



ST. LAWRENCE HIGH SCHOOL



Pre-Test Examination – 2018

Sub: Biological Science

Class: XII

F. M. 70

Duration: 3hrs 15 mins

Date: 04.08.2018

Answer all the questions

Part A

1. Answer the following questions:- (Alternatives to be noted) (2x5=10)

- i. Mention the cause and one symptom of Down's Syndrome.
- ii. State two important differences between Asexual & Sexual reproduction.

Or

Define the terms Clone & Life span.

- iii. What is parthenocarpy?
- iv. Differentiate between Perigynous & Hypogynous flower.

Or

What is Rete testis?

- v. What causes Sickle cell anemia?

2. Answer the following questions:- (Alternatives to be noted) (3x9=27)

- i. Explain the structure of a typical antibody with the help of a labelled diagram. (3)
- ii. What are hnRNA? How do they get converted to mRNA? (1+2)

Or

What is the scientific name of fruit fly? Write differences between linkage & recombination. (1+2)

- iii. Differentiate between active and passive immunity. What is colostrum? (2+1)
- iv. What are the causes and effects of Phenylketonuria?

Or

Differentiate between aneuploidy & polyploidy. What is Karyotype? (2+1)

- v. What are Pseudodoautosomal genes? Which gene controls the β globin chain, mutation of which causes β thalassemia? (2+1)

- vi. Why does RNA genome carrying organisms evolve faster than that of the DNA genome carrying organism.

Or

What is Nucleosome? State the Central Dogma. (2+1)

vii. Mention the three components of a Transcription Unit?

viii. State the function of the inducer in switching ON & OFF of the lac Operon.

ix. What do you mean by LH surge? What is Menopause? (2+1)

Or

What do you mean by Coitus Interruptus & lactational amenorrhea? (1+2)

3. Answer the following questions: (Alternatives to be noted)

(5x3=15)

i. Describe in brief the following processes of transcription.

a) Splicing b) Capping c) Tailing.

(3+2)

Give two salient features of genetic code.

Or

Why is Apple called a False fruit? What does a Blastocyst contain? Name four hormones secreted by Placenta. (1+2+2)

ii. Differentiate between chasmogamous & cleistogamous flowers. Define Geitonogamy.

What will be the mRNA sequence for the following DNA sequence?

3' AATTCGGTCTCGATTAGC 5'

5' TTAAGCCAGAGCTAATCG 3'

(1+2+2)

Or

Define Convergent & Divergent Evolution with examples. What is Adaptive Radiation? (2+2+1)

iii. Give an account of the Griffith's transformation experiment of bacteria by using Pneumococci. (5)

Or

Why is DNA replication considered to be Semi-conservative in nature? Explain the phenomenon of Incomplete Dominance with a suitable cross. (2+3)

Part B

1. Choose the correct option:-

(1x14=14)

i. _____ is a new breed of sheep developed in Punjab by crossing Bikaneri Ewe & Marino Ram.

a. Red sindhi

b. Sahiwal

c. Deoni

d. Hisardale

ii. Which one of the following organism is not employed by Single Cell Protein?

- a. *Spirulina* sp. b. *Candida lipolytica* c. *Saccharomyces cerevisiae* d. *Bacillus subtilis*

iii. Man is the _____ host in the life cycle of *Plasmodium*

- a. Primary b. Secondary c. Intermediate d. None of these

iv. Cancer cells are characterized by _____.

- a. Uncontrolled growth
b. Spreading to the other body parts
c. Invasion of local tissue
d. All the above

v. "Lock jaw is another name of _____.

- a. Malaria b. Tetanus c. Kala-azar d. Diphtheria

vi. *Homo erectus* is the scientific name of _____.

- a. Java ape man b. Peking man c. Cro-Magnon man d. Neanderthal man

vii. Allopatric Speciation is caused by _____.

- a. Temporal isolation
b. Adaptive radiation
c. Geographic isolation
d. Reproductive isolation

viii. AUG initiation codon occurs over _____.

- a. 5' end of mRNA
b. 3' end of mRNA
c. Long arm of tRNA
d. Short arm of tRNA

ix. Which condition of zygote cell will lead to birth of a normal human female child?

- a. One X chromosome
b. Two X chromosome
c. One Y chromosome
d. One X & one Y chromosome

x. A colour blind man marries a normal carrier woman. What percentage of children is expected to be colourblind?

- a. 75% b. 50% c. 100% d. 25%

xi. A method of Birth control is _____.

a.IUDs

b.STIs

c.ZIFT

d.GIFT

xii.The technique of Gamete Intra Fallopian Transfer(GIFT) is recommended for those females who cannot

a.provide suitable environment for fertilization

b.retain foetus inside uterus

c.produce ovum

d.none of these.

xiii.About which day in a normal menstrual cycle does rapid secretion of LH (LH surge) occurs?

a.5th day

b.11th day

c.14th day

d.20th day

xiv.*Bryophyllum* is multiplied vegetatively by _____.

a.Roots

b.Leaves

c.Stem branch

d.Rhizome

2. Answer the following questions:(Alternatives to be noted) (1x4=4)

i.Which enzyme joins the Okazaki fragments of lagging strand in DNA replication?

Or

Which factor associates transiently with RNA polymerase to initiate Transcription?

ii.What is inbreeding depression?

iii.What is the full form of AIDS?

iv.Give an example of an auto-immune disease.

Or

Define Allergy.



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06.08.18.

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06.08.18.



Solution

Part A

1. Answer the following questions:-(Alternatives to be noted) (2x5=10)

i. **Down's Syndrome:** Cause: Presence of an additional copy of the chromosome number 21
i.e., Trisomy of the 21st chromosome.

Symptoms: The affected individual is short statured with small round head, furrowed tongue & partially open mouth, Palm is short with distinct palm crease, physical, psychomotor & mental development retarded.

ii.

ASEXUAL REPRODUCTION	SEXUAL REPRODUCTION
a. It is a simple process of reproduction generally seen in lower groups of organisms.	a. It is a complex process of reproduction seen in higher groups of plants & animals.
b. It involves one individual.	b. It involves both the male & female individual.
c. Offsprings are identical to their parents.	c. Offsprings generally look different from their parents due to association of new characters.
d. Variation does not take place leading to chances of extinction.	d. Variation takes place giving rise to new characters which help individuals to better adapt to the changing environment.

Or

CLONE: Morphologically & genetically similar organisms are known as clones. The offsprings produced by Asexual reproduction are identical copies of their parent.

LIFE SPAN: The period from birth till natural death of an organism is known as life span. It may vary from minutes to several years. For ex: Life span of May fly is 1 day while that of Banyan tree is 200 years.

iii. **Parthenocarpy:** The process of development of female gametes i.e., ovary to form new organism (seedless fruits) without the process of fertilization is known as parthenocarpy.
Ex-Apple, Banana.

iv.

PERIGYNOUS FLOWER	HYPOGYNOUS FLOWER
a. Thalamus is cup shaped. b. Ovary is located at the centre of the thalamus. c. The other floral parts are present on the margin of the thalamus. Ex: <i>Pisum</i> , Rose.	a. Thalamus is conical. b. Ovary is located at the top of thalamus. c. Floral parts are present below. Ex: <i>Hibiscus rosa-sinensis</i>

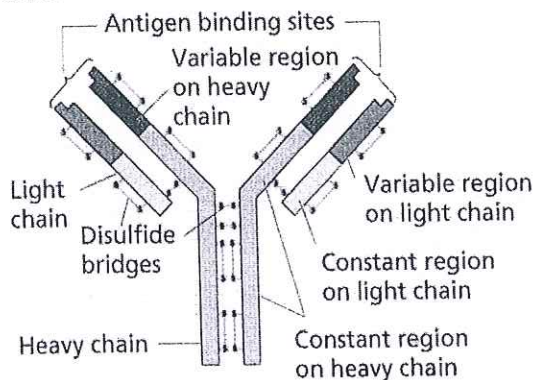
Or

Rete Testis: The seminiferous tubules of each testicular lobules unite to form a straight tubule, which in turn join together in an irregular manner to form a network like structure called rete testis.

v. **Sickle cell anaemia** is an autosomal recessive disorder caused when both the parents are carrier for the gene. The affected individual has a genotype of $Hb^S Hb^S$ carrying sickle shaped RBC instead of biconcave disc shaped ones. It is actually caused due to the substitution of Glutamic acid (Glu) by Valine (Val) at the 6th of the beta globin chain of Haemoglobin molecule.

2. Answer the following questions:-(Alternatives to be noted) (3x9=27)

i. **Structure of Antibody:** Antibodies are proteins which are formed by the influence of Antigens. Generally it has a Y shaped structure. Each antibody molecule has four peptide chains, two small called light chains & two longer called heavy chains represented as H_2L_2 . Each of the heavy and the light chains are connected by disulphide bond. Each polypeptide chains has one amino group ($-NH_2$) at one end and a carboxyl group ($-COOH$) at the other end.



ii. **hnRNA:** This is called the heterogenous nuclear RNA. It is the precursor of mRNA molecule in eukaryotic cells. It is much longer than the mRNA molecule due to the presence of intron and exon sequences.

Introns are the intervening non functional sequences between exons, the latter combine during processing to form the functional mRNA molecule. The introns are excised out by the process of splicing and the exons form the protein coding regions of the mRNA which are joined together to form the functional mRNA.

or

The scientific name of fruit fly is *Drosophila melanogaster*.

LINKAGE	RECOMBINATION
a. The tendency of genes to remain on a chromosome and to be inherited together is called linkage. b. In case of complete linkage only parental combinations tend to get inherited over several generations, while in incomplete linkage only one or two generations inherit the parental genes entirely.	a. The phenomenon of mixing up of genes of non-sister chromatids of homologous chromosomes during meiosis by crossing over is called recombination. b. It leads to the formation of new combination of genes revealing new characters.

iii.

ACTIVE IMMUNITY	PASSIVE IMMUNITY
a. This immunity develops by forming antibodies in the own blood of a person. b. Active immunity is slow & takes time to give its full response. Ex: Vaccination	a. This immunity is formed in one's body by direct supply of prepared antibodies from others blood. b. Passive immunity responds faster and effectively. Ex: Foetus receiving antibodies from mother through placenta.

Colostrum: The yellowish fluid secreted by mother's mammary glands during the initial days of lactation which contains abundant antibodies (IgA) to protect the new born baby. Colostrum is rich in protein but has low fat content.

iv. Phenylketonuria: Causes: It is an autosomal recessive disorder caused due to inborn error in metabolism. The affected individual lacks the enzyme which converts Phenylalanine to Tyrosine as a result of which the former accumulates & gets converted into Phenylpyruvic Acid.

Effects: Phenylpyruvic acid accumulates in the brain & resulting in mental retardation & are also excreted through urine due to poor absorption by kidney.

or

ANEUPLOIDY	POLYPLOIDY
a. Loss or gain of one or two chromosomes is called aneuploidy. b. Failure of segregation of chromatids during anaphase of cell division results in aneuploidy.	a. Increase in a full set of chromosomes in an organism is called polyploidy. b. Failure of cytokinesis leads to polyploidy.

Karyotype is the process of pairing and ordering all the chromosomes of an organism according to decrease in size of the autosomes while the allosomes remain at the end, thus providing a genome-wide snapshot of an individual's chromosomes

v. Pseudoautosomal genes: These comprise a set of genes present in homologous portions of both X & Y chromosomes.

Mutation of β globin gene causes β thalassemia.

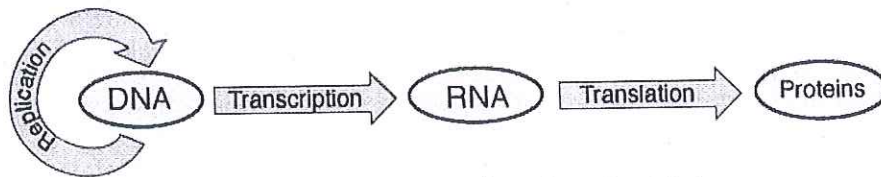
vi. Both DNA and RNA are able to mutate. In fact, RNA being unstable mutates at a faster rate compared to DNA. Consequently, viruses carrying RNA as the genome and having shorter life spans, mutate at a faster rate & as a result evolve faster.

Or

The negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called nucleosome. A typical nucleosome contains 200 bp of DNA helix. Histones are organised to form a unit of eight molecules called as histone octamer.

Nucleosomes constitute the repeating unit of a structure in nucleus called chromatin, thread-like stained (coloured) bodies seen in nucleus. The nucleosomes in chromatin are seen as 'beads-on-string' structure when viewed under electron microscope (EM).

Central dogma: Francis Crick proposed the Central dogma in molecular biology which states that the genetic information flows from DNA \longrightarrow RNA \longrightarrow PROTEIN.



Central dogma of molecular biology

vii. **Components of transcription unit:** i. Promoter sequence: present in the upstream of the transcription unit which interacts with the RNA polymerase. ii. Structural gene: The sequence which is to be transcribed. iii. Terminator site: The sequence which acts as a stop signal which is usually a GC rich sequence & the factor which promotes termination is rho factor which recognizes this sequence.

viii. **Function of inducer in lac operon:** **Lactose** acts as the inducer in lac operon. In its presence, the repressor molecule formed from the lac I gene, preferably binds to the inducer rather than binding to the operator site. Thus the RNA polymerase can easily bind to the promoter site and transcription of structural genes can take place forming β galactosidase, permease & transacetylase. Then the operon is considered to be ON.

When there is no lactose present, the repressor binds the lac O site blocking the promoter site and preventing the polymerase to get access and thus there is no transcription of the lac Z, lac Y, lac A genes. Then the operon is considered to be OFF.

ix. **LH Surge:** Rapid secretion of Luteinizing Hormone (LH) leading to its maximum level during the mid-cycle is called LH surge which induces rupture of Graafian follicle and thereby the release of ovum (ovulation). LH attains its peak level during this time (14th day) of

the menstrual cycle. The changes in the ovary and the uterus are induced by changes in the levels of pituitary and ovarian hormones.

Menopause: With advancing age certain irregularities in sexual life of a woman occur which cause permanent disappearance or cessation of menstrual cycle. This condition is called menopause.

Or

Coitus Interruptus: The method in which the male partner withdraws his penis from the vagina of the female partner just before ejaculation of the semen so as to avoid insemination and thus preventing fertilization and possible conception.

Lactational amenorrhea (absence of menstruation) method is based on the fact that ovulation and therefore the cycle do not occur during the period of intense lactation following parturition. Therefore as long as the mother breast-feeds the child fully, chances of conception are almost nil.

3. Answer the following questions: (Alternatives to be noted) (5x3=15)

i.a) Splicing- In molecular biology, **splicing** is the editing of a newly made precursor messenger RNA (pre-mRNA) transcript into a mature messenger RNA (mRNA). After splicing, introns are removed and exons are joined together. For nuclear-encoded genes, splicing takes place within the nucleus either during or immediately after transcription. For those eukaryotic genes that contain introns, splicing is usually required in order to create an mRNA molecule that can be translated into protein.

b) Capping- Heterogenous nuclear RNA undergoes two additional processing called as capping and tailing. In capping an unusual nucleotide (methyl guanosine triphosphate) is added to the 5'-end of hnRNA.

c) Tailing- In tailing adenylate residues (200-300) are added at the 3'-end in a template independent manner forming a poly A tail. It is the fully processed hnRNA, now called mRNA that is transported out of the nucleus for translation.

Two salient features of genetic code: i. Codon is triplet in nature-three nucleotides together constitute one codon formed of any three of the four bases A, G, C & U.

ii. Genetic codon is degenerate i.e., one amino acid may be specified by more than one codon.

iii. Codon is commaless.

or

In apple, the thalamus also contributes to fruit formation. Such fruits are called false fruits while other fruits develop only from ovary.

The blastomeres in the blastocyst are arranged into an outer layer called trophoblast and an inner group of cells attached to trophoblast called the Inner cell mass. The trophoblast layer then gets attached to the endometrium and the inner cell mass gets differentiated as the embryo. After attachment the uterine cells divide rapidly and covers the blastocyst.

Four hormones secreted by Placenta-Human chorionic gonadotrophin(hCG),human placental lactogen (hPL),estrogen, progesterone.

ii.

CHASMOGAMOUS FLOWER	CLEISTOGAMOUS FLOWER
a. chasmogamous flowers which are similar to flowers of other species with exposed anthers and stigma.	a. cleistogamous flowers which do not open at all.In such flowers, the anthers and stigma lie close to each other.

Geitonogamy: When self pollination takes place between two flowers of the same plant ,the phenomenon is called Geitonogamy.

mRNA sequence- 5'UUAAGCCAGAGCUAA^UCG 3'

Or

Convergent Evolution:It is the independent evolution of similar features in species of different lineages.It creates analogous structures that have similar form or function .

Divergent Evolution:It is the accumulation of differences of closely related species .It is exhibited when two populations become separated by a geographic barrier.

Adaptive Radiation:It is an evolutionary divergence of members of a single line of descent into a series of different niche or adaptive zones.

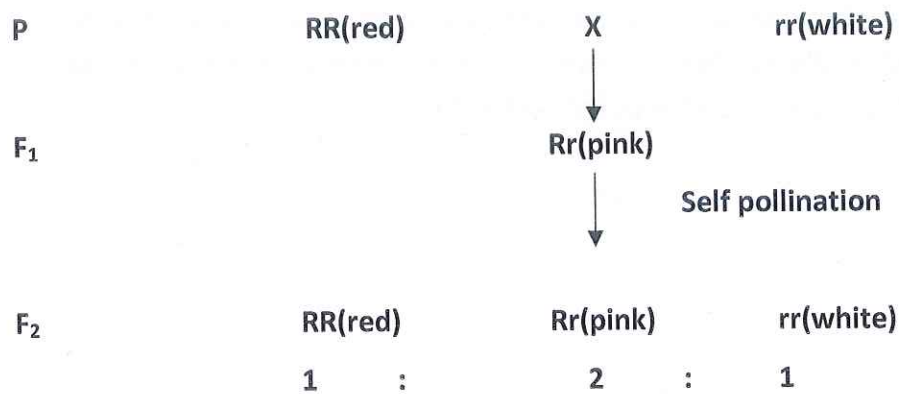
iii.Griffith's transformation experiment: Griffith inoculated some mice with heat-killed S pneumococci. These heat-killed bacteria did not produce infection. However, when Griffith inoculated other mice with a mixture of living R bacteria and heat-killed S bacteria, to his astonishment, the mice died of pneumonia.When he examined blood from the hearts of these mice, he found it full of living bacteria—many of them with characteristics of the virulent S strain. Griffith concluded that, in the presence of the dead S pneumococci, some of the living R pneumococci had been transformed into virulent S-strain organisms. Some substance— called at the time a chemical transforming principle—from the dead S pneumococci could cause a heritable change in the affected R cells.

Or

DNA replication is considered to be semi-conservative because each DNA double helix that is formed as a result of replication, contains one parental DNA strand and one new strand.

Incomplete Dominance: Individuals with contrasting features when produce some intermediate phenotype, the phenomenon is called incomplete dominance.

In evening primrose, *Mirabilis jalapa*, when a plant bearing white flowers is crossed with that bearing red flowers, the progeny plant bears pink flowers. When the progeny plants are crossed among themselves, in the F₂ generation there is formation of 1 red, 2 pink & 1 white flower bearing plants. So here the heterozygous condition reveals an altogether new phenotype where the so called dominant allele cannot show its full dominance over the recessive allele.



Part B

1. Choose the correct option:-

(1x14=14)

- i. d. Hisardale
- ii. d. *Bacillus subtilis*
- iii. b. Secondary or c. Intermediate
- iv. d. All the above
- v. b. Tetanus
- vi. a. Java ape man
- vii. c. Geographic isolation
- viii. a. 5' end of mRNA
- ix. b. Two X chromosome
- x. b. 50%
- xi. a. IUDs
- xii. c. produce ovum
- xiii. c. 14th day
- xiv. b. Leaves

2. Answer the following questions:(Alternatives to be noted)

(1x4=4)

i. DNA ligase joins the Okazaki fragments of lagging strand in DNA replication.

Or

σ (sigma) factor associates transiently with RNA polymerase to initiate Transcription.

ii. Inbreeding depression: Inbreeding refers to the mating of more closely related individuals within the same breed for 4-6 generations. Inbreeding exposes harmful recessive genes that are eliminated by selection. Continued inbreeding, especially close inbreeding, usually reduces fertility and even productivity. This is called inbreeding depression.

iii. Full form of AIDS is Acquired Immuno Deficiency Syndrome.

iv. Rheumatoid arthritis, Multiple Sclerosis, Myasthenia Gravis are examples of auto-immune disease.

or

Allergy : The exaggerated response of the immune system to certain antigens present in the environment is called allergy. The substances to which such an immune response is produced are called allergens for example-pollen, mites etc.
