Sample Question Paper

Class XII (2015-16)

Biology (044)

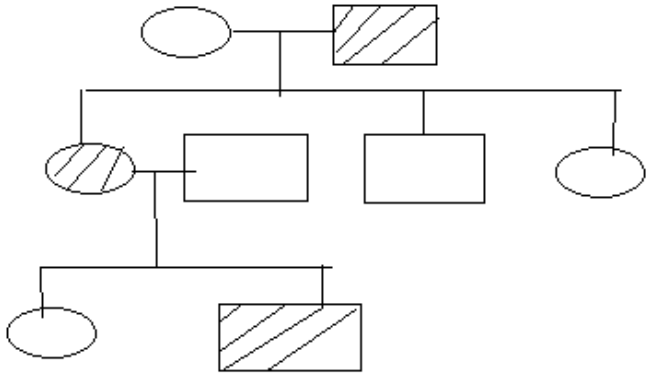
Time allowed: 3 Hrs **Maximum Marks: 70**

General Instructions:

1. **There are a total of 26 questions and five sections in the question paper. All questions are compulsory.**
2. **Section A contains question number 1 to 5, Very Short Answer type questions of one mark each.**
3. **Section B contains question number 6 to 10, Short Answer type I questions of two marks each.**
4. **Section C contains question number 11 to 22, Short Answer type II questions of three marks each.**
5. **Section D contains question number 23, Value Based Question of four marks.**
6. **Section E contains question number 24 to 26, Long Answer type questions of five marks each.**
7. **There is no overall choice in the question paper; however, an internal choice is provided in one question of two marks, one question of three marks and all three questions of five marks. An examinee is to attempt any of the questions out of the two given in the question paper with the same question number.**

SECTION -A

1. Observe the pedigree chart and answer the following questions:



(a) Identify whether the trait is sex-linked or autosomal.

(b) Give an example of a disease in human beings which shows such a pattern of inheritance.

[½ + ½=1]

2. Identify the reason for selection of DNA polymerase from *Thermus aquaticus* for Polymerase Chain Reaction.

[1]

3. Govt. of India has raised the marriageable age of female to 18 yrs and of males to 21 yrs. Suggest any two more measures adopted by Government for the purpose.

[½ + ½=1]

4. Thymus of a new born child was degenerating right from birth due to a genetic disorder. Predict its two impacts on the health of the child.

[½ + ½=1]

5. Give an example of a chromosomal disorder caused due to non-disjunction of autosomes.

[1]

SECTION -B

6. During an excavation assignment, scientists collected pollen grains of a plant preserved in deeper layers of soil. Analyse the properties of pollen grains which help in the fossilization.

[½+½ x3= 2]

7. Protein synthesis machinery revolves around RNA but in the course of evolution it was replaced by DNA. Justify.

[2]

8. Identify two ways in which *Spirulina is* helpful to mankind. **[1+1=2]**

OR

Keeping beehives in crop fields has several advantages. List any two.

[1+1=2]

9. Suryakant had banana plantation in his field. Quality of the fruit was excellent but the yield suffered due to infection of the plants by a virus. Suggest a fast and efficient method to get healthy and a large number of plants in the next generation without compromising on the existing quality. Justify the selection of your method.

[2]

10. Besides acting as 'conduits' for energy transfer across trophic levels, predators play other important roles. Justify.

[2]

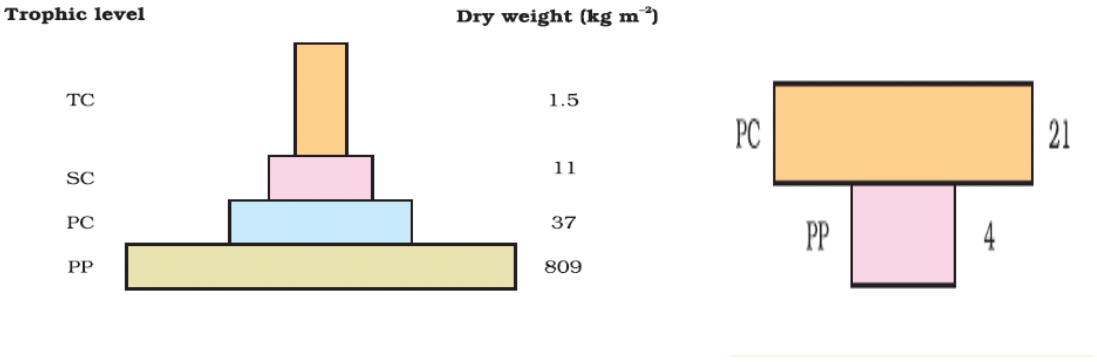
SECTION -C

11. Explain three outbreeding devices. **[1+1+1=3]**

12. After implantation interdigitation of maternal and foetal tissues takes place. Identify the tissues involved and justify their role.

[1+1+1=3]

13. Compare the two ecological pyramids of biomass given below and explain the situations in which this is possible. Also construct an ideal pyramid of energy if 200,000 joules of sunlight is available. **[1+2=3]**



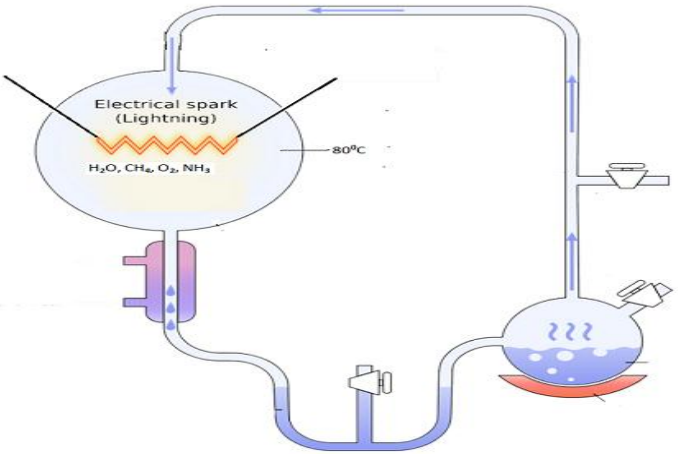
14. With respect to Messelson and Stahl's Experiment, answer the following questions:

(a) Identify the method used to distinguish between heavy and light isotopes of nitrogen.

(b) With the help of diagrams, compare the results for the DNA isolated after 20 minutes of experiment with the DNA which was isolated after 40 minutes.

[1+2=3]

15. A student was simulating Urey and Millers experiment to prove the origin of life. The set up used by the student is given –



(a) Find out the reasons why he could not get desired results.

(b) What conclusion was drawn by Urey and Miller through this experiment?

(c) Compare the conclusion drawn with the theory of spontaneous generation.

[1+1+1=3]

16. Given below is a figure of a biogas plant.

(a) Identify A and justify its floating nature.

(b) Identify the products B and C and discuss their significance.

[1+2=3]

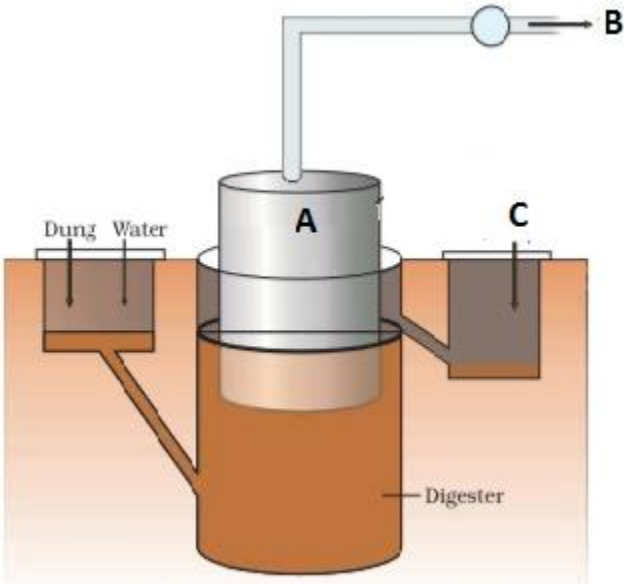


Figure A typical biogas plant

17. According to Global Hunger Index 2014 two billion people suffer from hidden hunger. Apply your knowledge of plant breeding techniques to suggest a programme to improve public health. Specify four objectives of the programme. Also mention one example of such a produce.

[½ +2+½=3]

18. DNA separated from one cell, when introduced into another cell is able to bestow some of the properties of former to the latter. What is this change called in technical terms? Describe the experimental evidences which led to the discovery of the above phenomenon.

[1+2=3]

19. When someone buys packets of cigarettes, cannot miss the statutory warning that is present on the packing which warns against smoking and says how it is injurious to health. Yet, smoking is very prevalent in our society, both among young and old. Advise the adolescents about the importance of avoiding smoking. (Mention any six points.)

[½x6= 3]

20. Biotechnology has helped farmers to get pest resistant cotton crops. Explain the technique adopted along with its mode of action. (Mention six points)

[½x6= 3]

OR

(a) Draw the figure of vector pBR322 and label the following:

Origin of replication

Ampicillin resistance site

Tetracycline resistance site

Bam H1 restriction site

(b) Identify the significance of Origin of replication

[½x4+1= 3]

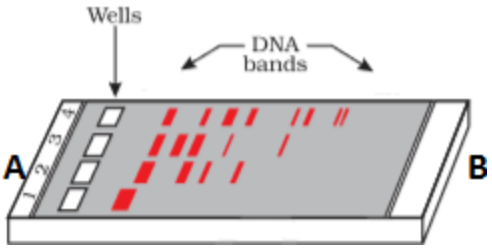
21. **(a)** Given below is a single stranded DNA molecule. Frame and label its sense and antisense RNA molecule.

5' ATGGGGCTC 3' sense

(b) How the RNA molecules made from above DNA strand help in silencing of the specific RNA molecules?

[2+1=3]

22. Rajesh was doing gel electrophoresis to purify DNA fragments. Given below is the sketch of the observations of the experiment performed by him.



(a) At which end he would have loaded the samples and where?

(b) Analyse the reason for different positions taken up by the DNA bands.

(c) Elaborate the step he would have followed to visualize DNA bands.

[1+1+1=3]

SECTION -D

23. Mohit and Sumit want to buy a new car for their company. Mohit insisted on buying a CNG car with a better mileage but Sumit insisted on buying a diesel version of a high end car with better music system and A.C but relatively low mileage.

(a) Being a responsible citizen of Delhi, how will Mohit convince Sumit about his decision in the wake of rising pollution levels.

(b) What qualities of personality are being exhibited by Mohit in doing so?

(c) Suggest two more measures which can help in reducing vehicular pollution.

[1+1+2=4]

SECTION -E

24. Human female is not fertile after menopause whereas males can produce gametes at any age after puberty. Analyse the statement and schematically represent a comparison between gametogenesis in males and females.

[5]

OR

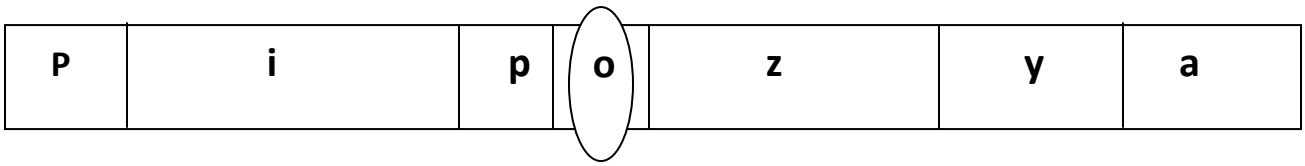
A village health worker was taking a session with women. She tells the women that one has to be very careful while using oral pills as method of birth control. Wrong usage can actually promote conception.

(a) Analyze the statement and compare the merits and demerits of using oral pills and surgical methods of birth control.

(b) Village women were confused as to how a thin metallic Copper loop can provide protection against pregnancy. Justify the use explaining the mode of action of IUDs.

[3 +2 =5]

25. Observe the representation of genes involved in the lac operon given below -



(a) Identify the region where the repressor protein will attach normally.

(b) Under certain conditions repressor is unable to attach at this site. Explain.

(c) If repressor fails to attach to the said site what products will be formed by z, y and a?

(d) Analyze why this kind of regulation is called negative regulation.

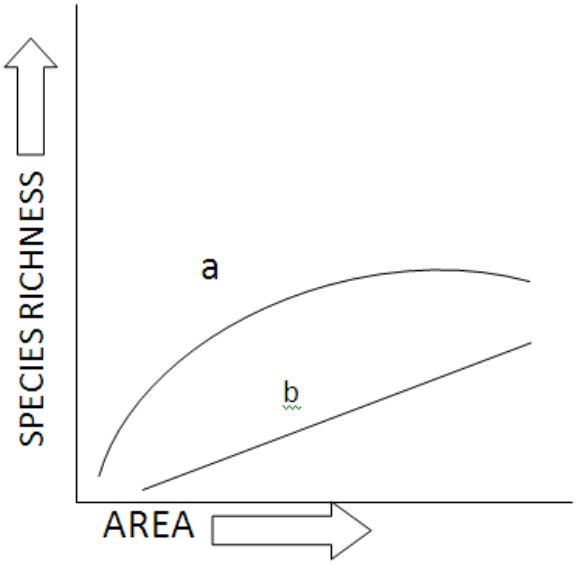
[½ +1+1½+2=5]

OR

Transcription in eukaryotes is more complex process than in prokaryotes. Justify and compare the initiation, elongation and termination in bacterial cells with eukaryotes.

[1+1+1+2=5]

26. The graph below shows species –area relationship:



(A) If b denotes the relationship on log scale-

i) Describe a and b.

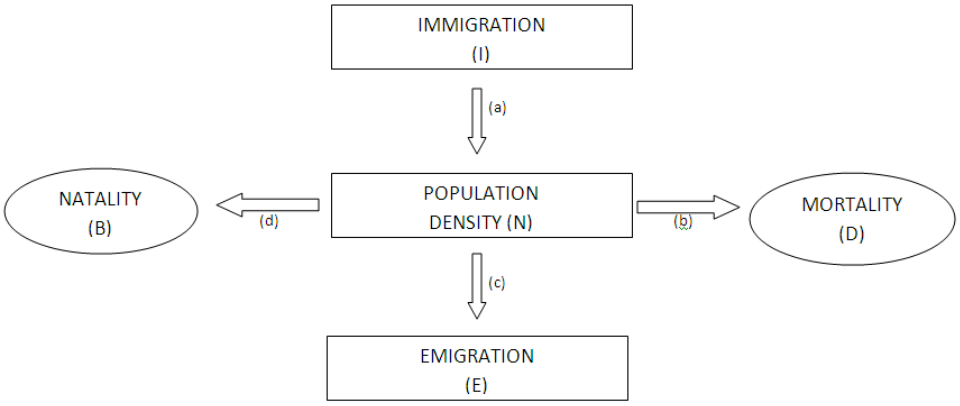
ii) How is slope represented? Give the normal range of slope.

iii) What kind of slope will be observed for frugivorous birds and mammals in a tropical forest?

(B) Species diversity of plants (22%) is much less than that of animals (72%). Analyze the reasons for greater diversity of animals as compared to plants.

[3+2=5]

OR



(a) Which of the above represents the increase or decrease of population?

(b) If N is the population density at time t, then what would be its density at time (t+1)? Give the formula.

(c) In a barn there were 30 rats. 5 more rats enter the barn and 6 out of the total rats were eaten by the cats. If 8 rats were born during the time period under consideration and 7 rats left the barn, find out the resultant population at time (t+1).

(d) If a new habitat is just being colonized, out of the four factors affecting the population growth which factor contributes the most?

[1+1+2+1=5]

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Sample Question Paper

Class XII (2015-16)

Biology (044)

Marking Scheme

Section - A

1. **a)** sex-linked **½**
b) Haemophilia/ Colour blindness **½**

2. It remains active during the high temperature induced denaturation of double stranded DNA. **1**

3. Incentives given to couples with small families /media publicity – posters of happy couples with two children(slogan- Hum Do Humare Do)./ Motivate to promote smaller families by using contraceptive methods
(Any two) **(½ x2)**

4. Thymus provides micro-environment for the development and maturation of T-lymphocytes; its degeneration will weaken the immune system so the child will be prone to frequent infections.
(½x 2)

5. Down's Syndrome **1**

Section - B

6. Pollen has an outer layer called exine which is made of sporopollenin. **½**
Most resistant organic material known/ withstand high temperature, strong acids and alkali/ no enzyme that degrades sporopollenin so far known.
(Any three) **(½x3=1½)**

7. Since RNA was unstable and prone to mutations, DNA evolved from RNA with chemical modifications that make it more stable.
DNA has double stranded nature and has complementary strands. These further resist changes by evolving a process of repair.
(1+1=2)

8. *Spirulina* is a source of food rich in protein, minerals, fats, carbohydrates and vitamins, It can grow on waste water from potato processing plants, straw, molasses, animal manure and even sewage, so it also reduces water pollution. **(1+1)**

OR

Pollination management, versatile use of resources, production at no cost (any two)

(1+1)

9. He can grow thousands of plants through tissue culture of meristem by micro-propagation/He can remove the meristem and grow it in-vitro using tissue culture technique./Although the plant is infected with a virus, the meristem (apical and axillary) is free of viruses.

(1+1)

10. Besides acting as 'conduits' of energy transfer across trophic levels, predators play other important roles like

- They keep prey population under control
- Predators also help in maintaining species diversity in a community by reducing the intensity of competition among competing prey species

(1+1)

Section - C

11. i) Pollen release and stigma receptivity is not synchronised
ii) Anther and stigma are placed at different position
iii) Self Incompatibility
iv) Production of unisexual flowers
(Any three)

(1+1+1)

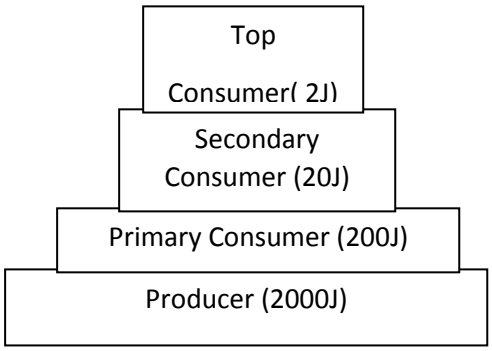
12. After implantation interdigitation of maternal & foetal tissues results in formation of structural and functional unit between embryo & maternal body called placenta.

1

It facilitates supply of oxygen and nutrients to the embryo, Removal of carbon dioxide and excretory material, Also acts as an endocrine tissue and produces hormones like HCG, hPL, estrogen. Progesterone, relaxin

(1+1)

13. The first pyramid of biomass corresponds to a terrestrial ecosystem. Second pyramid refers to a small standing crop of phytoplankton supporting a large standing crop of zooplankton/aquatic ecosystem.



200,000J of sunlight **(1+2)**

14.

a) Centrifugation in a CsCl density gradient. **1**

b) After 20 mins Hybrid $^{14}N^{15}N$.

After 40 mins 50% hybrid $^{14}N^{15}N$, 50% light $^{14}N^{14}N$ **2**

15. **a)**He could not get desired results because:
i) O_2 was used instead of H_2
ii) Temperature maintained was 80^0c instead of 800^0. **1**

b) It was concluded that life could have come from pre – existing non living organic molecules and their formation was preceded by chemical evolution **1**

c) He observed formation of Amino acids when in a closed flask CH_4, H_2, NH_3 and water vapour were heated at 800^0 C in presence of electric discharge. Analysis of meteorite content also reveals similar compounds indicating that similar process are occurring elsewhere in space / Chemical evolution. Urey & Miller proved that life originated abiogenetically whereas theory of spontaneous generation emphasized that units of life called spores were transferred to different planets including Earth. **1**

16.

a) A is the floating cover which is placed over the slurry, which keeps on rising as the gas is produced in the tank due to the microbial activity.

b) B is the biogas which is a mixture of gases consisting of methane, hydrogen sulphide and carbon dioxide. It can be used as a source of energy to nearby houses as it is inflammable.

C is the spent slurry or sludge which is removed through another outlet and may be used as fertiliser.

(1+2 =3)

17. Biofortification / Breeding crops with higher levels of vitamins and minerals, or higher protein and healthier fats **½**

Breeding for improved nutritional quality is improving –

(i) Protein content and quality; (ii) Oil content and quality; (iii) Vitamin content; and (iv) Micronutrient and mineral content.

2

In 2000, maize hybrids that had twice the amount of the amino acids, lysine and tryptophan, compared to existing maize hybrids were developed. /Wheat variety, Atlas 66, having a high protein content, has been used as a donor for improving cultivated wheat. / It has been possible to develop an iron-fortified rice variety containing over five times as much iron as in commonly consumed varieties./ The Indian Agricultural Research Institute, New Delhi has also released several vegetable crops that are rich in vitamins and minerals, e.g., vitamin A enriched carrots, spinach, pumpkin; vitamin C enriched bitter gourd, bathua, mustard, tomato; iron and calcium enriched spinach and bathua; and protein enriched beans – broad lablab, French and garden peas.
(Any one example) **½**

18. Transformation **1**

Griffith experiment

Avery, Macleod and Mc Carty identified the biochemical nature of transforming principle i.e. DNA (brief explanation)

2

19.

- Tobacco in cigarettes contains a large number of chemical substances including nicotine, an alkaloid.
- Nicotine stimulates adrenal gland to release adrenaline and nor-adrenaline into blood circulation, both of which raise blood pressure and increase heart rate.
- Smoking is associated with increased incidence of cancers of lung, urinary bladder, throat and oral cavity.
- It is responsible for bronchitis and emphysema.
- It is associated with increased risk of coronary heart disease, gastric ulcer, etc.
- Smoking increases carbon monoxide (CO) content in blood and reduces the concentration of haem-bound oxygen. This causes oxygen deficiency in the body.

(½ X 6 =3)

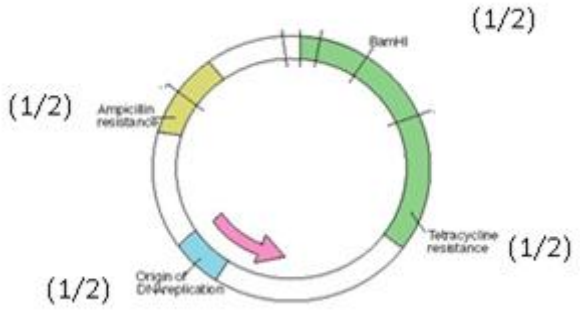
20.

- The technique involves the use of a popularly known bio pesticide Bt toxin produced by bacteria *Bacillus thuriengiensis.*
- Bt toxin protein when ingested by the insect gets converted to its active form due to alkaline pH of the gut.
- The activated toxin binds to the surface of midgut epithelial cells

- It creates pores in these cells that cause swelling and lysis and eventually kills the insect.
- The genes (cry genes) encoding this protein are isolated from the bacterium and incorporated into crop plants like cotton.The proteins encoded by these cry genes control the pest.
- Specifically, cry I Ac and cry II Ab control cotton bollworm (*Helicoverpa armigera)*, an insect belonging to Lepidoptera which earlier used to destroy the whole crop. **(½x 6 = 3)**

OR

a)



b) Origin of replication is responsible for controlling the copy number of the DNA sequence inserted.

1

21.

a) 5' ATGGGGCTC 3' sense

3' TACCCCGAG 5' antisense

RNA 5'AUGGGGCUC 3' sense

3'UACCCCGAG 5' antisense **2**

b) The two strands of RNA (i.e. sense and antisense) being complementary will bind with each other and form double stranded RNA as a result its translation and protein expression would be inhibited.

1

22.

a) He would have loaded the samples near end A; in the wells.
b) The DNA fragments separate (resolve) according to their size through sieving effect provided by the agarose gel. Hence, the smaller the fragment size, the farther it moves.

c) After staining the DNA with ethidium bromide followed by exposure to UV radiations the DNA bands appear coloured.

(1x3)

Section - D

23.

a) Mohit will give following reasons:

- CNG burns most efficiently, unlike petrol or diesel, in the automobiles and very little of it is left unburnt.

- CNG is cheaper than petrol or diesel , cannot be siphoned off by thieves and adulterated like petrol/ Diesel.
(Any one)

b) Mohit shows: concern towards environment, awareness towards sustainable development.

(Any two)

c) Phasing out of old vehicles, use of unleaded petrol, use of low sulphur petrol/ diesel, use of catalytic converters in vehicles and application of stringent pollution level norms for vehicles.
(Any two)

(1+1+2)

24.

Oogenesis is initiated during embryonic development stage when a couple of million gamete mother cells (oogonia) are formed within each foetal ovary; No more oogonia are formed and added after birth. A large number of these follicles degenerate from birth to puberty. Therefore at puberty only 60,000 to 80,000 primary follicles are left in each ovary. **1**

Menstrual cycle ceases after around 50 years of age and after this female is no more fertile as cannot do ovulation whereas in males at puberty, spermatogonia multiply by mitosis and increase in numbers, some of which periodically undergo meiosis throughout the life. **1**

Similarities:

- **Both processes result in the formation of haploid gametes**
- **Both processes involve mitosis, growth and meiosis**

Differences:

	Spermatogenesis	**Oogenesis**
Location	Testis	Ovary
Number of gametes produced	Life long production (millions)	Fixed amount (only ~ 400 mature)
Gametes per germ cell	Four	One
Beginning of process	Begins at puberty	Begins during fetal development
Timing of gamete formation	Continuous (any time)	Once a month (menstrual cycle)
End of process	Fertility is life long but reduces	Fertility stops at menopause
Timing of gamete release	Any time	Monthly cycle
Meiotic divisions	Uninterrupted	Arrested
Germ line epithelium	Involved in gamete production	Not involved in gamete production

(Any three similarities) **(½x3=1½)**
(Any three differences) **(½x3=1½)**

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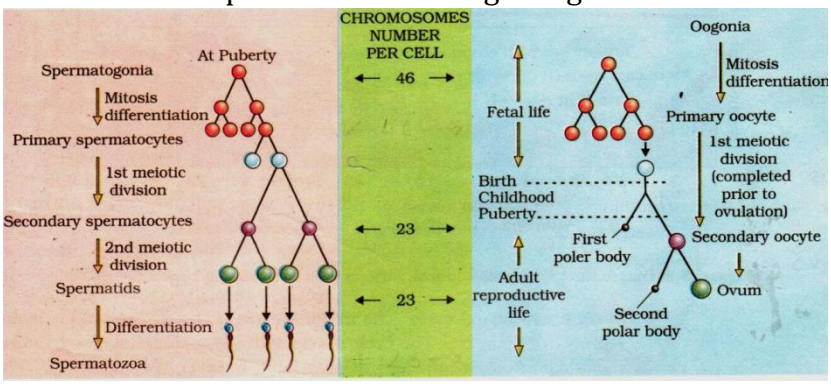
Representation through diagram



OR

a)

	Contraceptive pills	Surgical method
Merits	• Pills are effective with lesser side effects & well accepted by females • Reversible method	• Surgical intervention block gamete transport • Highly effective
demerits	• If not taken on right days	• Not Reversible

	they can promote conception • Can have side effects if taken for a long time	• Can affect health of a person if performed in unhygienic condition

b)

Mode of action of IUDs

i. Increase Phagocytosis of sperms within the uterus.
ii. Cu^{++} released suppress sperm motility / fertility capacity of sperm
iii. Hormone releasing IUDs make uterus unsuitable for implantation /cervix hostile to the sperm.
(Any two) **(3+2)**

25. **a)** Operator region O

b) In presence of an inducer- Lactose.

c) Z-β galactosidase

Y- permease

a-Transacetylase

d) It is called negative regulation as it involves constitutive (all the time) repressor. The operon is always in off position due to presence of repressor and is switched on only in presence of an inducer. Inducer Lactose or allolactose interacts with repressor making it inactive.
(½ +1+1½ +2)

OR

Transcription is more complex in eukaryotes due to following reasons:

a) In prokaryotes only one type of RNA polymerase is involved whereas in eukaryotes three types of RNA polymerases are involved. **1**

b) Description of processing of hnRNA is involved-introns/ exons/ splicing is involved in eukaryotes. **1**

c) Description of capping and tailing **1**

d) Diagram **2**

26. **A.** i) a-$S=CA^2$ **1**

ii) b=log S=log C+ Z log A **1**

Slope-Z(regression coefficient)

iii)Value of Z=1.15(frugivorous birds) **1**

(normal value 0.6to 1.2)

B.

- Animal are mobile- can avoid predator or unfavourable event.
- Well developed Nervous system to receive stimuli against external factors and respond to them

2

OR

a) a and d represents increase of population and b and c represent decrease of population.

b) $N_{t+1} = N_t + [(B+I)- (D + E)]$

c) Here $N_t=30$; I=5; E=7 ;D=6 ; B=8
Putting the value in $N_{t+1} = N_t + [(B+I)- (D + E)]$
$N_{t+1} = 30+ [(8+5)-(6+7)]$
$=30+[13-13]$
$= 30+0=30$ rats

d) Immigration contributes the most.

[1+1+2+1]

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