**Fatigue, jaundice, fever, rash and stomach pain.** **Liver cirrhosis and liver failure** occur in the later stage.
AIDS	**Enlarged lymph nodes, prolonged fever, prolonged diarrhoea, weight reduction, night sweating.**
Candidiasis	**Symptom :** Vaginal itching or soreness, abnormal vaginal discharge and pain during urination.
Trichomoniasis	**Symptoms:** Vaginitis, greenish yellow vaginal discharge, itching and burning sensation, urethritis, epididymitis and prostatitis

17. How are STDs transmitted?

- STDs are transmitted **during sexual contact with an infected partner**.
- **Eg. Person with Hepatitis-B** and **HIV.**
- They are also transferred by sharing **needles, surgical instruments,** with infected people, or blood transfusion or from infected mother to baby.
- **15 to 24 years people** are prone to these infections.

18. Write the preventive measures of STDs.

Preventive measure include :

- **Avoid sex with unknown partner**/ multiple partners
- **Use condoms**
- In case of doubt, **consult a doctor for diagnosis** and get complete treatment.

19. The procedure of GIFT involves the transfer of female gametes into the fallopain tube, can gametes be transferred to the uterus to achieve the same result? Explain.

- Transfer of gametes to the uterus **will not give the same result.**
- **This Process includes** (insemination to implantation)
- After ovulation, **ovum enters the fallopian tube**.
- **Sperm needs to reach** the ampulla and fertilise the egg.

• Uterus is the **place of implantation**, Fertilisation will not take place **inside the uterus.**

• Hence, transfer of female gamete directly into the uterus **will not give the same result .**

20. Amnicentesis, the foetal sex determination test, is banned in our country, Is it necessary? comment.

• Yes Is it necessary. Because Amniocentesis is misused to **find out thesex of the foetus leading to female foeticides**, itis necessary.

• **Amniocentesis** is a **prenatal technique used to detect any chromosomal abnormalities** and metabolic disorders of the foetus.

• Hence, a **legal ban on amniocentesis** is necessary.

21. Open Book Assessment

• Healthy reproduction, legally checked birth control measures and proper family planning programmes are essential for the survival of mankind' Justify.

4. PRINCIPLES OF INHERITANCE AND VARIATION

1. Haemophilia is more common in males because it is a

a) Recessive character carried by Y-chromosome

b) Dominant character carried by Y-chromosome

c) Dominant trait carried by X-chromosome

d) Recessive trait carried by X-chromosome

2. ABO blood group in man is controlled by

a) Multiple alleles b) Lethal genes c) Sex linked genes d) Y-linked genes

3. Three children of a family have blood groups A, AB and B. What could be the genotypes of their parents?

a) I**A** I**B** and ii **b) IA Io and IBIo** c) I**B**I**B** and I**A**I**A** d) I**A** I**A** and ii

4. Which of the following is not correct?

a) Three or more alleles of a trait in the population are called multiple alleles.

b) A normal gene undergoes mutations to form many alleles

c) Multiple alleles map at different loci of a chromosome

d) A diploid organism has only two alleles out of many in the population

5. Which of the following phenotypes in the progeny are possible from the parental combination AxB?

a) A and B only b) A,B and AB only c) AB only d) A,B,AB and O

6. Which of the following phenotypes is not possible in the progeny of the parental genotypic combination IAIO X IAIB?

a) AB **b) O** c) A d) B

7. Which of the following is true about Rh factor in the offspring of a parental combination Dd X Dd (both Rh positive)?

a) All will be Rh-positive b) Half will be Rh positive c) About ¾ will be Rh negative **d) About one fourth will be Rh negative**

8. What can be the blood group of offspring when both parents have AB blood group?

a) AB only **b) A, B and AB** c) A, B, AB and O d) A and B only

9. If the child's blood group is 'O' and fathers blood group is 'A' and mother's blood group is 'B' the

genotype of the parents will be

a) I**A** I**A** and I**B** I**o** **b) IA Io and IB Io**c) I**A** I**o** and I**oIo** d) I**oIo** and I**B** I**B**

10. XO type of sex determination and XY type of sex determination are examples of

a) Male heterogamety b) Female heterogamety c) Male homogamety d) Both b) and c)

11. In an accident there is great loss of blood and there is no time to analyse the blood group

which blood can be safely transferred?

a) 'O' and Rh negative b) 'O' and Rh positive c) 'B' and Rh negative d) 'AB' and Rh positive

12. Father of a child is colourblind and mother is carrier for colourblindness, the probability of the child being colourblind is

a) 25% **b) 50%** c) 100% d) 75%

13. A marriage between a colourblind man and a normal woman produces a. All carrier daughters and normal sons b. 50% carrier daughters, 50% normal daughters c. 50% colourblind sons, 50% normal sons d. All carrier offsprings

14. Mangolism is a genetic disorder which is caused by the presence of an extra chromosome number

a) 20 **b) 21** c) 4 d) 23

15. Klinefelters' syndrome is characterized by a karyotype of

a) XYY b) XO c) XXX **d) XXY**

16. Females with Turners' syndrome have

a) Small uterus b) Rudimentary ovaries c) Underdeveloped breasts **d) All of these**

17. Pataus' syndrome is also referred to as

a) 13 -Trisomy b) 18-Trisormy c) 21-Trisormy d) None of these

18. Who is the founder of Modern Eugenics movement?

a) Mendel b) Darwin **c) Fransis Galton** d) Karl pearson

19. Improvement of human race by encouraging the healthy persons to marry early and produce large number of children is called

a) Positive eugenics b) Negative eugenics c) Positive euthenics d) Positive euphenics

20. The _____deals with the control of several inherited human diseases especially inborn errors of metabolism

a) Euphenics b) Eugenics c) Euthenics d) All of these

21. "Universal Donor" and "Universal Recipients" blood group are _____ and_____ respectively

a) AB, O **b) O, AB** c) A, B d) B, A

22. ZW-ZZ system of sex determination occurs in

a) Fishes b) Reptiles c) Birds **d) All of these**

23. Co-dominant blood group is

a) A **b) AB** c) B d) O

24. Which of the following is incorrect regarding ZW-ZZ type of sex determination?

a. It occurs in birds and some reptiles

b. Females are homogametic and males are heterogametic

c. Male produce two types of gametes d. It occurs in gypsy moth

25. What is haplodiploidy?

• **It is a sex determination mechanism which** is common in **hymenopteran insects**

E.g : honeybees, ants and wasps

• In this, sex of the offspring is determined by the **number of sets of chromosomes it receives.**

26. Distinguish between heterogametic and homogametic sex determination systems.

S. No.	Heterogametic sex determination	Homogametic sex determination
1	In this type **two types of gametes are** produced	In this type **only one types of gamete is** produced
2	Sex chromosomes are **dissimilar**	Sex chromosomes are **similar**
3	These organisms are called as **Heteromorphic individuals**	These organisms are called as **Homomorphic individuals**

27. What is Lyonisation?

• It is an condition Where there are **two or more haploid sets of X- Linked genes** in each cell all but one of the genes are inactivated apparently at random and **have no phenotypic expression.**

• Lyonization is usual but it is **not common in all loci**

• Lyonization occurs in men with the **Klinefelter (XXY) karyotype**

28. What is criss-cross inheritance?

This type of inheritance of recessive sex linked character from **father to daughter and then from the daughter to her sons** is known as **criss-cross inheritance or sex linked or X-linked inheritance**.

29. Why are sex linked recessive characters more common in the male human beings?

• Sex linked inherited traits are **more common in males** than females

• This is because, males are hemizygous (has **only one X gene**)

30. What are holandric genes?

- **Y- linked or holandric genes –** The genes present in the region of Y chromosome
- The Y linked genes have **no corresponding allele in X chromosome.**
- Y linked genes inherit along with Y chromosome and **phenotypically express only in the male.**

31. Mention the symptoms of Phenylketonuria.

- **Symptoms of phenylketonuria include** severe **mental retardation, light pigmentation** of skin and hair.
- Phenylpyruvic acid is **excreted in the urine**.

32. Mention the symptoms of Downs syndrome.

- Severe mental retardation,
- Defective development of the central nervous system,
- Increased separation between the eyes,
- Flattened nose,
- Ears are malformed,
- Mouth is constantly open and the tongue protrudes

33. Differentiate Intersexes from Supersexes

The presence of both **male and female reproductive characteristics** in one individual is common both, but **Supersex** is a natural condition while **intersex is a disorder.**

Supersex individuals are **able to reproduce** while **intersex individuals are usually not.**

Supersexes are **found among animals and plants**, but intersex individuals are **found among humans.**

34. Explain the genetic basis of ABO blood grouping man.

- Blood group is determined by -**three autosomal alleles located on chromosome 9**.
- The **gene controlling** blood type are **'L'** (L-Landsteiner) or **I** (I - isoagglutination).
- I gene occurs in three allelic forms, **IA, IB and IO**.

IA denotes A antigen.

IB denotes B antigen

IO denotes no antigen.

• **IA and IB are dominant** to I**O**, but **co-dominant to each other** (I**A**=I**B**).

• Dominance hierarchy is - (**IA=IB> IO**).

• A child receives one of **three alleles from each parent**, and result in **six possible genotypes** and **four possible blood groups** (phenotypes).

• The genotypes : **IA IA, IA IO - A group**

IBIB, IB IO - B group

IA IB - AB Group

IOIO - O Group

35. How is sex determined in human beings?

• **Sex chromosomes determine the sex** of the individual.

• Autosomes - **chromosomes other than the sex chromosomes**

• Sex chromosomes may be **similar** (homomorphic) and **dissimilar** (heteromorphic).

• **Homomorphic individuals** - produce **only one type of gametes** (homogametic)

Heteromorphic individuals - produce **two types of gametes** (heterogametic).

• **Females are homogametic** with XX chromosome,

• **Males are heterogametic** with X and Y chromosome.

• **Females produce only one kind of egg**, each with one X chromosome,

• **Males produce two kinds of sperms** (1.with X chromosome and 2. with Y chromosome.

• Gender - **depends on the type of fertilizing sperm**.

36. Explain male heterogamety.

• In this **Males are heterogametic** producing dissimilar gametes.

• **Females are homogametic** producing similar gametes.

• It is of two kinds **XX-XO type and XX-XY** type.

XX-XO Type

This type is seen in **bugs, cockroaches and gras shoppers**.

• **Female - two X chromosomes** - XX (homogametic)

• **Males - only one X chromosome -** XO (heterogametic)

- **Unpaired X chromosomes determines the male sex**.
- The males produce **two types of sperms**, 1.one half **with X chromosome** 2. other half without X chromosome.
- The **sex of the offspring depends upon the sperm** that fertilizes the egg.

XX-XY type (Lygaeus Type)

This type seen in **human beings and in Drosophila**.

Females are homogametic with XX chromosome,

Males are heterogametic with X and Y chromosome.

Females produce only one kind of egg, each with one X chromosome,

Males produce two kinds of sperms (1.with X chromosome and 2. with Y chromosome.

Gender - **depends on the type of fertilizing sperm**

37. Brief about female heterogamety.

Heterogametic Females

- In this type seen in **insects, fishes, reptiles and birds**
- **Male produce a similar gametes**
- Female produce **dissimilar gametes.**
- **Female sex** - 'X' chromosome or one 'X' and one 'Y' chromosome.
- Thus **females are heterogametic** and **produce two types of eggs.**
- In this **'Z' and 'W'** are used here instead of **X and Y respectively**.
- Heterogametic females are of two types, **ZO-ZZ type and ZW-ZZ type**.

ZO-ZZ Type

This type is seen in **moths, butterflies and domestic chickens**.

This type seen in **human beings and in Drosophila**.

- **Females are homogametic** with XX chromosome,
- **Males are heterogametic** with X and Y chromosome.
- **Females produce only one kind of egg**, each with one X chromosome,
- **Males produce two kinds of sperms** (1. with X chromosome and 2. with Y chromosome.)
- Gender - **depends on the type of fertilizing sperm**.

41. What are the applications of Karyotyping?

- It helps in **gender identification.**
- It is **used to detect the chromosomal aberrations** like deletion, duplication, translocation, nondisjunction of chromosomes.
- It helps to **identify chromosomal abnormalities** like aneuploidy.
- It is also used to **predict the evolutionary relationships** between species.
- It is used to **Genetic diseases** can be detected.

42. Explain the inheritance of sex linked characters in human being.

- The inheritance of X or Y linked genes is called **sex-linked inheritance.**
- **Genes present on region of X or Y** chromosomes are called **sex linked genes**.
- **X linked genes** - The genes present in the l region of "X" chromosome.
- The X–linked genes have **no corresponding alleles in the Y chromosome**.
- **Y- linked or holandric genes –** The genes present in the region of Y chromosome
- The Y linked genes have **no corresponding allele in X chromosome.**
- Y linked genes inherit along with Y chromosome and **phenotypically express only in the male.**
- Sex linked inherited traits are **more common in males** than females
- This is because, males are hemizygous (has **only one X gene**)
- **X - linked and Y - linked genes** (non homologus region) **do not undergo pairing or crossing over** during meiosis.

43. What is extra chromosomal inheritance? Explain with an example.

- Transmission of characters dependent on some factor which is not connected with the chromosomes
- It is also known as **cytoplasmic inheritance**
- **Example:** Cytoplasmic inheritance of **chloroplasts and mitichondria**.

44. Comment on the methods of Eugenics

Classical eugenics

- Advocacy for sexual abstinence
- **Sex education** in schools.
- Promoting the **use of contraception.**
- Research for **better contraceptives.**
- **Voluntary sterilization.**

• **Abortion.**

Negative eugenics

• **Incentives** for sterilization.

• **Incentives for women** on welfare to use contraceptions.

• **Compulsory sterilization** of the "mentally retarded" and criminals.

Positive eugenics.

• **Financial incentives** to have children.

• **Taxation of the childless**.

• Eugenic immigration

New eugenics

• **Artificial insemination** by donor.

• **Egg donation.**

• Pre implantation and prenatal diagnosis of genetic disorders and pregnancy terminations of defective fetuses.

• **Embryo selection.**

• **Genetic engineering.**

• **Gene therapy**

• **Cloning**

5. MOLECULAR GENETICS

1. Hershey and Chase experiment with bacteriophage showed that

a) Protein gets into the bacterial cells **b) DNA is the genetic material**

c) DNA contains radioactive sulphur d) Viruses undergo transformation

2. DNA and RNA are similar with respect to

a) Thymine as a nitrogen base b) A single-stranded helix shape

c) Nucleotide containing sugars, nitrogen bases and phosphates

d) The same sequence of nucleotides for the amino acid phenyl alanine

3. mRNA molecule is produced by

a) Replication **b) Transcription** c) Duplication d) Translation

4. The total number of nitrogenous bases in human genome is estimated to be about

a) 3.5 million b) 35000 c) 35 million **d) 3.1 billion**

5. E. coli cell grown on 15N medium are transferred to 14N medium and allowed to grow for two generations. DNA extracted from these cells is ultracentrifuged in a cesium chloride density gradient. What density distribution of DNA would you expect in this experiment?

a) One high and one low density band.

b) One intermediate density band.

c) One high and one intermediate density band.

d) One low and one intermediate density band.

6. What is the basis for the difference in the synthesis of the leading and lagging strand of DNA molecules?

a) Origin of replication occurs only at the 5' end of the molecules.

b) DNA ligase works only in the 3' → 5' direction.

c) **DNA polymerase can join new nucleotides only to the 3' end of the growing stand.**

d) Helicases and single-strand binding proteins that work at the 5' end.

7. Which of the following is the correct sequence of event with reference to the central dogma?

a) Transcription, Translation, Replication b) Transcription, Replication, Translation

c) Duplication, Translation, Transcription **d) Replication, Transcription, Translation**

8. Which of the following statements about DNA replication is not correct?

a) Unwinding of DNA molecule occurs as hydrogen bonds break.

b) Replication occurs as each base is paired with another exactly like it.

c) Process is known as semi conservative replication because one old strand is conserved in the new molecule.

d) Complementary base pairs are held together with hydrogen bonds.

9. Which of the following statements is not true about DNA replication in eukaryotes?

a) Replication begins at a single origin of replication.

b) Replication is bidirectional from the origins.

c) Replication occurs at about 1 million base pairs per minute.

d) There are numerous different bacterial chromosomes, with replication ocurring in each at the same time.

10. The first codon to be deciphered was _____ which codes for _____.

a) AAA, proline b) GGG, alanine **c) UUU, Phenylalanine** d) TTT, arginine

11. Meselson and Stahl's experiment proved

a) Transduction b) Transformation c) DNA is the genetic material

d) Semi-conservative nature of DNA replication

12. Ribosomes are composed of two subunits; the smaller subunit of a ribosome has a binding site for _____ and the larger subunit has two binding sites for two _____.

Ans: mRNA, tRNA

13. An operon is a:

a) Protein that suppresses gene expression b) Protein that accelerates gene expression

c) Cluster of structural genes with related function d) Gene that switched other genes on or off

14. When lactose is present in the culture medium:

a) Transcription of lac y, lac z, lac a genes occurs. b) Repressor is unable to bind to the operator.

c) Repressor is able to bind to the operator. d) Both (a) and (b) are correct.

15. Give reasons: Genetic code is 'universal'.

The **genetic code is universal.**

It means that in all living organism genetic code (triplet codon) direct the **synthesis of same kind of protein from amino acids**.

Eg. In mRNA (UUU) **codon codes for phenylalanine** in all cells of all organisms.

16. Name the parts marked 'A' and 'B' in the given transcription unit: A B 3' 3' Ans :

A – Promoter

B – Coding strand

17. Mention any two ways in which single nucleotide polymorphism (SNPs) identified in human genome can bring revolutionary change in biological and medical science.

- A single-nucleotide **polymorphism is a variation in a single nucleotide that occurs at a specific position in the genome**, where each variation is present to some appreciable degree within a population
- E.g. the C nucleotide may appear in most individuals, but in a **minority of individuals, the position is occupied by an A**.
- This means that there is a **SNP at this specific position, and the two possible nucleotide variations – C or A** – are said to be alleles for this position

18. Differentiate - Leading stand and lagging strand

Leading Strand	Lagging Strand
1. This strand **grows continuously** without any gap	1. Its **growth is discontinuous** This strand formed in short segments called **Okazaki fragments**.
2. It **does not require DNA ligase** for its growth.	2. **DNA-ligase is required** for joining Okazaki fragments.
3. The direction of growth of the **leading strand is 5′ □□3′**	3. The direction of growth of the **lagging strand is 3′ □□5′**
4. Only a **single RNA primer is required.**	4. M**ore number of RNA primer is required**
5. It is a **rapid process.**	5. it's a **slower process**.

19. Differentiate - Template strand and coding strand.

Template strand	Coding strand
l. Template strand is directed in the **5' to 3' direction**	1. Coding strand is directed in the **3' to 5' direction**
2. **Transcribed into mRNA**	2. **Not transcribed** into mRNA
3. **Contains the complementary nucleotide sequence** as the mRNA	3. **Contains the same nucleotide sequence** to mRNA, except thymine
4. Contains **anticondons**	4. Contains **codons**
. Contains the **same nucleotide sequence as the tRNA**	5. Contains the **complementary nucleotide sequence as the tRNA**
5. **Hydrogen bonds are formed** between the template strand and the synthesizing mRNA.	6. **No hydrogen bonds are formed** between the coding strand and synthesizing mRNA

20. State any three goals of the human genome project.

- **Identify all the genes** (approximately 30000) in human DNA.
- **Determine the sequence of the three billion chemical base pairs** that makeup the human DNA.
- To **store this information in data bases.**
- **Improve tools for data analysis.**
- **Transfer related technologies** to other sectors, such as industries.
- **Address the ethical, legal and social issues** (ELSI) that may arise from the project.

21. In E.coli, three enzymes β- galactosidase, permease and transacetylase are produced in the presence of lactose. Explain why the enzymes are not synthesized in the absence of lactose.

- If lactose is absent or lacking, the **transcription of lac mRNA stops.**
- The metabolism of lactose in E.coli requires three enzymes – **permease, β-galactosidase (β-gal) and transacetylase.**
- The enzyme **permease is needed for entry of lactose into the cell**,
- **β-galactosidase brings about hydrolysis of lactose** to glucose and galactose,
- **Transacetylase transfers acetyl group from acetyl Co A to β-galactosidase.**
- If **lactose is available as an energy source** for the bacteria then lactose enters the cell as a result of permease enzyme.
- **Lactose acts as an inducer** and interacts with the repressor to inactivate it.
- This **allows RNA polymerase to bind to the promotor site** and transcribe the operon to produce lac mRNA which enables formation of all the required enzymes needed for lactose metabolism.

22. Distinguish between structural gene, regulatory gene and operator gene.

S. No.	Structural Genes	Regulator Gene	Operator Gene
1.	This gene is connected with **transcription or formation of mRNA for synthesis**	It controls the **functioning of operator gene.**	It determines the **functioning of structural genes.**
2.	It functions only when receives complementary nucleotides and	Regulator gene **produces a repressor or Apo repressor for**	Operator gene functions **only when it is not blocked by repressor.**

	RNA polymerase.	**blocking** operator gene	
3.	**Moderat e l y long gene**	**Large gene.**	**Smaller gene**
4.	It functions through the **f o rma t i o n of mRNA for s t r u c t u r a l** or enzymatic polypeptide	It **functions through the formation of an mRNA of repressor**	It f**unction through the presence or absence of repressor.**

23. A low level of expression of lac operon occurs at all the windows for treatment of various genetic disorders. Justify the statement.

- A very **low level of expression of lac operon has to be present** in the cell all the time, otherwise **lactose cannot enter the cells**

24. Why the human genome project is called a mega project?

- Human genome project was considered to be a mega project because it **had a specific goal to sequence every base pair** present in the human genome.
- It took around **13 years for its completion** and got accomplished in year 2003.
- It was a **large scale project, which aimed at developing new technology** and generating new information in the field of genomic studies.

25. From their examination of the structure of DNA, What did Watson and Crick infer about the probable mechanism of DNA replication, coding capability and mutation?

- **Watson and Crick** explain the Semi – conservative mode of DNA replication DNA Replication takes place during **S phase**
- During replication, each **DNA molecule gives rise to two DNA strands,** identical to each other and parent

Hypotheses of DNA replication.

1. Conservative replication,

2. Dispersive replication,

3. Semi –conservativereplication.

Semi- conservative replication.

- It was **proposed by Watson and Crick in** 1953.
- This mechanism is **based on the DNA model**.

- Initially **two polynucleotide strands of DNA molecule unwind** and start separating at one end.
- During this process, **covalent hydrogen bonds are broken.**
- The separated **single strand then acts as template** for the synthesis of a new strand.
- Later, **each daughter double helix carries one polynucleotide strand from the parent and other strand is newly synthesised.**
- Any error in replication leads to Mutation

26. Why tRNA is called an adapter molecule?

- The transfer RNA, (tRNA) molecule of acell **acts as a vehicle that picks up the amino acids scattered** through the cytoplasm and also **reads specific codes of mRNA molecules.**
- Hence tRNA is called an **adapter molecule.**
- This term was **postulated by Francis Crick**.

27. What are the three structural differences between RNA and DNA?

Comparison	DNA	RNA
Full Name	Deoxyribonucleic Acid	Ribonucleic Acid
Structure	DNA consists of **two strands, arranged in a double helix.** These strands are **made up of subunits called nucleotides.** Each nucleotide contains a **phosphate, a 5-carbon sugar molecule and a nitrogenous base**.	**RNA only has one strand,** but like DNA, is made up of nucleotides. **RNA strands are shorter than DNA** strands. RNA sometimes forms a **secondary double helix structure,** but only intermittently.
Length	DNA is a much **longer than RNA.**	RNA molecules are **shorter than long DNA polymers.**
Sugar	The sugar in DNA is **deoxyribose**	RNA contains **ribose sugar molecules**
Bases	The bases in DNA are **Adenine ('A'), Thymine ('T'), Guanine ('G') and Cytosine ('C').**	RNA shares **Adenine ('A'), Guanine ('G') and Cytosine ('C')** with DNA, but contains **Uracil ('U')** rather than Thymine.
Base Pairs	**Adenine and Thymine pair (A-T)**	**Adenine and Uracil pair (A-U)**

Cytosine and Guanine pair (C-G) **Cytosine and Guanine pair (C-G)**

28. Name the anticodon required to recognize the following codons:

AAU, CGA,UAU,GCA.

Ans :

Codon - Anti Codon

AAU - UUA

CGA - GCU

UAU - AUA GCA - CGU

29. a) Identify the figure given below

b) Redraw the structure as a replicating fork and label the parts

c) Write the source of energy for this replication and name the enzyme involved in this process.

d) Mention the differences in the synthesis of protein, based on the polarity of the two template strands.

Ans : a

a) Given structure represents **replicating fork**. the two parental strands of DNA unwind at the start of replication.

b) **Mechanism of replication showing a repl ication fork**

c) Deoxy nucleotidetriphosphate - provide energy for replication

- d) **DNA-polymerase can polymerise nucleotides only in 5'→3' direction** on 3'→ 5' strand because it adds them at the 3′ end.
- Since the **two strands of DNA run in antiparallel directions,** the two templates provide different ends for replication.
- Replication over the two templates thus **proceeds in opposite directions.**
- One strand with polarity **3′→5′forms its complementary strand** continuously because 3' end of the latter is always open for elongation.
- It is called **leading strand.**
- Replication is **discontinuous on the other template with polarity 5′→3′** because only a short segment of DNA strand can be built in **5′→3′direction** due to exposure of a small stretch of template at one time

30. If the coding sequence in a transcription unit is written as follows:

'5' TGCATGCATGCATGCATGCATGCATGC 3' Write down the sequence of mRNA.

Ans : mRNA - '5'ACGUACGUACGUACGUACGUACGUACG 3'

31. How is the two stage process of protein synthesis advantageous?

- In eukaryote, Transcription take place in **membrane bound nucleus**
- **Translation – take place in cytoplasm** (outside of nucleus
- This two stage of protein synthesis **enable eukaryotes to regulate gene expression** in much more complicated way, and also contributing to the **richness of eukaryotic form and functions.**

32. Why did Hershey and Chase use radioactively labelled phosphorous and sulphur only? Would they have got the same result if they use radiolabelled carbon and nitrogen?

- Hershey and Chase experiment on T2 bacteriophage
- **Alfred Hershey and Martha Chase** (1952) conducted experiments on **bacteriophages**
- **T2 - bacteriophages** is a virus that **infects the bacterium Escherichia coli.**
- **Experiment** - phages are added to bacteria □□some material enters the bacterium□**bacterium lyses and release many progeny.**
- They wanted to **check which part entered the bacteria (DNA or protein)**
- All nucleic acids contain **phosphorus, and contain sulphur(also amino acid - cysteine and methionine).**
- Hershey and Chase designed an experiment
- Radioactive isotopes of **Sulphur (35S) and phosphorus (32P)** to keep separate pathway of the viral protein and nucleic acids during the infection process. Phages were allowed to **infect bacteria containing the radioactive isotopes 35S or 32P** in the medium.
- The bacteriophage that grew in the **presence of 35S** had labelled proteins
- Bacteriophages grown in the **presence of 32P had labelled** DNA.
- They **mixed the labelled phages** with unlabeled E. coli and allowed bacteriophages to infect
- Before lysis of bacteria the **bacterial cells were gently** agitated to loosen particles. **Findings :**
- 32P was found inbacterial cells
- 35S was found in medium
- Phage progeny carry only 32P and not 35S.
- **Results :**
- **DNA only entered the bacterial** cells and not protein coat

- Hence its proved that **DNA carries** the hereditary informationfrom virus to bacteria.

33. Explain the formation of a nucleosome.

- Ineukaryotes,**nucleus organization** is much **more complex.**
- Chromatin **consists of repeating units called nucleosomes.**
- **2 molecules of the four histone proteins H2A, H2B, H3 and H4** are organized to form a unit of eight molecules called **histone octamere**
- The **negatively charged DNA is wrapped around the positively charged histone octamere** to form a structure called **nucleosome.**
- Nucleosome contains **200 bp of DNA helix**.
- **DNA is coiled on the outside of nucleosome.**
- Adjacent **nucleosomes are connected by linker DNA(H1)** that is exposed to enzymes.
- TheDNA makes **two complete turns around the histone octameres** and the t**wo turns are sealed off by an H1 molecule.**
- Chromatin **without H1** has a **beads-on-a-string appearance** in which **DNA enters and leaves the nucleosomes** at random places.
- Further folding is due to interaction between H1 of one nucleosomes

34. It is established that RNA is the first genetic material. Justify giving reasons.

RNAworld

A cell contains **RNA which is ten times more than DNA.**

Because **RNA play a variety of roles** in the cell.

- **Fraenkel-Conratand Singer** (1957) first demonstrated that **RNA is the genetic material in TMV** (Tobacco Mosaic Virus)
- They **separated RNA from the protein** of TMV viruses.
- In 1980's (**Molecular biologists** - Leslie Orgel, Francis Brick and Carl Woese) proposed the **'RNA world' as the first stage in the evolution of life.**
- **RNA catalysed all molecules** necessary for survival and replication.
- The term **'RNA world' first used by Walter Gilbert** in 1986
- This hypothesizes reveals that **RNA as the first genetic material on earth.**
- RNA act as **both genetic material and catalyst.**
- The **catalytic RNA is known as ribozyme.**
- RNA being a **catalyst was reactive** and hence unstable.
- **This lead to evolution** with certain modifications.
- Hence DNA is a double stranded molecule, its **resisted changes**

- Some **RNA molecules function as gene regulators** when it binding with DNA
- In Some viruses **RNA act as genetic material**.
- Andrew Fire and Craig Mellow state that **RNA is an active ingredient** in the chemistry of life.

6. EVOLUTION

1. The first life on earth originated

a) in air b) on land **c) in water** d) on mountain

2. Who published the book "Origin of species by Natural Selection" in1859?

a) Charles Darwin b) Lamarck c) Weismann d) Hugo de Vries

3. Which of the following was the contribution of Hugo de Vries?

a) Theory of mutation b) Theory of natural Selection c) Theory of inheritance of acquired characters d) Germplasm theory

4. The wings of birds and butterflies is an example of

a) Adaptive radiation **b) convergent evolution** c)divergent evolution d) variation

5. The phenomenon of" Industrial Melanism" demonstrates

a) Natural selection b) induced mutation

c) reproductive isolation d) geographical isolation

6. Darwin's finches are an excellent example of

a) connecting links b) seasonal migration **c) adaptive radiation**

d) parasitism

7. Who proposed the Germplasm theory?

a) Darwin **b) August Weismann** c) Lamarck d) Alfred Wallace

8. The age of fossils can be determined by

a) electron microscope b) weighing the fossils **c) carbon dating** d) analysis of bones

9. Fossils are generally found in

a) igneous rocks **b) meta morphic rocks** c) volcanic rocks

d) sedimentary rocks

10. Evolutionary history of an organism is called

a) ancestry b) ontogeny **c) phylogeny** d) paleontology

11. The golden age of reptiles was

a) Mesozoic era b) Cenozoic era c) Paleozoic era d) Proterozoic era

12. Which period was called "Age of fishes"?

a)Permian b) Triassic **c) Devonian** d) Ordovician

13. Modern man belongs to which period?

a) Quaternary b) Cretaceous c) Silurian d) Cambrian

14. The Neanderthal man had the brain capacity of

a) 650–800cc b) 1200cc c) 900cc **d) 1400cc**

15. List out the major gases seems to be found in the primitive earth.

• Primitive earth contain **ammonia, methane, hydrogen and water vapour.**

• Due to split up water molecules by UV rays **hydrogen and oxygen also present.**

16. Explain the three major categories in which fossilization occur?

Fossilization occur in three ways they are

1. **Actual remains**
2. **Petrifaction**
3. **Natural moulds and casts**

i) Actual remains –

• This is the most **common method of fossilization.**

• Hard parts such as **bones, teeth or shells are preserved as such** in the earth's atmosphere.

• If Marine animals die their parts are **covered with sediments and are protected**.

• They **get preserved as such** as they are preserved in vast ocean, the **salinity in them prevents decay.**

• The sediments **become hardened** to form definite layers or strata.

• Eg. **Woolly Mammoth fossils** were preserved in the **frozen coast of Siberia**

• Several human beings and animals ancient city of Pompeii were **preserved intact by volcanic ash**

ii) Petrifaction

• When animals die the **original portion of their body may be replaced** by minerals and the **original substance being lost through disintegration.**

• This method of fossilization is called **petrifaction.**

• **Minerals involved -** iron pyrites, silica, calcium carbonate and bicarbonates of calcium and magnesium**.**

iii) Natural moulds and casts

• Even after **disintegration, the body of an animal might leave indelible impression** on the soft mud which later becomes hardened into stones.

• Such impressions are called **moulds.**

• The cavities of the moulds may get **filled up by hard minerals and get fossilized**, which are called casts.

17. Differentiate between divergent evolution and convergent evolution with one example foreach.

Divergent Evolution	**Convergent evolution**
Development of **different functional structures** from a common ancestral form.	Development of **similar adaptive functional structures** in unrelated groups of organisms.
. **Homologous organs** show divergent evolution.	. **Analogous organs** show convergent evolution.
Eg. **Darwin's finches, Australian Marsupials, locomotion in mammals.**	Eg. Australian Marsupials and placental mammals, various aquatic vertebrates and **wings of insect, bird and bat.**

18. How does Hardy-Weinberg's expression (p2+2pq+q2=1) explain that genetic equilibrium is maintained in a population? List any four factors that can disturb the genetic equilibrium.

• If a population is in a state of Hardy Weinberg equilibrium, **the frequencies of alleles and genotypes or sets of alleles in that population will remain same** over generations.

• Suppose we have a large population of beetles, and appear in two **colours dark grey** (black) and **light grey**, and their colour is determined by **'A' gene**.

• '**AA' and 'Aa'** beetles are dark grey

• '**aa' beetles** are light grey.

• In a population let's say that **'A' allele has frequency (p)** of 0.3 and **'a' allele has a frequency (q)** of 0.7.

• Then **p+q=1.**

• If a population is in **Hardy Weinberg equilibrium**, the genotype frequency can be estimated by Hardy Weinberg equation.

$(p + q)^2 = p^2 + 2pq + q^2$

p^2 = frequency of AA

2pq= frequency of Aa

q^2= frequency of aa

p = 0.3, q = 0.7 then,

$p^2 = (0.3)^2 = 0.09 = 9$ % AA

2pq = 2(0.3) (0.7) = 0.42 = 42 % Aa

$q^2 = (0.7)^2 = 0.49 = 49$ % aa

• Hence the beetle population appears to be in **Hardy- Weinberg equilibrium**.

• The major factors which **disturb Hardy- Weinberg equilibrium** are

1. **Gene migration or gene flow**
2. **Mutation**
3. **Genetic drift**
4. **Recombination**
5. **Natural selection**

19. Explain how mutations, natural selection and genetic drift affect Hardy Weinberg equilibrium.

- Allele frequencies in a population may change due to four fundamental forces of evolution such as **natural selection, genetic drift, mutation and gene flow.**
- If these events are not possible the **population will not be in Hardy – Weinberg equilibrium**

20. How did Darwin explain fitness of organisms?

- Fitness is the state of **being suitably adapted** to an environment.
- Darwin proved that **fittest organisms can survive and leave more progenies** than the unfit ones through natural selection.
- Because they **will survive more** and hence are selected by nature.

- 21. **Mention the main objections to Darwinism.**
- **objections against Darwinism are**
- Darwin failed to explain the **mechanism of variation.**
- Darwinism explains the survival of the fittest **but not the arrival of the fittest**.
- He focused on **small changing variations that are mostly non-heritable.**
- He did not **distinguish between somatic and germinal variations.**

5. He **could not explain the occurrence of**

vestigial organs, over specialization of some organs

Eg. large tusks in mammoths, oversized antlers in Irish deer, etc.,

22. Taking the example of Peppered moth, explain the action of natural selection. What do you call the above phenomenon?

- Phenomenon - **industrial melanism**
- **Peppered moth – Bistonbetularia** were available in two colours, **white and black.**
- Before industrialization **peppered moth both white and black** coloured were common in England.
- Pre-industrialization witnessed white coloured background of the wall of the buildings hence the **white coloured moths escaped from their predators.**
- Post industrialization, the **tree trunks became dark due to smoke and dust** let out from the industries.
- The **black moths masked on the dark bark** of the trees and the **white moths were easily identified by their predators.**
- Hence the **dark coloured moth population was selected** and their number increased when compared to the white moths.
- Nature offered **positive selection pressure to the black coloured moths.**
- The above proof shows that in a population, **organisms that can adapt will survive and produce more progenies** resulting in increase in population through natural selection.

23. Darwin's finches and Australian marsupials are suitable examples of adaptive radiation – Justify the statement.

- 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**

E.g., **Darwin's finches.**

• Common **ancestor of** Darwin's finches **arrived on the Galapagos** about 2 million years ago.

• Darwin's finches have evolved into **14 recognized species differing in body size, beak shape and feeding behavior.**

• Changes in the size and form of the beak have **enabled different species to utilize different food resources** such as insects, seeds, nectar from cactus flowers and blood from iguanas, all driven by Natural selection.

• Genetic variation in the **ALX1 gene in the DNA of Darwin finches is associated with variation** in the beak shape.

• **Mild mutation in the ALX1 gene leads to phenotypic change** in the shape of the beak of the Darwin finches.

Eg.,Australian marsupials :

• **A number of marsupials,** each different from the other **evolved from an ancestral stock**, but all within the Australian island continent.

24. Who disproved Lamarck's Theory of acquired characters? How?

- **August Weismann** disproved Lamarck's "Theory of Acquired characters"
- He conducted experiments on mice for **twenty generations by cutting their tails** and breeding them.
- All mice born were **with tail.**
- Weismann **proved that change in the somatoplasm will not be transferred** to the next generation but changes in the germplasm will be inherited.

25. How does Mutation theory of De Vries differ from Lamarck and Darwin's view in the origin of new species.

- According to de Vries, **sudden and large variations were responsible for the origin of new species** whereas Lamarck **and Darwin believed in gradual accumulation of all variations**
- According to Hugo de Vries, **mutations are sudden and heritable variations** which causes evolution, hence called it saltation (single step large mutations).
- While Darwin's theory of natural selection states that **speciation is due to accumulation of small, directional, and heritable variations,** and is a gradual process.

26. Explain stabilizing, directional and disruptive selection with examples.

There are mainly three types of natural selection

1. Stabilising Selection (centipetal selection):

- This type of selection operates in a **stable environment**.
- The organisms with average phenotypes survive whereas the **extreme individuals from both the ends are eliminated.**
- There is **no speciation but the phenotypic stability is maintained** within the population over generation.

  E.g., measurements of sparrows that survived the storm clustered around the mean, and the sparrows that failed to survive the storm clustered around the extremes of the variation

2. **Directional Selection:**

- The environment which undergoes **gradual change is subjected to directional selection**
- This type of selection **removes the individuals from one end towards the other end** of phenotypic distribution.

  E.g., **size differences between male and female sparrows**.
- Both male and female **look alike externally but differ in body weight**.
- Females show directional selection in relation to body weight.

3. Disruptive Selection (centrifugal selection) :

- When **homogenous environment changes into heterogenous environment** this type of selection is operational
- The organisms of both the extreme phenotypes are selected **whereas individuals with average phenotype are eliminated.**
- This is a rare form of selection but **leads to formation of two or more different species.**
- It is also called **adaptive radiation.**
- E.g., Darwin's finches-beak size in relation to seed size inhabiting Galapagos islands.

27. Rearrange the descent in human evolution

Austrolopithecus → Homo erectus → Homosapiens→Ramapithecus→Homo habilis.

Answer : **Ramapithecus → Homo habilis → Homo erectus → Homo sapiens**

28. Differentiate between the eating habit and brain size of Australopithecus and Ramapithecus.

Australopithecus	**Ramapithecus**

Eating pattern	It mainly ate **fruit, vege tables, small lizards, and tubers.**	It ate **hard nuts and seeds**
Brain size	**350 – 450 cc**	R e l a t i v e l y large brain

29. How does Neanderthal man differ from the modern man in appearance?

Neanderthal	Modern human
Neanderthals are an **extinct species of human.**	Humans refer to the **primate species** of to which modern humans belong
Named as **Homo Neanderthalensis**	Named as **Homo sapiens**
Evolved about **400,000 to 40,000 years ago in** Europe and Southwestern to central Asia	Evolved about **200,000** years ago in Africa
Skull comprised a large middle part of **the face, A huge nose and angled check bone**	Skull is **thin-walled, dome shape, with a flat,** and near vertical forehead
Brain was **larger in comparison to body**	Have special features in their skull to overcome the **large size of the brain**
Average height - **Males : 5 ft 5 Females was 5 ft 1**	Average height - **Males : 5 ft** 71/2 **Females was 5 ft** 2

30. Mention any three similarities found common in Neanderthal man and Homosapiens.

- Neanderthal man and Homo sapiens are **belongs to the genus –Homo**
- Both are **primates**
- Both Neanderthal man and Homo sapiens **have a similar size brain**

31. According to Darwin, the organic evolution is due to

a) Intra specific competition

b) Inter specific competition

c) Competition within closely related species

d) Reduced feeding efficiency in one species due to the presence of interfering species.

32. A population will not exist in Hardly- Weiberg equilibrium if

a) Individuals mate selectively

b) There are no mutations

c) There is no migration

d) The population is large

7. HUMAN HEALTH AND DISEASES

1. A 30 year old woman has bleedy diarrhoea for the past 14 hours, which one of the following organisms is likely to cause this illness?

a) Streptococcus pyogens b) Clostridium difficile **c)Shigella dysenteriae** d) Salmonella enteritidis

2. Exo-erythrocytic schizogony of Plasmodium takes place in -------

a) RBC b) Leucocytes c) Stomach **d) Liver**

3. The sporozoites of Plasmodium vivax are formed from ----------

a) Gametocytes b) Sporoblasts **c) Oocysts** d) Spores

4. Amphetamines are stimulants of the CNS, whereas barbiturates are ----

a) CNS stimulant b) both a and b c) hallucinogenic **d)CNS epressants**

5. Choose the correctly match pair.

a) Amphetamines - Stimulant b) LSD - Narcotic c) Heroin - Psychotropic

d) Benzodiazepine - Pain killer

6. The Athlete's foot disease in human is caused by _____

a) Bacteria **b) Fungi** c) Virus d) Protozoan

7. Cirrhosis of liver is caused by chronic intake of _____

a) Opium **b) Alcohol** c) Tobacco d) Cocaine

8. The sporozoite of the malarial parasite is present in _____

a) saliva of infected female Anopheles mosquito. b) RBC of human suffering from malaria. c) Spleen of infected humans. d) Gut of female Anopheles mosquito.

9. Where do the following events in the life cycle of Plasmodium takes place?

a) Fertilization - in Gut of mosquito b) Development of gametocytes - in body of mosquito

c) Release of sporozoites - from mouth parts of mosquito to blood stream

d) Schizogony - in human body

10. Paratope is an

a) Antibody binding site on variable regions b) Antibody binding site on heavy regions

c) Antigen binding site on variable regions d) Antigen binding site on heavy regions **Ans: c**

11. Allergy involves

a) IgE b) IgG c) lgA d) IgM

12. Spread of cancerous cells to distant sites is termed as

a) Metastasis b) Oncogenes c) Proto-oncogenes

d) Malignant neoplasm

13. AIDS virus has

a) Single stranded RNA **b) Double stranded RNA** c) Single stranded DNA d) Double stranded DNA

14. B cells that produce and release large amounts of antibody are called

a) Memory cells b) Basophils **c) Plasma cells** d) killer cells

15. Given below are some human organs. Identify one primary and one secondary lymphoid organ.

Explain its role. Liver, thymus, stomach, thyroid, tonsils

Thymus - is the primary lymphoid organ

Role : production and maturation of Lymphocytes

Tonsils - is the secondary lymphoid organ

Role : it encounter antigen in the presence of lymphocytes

16. Name and explain the type of barriers which involve macrophages.

Macrophages involve in **Phagocytic barrier**

It is a Specialized cells for phagocytosis, and digest whole microorganisms

17. What are interferons? Mention their role.

Interferons are **antiviral proteins**

They are the included in **chemical mediators of innate immunity**

Role : They **act against invading viral particles**

18. List out chemical alarm signals produced during inflammation.

Chemical alarm signals are **serotonin, histamine and prostaglandins**

19. Explain the process of replication of retrovirus after it gains entry into the human body.

- After HIV virus enter into the body of the person, the **virus enters into macrophages** where **RNA genome** of the virus replicates to form **viral DNA** with the help of the enzyme **reverse transcriptase**.
- This viral DNA gets incorporated into the DNA of host cells and directs the **infected cells to produce viral particles.**
- The macrophages **continue to produce virus** and in this way acts like a HIV factory.
- Simultaneously, **HIV enters into helper T-lymphocytes**, replicates and produces progeny viruses.

20. Explain the structure of immunoglobulin with suitable diagram.

- An antibody molecule is Y shaped structure that comprises of four polypeptide chains, **two identical light chains (L)** of molecular weight 25,000 Da and **two identical heavy chains (H)** of molecular weight 50,000 Da.
- The polypeptide chains are **linked together by di-sulphide** (S-S) bonds.
- One light chain is attached to each heavy chain and two heavy chains are attached to each other to form a **Y shaped structure**.
- Hence, an antibody is represented by H2 L2.
- The heavy chains have a **flexible hinge region** at their approximate middles.
- Each chain (**L** and **H**) has **two terminals**.
- **C - terminal (Carboxyl**
- **amino or N-terminal.**
- Each chain (**L** and **H**) has two regions.
- They have **variable (V) region** at one end and a much **larger constant c) region** at the other end.
- Antibodies responding to different antigens **have very different (V) regions but their c) regions are the same** in all antibodies.

21. What are the cells involved innate immune system?

Cells included in innate immunity are **- Lysozyme, Interferron, leucocytes, Monocytes, neutrophils, tissue macrophages**

22. What is vaccine? What are its types?

- A vaccine **is a biological preparation that provides active acquired immunity** to a particular disease and resembles a disease- from weakened or attenuated or killed forms of the microbes, their toxins, or one of its surface proteins.
- The vaccines are classified as **first, second and third generation vaccines.**
- **First generation vaccine** is further subdivided into **live attenuated vaccine, killed vaccine and toxoids**.
- **Live attenuated vaccines** use the **weakened (attenuated), aged, less virulent** form of the virus.
- **E.g :** MMR vaccine and the Varicella vaccine,
- **Killed (inactivated) vaccines** are killed or inactivated by heat and other methods.
- **E.g :** Salk's polio vaccine.
- **Toxoid vaccines** contain a **toxin or chemical** secreted by the bacteria or virus.
- **E.g :** DPT vaccine (Diphtheria, Pertussis and Tetanus).
- **Second generation vaccine** contains the **pure surface antigen of the pathogen**.
- **E.g :** Hepatitis-B vaccine.
- **Third generation vaccine** contains the **purest and the highest potency vaccines** which are synthetic in generation.
- The latest revolution in vaccine is **DNA vaccine** or **recombinant vaccine.**

23. A person is infected by HIV. How will you diagnose for AIDS?

- A simple blood test is available to diagnose HIV.
- **ELISA** test (Enzyme Linked Immuno Sorbent Assay) detects the presence of HIV antibodies.
- It is a preliminary test.
- **Western blot** test is **more reliable and a confirmatory test.**
- It detects the **viral core proteins.**

24. Autoimmunity is a misdirected immune response. Justify.

- Autoimmunity is due to an **abnormal immune response** in which the immune system **fails to properly distinguish** between self and non-self and attacks its own body.
- Our body produces antibodies **(auto antibodies)** and **cytotoxic T cells** that destroy our own tissues.
- If a disease-state results, it is referred to as **auto-immune disease.**
- Thus, autoimmunity is a **misdirected immune response.**

- **E.g : Hashimoto's thyroiditis, Graves' disease, Addison's disease, Rheumatoid arthritis and multiple sclerosis.**

25. List the causative agent, mode of transmission and symptoms for Diphtheria and Typhoid.

S. No	Diseases	Causative agent	Mode of transmission	Symptoms
1	Diphtheria	Corynebac-terium diph-theriae	Droplet Infection	Fever, sore throat, hoarseness and difficulty in breathing
2	Typhoid (Enteric fever)	Salmonella typhi	Through contaminated food and water	Headache, abdominal discomfort, fever and diarrhoea

26. A patient was hospitalized with fever and chills. Merozoites were observed in her blood. What is your diagnosis?

- Merozites in the blood indicate the presence of **Malaria parasite**
- Hence he/she is suffering from **Malaria fever**

27. i) Write the scientific name of the filarial worm that causes filariasis.

ii) Write the symptoms of filariasis.

iii) How is this disease transmitted?

i) **Filariasis** is caused by **Wuchereria bancrofti**, commonly called **filarial worm.**

ii) **Symptoms :**

- **Inflammation of the lymph node** due to accumulation of the worms block the lymphatic system In some cases, the obstruction of lymph vessels causes elephantiasis or filariasis of the **limbs**, **scrotum** and **mammary glands.**
- iii) It is transmitted by Female Culex mosquito

28. List the common withdrawal symptoms of drugs and alcohol abuse.

- **Short term effects** :
- **Euphoria, (Joy**
- **Pain,**
- **Dullness of senses,**
- **Alteration in behaviour,**
- **Blood pressure,**
- **Narcosis (deep sleep),**
- **Nausea and vomiting.**
- **Long-term effect :**
- The physical and mental disturbance
- Damage in **liver and brain.**
- **Fat accumulation and high levels of alcohol destroy the liver cells** and a scar tissue grows in the place of dead cells. This scarring of the liver is called **"Liver cirrhosis**".
- **Alcohol irritates the stomach** lining due to the production of excess acid leading to ulcers.
- weakens the **heart muscle, causing scar tissue to build up in the cardiac muscle fibers.**
- **High blood pressure, stroke, coronary artery disease and heart attack.**
- **Korsakoff syndrome,** a **chronic memory disorder** is most commonly caused by alcohol misuse.

29. Why do you think it is not possible to produce vaccine against 'common cold'?

- It is not possible to produce vaccine against 'common cold' because **more than 200 different types of viruses that can cause common cold.**

8. MICROBES IN HUMAN WELFARE

1. Which of the following microorganism is used for production of citric acid in industries?

a) Lactobacillus bulgaris b) Penicillium citrinum c) **Aspergillus niger** d) Rhizopus nigricans

2. Which of the following pair is correctly matched for the product produced by them?

a) Acetobacter aceti - Antibiotics b) Methanobacterium - Lactic acid

c) Penicilium notatum - Acetic acid **d) Saccharomyces cerevisiae - Ethanol**

3. The most common substrate used in distilleries for the production of ethanol is

a) Soyameal b) Groundgram **c) Molasses** d) Corn meal

4. Cry toxins obtained from Bacillus thuringiensis are effective against for

a) Mosquitoes b) Flies c) Nematodes **d) Bollworms**

5. Cyclosporin – A is an immunosuppressive drug produced from

a) Aspergillus niger b) Manascus purpureus c) Penicillium notatum **d) Trichoderma polysporum**

6. Which of the following bacteria is used extensively as a bio-pesticide?

a) Bacillus thurigiensis b) Bacillus subtilis c) Lactobacillus acidophilus d) Streptococcus lactis

7. Which of the following is not involved in nitrogen fixation?

a) Pseudomonas b) Azotobacter c) Anabaena d) Nostac

8. CO_2 is not released during

a) Alcoholic fermentation **b) Lactate fermentation** c) Aerobic respiration in animals d) Aerobic respiration in plants

9. The purpose of biological treatment of waste water is to

a) Reduce BOD b) Increase BOD c) Reduce sedimentation d)Increase sedimentation

10. The gases produced in anaerobic sludge digesters are

a) Methane, oxygen and hydrogen sulphide. b) Hydrogen sulphide, methane and sulphur dioxide. c) Hydrogen sulphide, nitrogen and methane.

d) Methane, hydrogen sulphide and CO2.

11. How is milk converted into curd? Explain the process of curd formation.

• A small amount of curd added to fresh milk as a **starter or inoculum** contains millions of Lactobacilli, which under suitable temperature (≤ 400C) multiply and **convert milk into curd.**

• Curd is more **nutritious than milk** as it contains a number of organic acids and vitamins.

12. Give any two bioactive molecules produced by microbes and state their uses.

Lipases – used in **detergent formulations** and **removal of oily stains**.

a) **Pectinase, protease** and **cellulase** - Used as a clarifier in Bottled juices

b) **Rennet** - used to **separate milk into solid curds** for cheese making.

13. What is biological oxygen demand?

• BOD refers to the **amount of the oxygen**

that would be consumed, if all the organic matter in one litre of water were oxidized by bacteria.

• The **greater the BOD** of the waste water indicate it is more polluted.

14. Explain the role of cry-genes in genetically modified crops.

• **Cry toxin** is a toxin produce by Bacillus thuringiensis and used as a biopesticide

• During sporulation **Bacillus thuringiensis produces crystal proteins** called **Delta-endotoxin** which is encoded by **cry genes**.

• Delta-endotoxins used against the insects of the orders **Lepidoptera**, **Diptera, Coleoptera** and **Hymenoptera**.

• When the insects ingest the toxin crystals these toxin inserted into the **gut cell membrance and paralyzes the digestive tract.**

• The insect then **stops eating and starves to death.**

15. Write the key features of organic farming.

• **Protecting soil quality** using organic materials and encouraging biological activity.

• Indirect **provision of crop nutrients** using soil microorganisms.

• **Nitrogen fixation in soils** using legumes.

• **Weed and pest control** based on methods like crop rotation, biological diversity, natural predators, organic manures and suitable chemical, thermal and biological interventions.

16. Justify the role of microbes as a bio-fertilizer.

• **Bacteria, fungi and cyanobacteria** used as a biofertilisers.

• Eg .**Rhizobium** is a symbiotic nitrogen fixing bacteria.

• This bacterium infects the root nodules of leguminous plants and **fixes atmospheric nitrogen into organic forms.**

• **Azospirillum and Azotobacter** are free living bacteria that fix atmospheric nitrogen and enrich the nitrogen content of soil.

• A symbiotic association between a fungus and the roots of the plants is called **mycorrhiza**.

The fungal symbiont in these associations **absorbs the phosphorus from soil and transfers to the plant.**

Uses :

- **Resistance to root- borne pathogens, tolerance to salinity, drought, enhances plant growth and developments**.
- **Cyanobacteria** (or) blue green algae (BGA) are also fix nitrogen.
- Eg. **Oscillatoria, Nostoc, Anabaena, Tolypothrix**
- In water logged paddy fields, **Cyanobacteria multiply and fix molecular nitrogen.**
- Cyanobacteria secrete growth promoting substances like **indole-3-acetic acid, indole-3- butyric acid, naphthalene acetic acid, amino acids, proteins, vitamins** which promotes plant growth and production.

17. Write short notes on the following.

a) **Brewer's Yeast :**

- c) **Saccharomyces cerevisiae** commonly called brewer's yeast is used for fermenting malted cereals and fruit juices to **produce various alcoholic beverages.**
- b) **Ideonella sakaiensis** :
- Ideonella sakaiensis is currently tried for **recycling of PET plastics**.
- These bacteria use **PETase and MHETase** enzymes to **breakdown PET plastic into terephthalic acid and ethylene glycol.**
- **c Microbial fuel cells**
- A microbial fuel cell is a bio-electrochemical system that **drives an electric current** by using bacteria
- Microbial fuel cells work by **allowing bacteria to oxidize and reduce organic molecules**.
- Microbes at the **anode oxidize the organic fuel** generating protons which pass through the membrane to the cathode and the **electrons pass through the anode to the external circuit** to generate current.

18. List the advantages of biogas plants in rural areas.

1. Biogas is **used for cooking and lighting**
2. The slurry is drained through another outlet and is **used as fertilizer.**
3. The technology of biogas production was developed by **Indian Agricultural Research Institute** (IARI) and **Khadi and Village Industries Commission** (KVIC) .

19. When does antibiotic resistance develop?

- Antibiotic resistance occurs when **bacteria develop the ability to defeat the drug**.
- It is one of the most **acute threat to public health.**
- When the **bacteria become resistant**, antibiotics cannot fight against them and the bacteria multiply.
- **Narrow spectrum antibiotics are preferred** over broad spectrum antibiotics.
- **Narrow spectrum antibiotics** are less **chance to cause antibiotic resistance.**

20. What is the key difference between primary and secondary sewage treatment?

S. No.	Primary sewage treatment	Secondary sewage treatment
1.	It is a **physical method of treatment**	It is a biological method of treatment
2.	It involves in **removal of large particles and floating materials**	It involves the **removal of fine suspended and dissolved organic matter.**
3.	It makes the used of **sedimentation and filtration process**	It makes the use of **aerobic or anaerobic biological units**
4.	It is relatively **simple and less time consuming process**	It is relatively **complex and takes a long time for its completion**

9. APPLICATIONS OF BIOTECHNOLOGY

1. The first clinical gene therapy was done for the treatment of

a) AIDS b) Cancer **c) Cystic fibrosis** d) SCID

2. Dolly, the sheep was obtained by a technique known as

a) Cloning by gene transfer b) Cloning without the help of gametes

c) Cloning by tissue culture of somatic cells **d) Cloning by nuclear transfer**.

3. The genetic defect adenosine deaminase deficiency may be cured permanently by

a) Enzyme replacement therapy

b) periodic infusion of genetically engineered lymphocytes having ADA cDNA

c) administering adenosine deaminase activators

d) introducing bone marrow cells producing ADA into embryo at an early stage of development.

4. How many amino acids are arranged in the two chains of Insulin?

a) Chain A has 12 and Chain B has 13

b) Chain A has 21 and Chain B has 30 amino acids

c) Chain A has 20 and chain B has 30 amino acids

d) Chain A has 12 and chain B has 20 amino acids.

5. PCR proceeds in three distinct steps governed by temperature, they are in order of

a) Denaturation, Annealing, Synthesis b) Synthesis, Annealing, Denaturation

c) Annealing, Synthesis, Denaturation d) Denaturation, Synthesis, Annealing

6. Which one of the following statements is true regarding DNA polymerase used in PCR?

a) It is used to ligate introduced DNA in recipient cells b) It serves as a selectable marker b) It is isolated from a Virus **d) It remains active at a high temperature.**

7. ELISA is mainly used for

a) Detection of mutations **b) Detection of pathogens**

c) Selecting animals having desired traits d) Selecting plants having desired traits

8. Transgenic animals are those which have

a) Foreign DNA in some of their cells **b) Foreign DNA in all their cells**

c) Foreign RNA in some of their cells d) Foreign RNA in all their cells

9. Recombinant Factor VIII is produced in the ------- cells of the Chinese Hamster

a) Liver cells b) blood cells **c) ovarian cells** d) brain cells.

10. Vaccines that use components of a pathogenic organism rather than the whole organism are called

a) Subunit recombinant vaccines b) attenuated recombinant vaccines

c) DNA vaccines d) conventional vaccines.

11. Mention the number of primers required in each cycle of PCR. Write the role of primers and DNA polymerase in PCR. Name the source organism of the DNA polymerase used in PCR.

- **Two sets of primers** are required in each cycle of PCR.
- **Primers - hybridise to target DNA region** and allow synthesis of the DNA towards one another
- **DNA polymerase - synthesise DNA region** between the primers

Source organism - Thermophilic bacterium - thermus aquaticus

12. How is the amplification of a gene sample of interest carried out using PCR?

- Taq DNA polymerase used in polymerase chain reaction (PCR).
- During the polymerisation step in PCR, **repeated amplification is achieved by the use of Taq DNA polymerase,** which remains active even at the high temperature induced denaturation of dsDNA.

13. What is genetically engineered Insulin?

- Artificial Production of insulin by recombinant DNA technology is known as **genetically engineered Insulin**
- This technique involved the **insertion of human insulin gene** on the plasmids of E.coli.
- This genetically engineered bacteria start producing insulin.

This kind of insulin is known as **humulin**

14. Explain how "Rosie" is different from a normal cow.

- Rosie is the **first transgenic cow** which contains human gene coding for protein **alpha-lactalbumin.** The gene is expressed in mammary tissues and the protein is secreted in milk.
- This milk is **nutritionally a more balanced product** for human babies than natural cow milk.
- This is **protein rich milk** (2.4 gm/litre)

15. How was Insulin obtained before the advent of rDNA technology? What were the problems encountered?

- In the early years, **insulin isolated and purified from the pancreas of pigs and cows** was used to treat diabetic patients.
- This animal insulin result in the **occurrence of allergic reactions in some diabetic patients.**

16. ELISA is a technique based on the principles of antigen-antibody reactions. Can this technique be used in the molecular diagnosis of a genetic disorder such as Phenylketonuria?

- ELISA is **highly sensitive and can detect antigens** in the range of a nanogram.
- It is a **highly sensitive and specific method** used for diagnosis.
- **This technique will not be used to diagnose Phenylketonuria**
- Genetic disorder like sickle cell anemia, β-thalassemia and phenylketonuria can be **detected by PCR** in these samples.

17. Gene therapy is an attempt to correct a Genetic defect by providing a normal gene into the individual. By this the function can be restored. An alternate method would be to provide gene product known as enzyme replacement therapy, which would also restore the function. Which in your opinion is a better option? Give reasons for your answer.

Gene therapy is the better option because

- Because Enzyme replacement therapy works on **artificially administering the required enzyme** into the patient's body.
- This helps in **management of the disease.**
- But this needs **frequent re-administration of enzyme** and other necessary drugs to continue the therapy.
- Enzyme replacement **therapy is more costly**
- Using **gene correction is a permanent solution**.
- E.g. a person with **ADA deficiency can be permanently cured** if the required gene is introduced during the embryo stage.

- This will **ensure a better quality of life** for the patient.

18. What are transgenic animals? Give examples.

- Transgenic animals are those **animals which contain** a **foreign gene in their genome**, introduced by recombinant DNA technology.
- Such gene is called **transgene**.

E.g. **Transgenic mice and transgenic rabbit** etc.

19. If a person thinks he is infected with HIV, due to unprotected sex, and goes for a blood test. Do you think a test such as ELISA will help? If so why? If not, why?

- ELISA is based on the principle of **antigen - antibody interaction**.
- **ELISA test can be used in diagnose of AIDS**
- HIV Infection by pathogen can be detected by the **presence of very small amount of proteins, glycoproteins,** or by detecting the **antibodies synthesised** against the pathogen

20. Explain how ADA deficiency can be corrected?

Bone marrow transplantation

- ADA deficiency could be cured by **bone marrow transplantation**, where defective immune cells could be replaced with healthy immune cells from a donor.
- **Enzyme replacement therapy**
- In some patients it can be **treated by enzyme replacement therapy**, in which **functional ADA is injected into the patient.**
- **Gene therapy**
- It also **treated by gene therapy, in which** lymphocytes from the blood of the patient are removed and grown in a nutrient culture medium.
- A **healthy and functional human gene**, ADA cDNA encoding this enzyme is introduced into the lymphocytes using a retrovirus.
- The genetically engineered lymphocytes are **subsequently returned to the patient.**
- The disease could be **cured permanently if the gene for ADA isolated from bone marrow cells** are introduced into the cells of the early embryonic stages.

21. What are DNA vaccines?

- DNA vaccine are the type of **vaccine which contain genetic material**
- If the immune response of the body is **stimulated by a DNA molecule which inserted into organisms.**

- The DNA vaccine **cannot cause the disease as it contains only copies** of a few of its genes.
- DNA vaccines are **relatively easy and inexpensive to design and produce**.

22. Differentiate between Somatic cell gene therapy and germline gene therapy.

SOMATIC CELL GENE THERAPY	GERM LINE GENE THERAPY
Therapeutic genes **transferred into the somatic cells**	Therapeutic genes **transferred into the germ cells**
Introduction of genes into **bone marrow cells, blood cells, skin cells etc.,**	Genes introduced **into eggs and sperms.**
Will not be inherited in later generations.	**Heritable and passed** on to later generations.

23. What are stem cells? Explain its role in the field of medicine.

- Stem cells are **undifferentiated cells** found in most of the multi cellular animals.
- These cells **maintain their undifferentiated state** even after undergoing numerous mitotic divisions.
- Stem cells have the **ability to regenerate damaged and diseased organs,** this is the important key feature of stem cell which is used in medicine.

Other feature of stem cell are :

- Stem cells are capable of **self renewal and exhibit 'cellular potency'**.
- Stem cells can **differentiate into all types of cells**

24. One of the applications of biotechnology is 'gene therapy" to treat a person born with a hereditary disease. What does "gene therapy" mean?

- **Gene therapy :**
- It is treatment process for a person is born with a hereditary disease
- Principle : **Replacement of healthy gene in place of defective / mutant alleles**
- This process involves the **transfer of a normal gene into a person's cells** that carries one or more mutant alleles.
- Expression of **normal gene in the person results in a functional gene product** whose action produces a normal phenotype.
- Delivery of the **normal gene is accomplished by using a vector**.
- Strategies involved in gene therapy - **Gene augmentation therapy and Gene inhibition therapy**

25. Name the hereditary disease for which the first clinical gene therapy was used. Mention the steps involved in gene therapy to treat this disease.

- The first clinical gene therapy was **given in 1990** by **French Anderson** to a four year old girl with **adenosine deaminase (ADA) deficiency.**
- **ADA deficiency or SCID** (Severe combined immunodeficiency) is an **autosomal recessive metabolic disorder.**
- It is caused by the deletion or dysfunction of the gene coding for ADA enzyme.
- In these patients the **non functioning T-Lymphocytes cannot elicit immune responses** against invading pathogens.
- The right approach for SCID treatment would be to **give the patient a functioning ADA** which breaks down toxic biological products.
- In some children ADA deficiency could be **cured by bone marrow transplantation**, where **defective immune cells could be replaced with healthy immune cells from a donor.**
- In some patients it can be **treated by enzyme replacement therapy**, in which **functional ADA is injected into the patient.**
- It also **treated by gene therapy, in which** lymphocytes from the blood of the patient are removed and grown in a nutrient culture medium.
- A **healthy and functional human gene**, ADA cDNA encoding this enzyme is introduced into the lymphocytes using a retrovirus.
- The genetically engineered lymphocytes are **subsequently returned to the patient.**
- Since these cells are **not immortal**, the **patient requires periodic infusion** of such genetically engineered lymphocytes.
- The disease could be **cured permanently if the gene for ADA isolated from bone marrow cells** are introduced into the cells of the early embryonic stages.

26. PCR is a useful tool for early diagnosis of an Infectious disease. Elaborate.

- The specificity and sensitivity of PCR is useful for the **diagnosis of inherited disorders** (genetic diseases), **viral diseases, bacterial diseases**, etc.
- The diagnosis and treatment of a particular disease often **requires identifying a particular pathogen.**
- Traditional methods of identification involve **culturing these organisms from clinical specimens** and performing metabolic and other tests to identify them.

- The concept behind PCR based diagnosis of infectious diseases is simple – **if the pathogen is present in a clinical specimen its DNA will be present.**
- Its **DNA has unique sequences** that can be detected by PCR, often using the clinical specimen (for example, blood, stool, spinal fluid, or sputum) in the PCR mixture.
- PCR is also employed in the **prenatal diagnosis of inherited diseases** by using chorionic villi samples or cells from amniocentesis.
- Diseases like **sickle cell anemia, β-thalassemia and phenylketonuria** can be detected by PCR in these samples.
- cDNA from PCR is a valuable tool for **diagnosis and monitoring retroviral infections**
- **Cervical cancer** caused by Papilloma virus can be detected by PCR.

27. What are recombinant vaccines?. Explain the types.

- Recombinant DNA technology has been used to **produce new generation vaccines.**
- The recombinant vaccines are **generally of uniform quality and produce less side effects** as compared to the vaccines produced by conventional methods.
- **Types of recombinant vaccines - subunit recombinant vaccines, attenuated recombinant vaccines and DNA vaccines**

28. Explain why cloning of Dolly, the sheep was such a major scientific breakthrough?

- Dolly was the first animal to be cloned from a differentiated somatic cell taken from an adult animal **without the process of fertilization. It is a major scientific breakthrough because it**
- **Offers benefits** for clinical trials and medical research.
- It can **help in the production of proteins** and drugs in the field of medicine.
- **Aids stem cell research**.

29. Mention the advantages and disadvantages of cloning.

- **Advantages**
- **Offers benefits** for clinical trials and medical research.
- It can help in the **production of proteins and drugs** in the field of medicine.
- **Aids stem cell research**.
- Animal cloning could help to **save endangered species**.
- It is used to **save endangered animals**

- **Disadvantages :**
- The process is **tedious and very expensive**.
- It can cause **animals to suffer.**
- Cloned animals were affected with disease and have **high mortality rate.**
- **Human health affected** through consumption of cloned animal meat.
- Cloned animals age faster than normal animals and are **less healthy than the parent organism** as discovered in Dolly
- Cloning can **lead to occurrence of genetic disorders** in animals.
- More than **90% of cloning attempts fail** to produce a viable offspring.

30. Explain how recombinant Insulin can be produced.

- The Human insulin is synthesized by the β cells of Islets of Langerhans in the pancreas.
- Production of insulin by recombinant DNA technology **started in the late 1970s**.
- This technique involved the **insertion of human insulin gene on the plasmids of E.coli**.
- The polypeptide chains are **synthesized as a precursor called pre-pro insulin,** which contains A and B segments linked by a third chain c) and preceded by a leader sequence.
- The **leader sequence is removed after translation** and the C chain is excised, leaving the A and B polypeptide chains.
- Insulin was the **first ever pharmaceutical product** of recombinant DNA technology administered to humans.
- In 1986 human insulin was **marketed under the trade name Humulin.**

31. Explain the steps involved in the production of recombinant hGH.

- Human growth hormones somatostatin and somatotropin are **peptide hormones secreted by the pituitary gland.**
- This hormone helps in the **growth and development** by increasing the uptake of amino acids and promoting protein synthesis.
- hGH can be produced using **recombinant DNA technology.**
- The **gene for hGH is isolated** from the human pituitary gland cells.
- The isolated gene is **inserted into a plasmid vector** and then is transferred into E. coli.

The recombinant **E. coli then starts producing human growth hormone**.

- The recombinant E. coli are isolated from the culture and **mass production of hGH is carried out by fermentation technology.**
- A recombinant form of human growth hormone called **somatropin is used as a drug to treat growth disorders in children.**

- Deficiency of human growth hormone causes **dwarfism,** which could be treated by injecting hGH extracted from the human pituitary glands.

10. ORGANISMS AND POPULATIONS

1. All populations in a given physical area are defined as

a) Biome b) Ecosystem c) Territory d) Biotic factors

2. Organisms which can survive a wide range of temperatuer are called

a) Ectotherms **b) Eurytherms** c) Endotherms d) Stenotherms

3. The interaction in nature, where one gets benefit on the expense of other is...

a) Predation b) Mutualism c) Amensalism **d) Commensalism**

4. Predation and parasitism are which type of interactions?

a) (+,+) b) (+, O) c) (,) **d) (+,)**

5. Competition between species leads to

a) Extinction b) Mutation c) Amensalism d) Symbiosis

6. Which of the following is an r-species

a) Human **b) Insects** c) Rhinoceros d) Whale

7. Match the following and choose the correct combination from the options given below.

Column I	**Column II**
.) Mutalism	. Lion and deer
) Commensalism	. Round worm and man
) Parasitism	. Birds compete with squirrels for nuts
) Competition	. Sea anemone on hermit crab
) Predation	. Bernacles attached to Whales**.**

Dispersal

a) A- 4, B-5, C-2, D –3, E-1 b) A- 3, B-1, C-4, D – 2, E-5

c) A- 2, B-3, C-1, D – 5, E-4 d) A- 5, B-4, C-2, D – 3, E-1

8. The figure given below is a diagrammatic representation of response of organisms to abiotic factors. What do A, B and C represent respectively.

S. No.	A	B	C
a.	Conformer	Regulator	Partial Regulator
b.	Regulator	Partial Regulator	Conformer
c.	Partial Regulator	Regulator	Conformer
d.	Regulator	Conformer	Partial Regulator

9. The relationship between sucker fish and shark is.....

a) Competition **b) Commensalism** c) Predation d) Parasitism

10. What type of human population is represented by the following age pyramid?

a) Vanishing population **b) Stable population**

c) Declining population d) Expanding population

11. Which of the following is correct for r-selected species

a) Large number of progeny with small size

b) large number of progeny with large size

c) small number of progeny with small size

d) small number of progeny with large size

12. Animals that can move from fresh water to sea called as.....

a) Stenothermal b) Eurythermal **c) Catadromous** d) Anadromous

13. Some organisms are able to maintain homeostasis by physical means ...

a) Conform **b) Regulate** c) Migrate d) Suspend

14. What is a Habitat?

A habitat can be considered as the **'address' of the organism.**

The collection of all the habitat areas of a species constitutes its **geographical range.**

E.g. Xerophytic habitat.

15. Define ecological niche. As every organism has its unique habitat, so also it has an ecological niche which includes the physical space occupied by an organism and its functional role in the community.

- The ecological niche of an organism not only depends on where it lives but also includes the sum total of its environmental requirements.

16. What is Acclimatisation?

Animals are known to **modify their response to environmental changes** (stress) in reasonably short time spans. This is known as **Acclimatization**

Acclimatization occurs in a **short period of time**, and **within the organism's life**

17. What is Pedogenesis?

The soil zone is known as **Pedosphere**.

Soil is formed from **rocks which are the parent materials of soil, by weathering** and is called embryonic soil (Pedogenesis).

18. What is Zero Stress?

Animals are known to modify their response to environmental changes (stress) in reasonably short time spans. This is known as **Acclimatization**.

Constant environmental conditions is known as Zero Stress

19. What is soil permeability?

- The characteristic of **soil that determines the movement of water** through pore spaces is known as soil permeability.
- Soil permeability is **directly dependent on the pore size**.

20. Differentiate between Eurytherms and Stenotherms.

S. No.	Eurytherms	Stenotherms
1.	Organisms which can survive a wide range of temperature are referred to as **Eurytherms**	Organisms which can tolerate only a narrow range of temperature are **Stenotherms**
2.	Eurythermy can be an **evolutionary advantage**	**No relationship with evolution**
3.	**E.g :** Cat, dog, tiger, human.	**E.g :** Fish, Frogs, Lizards and Snakes

21. Explain hibernation and aestivation with examples.

- **Hibernation is a winter sleep** which is useful adaptations to overcome extreme winters squirrel, bears.
- **Aestivation is referred as Summer sleep** which is useful adaptations to overcome extreme summers. **E.g : Crocdile, Lemurs.**

22. Give the diagnostic characters features of a Biome?

- Location, Geographical position (**Latitude, Longitude**)
- **Climate and physiochemical** environment
- **Predominant plant** and animal life
- Boundaries between **biomes are not always sharply defined**.
- **Transition or transient zones** are seen as in case of grassland and forest biomes

23. Classify the aquatic biomes of Earth.

1. **Freshwater** (Lakes, ponds, rivers)
2. **Brackish water** (Estuaries / Wetlands)
3. **Marine** (Coral reefs, pelagic zones and abyssal zones)

24. What are the ways by which organisms respond to abiotic factors?

Regulate:

- Some organisms are **able to maintain homeostasis** by physiological means which ensures **constant body temperature, ionic / osmotic balance.**
- **E.g : Birds, mammals and a few lower vertebrate** and **invertebrate species**.
- **Conform**:
- Most animals **cannot maintain a constant internal environment**.
- Their **body temperature changes** with the ambient temperature.
- In aquatic animals like fishes, the **osmotic concentration of the body fluids changes** with that of the ambient water osmotic concentration.
- Such animals are called **Conformers**.
- In case of extreme condition, the **inhabitants relocate themselves as in migration.**
- **Migrate:**
- Organisms tend to **move away temporarily from a stressful habitat** to a new, hospitable area and return when the stressful period is over.
- **E.g : Birds migrate** from Siberia to Vedanthangal in Tamilnadu to escape from the severe winter periods.
- **Suspend:**
- In certain conditions, if the **organisms is unable to migrate**, it may avoid the stress by becoming inactive.
- This is seen commonly in bears going into **hibernation** during winter.
- Some snails and fish go into **aestivation** to **avoid summer related problems** like heat and desiccation.

- Some lower animals **suspend a certain phase of their life cycle**, which is referred to as **diapause**

25. Classify the adaptive traits found in organisms.

- The adaptive traits may be **structural adaptation, behavioral adaptation and physiological adaptation**.
- **Structural adaptations :**
- The external and internal structures of animals can help them to **adapt better to their environment**.
- **E.g :** Mammals growing **thicker fur to survive freezing climates**.
- Some of the most attractive **adaptations in nature occur for reasons of crypsis** (e.g. camouflage) and **mimicry.**
- Cryptic animals are those which **camouflage perfectly with their environment** and are almost impossible to detect.
- Certain reptiles and insects such as **chameleons and stick insects show this type of adaptation**, which helps in prey capture or to evade from predators.
- Likewise, **horse legs are suitable for fast running** and **adapted for grasslands** and similar terrestrial environments.
- **Behavioural adaptations :**
- Action and behaviour of animals are **instinctive or learned**.
- Animals develop certain **behavioural traits or adaptations for survival.**
- **E.g : Fleeing from a predator, hiding during sleep, seeking refuge from climate change or moving to find different food sources**
- Important Behavioral adaptations are **migration and courtship.**
- Migration allows the **animals to find better resources** or evade threat.
- Courtship is a set of **behavioral patterns to find a mate to reproduce**.
- Most nocturnal animals **remain underground or inactive during daytime.**
- This is a modification of their **feeding and activity pattern or habit or behaviour.**
- **Ethology** is the scientific **study of animal behaviour, under natural conditions.**
- **Physiological adaptations :**
- These are adaptations of organisms that **help them to live and survive in their environment** with unique niches.
- **E.g : Lions have sharp canines to hunt and tear** meat and a digestive system suitable for digesting raw meat.
- The two most well-known physiological adaptations are **hibernation and aestivation**.
- These are two different **types of inactivity where the metabolic rate slows down** so much that the animal can survive without eating or drinking.

26. Differentiate Natality and Mortality.

S. No.	Natality	Mortality.
1.	It define as a **birth of individual in unit time.**	It define as a **death of individuals in unit time.**
2	It is also known as **Birth rate**	It is also known as **death rate**

27. Differentiate J and S shaped curve.

S. No.	J shaped curve	S shaped curve
1.	In this kind **population increases rapidly** in an exponential fashion then **stops shortly due to environmental resistance** or due to sudden appearance of a limiting factor,	In this kind **population of small mammals, increase slowly** at first then **more rapidly and gradually slow down** as environmental resistance increases.
2	Their growth is **represented by J-shaped growth form.**	Their growth is **represented by S shaped growth curve**

28. Give an account of population regulation.

- The inherent tendency of all animal populations is to **increase in number.**
- But it does **not increase indefinitely.**
- Once the carrying capacity of the environment is reached, population numbers remain static or fluctuate depending on environmental conditions.
- This is regulated by many factors which are
- **Density independent - Extrinsic factors**
- **Density dependent - Intrinsic factors**
- Extrinsic factors include **availability of space, shelter, weather, food,** etc.
- Intrinsic factors include **competition, predation, emigration, immigration and diseases**.

29. What is ecological density, crude density and population density?

S. No.	Indices of Density	Keys
1	**Population density**	It is usually expressed as the **number of individuals per unit area or**

		volume. Eg.**100 trees/acre**
2	**Crude density**	It is the size of a population in **relation to the numbers per unit of total space.** Eg.**1000 fish in a pond**.

No.	**Indices of Density**	**Keys**
3	**Ecological density**	It is the size of a population in **relation to the numbers per unit of habitat space.** (**Available area or volume** that can be colonized by a population). Eg. **1000 fish in the volume of water** in the pond.

30. Give an account of the properties of soil.

- **Texture of soil**
- The texture of soil is determined by the **size of the soil particles**.
- The types of soil include **sand, silt and clay** on the basis of their size differences.
- **Porosity**
- The **space present between soil particles** in a given volume of soil are called pore spaces.
- The percentage of soil volume occupied by pore space or by the interstitial spaces is called **porosity of the soil.**
- **Permeability of soil**
- The characteristic of soil that **determines the movement of water through pore** spaces is known as soil permeability.
- Soil permeability is **directly dependent on the pore size**.
- Water holding capacity of the soil is **inversely dependent on soil porosity.**
- **Soil Temperature**
- Soil gets its heat energy from **solar radiation, decomposing organic matter, and heat** from the interior of earth.
- Soil temperature effects the **germination of seeds, growth of roots** and **biological activity** of soil-inhabiting micro-and macro-organisms.
- **Soil water** In soil, water is not only important as a solvent and transporting agent, but also **maintains soil texture**, **arrangement and compactness of soil particles**, making soil habitable for plants and animals.

31. Differentiate between Tundra and Taiga Biomes.

S. No.	Tundra Biomes	Taiga Biomes
1.	It extends beyond the **Arctic and Antarctic circle** (66.6**0** to the poles)	It extends in the **sub polar belt of North America and Eurassia** (55**0** to 66.5**0** North)
2.	The winters are very long and severe. **Summers are very short and warm**	The winters are **long and cold**. **Summers are short and warm**
3.	Precipitation is **less than 250 mm** per year.	Precipitation ranges about **380-1000 mm** annually.
4.	This is the almost **treeless plain in the northern parts** of Asia, Europe and North America.	The Taiga is a **forest of coniferous trees** such as spruce, fir and pine.
5.	**Reindeer, arctic hare, musk ox, lemmings** are important Tundra herbivores **E.g : ducks and geese, nest** in the Tundra during the summer and migrate south for the winter**.**	Important migratory herbivores include **moose, elk, deer and reindeer.** The common smaller mammals are herbivorous **squirrels, snowshoe hare** and predatory pine martens. Important predators include the **timber wolf, grizzly bear, black bear, bobcat and wolverines**.

32. List the adaptations seen in terrestrial animals.

- **Adaptations of terrestrial animals :**
- Earthworms, land Planarians à **secrete a mucus coating to maintain a moist situation**
- Arthropods à have an **external covering over the respiratory surfaces** and well-developed tracheal systems.
- In vertebrate skin, there are many cellular layers besides the **well protected respiratory surfaces that help in preventing loss of water.**

- Some animals obtain their water requirement from food as **partial replacement of water lost through excretion.**
- Birds à make nests and **breed before the rainy season** as there is availability of abundant food. But **during drought birds rarely reproduce.**
- Camels are able to **regulate water effectively for evaporative cooling** through the skin and respiratory system and **excrete highly concentrated urine, and can also withstand dehydration** up to 25% of their body weight.

33. Describe Population Age Distribution.

- The **proportion of the age groups** (pre- reproductive, reproductive and post reproductive) in a population is its age distribution attribute.
- This determines the **reproductive status of the population at the given time** and is an indicator of the future population size.
- Usually a rapidly growing population will have **larger proportion of young individuals**.
- A stable population will have an **even distribution of various age classes**.
- A **declining population** tends to **have a larger proportion of older individuals**.

34. Describe Growth Models/Curves.

Populations show **characteristic growth patterns or forms.**

These patterns can be plotted and termed as **J-shaped growth form and S-shaped** growth form (Sigmoid form).

10. BIODIVERSITY AND IT'S CONSERVATION

1. Which of the following region has maximum biodiversity

a) Taiga **b) Tropical forest** c) Temperate rain forest d) Mangroves

2. Conservation of biodiversity within their natural habitat is

a) Insitu conservation b) Exsitu conservation

c) In vivo conservation d) In vitro conservation

3. Which one of the following is not coming under insitu conservation

a) Sanctuarie b) Natural parks **c) Zoological park** d) Biosphere reserve

4. Which of the following is considered a hotspots of biodiversity in India

a) Western ghats b) Indo-gangetic plain

c) Eastern Himalayas **d) A and C**

5. The organization which published the red list of species is

a) WWF **b) IUCN** c) ZSI d) UNEP

a) Edward Wilson **b) Walter Rosen**

c) Norman Myers d) Alice Norman

7. Which of the following forests is known as the lungs of the planet earth?

a) Tundra forest **b) Rain forest of north east India** c) Taiga forest

d) Amazon rain forest

8. Which one of the following are at high risk extinction due to habitat destruction

a) Mammals b) Birds **c) Amphibians** d) Echinoderms

Ans : c

9. Assertion: The Environmental conditions of the tropics are favourable for speciation and diversity of organisms.

Reason: The climate seasons, temperature, humidity and photoperiod are more or less stable and congenial.

a) Both Assertion and Reason are true and Reason explains Assertion correctly.

b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

c) Assertion is true , but Reason is false.

d) Both Assertion and Reason are false.

10. Define endemism.

It is the ecological state of a **species being unique to a defined geographical location**.

This is known as Endemism. It is a **crucial indicator of richness.**

11. How many hotspots are there in India? Name them.

India has **four biodiversity** hotspots. They are

1. **Himalaya** (the entire Indian Himalayan region)

2. **Western Ghats**

3. **Indo-Burma:**

It includes **entire North-eastern India,** except Assam and Andaman group of Islands

4. **Sundalands:**

It includes **Nicobar group of Islands**

12. What are the three levels of biodiversity?

Levels of biodiversity are

1. **Genetic diversity,**

2. **Species diversity,**

3. **Community or Ecosystem diversity.**

13. Name the active chemical found in the medicinal plant Rauwolfia vomitoria. What type of diversity it belongs to?

Reserpine is the active chemical found **Rauwolfia vomitoria**.

It belongs to **genetic diversity**.

Genetic diversity helps to **develop adaptations.**

14. "Amazon forest is considered to be the lungs of the planet"-Justify this statement.

Amazon covers a vast area, and sheltering millions of species.

More over it has numerous plants which involve in reduction of CO_2 by photosynthesis, hence it is called as"Lungs of the planet"

15. 'Red data book'-What do you know about it?

- Red Data book or Red list is a **catalogue of taxa facing risk of extinction**.
- Red Data book **is** maintained by **WCU** – **W**orld **C**onservation **U**nion (early known as **IUCN** – **I**nternational **U**nion of **C**onservation of **N**ature and Natural Resources)
- The concept of Red list **was suggested in 1963.**

The purpose of preparation of Red List are:

1. **To create awareness** on the degree of threat to biodiversity.

2. **Identification and documentation** of species at high risk of extinction.

3. **Provide global index** on declining bio diversity.

4. Preparing conservation priorities and **help in conservation of action.**

5. Information on **international agreements on conservation** of biological diversity

Red list has eight categories of species

i) Extinct ii) Extinct in wild iii) Critically Endangered iv) Endangered v) Vulnerable vi) Lower risk vii) Data deficiency viii) Not evaluated.

16. Extinction of a keystone species led to loss of biodiversity – Justify.

- Keystone species is a species that has a **excessively large effect on its natural environment to its abundance.**
- Keystone species is an organism that **helps define an entire ecosystem**.
- **Extinction of a keystone species leads to the** extinction of another/cease another orgnisms.
- **E.g : orchid bees** and forest trees by cross pollination
- Extinction of one will automatically cause extinction of the other.
- **E.g : Dodo** in Mauritius Island
- There is a direct relationship between **Calvaria tree and the extinct bird of Mauritius Island, the Dodo**.
- The Calvaria tree is **dependent on the Dodo bird** for completion of its life cycle.
- **Tough horny endocarp of the seeds** of Calvaria tree are made permeable by the actions of the large stones in **birds gizzard and digestive juices** thereby facilitating easier germination.

The **extinction of the Dodo bird led to the extinction of Calvaria tree**.

17. Compare and Contrast the insitu and exsitu conservation.

Insitu Conservation	**Exsitu Conservation**
. It is the **on-site conservation** of plant or animal species.	. It is a conservation of threatened animals and plants in **special care locations.**
. It is the process of **protecting an endangered plant or animal species in its natural habitat.**	. It helps in recovering populations or **preventing their extinction under simulated conditions**.
.g : National Parks, Biosphere Reserve	**.g : Zoological parks and Botanical gardens**

18. What are called endangered species? Explain with examples.

- A species that are **likely to become extinct in future** are known as Endangered species.

- Endangered species are categorized by **IUCN E.g : Dodo bird, orchid bees, Sparrow, White tiger.**

19. Why do we find a decrease in biodiversity distribution, if we move from the tropics towards the poles?

Reason for decrease in biodiversity distribution in polar region :

1. **Very harsh (too cold)** conditions prevail for most of the year in polar regions that will reduce bio diversity.
2. Organisms need a range of **temperatures between 25°C to 35°C**, for most of the metabolic activities, which is absent in polar region
3. **Climate, seasons, temperature, humidity, photoperiods** are not support the growth of variety of organism.

20. What are the factors that drive habitat loss?

Mining ,Construction of highways,Over population,

Urbanization, industrialization ,Agricultural advancements

Filling wetlands ,Ploughing grasslands,Cutting down trees

Deforestation ,Caving mountains,,Changing the course of rivers and filling of seashore.

21. Where are biodiversity hotspots normally located? Why?

- Hotspots are located in areas where **high concentration of endemic species** experiencing **unusual rapid rate of habitat modification loss.**

22. Why is biodiversity so important and worthy of protection?

- Biodiversity is essential for **stability of an ecosystem.**
- Biodiversity serves as **source of food and provides source material** for new improved varieties.
- Biodiversity has **scientific value also**, as different animal species are used **for biological and medical research.**
- **Various products** of human use can be obtained from rich biodiversity.
- **E.g :** gums, resins, dyes, paper, fibres, etc.
- Variety of **plant species provide innumerable drugs and medicines**.
- **E.g : Morphine, Quinine,**

23. Why do animals have greater diversification than plant diversity?

- Plants are **self dependent (Autotroph)** for their nutrition so there is no need of variation and adaptation by the plant, this lead to the **limited diversity in plant.**

- Plant can **withstand in any kind of environment condition** but animal need adaptation to suit different environment.
- This also result in **more diversity in animal than plants**.

24. Alien species invasion is a threat to endemic species – substantiate this statement.

- Exotic species are organisms often **introduced unintentionally or deliberately** for commercial purpose, as biological control agents and other uses.
- They often become **invasive and drive away the local species** and is considered as the second major cause for extinction of species.
- Exotic species have proved **harmful to both aquatic and terrestrial ecosystems**.
- **E.g Tilapia fish (Jilabi, kendai) (Oreochromis mosambicus**) introduced from South Africa for its high productivity into Kerala's inland waters, became invasive, due to which the native species such as **Puntius dubius and Labeo kontius face local extinction.**
- **Amazon sailfin catfish** is responsible for destroying the fish population in the wetlands of Kolkata.
- **African apple snail (Achatina fulica)** is the most invasive among all alien fauna in India.
- **Papaya Mealy Bug (Paracoccus margin atus)** is native of Mexico and Central America, is believed to have destroyed huge crops of papaya in Assam, West Bengal and TamilNadu.

25. Mention the major threats to biodiversity caused by human activities. Explain.

- **India is one of the 17 identified mega diverse countries** of the world, but it faces lots of threats to its biodiversity.
- Apart from natural causes, **human activities, both directly and indirectly** are today's main reason for habitat loss and biodiversity loss.
- Fragmentation and degradation due to **agricultural practices, extraction** (mining, fishing, logging, harvesting) **and development** (settlements, industrial and associated infrastructures) leads to **habitat loss and fragmentation** leads to formation of isolated, small and scattered populations and as endangered species.
- Some of the other threats include **specialised diet, specialized habitat requirement, large size, small population size, limited geographic distribution and high economic or commercial value**.

- **Large mammals by virtue of their size require larger areas** to obtain the necessities of life - food, cover, mates than do smaller mammals.

E.g : Single Lion need about 100 square Km.

26. What is mass extinction? Will you encounter one such extinction in the near future. Enumerate the steps to be taken to prevent it.

- The **extinction of large number of species** within a short period of time is known as **mass extinction.**
- In the 450 million years of life on Earth, there had been 5 mass extinctions, which had eliminated at least 50% of the species of flora and fauna on the globe.
- The extinction of species is mainly due to drastic environmental changes and population characteristics.
- Extinctions are three types. It include,
- **Mass extinction:** The earth has experienced quite a few mass extinctions due to environmental catastrophes.
- A mass **extinction occurred about 225 million years ago** during the Permian, where 90% of shallow water marine invertebrates disappeared.

27. In north eastern states, the jhum culture is a major threat to biodiversity – substantiate.

- In shifting cultivation, plots of **natural tree vegetation are burnt away** and the cleared patches are farmed for 2-3 seasons, after which their **fertility reduces to a point where crop production is no longer profitable.**
- The farmer then **abandons this patch** and **cuts down a new patch of forest trees** elsewhere for crop production.
- This system is practiced in **north-eastern regions of India.**
- When vast areas are cleared and burnt, it r**esults in loss of forest cover, pollution and discharge of CO**2 which in turn attributes to loss of habitat and climate change which has **an impact on the faunal diversity of that regions.**

28. List out the various causes for biodiversity losses.

The major causes for reduction in biodiversity are:

1. **Habitat loss, fragmentation and destruction** (affects about 73% of all species)
2. **Pollution and pollutants** (smog, pesticides, herbicides, oil slicks, GHGs)
3. **Climate change**
4. Introduction of **alien/exotic species**

5. **Over exploitation of resources** (poaching, indiscriminate cutting of trees, over fishing, hunting, mining)

6. **Intensive agriculture and aqua cultural practices**

7. **Hybridization** between native and non-native species and loss of native species

8. **Natural disasters** (Tsunami, forest fire, earth quake, volcanoes)

9. **Industrialization, Urbanization, infrastructure development, Transport**, **communication towers, dam construction, unregulated tourism** are areas of specific threats

10.**Co-extinction**

29. How can we contribute to promote biodiversity conservation?

We can conserve biodiversity by

1. **Identify and protect** all threatened species
2. Identify and conserve in protected areas the wild relatives of all the **economically important organisms**
3. Identify and protect critical habitats for **feeding, breeding, nursing, resting of each species**
4. **Resting, feeding and breeding places** of the organisms should be identified and protected.
5. **Air, water and soil should be conserved** on priority basis.
6. **Wildlife protection** act should be implemented.

30. Stability of a community depends upon its species diversity' Justify the statement.

- Communities with **more species tend to be more stable** than those with less species as it is able to resist occasional disturbance.
- This has been confirmed experimentally by **David Tilman's**.
- He raised **plots with different diversities in Minesota grassland** and subjected them various stresses.
- He found that **plots with more species showed less year to year variation** in total biomass.
- He also showed that in his experiments, increased diversity contributed to higher productivity.

31. Write a note on

- **Protected areas, ii) Wild life sanctuaries, iii) WWF.**

- **Protected areas :-**
- These are **biogeographical areas** where biological diversity along with natural and cultural resources is protected, maintained and managed through legal measures.
- Protected areas include **national parks, wild life sanctuaries, community reserves and biosphere reserves.**
- World Conservation monitoring centre has recognized **37,000 protected areas world-wide**.
- India has about **771 protected areas covering 162099 km2** comprising of **National Parks (104), Wild Life Sanctuaries (544),** biosphere reserves and several sacred groves.
- **Wild Life Sanctuaries (WLS):**
- Any area other than the area comprised with any reserve forest or the territorial waters can be notified by the State Government to **onstitute as a sanctuary** if such area is of **adequate ecological, aunal, floral, geomorphological, natural or zoological significance.**
- This is for the purpose of **protecting, endangered factual species**.
- **Some restricted human activities are allowed inside** the Sanctuary area under Wildlife Protection Act (WPA) 1972.
- **Ecoturism is permitted,** as long as animal life is undistrubed.
- There are **544 existing wildlife sanctuaries in India** covering an area of 118,918 km**2**, which is **3.62 % of the geographical area of the country** (National Wildlife Database, 2017).
- Sanctuaries are tracts of land where **wild animals and fauna can take refuge** without being hunted or poached.
- **Collection of forest products, regulated harvesting of timber, private ownership** of land are also permitted.
- E.g Periyar wild life sanctuary in Kerala is famous for the Indian Tiger and Asiatic Elephant.
- **iii) WWF**

WWF – **W**orld **W**ide **F**und for Nature

- It is an **international non- government organization** founded in1961, working in the field of the **wilderness preservation,** and the **reduction of human impact** on the environment.

12. ENVIRONMENTAL ISSUE

1. Right to Clean Water is a fundamental right, under the Indian Constitution

a) Article 12 **b) Article 21** c) Article 31) Article 41

2. With which of the following, the agenda 21' of Rio Summit, 1992 is related to?

a) Sustainable development

b) Combating the consequences of population

c) Mitigation norms of Green House Gases (GHGs) emission.

d) Technology transfer mechanism to developing countries for 'clean-energy' production.

3. Which among the following awards instituted by the Government of India for individuals or communities from rural areas that have shown extraordinary courage and dedication in protecting Wildlife?

a) Indira Gandhi Paryavaran Puraskar b) Medini Puruskar Yojana

c) Amrita Devi Bishnoi Award d) Pitambar Pant National Award

4. The 'thickness' of Stratospheric Ozone layer is measured in/on.

a) Sieverts units **b) Dobson units** c) Melson units d) Beaufort Scale

5. Which among the following is the most abundant Green-House-Gas (GHG) in the earth's atmosphere?

a) Carbon dioxide **b) Water Vapour** c) Sulphur Dioxide d) Tropospheric Ozone

6. As per 2017 statistics, the highest per capita emitter of Carbon dioxide in the world is

a) USA **b) China** c) Qatar d) Saudi Arabia

7. The use of microorganism metabolism to remove pollutants such as oil spills in the water bodies is known as

a) Biomagnification **b) Bioremediation** c) Biomethanation d) Bioreduction

8. The Ozone Day is observed every year on September 16 as on this day in 1987 the _____was signed for launching efforts to arrest the depletion of the fragile ozone layer in the stratosphere that prevents the harmful ultra-violet rays of the sun from reaching the earth. Fill the correct word in blank.

a) Montreal Protocol b) Geneva Protocol c) Kyoto Protocol d) Nagoya Protocol

9. Which among the following always decreases in a Food chain across tropic levels?

a) Number b) Accumulated chemicals c) Energy d) Force

10. In the E-waste generated by the Mobile Phones, which among the following metal is most abundant?

a) Copper b) Silver c) Palladium d) Gold

11. The Hydro chloro fluoro carbons (HCFCs) are the compounds which have the following molecules.

a) Hydrogen b) Carbon **c)Chlorine** d) Fluorine

12. SMOG is derived from :

a) Smoke b) Fog **c) Both A and B** d) Only A

13. Excess of fluoride in drinking water causes:

a) Lung disease b) Intestinal infection **c) Fluorosis** d) None of the above

14. Expand (i) CFC (ii) AQI (iii) PAN

i. **CFC – C**hloro **F**luoro **C**arbon ii. **AQI -A**ir **Q**uality **I**ndex iii. **PAN - Peroxyacetyl nitrate**

15. What is SMOG and how it is harmful for us?

- Smog is a **type of air pollution** caused by tiny particles in the air.
- The word comes from a **mixture of the words smoke and fog**.
- Today, smog generally refers to **photochemical smog, which is created when sunlight reacts with nitrogen oxides and volatile organic compounds** found in fossil fuel emissions from automobiles, factories, and power plants.
- These reactions **create ground-level ozone and particulate matter, reducing visibility**.
- Smog can **make breathing more difficult**, especially for people with asthma.
- Smog also **affects plants and animals.**

It **damages crops as well as causes health problems** in pets, farm animals and human beings.

Smog has also been known to **cause corrosive damage to buildings and vehicles.**

16. List all the wastes that you generate, at home, school or during your trips to other places. Could you very easily reduce the generation of these wastes? Which would be difficult or rather impossible to reduce?

Waste category	Source
Residential	**Food wastes, plastics, paper, glass, leather, cardboard, metals, yard wastes, ashes, tires, batteries, old mattresses**
School	**Wood, paper, metals, cardboard materials, electronics**
During trip	**Plastic water bottle, carry bag , Aluminium foils**

Yes, we can reduce the generation of waste by adopting some measure

Plastics and E –Waste are very difficult to remove because they are **non bio-degradable.**

17. Discuss the causes and effects of global warming. What measures need to be taken to control global warming?

- The **raised atmospheric average temperature** by the increase in concentration of green house gases is known as global warming.
- **Causes of Global warming :**
- It is caused mainly due to **CO2 from automobiles or burning coals by power plants, soil erosion, desertification**, and **CFC** etc.
- **Effects**

1. **Seasons will be longer** in some areas
2. Some types of **forests may disappear**
3. Storms are expected to be **more frequent and intense**
4. Tropical diseases such as **malaria, dengue fever, yellow fever and encephalitis** will spread to other parts of the world
5. **Rise in the sea level**

6. It causes **food & water shortage**

- **Control measures ,Reforestation , Recycling of products**
- **Using natural resources like wind energy, solar energy and wave energy**
- Conservation of energy by **using eco-friendly bulbs, carpooling & adopting CFC free zone**
- **Carbon sequestration**
- Reduce the **production of green house gases.**

18. What would Earth be like without the greenhouse effect?

- Greenhouse gases in the air , **trap radiation from the Sun and act like a thermal blanket** around the planet.
- Without the greenhouse effect, the **Earth would have an average temperature of -18 °C** and be **covered in ice.**
- This makes living organisms **unable to survive**

19. Write notes on the following:

a) **Eutrophication :**

- **Overflow of nutrient rich water** from land to water bodies like lakes, it results in dense growth of plant life.
- This phenomenon is called **Eutrophication.**

b) Algal Bloom:

- An algal bloom is a **rapid increase in the population of algae** in an aquatic system.
- Algal blooms may **occur in freshwater as well as marine environments**.

20. What effect can fertilizer runoff have on an aquatic ecosystem?

- **Overflow of nutrient rich water** from land to water bodies like lakes, it results in dense growth of plant life.
- It will result in **Eutrophication and algal bloom.**

21. How can we control eutrophication?

- In order to control eutrophication first you **need to identify the sources.**
- **Depending on the sources**, you have to decide your management strategy.
- And also **reducing the usage of fertilizer** eutrophication can be controlled.

22. Why does ozone hole form over Antarctica?

- Chlorine reacts with ozone and **produce chlorine monoxide and diatomic oxygen.**
- These reactions are **most effective when they occur on the surface of ice crystals**, in the stratosphere.
- Antarctica is **colder than** other part of world
- Therefore **ozone hole form over Antarctica.**

23. Mention the causes of enhanced use of ultraviolet radiation.

Ozone layer depletion decreases our atmosphere's natural protection from the sun's harmful ultraviolet (UV) radiation.

Causes of Skin Cancer are

1. **Skin cancer**
2. **Premature aging and other skin damage**
3. **Cataracts and other eye damage**
4. **Immune system suppression**

24. Discuss the role of women in protection and conservation of forests.

Women play a vital role in conservation of forest.

- **Amrita Devi :**
- **Amrita Devi** was a brave lady from Khejarli Village of Jodhpur District, Rajasthan.
- She **sacrificed her life to maintain Bishnoi Dharma**.
- In 1730, Maharaja Abhay Singh, ruler of Marwar, Rajasthan state **wanted to log green Khejri (Prosopis cineraria) trees to burn lime** for the construction of his new palace.
- Since there was a **lot of greenery in the Bishnoi villages even in the middle of Thar Desert**, the king ordered his men to get the wood from Khejri trees.
- When **she came to know about the cutting of trees** by the King's men, **she and many others had hugged the Khejri trees to save from cutting.**
- But king's men **killed Amrita Devi along with more than 363 other Bishnois**.
- It was a Tuesday, **black Tuesday in Khejarli.**
- This incident took place to **save trees and is recorded in India's history.**
- To commemorate her bravery, the Government of Rajasthan and Madhya Pradesh have initiated the prestigious state level award named as **'Amrita Devi Bishnoi Smriti Award'** for excellent contribution to the protection and conservation of wildlife.
- **Chipko movement :**

- The **Chipko movement** resisted the destruction of forests of India **in the 1970s**.
- **Sunderlal Bahuguna** was the leader of this movement.
- People in the movement **hugged the trees, and prevented felling of trees by contractors.**

25. Discuss the role of an individual to reduce environmental pollution.

- Installation of **proper sewage disposal methods**.
- Dumping of **non biodegradable wastes** in low lying areas.
- **Installation of gobar gas plants** in areas of high availability of cow dung.
- **Reduction of smoke emission and treatment of chimney smoke** to remove solid carbon particles.
- **Limited use of fertilizers, pesticides and detergents.**
- **Reforestation**

26. How does recycling help reduce pollution?

- **Recycling** prevents the emissions of many green house gases and **pollutants**, and saves energy. Using recovered material generates less solid waste.
- **Recycling helps** to **reduce** the **pollution** caused by the extraction and processing of virgin materials.

27. What is the primary purpose of the Kyoto Protocol?

To **decrease the dependence on natural resources** in developing countries

To limit and **decrease the world-wide emission** of greenhouse gases

28. In what way Peyang conserves the forest?

- **Jadav Payeng** known as '**Forest man of India'.**
- He created 1,360 acres of dense and defiant forest was born in **Arunasapori**(a river island on the Brahmaputra).
- He had just completed his Class X exams in1979 when **he started to sow the seeds and shoots** on the eroded island covered with sand and silt.
- Thirty-six years later he had **converted the once unproductive land into a forest.**
- Payeng's forest is now home to **five Royal Bengal tigers, over a hundred deer, wild boar, vultures, and several species of birds.**
- For his remarkable initiative, the **Jawaharlal Nehru University invited Payeng in 2012 on Earth Day and honoured him with the title of the 'Forest Man of India'.**
- Later, the President **APJ Abdul Kalam felicitated him with a cash award** in Mumbai.

- The same year, he received the '**Padma Shri'.**
- The Indian Constitution also **stresses on the importance of the role of the People in protecting their environment.**

29. Discuss briefly the following :

- **Catalytic converter**
- Catalytic converters in **vehicles help to reduce polluting gases** drastically
- **Greenhouse gases**
- Gases which are **responsible for green house effect** is known as Greenhouse gases
- **E.g : Water vapour, carbon dioxide, methane, nitrous oxide, ozone** and chlorofluorocarbons (CFCs)
- **EcoSan :**
- Ecological sanitation (EcoSan) is a **sustainable system for handling human excreta** by using dry composting toilets.
- EcoSan toilets not only reduce wastewater generation but also **generate the natural fertilizer from recycled human excreta,** which forms an excellent substitute for chemical fertilizers.

30. What are some solutions to toxic dumping in our oceans?

Management and minimization of waste dumping at the port

Education and awareness creation

Regulations and laws

Using reusable plastics

31. Describe how deforestation might contribute to global warming.

- Forests through photosynthesis **absorb carbon dioxide** (CO_2) and release oxygen.
- The timber of the **trees also sequesters carbon.**
- Deforestation means result in **reduction in area of forest**.
- Hence, green leaves **no longer act as carbon sinks** to suck in CO_2.
- By this way **deforestation contributes to the global warming**.

32. How does forest conservation help to reduce air pollution?

- The most important function of forests is that it **produces mass amounts of oxygen** as a by-product of photosynthesis.
- And while photosynthesis**, trees also absorb carbon dioxide** from the air.
- This is one of the **main pollutants of air pollution.** Hence, **forests also reduce air pollution**.

*******ALL THE BEST*********