

Sample Question Paper

Class XII (2015-16)

Biology (044)

Marking Scheme

Section - A

1. a) sex-linked 1/2
b) Haemophilia/ Colour blindness 1/2
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) (1/2 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. (1/2x 2)
5. Down's Syndrome 1

Section - B

6. Pollen has an outer layer called exine which is made of sporopollenin. 1/2
Most resistant organic material known/ withstand high temperature, strong acids and alkali/ no enzyme that degrades sporopollenin so far known.
(Any three) (1/2x3=1 1/2)
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)

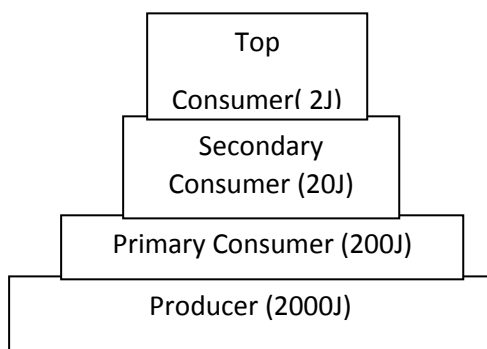
12. After implantation interdigitation of maternal & foetal tissues results in formation of structural and functional unit between embryo & maternal body called placenta.

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 $^{14}\text{N}^{15}\text{N}$.

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

15. a) He could not get desired results because:

- i) O_2 was used instead of H_2
 ii) Temperature maintained was 80°C instead of 800° . 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°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 $\frac{1}{2}$

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)

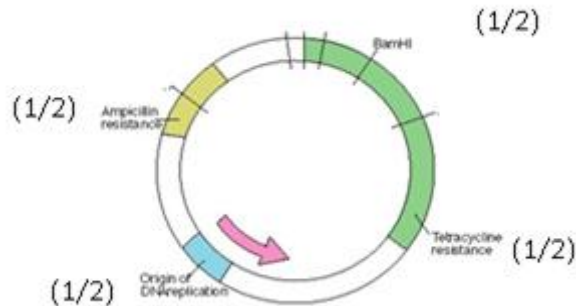
20.

- The technique involves the use of a popularly known bio pesticide Bt toxin produced by bacteria *Bacillus thuriangiensis*.
- 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. (1/2 x 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)

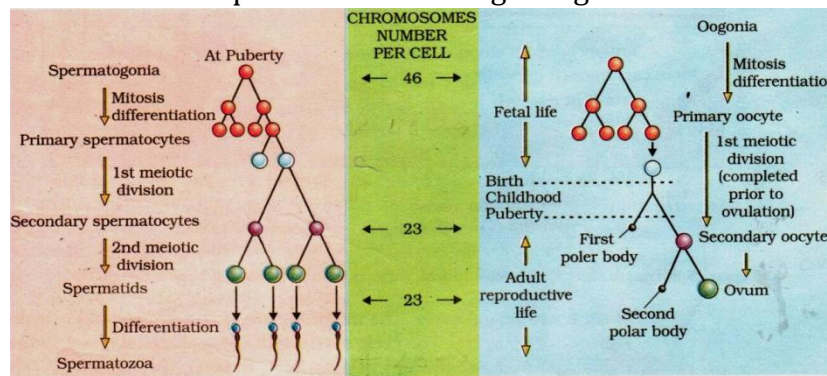
($\frac{1}{2} \times 3 = 1\frac{1}{2}$)

(Any three differences)

($\frac{1}{2} \times 3 = 1\frac{1}{2}$)

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Representation through diagram



OR

a)

| | Contraceptive pills | Surgical method |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Merits | <ul style="list-style-type: none"> • Pills are effective with lesser side effects & well accepted by females • Reversible method | <ul style="list-style-type: none"> • Surgical intervention block gamete transport • Highly effective |
| demerits | <ul style="list-style-type: none"> • If not taken on right days | <ul style="list-style-type: none"> • 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.

($\frac{1}{2} + 1 + 1\frac{1}{2} + 2$)**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 $N_{t+1} = N_t + [(B+I) - (D + E)]$

$$N_{t+1} = 30 + [(8+5) - (6+7)]$$

$$= 30 + [13 - 13]$$

$$= 30 + 0 = 30 \text{ rats}$$

d) Immigration contributes the most.

[1+1+2+1]
