



GuruAanklan

**Grand
Test**

**HSC EXAMINATION SET - A
HINT & SOLUTION
BIOLOGY**

M.Marks : 70

Duration : 3 Hrs

SECTION-I (BOTANY)

Q.1. Select and write the most appropriate answer from the given alternatives for each sub question given below: (7)

- 1) In albuminous seeds the endosperm present is
Ans (b) Present in the form of perisperm
- 2) Guano deposits are given by
Ans (c) Marine birds
- 3) _____ is a segment of D.N.A that participates in recombination through crossing over during meiosis.
Ans (b) Recon
- 4) The disease free variety of wheat is
Ans (d) Himgri
- 5) Papaya is an example of
Ans (a) Xenogamy
- 6) In Michelia, self pollination is avoided by
Ans (a) Protogyny
- 7) The spatial patterns in an ecosystem determined by the height of the organism is
Ans (a) Zonation

Q2. A. Answer in one sentence

- 1) What is the name of the microbe used in the wine industry
Ans : Some of the species of yeast like *saccharomyces cerevisiae* are used in wine industry

2) What is the meaning of pure line

Ans : An individual or a group of individuals that is homozygous or true breeding for one or more traits is called pure line.

3) What is cryptogram

Ans : Each triplet codon on mRNA codes for specific amino acid; which is called as genetic code or cryptogram.

4) What is epihdrophily

Ans : When pollination occurs on the surface of water, it is called epihydrophily e.g. Vallisneria.

5) What is leaching

Ans : Water soluble inorganic nutrients go down into the soil horizon get precipitated as salt this process is called leaching

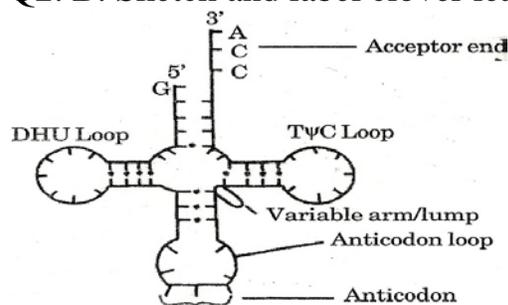
6) What is VAM

Ans : Vesicular Arbuscular Mycorrhiza is a type of Endomycorrhiza called as VAM.

7) What is cellular totipotency ?

Ans : The ability of a single plant cell to divide and differentiate into a mature plant is called cellular totipotency

Q2. B. Sketch and label clover leaf label of t- R.N.A.



(Marking scheme : ½ mark for sketching,
1½ marks for labeling – 3 labels)

Q.2. C. Answer any two of the following :

1) Explain in brief the role of ozone

Ans :-

a) Ozone, in troposphere is harmful for living organism so it is called 'bad' ozone.

b) The good ozone is present in stratosphere (upper part of atmosphere)

- c) The ultra violet rays from the sun breaks chemical bonds within the molecular DNA and proteins, therefore they are harmful to living organisms.
- d) These rays also cause damage to the skin and eyes (i.e. cornea)
- e) The ozone present in stratosphere absorbs these UV rays thus protecting the organisms present on earth.

b) Explain the significance of polar nuclei

Ans :-

- 1) The polar nuclei lie in the centre of the embryo sac fuse to form 2 nucleated single cell (before fertilisation).
- 2) Later they fuse with second male gamete and form primary endosperm nucleus (3n) which is also called as PEN
- 3) The PEN develops into endosperm. Simultaneously zygote also develop into embryo.
- 4) The function of the endosperm is to nourish developing embryo.

c) Explain how photo respiration is avoided in C₄ plants

Ans :- At high temperature and low CO₂ concentration RUBP carboxylase (i.e. RUBISCO) functions as oxygenase.

- 1) It brings about oxidation of RUBP instead of carboxylation. This is called photo respiration.
- 2) To avoid this problem in C₄ plant which grows in extreme condition PEP carboxylase fixes CO₂ at low CO₂ concentration in the mesophyll cell.
- 3) Inside the bundle sheath cell where CO₂ concentration is more RUBISCO function as carboxylase and thus photo respiration is avoided.

Q3. A. Answer in one sentence

a) State and explain Mendel's second law of Inheritance

Ans : Second law of inheritance is also called as law of Segregation.

Statement : Members of allelic pair in a hybrid remain together without mixing with each other and separate or segregate during gamete formation. Thus gametes receive only one of the two factor which is pure for the given trait. Therefore this is also known as Law of purity of Gametes.

Explanation : This law can be explained with the help of mono hybrid cross experiment.

Phenotypic parents :

F₂ generation

	T	t	
T	TT (tall)	Tt (tall)	
t	Tt (tall)	tt (dwarf)	
Phenotypic Ratio	tall 2	dwarf 1	dwarf
Genotypic Ratio	TT 1	Tt 2	tt 1
	tall	tall	Dwarf

The appearance of dwarf character (recessive) in F₂ generation proves law of segregation or law of purity of gametes.

b) Give the characters of Genetic code

Ans :

- 1) The code is non over-lapping i.e. Each letter is read only once.
- 2) The code is commales, there are no gaps or demarcating signals between codons.
- 3) The code has polarity. The code must be read between fixed start and end point (initiation and termination codon). The code must be read in fixed direction.
- 4) It is non-ambiguous each codon will specify a particular amino acid. Same codon shall never code for two different amino acid.
- 5) the genetic code generates as 61 codons are available for 20 amino acids, two or more codons are can specify the same amino acid. Hence it is said to be degenerate.
- 6) The genetic code is universal i.e code being the same for different Organisms.
- 7) Wobble (pair loosely) phenomenon : This phenomenon says only the first two positions of triplet codon on m-RNA have precise pairing with the base on t-RNA anti codon. The pairing of 3rd position bases of codon may be ambiguous.

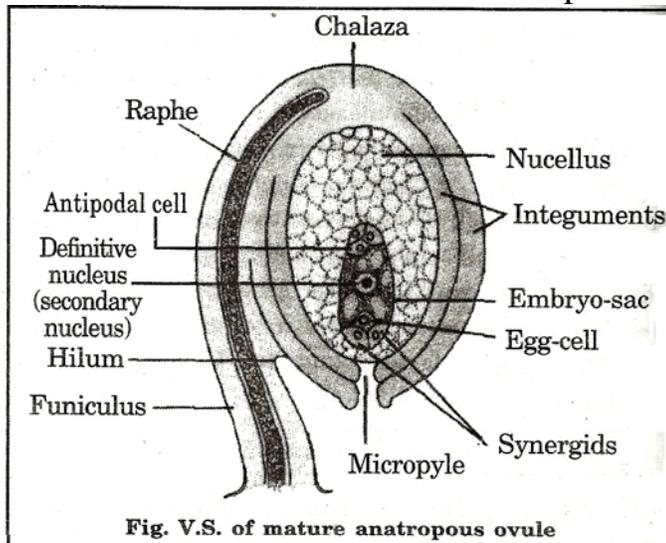
c) Write a note on Cyanobaeterial Fertilisers

Ans :

- 1) Cyanobaeterial means blue green algae. They are widely distributed in aquatic and terrestrial environment.
- 2) These blue green (BGA) have some specialised and colourless cells, called heterocysts which are the sites of nitrogen fixation.
- 3) Some species of anabaena are symbiotic (*Anabaena azollae*)
- 4) *Azolla* is an aquatic fern. It propagates negatively and spreads in rice field rapidly.
- 5) *Anabaena* and *Nostoc* are commonly used bio-fertilisers for rice.
- 6) *Anabaena* filaments multiply inside the air spaces of dorsal lobes of leaves of *Azolla*.
- 7) When the plant dies off, the whole nutrients mix with soil which is now available for new paddy field.
- 8) They increase the yield of the rice by 15-30%
- 9) Along with nitrates they also release vitamin B₁₂, vitamin C, auxins which help in growth of the plant.

Q3. B

Sketch and label v.s. of mature anatropous ovule



(Marking scheme : 1 mark for diagram,
2 marks for 4 correct lables)

Q4. Give brief account of replication of bacetriophage

Ans : Replication of bacetriophage has the following five stages

a) Attachment : b) Penetration c) Synthesis d) Matuartion e) Release

a) Attachment : Bacteriophage attach to specific receptors on the surface of the bacteria. The basal plate of bacteriophage attaches on the rigid bacterial wall in lock and key manner very firmly.

b) Penetration : Viral enzyme digests the part of bacterial wall and only viral DNA is injected in to the bacterial cell leaving remaining part of phage i.e. Capsid and tail which is empty outside as ghost.

c) Synthesis : Synthesis of viral components begins only after it brings out inactivation of host genes not necessary to viral replication and within minutes bacterial ribosomes start translating viral mRNA into protein. The viral DNA takes over the entire metabolic machinery of the host cell. The bacterium then produces multiple copies of viral DNA and capsid.

d) Matuartion : Several copies of viral DNA along with capsid occupy the entire space, now ready to release out.

e) Release : Endolysin an ezyme coded by viral gene is produced by the viral cell which help in breaking of bacterial cell. The newly produced bacterio phages are now freed in surrounding. The bacterial cell dies as a result.

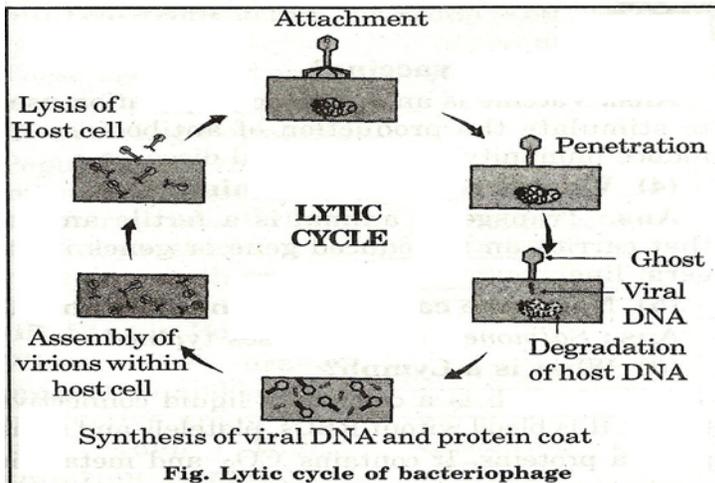


Fig. Lytic cycle of bacteriophage

(Marking scheme : Explanation of 5 steps – 5 marks, 2 marks (½ + 1 ½) for diagram with 3 correct labels)

Describe non-cyclic photophosphorylation with diagrammatic Representation.

Ans : The process of ATP synthesis from ADP and ip during non-cyclic transfer of electrons in presence of light is called non-cyclic photophosphorylation.

- A) It takes place in grana of chloroplast.
- B) It involves both pigment system i.e. PS I and PS II.
- C) There is synthesis of ATP and NADPH_2 i.e. assimilatory power and reducing power.
- D) There is photolysis of water and release of oxygen.

It is completed in following steps :

- (1) The chlorophyll a_{700} PS I i.e. P_{700} absorbs light energy and gets excited.
- (2) P_{700} after emitting electron gets ionised and becomes unstable (+vely charged)
- (3) The energy rich electrons are first accepted by FRS (Ferridoxin reducing substance) and then ferridoxin (Fd) and finally accepted by NADP.
- (4) After acceptance of electron. NADP get ionised i.e. NADP^-
- (5) The Chl a_{680} PS II absorb light and gets excited and becomes unstable Chl a^{+680}
- (6) The energy rich electrons are first accepted by Plastoquinone (PQ) then transferred to Cyt 13_6 .
- 7) From Cyt b_6 the electrons are transferred to Cyt-f. During this transfer, electron loose energy which is used in synthesis of ATP.
- 8) Cyt-f passes electrons to plastocyanin and then to ionised PSI (P_{700}).
- 9) The Chl- a_{700} or P_{700} of PS I comes back to ground state and Again takes part in the process.
- 10) The water, meanwhile splits into protons ($1-1^+$) and hydroxyl ions (OH^-)



- 11) The H⁺ i.e. proton are accepted by ionised NADP⁻ and get reduced to NADPH₂.
- 12) The hydroxyl ions donates the electrons to PS II and becomes neutral (OH radicles).
- 13) 2OH react to form water with evolution of oxygen gas.

$$2\text{OH} \rightarrow 2\text{e}^- + 2\text{OH}$$

$$2\text{OH} \rightarrow \text{H}_2\text{O} + \frac{1}{2}\text{O}_2 \uparrow$$
- 14) Thus ionized Chl-a of PS II is brought back to its ground state with the help of electrons from photolysis of water.
- 15) Therefore the electron emitted from PS II does not return to Chl a₆₈₀ . Hence its movement is unidirectional and non cyclic.

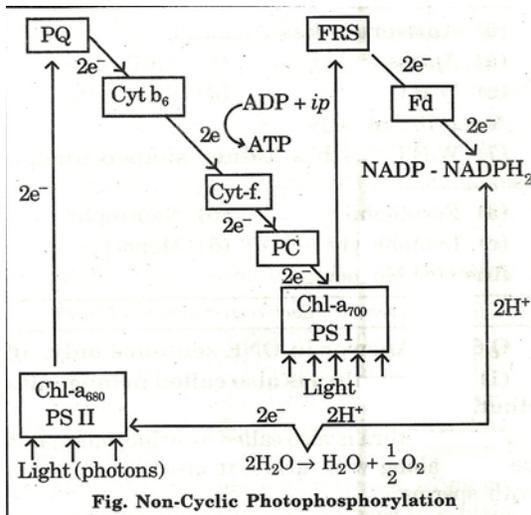


Fig. Non-Cyclic Photophosphorylation

(Marking scheme - 10 correct sequential steps - 5 marks,
Diagram with 3 labels - 2 marks)

SECTION II (ZOOLOGY)

Q5. Select and write the most appropriate answer from the given alternatives for each sub question given below: (7)

1) Passive immunity is obtained by injecting

Ans.: (b) antibodies

2) Failure of descending testes into the scrotum is known as

Ans.: (a) Cryptorchidism

3) Which of the following is not X – linked disorder

Ans.: (d) Hypertrichosis

4) Key factor of D.N.A. profiling is

Ans.: (c) VNTR

5) Bird flu is caused by

Ans.: (d) Virus

6) Anti serum has

Ans.: (b) Antibody

7) W.B.C. with a kidney shaped nucleus is

Ans.: (d) Monocyte

Q5. A. Answer in one sentence

1) Why urethra is also called urogenital duct.

Ans.: Urethra is also called as urinogenital duct_ because along with urine, it also carries semen with sperms.

2) What was the cranial capacity of cro-magnan man.

Ans.: The cranial capacity of Cro-magnon man was 1600 c.c.

3) **What is vaccine.**

Ans : Vaccine is an antigenic preparation used to stimulate the production of antibodies and induce immunity against several diseases.

4) What are transgenic animals.

Ans.: Transgenic animal is a fertile animal that carries an introduced gene or genes in its germ line.

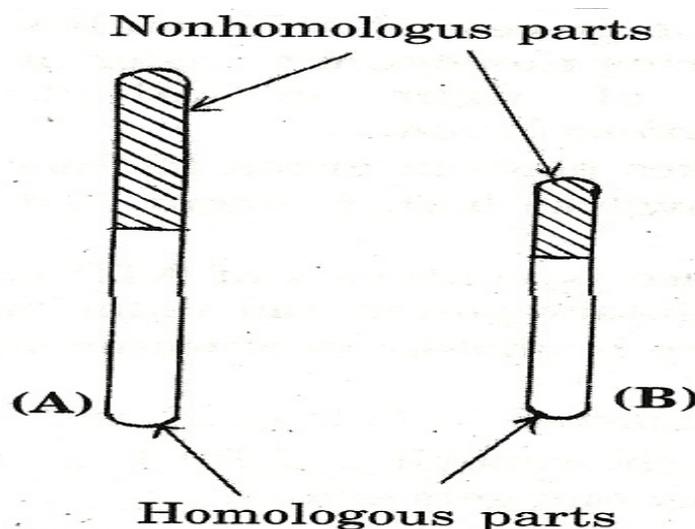
5) Name the causative agent of typhoid.

Ans.: *Salmonella typhi* causes typhoid.

6) What is lymph

Ans.: Lymph is a colourless liquid connective tissue. It is Blood without RBCs, platelets and some plasma proteins. It contains CO₂ and metabolic waste.

Q6. B. Sketch and label X & Y chromosomes to show non homologous parts of them.



**Fig. Sex Chromosomes - (A) : X - chromosome
(B) : Y - chromosome**

*(Marking scheme : ½ mark for sketching,
1½ marks for 3 correct labeling – 3 labels)*

Q.6. C. Answer any two of the following :

a) What is age structure? Explain

Ans.: *Age structure* : The relative **proportion** of individuals of various age groups in **the** population is called *age structure* of population..

Population is divided into **3** age groups :

- 1) Pre reproductive age group — 0 to 14 years
- 2) Reproductive age group — 15 to 59 years

3) Post reproductive age group — 50 years and above

These age groups are distributed to determine the trend of the population

- a) Growing Population : Population having larger number of individuals of the pre-productive age groups shows a very rapid growth rate.
- b) Steady Population : When post reproductive and pre-reproductive group is same then the population remains steady
- c) Declining Population : Larger number of post reproductive and smaller number of pre-reproductive make population decline

b) Give the functions of cerebral hemispheres

Ans.: Functions of cerebral hemisphere :

- 1) Cerebral hemisphere is concern with intelligence, memory and Judgement
- 2) Perception of sensation of pain, temperature, touch, sight, hearing, taste, smell.
- 3) It controls all voluntary activities of the y.
- 4) It is the centre for micturation, defecation, weeping, laughing, etc.
- 5) It responses to heat, cold, light and pressure.

c) What is the result of hybridization with respect to D.N.A finger printing.

Ans.: (i) DNA fragmentation results in formation of bands.

- 2) During hybridization these bands are flooded with single stranded radio active DNA probe.
- 3) Due to natural affinity, sample DNA and probe DNA form double stranded DNA.
- 4) These double stranded DNA structure remain embeded in nylon membrane and remaining single stranded DNA probe fragment are washed off. This is the result of Hybridization.

Q7. A. Answer any TWO of the following :

a) What is air pollution? Mention hazards of air pollution.

Ans.: Undesirable changes in physical, chemicals and biological characteristics of air which is harmful to plants, animals and mankind is known as air pollution.

Various hazards of air pollution are -

- 1) High concentration of SO₂ causes burning and watering of eyes.
- 2) It can irritate respiratory system.
- 3) Exposure to H₂S results in leaf lertion, defoliation and reduced growth. To man it causes headache, nausea conjunctivitis, calic diarrhea, bronchal pneumonia, coma.
- 4) Carbon monoxide and nitrogen oxide gel dissolved in tissue water and diffuses into blood stream on reaching blood, they combine with haemoglobin and reduce the ability of blood to carry O₂.

b) What is filariasis? Explain signs and symptoms

Ans.: Filariasis is an infections tropical parasitic disease caused by thread like filarial nematode.

Signs and symptoms :

- 1) It shows edema with thickening of skin and underlaying tissue.
- 2) Lymphatic filaria or elephantiasis results when the parasite reaches the lymphatic system.
- 3) It affects legs, arms, vulva, breast, and scrotum.
- 4) Different species of filaria affect different parts

c) Explain the characteristics of Propliopithecus, Drypithecus and Ramapithecus.

Ans.: (a) **Propliopithecus**

- 1) It is ape like primate lived in Oligocene epoch about 30 million years ago.
- 2) Fossil obtained from Fayum deposits of Egypt represented by fossil jaw and teeth.
- 3) Incisors were vertical like ape.
- 4) Might be ancestor of apes and man

(b) Dryopithecus :

- 1) It is ape fossil lived in miocene epoch about 25 million years ago.
- 2) Legs and heels indicate semi erect posture.

(c) Ramapithecus :

- 1) It lived during late miocene and early pliocene epoch about 12 to 14 million years ago.
- 2) They walked erect on their hind limbs.
- 3) It shows direct line of human evolution
- 4)

Q7. B Sketch and label the diagram illustrating formation of urine

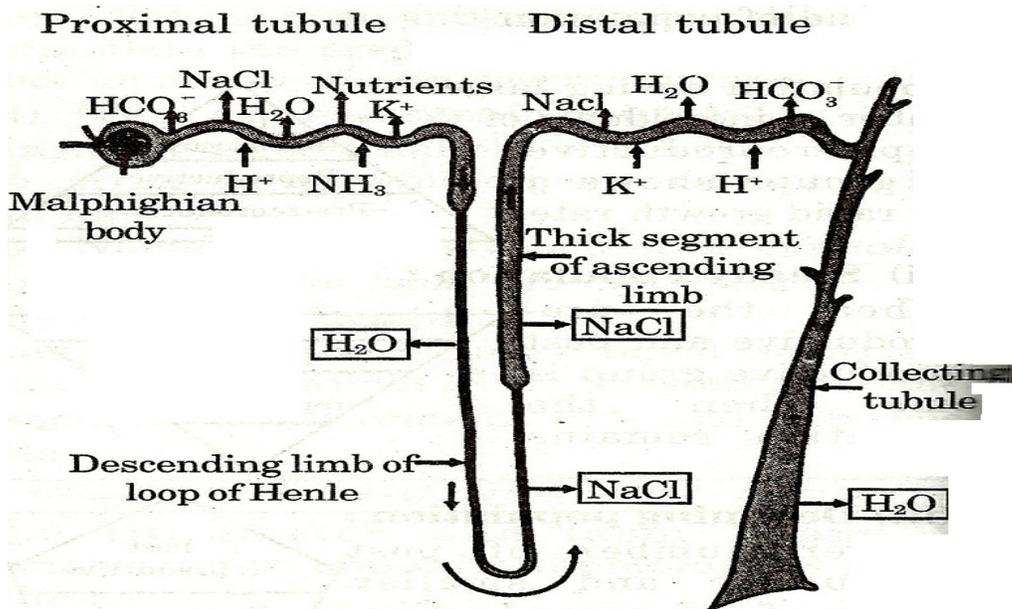


Fig. Formation of urine

(Marking scheme : 1 mark for sketching the diagram, 2 marks for any 4 - correct labels)

Q.8. Define reflex action. Explain the mechanism of reflex action and give the types of reflex actions with significance.

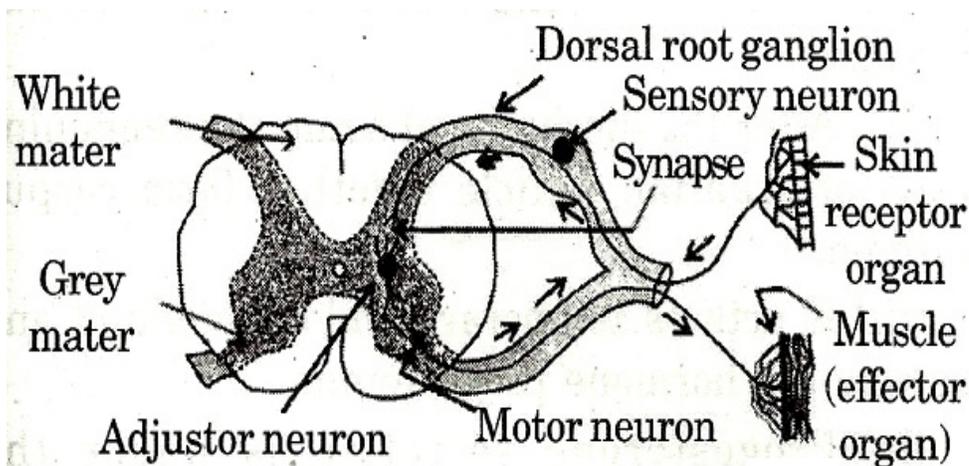


Fig. Reflex action

Ans.: Reflex action : 'A quick, automat involuntary and often unconscious action brought about when the receptors are stimulated external or internal stimuli is called reflex actin

e.g. Hammering by hand at the site of mosquito bite.

The structural and functional unit of reflex action is Reflex arc. It is a unidirectional path followed by impulse. It originates in receptor organ and ends in effector organ. Reflex arc consists of following components.

- 1) **Receptor organs** : These are various sense organs that receive stimulus and convert it in impulses.
- 2) **Sensory or afferent neuron** : It can sense a nerve impulse from receptor to central nervous system. Its cyton is located in the dor root ganglion. Its dendron is long and connects to receptor while axon enters the grey matter spinal cord to form synapse
- 3) **Association neuron** : It is present in grey matter of spinal cord. It receives the senses impulse, interprets it and generates motor impulse.
- 4) **Motor neuron** : Its cyton is present in the ventral horn of grey matter and axon travels through ventral root. It conducts motor impulse from spinal cord to effector organ.
- 5) **Effector organ** : It is a special part of the body which is excited by receiving the motor impulse. It gives proper response to the stimulus.
e.g. Muscles and glands.

Mechanism of Reflex action :

Reflex action is completed with series of events. For e.g. Immediate withdrawal of hand after pricking of needle.

- (1) Pricking of needle stimulates skin receptor by receiving the stimulus.
- (2) Sensory impulse thus formed is carried by dendrites in the skin.
- (3) Impulse is passed on to the association neuron by axon of sensory neuron.
- (4) When impulse reaches the end of the axon there is a synapse.
- (5) Synaptic transmission is chemical, end of axon releases neurotransmitter substance acetylcholine .It fills the gap temporarily and brings about chemical transmission from axon of one neuron to the dendron of other neuron. Once the impulse passes to the dendrites of association neuron, axon releases an enzyme acetylcholimesterase which neutralizes acetylcholine and the synaptic gap is formed again. This helps in avoiding mixing of different impulses as the gap is ready to receive next impulse.

- 6) Association neurone receives sensory impulse interprets and analyses it and generates motor impulse.
- 7) Motor impulse then passes through synapse between association neuron and motor neuron.
- 8) Impulse travels through motor neuron, motor nerve and reaches the effective organ like skeletal muscle and glands.
- 9) Effective organ then gives response like contraction of muscles or secretion by the gland.

Significance of Reflex action :

- (a) It helps the animal to adjust quickly with changing environment.
- (b) Reflexes have survival value as it protects from danger.
- (c) Most reflexes are controlled by spinal cord without involving brain and hence prevents over loading of the brain.

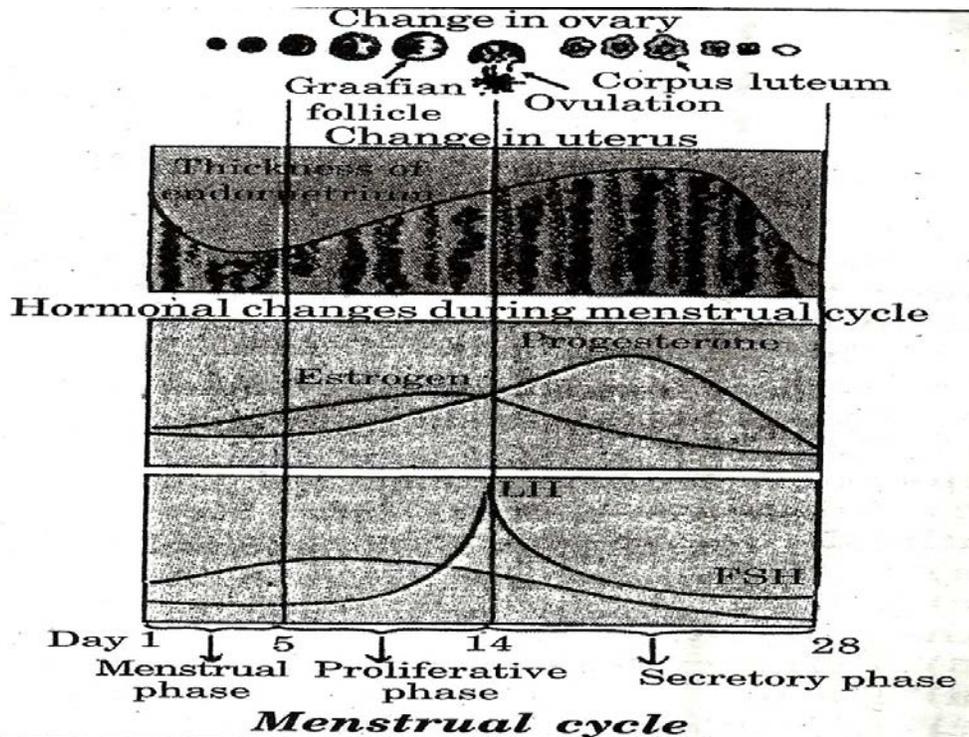
Types of reflex actions : Reflexes are of two types –

- (a) **Unconditioned or Inborn reflexes :** They are inborn and are permanent, never disappear and need no previous experience.
Blinking of eyes with strong light, breast feeding etc.
- (b) **Conditioned or acquired reflexes :** These are acquired during life by experience. Here individuals require proper training. Long experience and proper training make them perfect. They are non-inherited. They are temporary and disappear. **e.g.** Cycling, driving, playing water polo etc.

OR

Q.8 What is menstrual cycle and Explain the various phases of it.

Ans.: Menstrual cycle or Ovarian cycle :



- 1) Menstrual Cycle in human last for 28 days.
- 2) A series of events occur regularly in females after every 26 to 30 days throughout child bearing period of about 32 years.
- 3) During the menstrual cycle simultaneous changes take place in the ovaries and in the uterine wall (endometrium) stimulated by FSH and LH.
- 4) FSH — Promotes maturation of ovarian follicles and secretion of oestrogen leading to ovulation.
- 5) LH— Stimulates the development of corpus luteum and secretion of progesterone.
- 6) It include 4 phases :
 - a) Menstrual phase
 - b) Proliferative or follicular phase
 - c) Ovulatory phase
 - d) Secretory phase.

(1) Menstrual phase

- (i) It is also called Bleeding phase. Lasts from 1st to 4th day of menstrual cycle.
- (ii) When the ovum is not fertilized high level of progesterone inhibits the secretion of LH. Therefore LH level decreases.
- (iii) It leads to decrease in level of progesterone from corpus luteum.
- (iv) After 14th day of ovulation if ovum is not fertilized the lining of the uterus degenerates and menstruation begins and lasts for 4 days.
- (v) Menstrual flow consists of secretions from endometrial glands, cell debris, blood and unfertilized ovum.
- (vi) During this phase 35 to 45 mL of blood is loss.
- (vii) When the amount of progesterone further decreases and stimulates pituitary to secrete FSH and proliferative or follicular phase begins the basal part of endometrium remains intact and is only 1 mm thick.

(2) **Proliferative or follicular phase** : This phase extends from 5th to 13th day.

Changes in ovary :

- (i) Primordial follicle develops into graafian follicle.
- (ii) Many primordial follicles are already present in the ovary.
- (iii) The ovum becomes eccentric and is connected by few follicular cells called as *germ hill* or *cumulus oophorus* or *discus proligerous*.
- (iv) The Granulosa cells lining the antrum form *membrana granulosa* and the follicular cells surrounding the ovum are called *corona radiata*.
- (v) Ovum increases in size. Thick membrane is formed surrounding the outer surface of the ovum is called as zona pellucida.
- (vi) From the stroma of the ovary follicle is covered by 2 layers theca externa and theca interna.
- (vii) **Theca interna** : Vascular and consists of loose connective tissues.
- (viii) These cells become endocrine and secrete female sex hormone estrogen
- (ix) **Theca externa** : is outer layer of the follicle and consists of fibrous connective tissue
- (x) Follicle is now called mature follicle or Graafian follicle.
- (xi) Out of many only one follicle changes into graafian follicle.

Changes in uterus :

- (1) Oestrogen secreted by follicular cells of the ovary stimulate endometrial glands and they repair the endometrium
- (2) Endometrial cells proliferate and the thickness of the endometrium increases from 3 to 5 mm.

(3) Ovulatory phase :

- i) Ovulation is the process in which there is rupture of graffian follicle with discharge of ovum, in the abdominal cavity.
- (ii) It is under the influence of LH.
- (iii) Sudden rise in the level of LH stimulate ovulation which occurs on 14th day.
- (iv) Rupture of Graffian follicle results in oozing out of follicular fluid.
- (v) Ovum along with radially arranged cells called *corona radiata* is released in the abdominal cavity.
- (vi) Ovum enters the fallopian tube through ostium assisted by fimbriae.
- (vii) Ovum is haploid.
- (viii) Ovum must be fertilized within 24 to 48 hours after ovulation. Only during this time it is viable for fertilization,
- (ix) If fertilization takes place the fertilized egg passes through fallopian tube and reaches the uterus on 3rd day of ovulation.
- (x) Implantation of the embryo in the uterine wall occurs on 6th or 7th day.
- (xi) If fertilization does not occur **the**. ovum degenerates.

(4) Luteal or Secretary Phase : It extends from 15th to 28th day.

Changes in the ovary :

- (i) After ovulation the ruptured follicle develops into the yellow body called as corpus luteum
- (ii) After the discharge of ovum the remaining cells of graafian follicle together form corpus luteum.
- (iii) It acts as temporary endocrine gland and secretes the hormone progesterone.
- (iv) Progesterone secretion is under the control of **LII**.
- (v) Progesterone helps in maintaining the thickness of endometrium. Therefore, also called pregnancy hormone.
- (vi) Corpus luteum is active till the placenta takes up the function of secretion of hormone HCG (Human Chorionic Gonadotropin).
- (vii) HCG is similar to LH.
- (viii) Abortion occurs if the corpus luteum becomes inactive before the formation of placenta.