

Version No.			

ROLL NUMBER					

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Answer Sheet No. _____

Sign. of Candidate _____

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BIOLOGY HSSC-II (2nd Set)

SECTION – A (Marks 17)

Time allowed: 25 Minutes

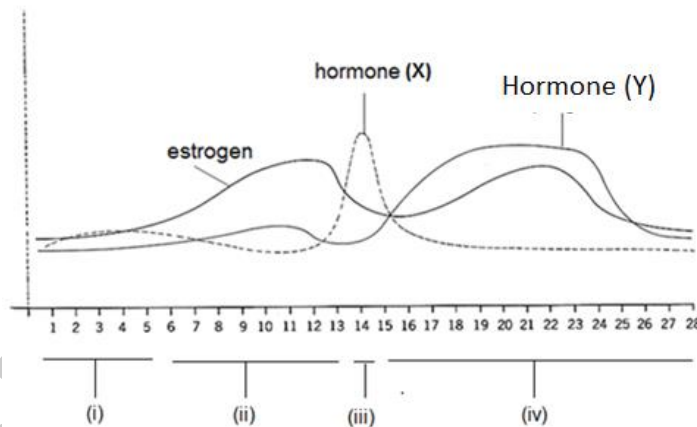
Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. **Do not use lead pencil.**

Q.1 Fill the relevant bubble for each part. All parts carry one mark.

(1) Skeletal disease which cause immobility and fusion of vertebral joints is called:

- A. Disc slip B. Sciatica
 C. Arthritis D. Spondylosis

(2) Following graph show the concentration changes of different hormones during menstrual cycle. Name the hormone represented by “X”.

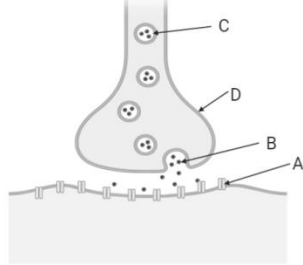


- A. FSH B. LH
 C. GnRH D. Progesterone

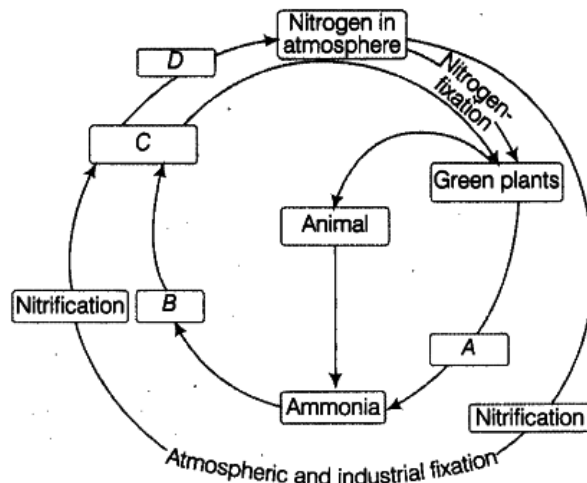
(3) The table show different endocrine glands with their hormones, target organs and brief functions. Identify the mismatched row.

GLAND	HORMONE	TARGET ORGAN	FUNCTION
A Thyroid	Calcitonin	Bone	Retains calcium in bones
B Adrenal cortex	Adrenalin	Skeletal muscles	Prepare for fight or flight situation
C Pancreas	Insulin	Liver	Control blood sugar level
D Posterior lobe of pituitary	Vasopressin	Kidney	Reabsorption of water

- (4) The diagram shows a synapse. Heroin affects neuron. Which labelled part does the heroin directly affect?



- A. B.
 C. D.
- (5) A sea slug normally responds to being poked by curling up. After being poked repeatedly the slug no longer curls up. This is an example of:
- A. Classical conditioning B. Habituation
 C. Imprinting D. Operant conditioning
- (6) Which one of the following events is likely to take place, if the nuclei from an 8-celled stage of an embryo are transplanted into enucleated eggs?
- A. Recipient egg dies
 B. Donor nuclei die in the new environment
 C. Cleavage occurs but is arrested after some time
 D. Formation of the viable embryo in the recipient eggs
- (7) Nitrogen cycle in nature is depicted in the following flowing flow chart.



Locate among the labels A/B/C/D, the one symbolizing NITRITES

- A. B.
 C. D.
- (8) According to the semi-conservative model of DNA replication, two DNA molecules result:
- A. Each strand with one new strand and one original strand
 B. Each with two new strands
 C. One with two new strands and one with both original strands
 D. Each with two original strands
- (9) How many different trinucleotides can be made using the DNA nucleotides?
- A. 4 B. 16
 C. 20 D. 64

- (10) The primary organizer during embryonic development:

- A. drives cell division during cleavage.
- B. gives rise to extra embryonic tissues.
- C. secretes signaling molecules to influence the fate of other cells.
- D. folds inwards during gastrulation.
- (11) Using product rule, what proportion of offspring from the genetic cross AaBbCc x AaBbcc are expected to be heterozygous at all three genetic loci, assuming that loci are unlinked?
- A. $\frac{1}{4}$ B. $\frac{1}{8}$
- C. $\frac{1}{16}$ D. $\frac{1}{32}$
- (12) Recalling your knowledge of epistasis based on the coat colour in *Labrador retriever*; find out the coat colour with genotype Bbee.
- A. Black B. Chocolate
- C. Yellow D. White
- (13) Shorter than average height, infertility, webbed neck, low hair line at the back of neck, abnormal bone development, larger than normal number of moles on skin and edema indicates:
- A. Down syndrome
- B. Klinefelter syndrome
- C. Turner syndrome
- D. Duchenne muscular dystrophy
- (14) A biochemist isolated and purified molecules needed for DNA replication. When he added some DNA, replication occurred, but the DNA molecules formed were defective. Each consisted of normal DNA strand paired with numerous segments of DNA, a few hundred nucleotides long. What had the scientist probably left out of the mixture?
- A. DNA polymerase B. Ligase
- C. Nucleotides D. Primers
- (15) Virologists have discovered how to put together a bacteriophage with protein coat of phage T2 and DNA of phage T4. If this composite phage were allowed to infect a bacterium, the phages produced in the host cell would have:
- A. The protein of T2 and DNA of T4
- B. The protein of T4 and DNA of T2
- C. The protein and DNA of T2
- D. The protein and DNA of T4
- (16) A paleontologist has recovered a bit of tissue from 500 years old preserved skin of an extinct bird. The researcher would like to compare DNA from the sample with DNA from a living bird. Suggest the technique that would be more useful for increasing the amount of DNA available for testing.
- A. Gel electrophoresis B. RFLP analysis
- C. Polymerase chain reaction D. Tissue culture
- (17) In a population that is in Hardy-Weinberg equilibrium, 16% of the individuals show recessive trait. The frequency of dominant allele in the population is:
- A. 0.36 B. 0.4
- C. 0.48 D. 0.6

Federal Board HSSC-II Examination
Biology Model Question Paper
(Curriculum 2006)

Time allowed: 2:35 hours

Total Marks: 68

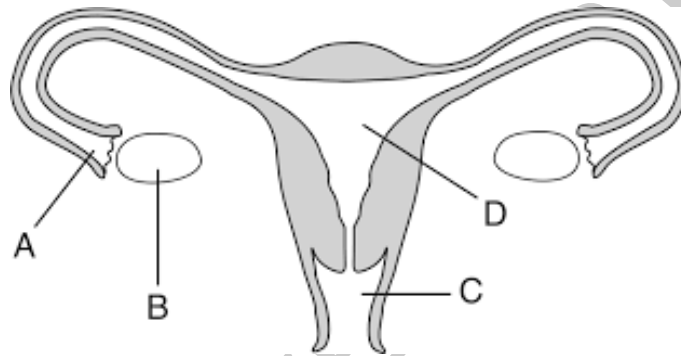
Note: Answer any fourteen parts from Section 'B' and attempt any two questions from Section 'C' on the separately provided answer book. Write your answers neatly and legibly.

SECTION – B (Marks 42)

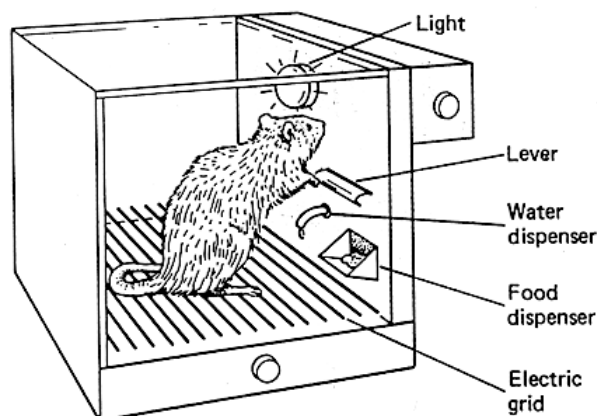
Q.2 Attempt any **FOURTEEN** parts from the following. All parts carry equal marks.

(14 × 3 = 42)

- i. Compare the osmoregulatory strategies of fresh water and marine bony fishes.
- ii. How does the structure of the synapse and axon membrane ensure that nerve impulse is only able to travel in one direction? (1.5+1.5)
- iii. What is the role of calcium ions in muscle contraction?
- iv. Following is the diagram of female reproductive system in human beings.



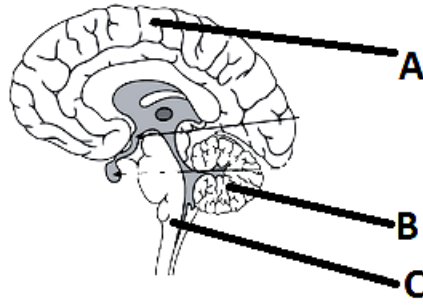
- a. Correctly name the parts labelled as A, B, C and D. (0.25 x 4 = 1)
 - b. The foetus normally develops in structure: (01)
 - c. Exposure to certain radiations could alter the genetic information in the gamete that form in the structure. (01)
- v. The diagram below shows a typical Skinner box with a rat inside.



Relate this diagram with a pattern of learning behaviour and explain it briefly.

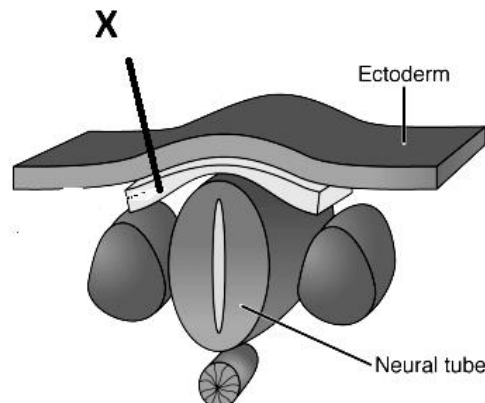
- vi. Why do most synapses contain gaps across which an electrical impulse cannot pass, when a direct physical connection would enable the uninhibited passage of the impulse?

- vii. Observe the following diagram of human brain with labelled parts A, B, C and fill the given table.



Part	Name	Functions
A		
B		
C		

- viii. Trace the path taken by a molecule of urea from the time it is produced in the liver, to the time it leaves the body in urine.
- ix. If you see an angry dog barking at you, you will run as fast as you can,
- What hormone is secreted first in such an emergency?
 - State three effects of the hormone that help you to run away.
- x. In the following diagram, a stage in the process of neurulation is shown.



Elaborate the role of the part labeled as "X"

- xi. Complete the following table for the comparison of sex determination patterns in animals.

FEATURE	XY-SYSTEM	WZ-SYSTEM	XO-SYSTEM
Found in			
Sex chromosomes in body cells			
Gamete type that determine gender			

- xii. Carefully observe the following stretch of antisense strand of DNA
- 5' TACGAGCTTCCGATTCGA 3'

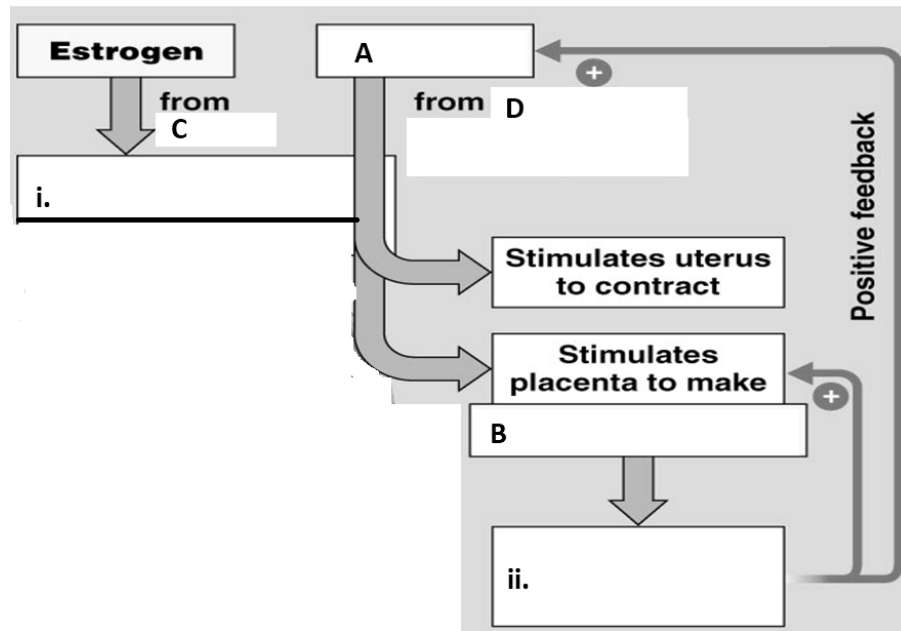
Codons for amino acids are:

GCU : Alanine AUG : Methionine CUC : Leucine

GAA : Glutamate GGC : Glycine UAA : Stop

Using the provided data, determine the primary structure of protein produced from this segment of DNA, during translation.

xiii. The following flow chart shows the role of hormones in the birth process.



- Name the chemicals "A" and "B" in the flow chart.
- Write the activity taking place at "i" and "ii".
- Name the organs "C" and "D" from which the hormones are secreted.

xiv. a. From the following hypothetical data, construct a histogram to show the distribution of male population in different height groups.

Height of body in inches	60	63	66	69	72	75	78
Number of individuals	10	60	150	200	150	60	10

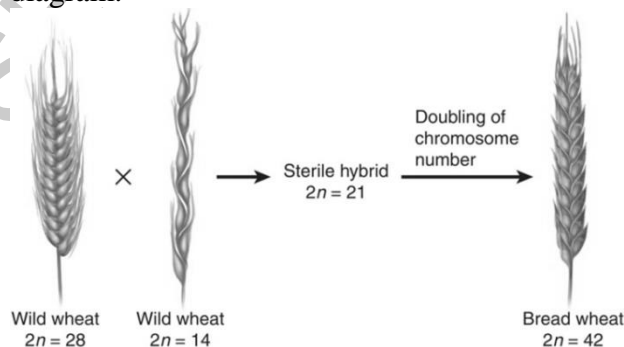
b. How many gene pairs are controlling this trait according to the provided data?

xv. Compare nervous and chemical coordination for the features listed in the following table.

FEATURES	NERVOUS COORDINATION	CHEMICAL COORDINATION
Transmission pathway		
Speed of transmission		
Duration of effect		

xvi. Explain the evolution of giraffe neck according to Lamarck's theory.

xvii. The origin of bread wheat (*Triticumaestivum*) is depicted in the following diagram.



Explain the mode of speciation shown in this diagram.

xviii. Why there are few tertiary consumers in any ecosystem as compared to the number of individuals in lower trophic levels? Explain it according to the concept of energy and biomass.

- xix. Construct a table to show the role of microbes (mentioning specific names) in processing of at least three household food items.
- xx. What are holandric traits? How are they inherited? Give any example.

SECTION – C (Marks 26)

Note: Attempt any **TWO** questions. All questions carry equal marks. (2×13 = 26)

- Q.3** a. Describe the specific steps that occur during the process of transcription. (8)
b. Compare the mode of action of steroid and protein hormones. Also draw diagrams. (5)
- Q.4** a. Describe the events of ovaries and uterus in human menstrual cycle and explain its hormonal regulation. (7)
b. Differentiate between *in-vitro* and *in-vivo* gene therapy. Describe *in-vivo* gene therapy for treatment of cystic fibrosis. (6)
- Q.5** a. Write an essay on ecological succession that takes place on bare rocks? (7)
b. How carbon dioxide is transported in human blood? (6)

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BIOLOGY HSSC-II (2nd Set)
Student Learning Outcomes Alignment Chart(Curriculum 2006)

SECTION – A

Q.1

- (1) Describe the disorders of human skeleton (disc-slip, spondylosis, sciatica, arthritis) and their causes.
- (2) Describe the menstrual cycle emphasizing the role of hormones.
- (3) Outline the major functions of the hormones of above mentioned glands and also relate the problems associated with the imbalance of these hormones.
- (4) Associate the effects of drug addiction and tolerance with the functioning of nervous system.
- (5) Define habituation and illustrate it through the example of squirrels' adjustment in a park.
- (6) Through experimental narration, describe the role of the nucleus and cytoplasm in controlling development.
- (7) Describe nitrogen cycle in detail.
- (8) Narrate the work of Meselson and Stahl to justify the semi-conservative replication as the correct method of replication.
- (9) Differentiate between the terms genetic code and codon.
- (10) Define organizers and differentiate between primary and secondary induction.
- (11) Evaluate that inheritance of genes and their mixing during fertilization is based on mathematical probabilities.
- (12) Give one example of epistasis from mammals (coat color inheritance in Labrador retrievers) and one from plants (pigment phenotype in foxgloves) and justify modified Mendelian ratios.
- (13) Describe the symptoms, causes and possible available treatments of some of the chromosomal mutations. (Down's, Klinefelter's and Turner's syndrome)
- (14) Describe the events of the process of DNA replication.
- (15) Narrate the experimental work of Griffith and Hershey-Chase, which proved that DNA is the hereditary material.
- (16) Describe the steps involved in gene amplification through polymerase chain reaction.
- (17) Describe the assumptions of the Hardy-Weinberg theorem and relate these to the factors that change the allelic frequencies of the population.

SECTION – B

Q.2

- i. Explain the different methods of osmoregulation found in freshwater, marine water and terrestrial habitats.
- ii. Explain synaptic transmission of nerve impulse.
Describe the role of local circuits in saltatory conduction of nerve impulse.
- iii. Explain the sliding filaments model of muscle contraction.
- iv. Explain the structures of female reproductive system and describe their functions.
- v. Describe latent learning, through the example of a rat in a maze with no reward.
- vi. Describe the structure of synapse. Explain synaptic transmission of nerve impulse.
- vii. Explain briefly the functions of major divisions of brain.
- viii. Explain the processes of glomerular filtration, selective re-absorption and tubular secretion as the events in kidney functioning.
- ix. Outline the major functions of the hormones of above mentioned glands and also relate the problems associated with the imbalance of these hormones.

- x. Describe the formation of neural crest and list the structures that are derived from neural crest cells.
- xi. Explain the XX-XY mechanism of sex determination in *Drosophila* and mammals. Describe the XX-XO and ZZ-ZW sex determination systems and evaluate by studying the karyotype.
- xii. Describe the mechanism of protein synthesis.
- xiii. Describe the role of fetal and maternal hormones in initiating labor pains and culminating in the birth of baby.
- xiv. Describe polygenic inheritance, using suitable examples from plants (grain color in wheat) and animals (skin color in man).
- xv. Trace the path of a message transmitted to the CNS for processing. Trace the path of the chemical message from its release from the endocrine gland to its action at the target site.
- xvi. Outline the steps of the evolution of the giraffe, as illustrated in Lamarckism.
- xvii. Define the concept of speciation and explain the mechanisms of speciation (allopatric, parapatric and sympatric speciation).
- xviii. Describe the composition of the ozone layer and its role in protecting the life on earth.
- xix. Explain the role of microbes in household food processing, industrial production, sewage treatment and energy generation.
- xx. Describe the sex-linked inheritance of male characters due to Y-chromosome and the effect of Holandric genes.

SECTION – C

- Q.3**
 - a. Explain the mechanism of transcription.
 - b. Explain the two modes of hormone action at the cells of target site.
- Q.4**
 - a. Describe the menstrual cycle emphasizing the role of hormones.
 - b. Explain the current methods employed for gene therapy (ex-vivo and in-vivo methods). Explain with example gene therapies in the detection and treatment of some genetic diseases.
Explain the role of successful gene therapy for cystic fibrosis.
- Q.5**
 - a. Explain the xerarch succession on a bare rock starting from the small pockets of lichens to the vegetations of flowering plants.
 - b. Describe the transport of oxygen and carbon dioxide through blood.

BIOLOGY HSSC-II (2nd Set)

Table of Specifications

Assessment Objectives	Unit 14: Respiration	Unit 15: Homeostasis	Unit 16: Support and movement	Unit 17: Nervous coordination	Unit 18: Chemical coordination	Unit 19: Behaviour	Unit 20: Reproduction	Unit 21: Development and aging	Unit 22: Inheritance	Unit 23: Chromosome and DNA	Unit 24: Evolution	Unit 25: Man and his environment	Unit 26: Biotechnology	Unit 26: Biology and human welfare	Total Marks	%age
K (Knowledge)		2(viii)3	1(1) 1 2(iii) 3	2(vii)3		2(v)3	2(iv)3	2(xiii)3	2(xx)3	1(13)1	2(xvi)3	5(a)7			33	28.4%
U (Understanding)	5(b)6	2(i)3		2(ii)3 2(vi)3 2(xv)3	1(3)1 3(b)5		1(2)1 4(a)7	1(10)1	1(12)1 2(xi)3	1(8)1 1(9)1 3(a)8	2(xvii)3	2(xviii)3	4(b)6		59	50.9%
A (Application)				1(4)1	2(ix)3	1(5)1		1(6)1 2(x)3	1(11)1 2(xiv)3	1(14)1 1(15)1 2(xii)3	1(17)1	1(7)1	1(16)1	2(xix)3	24	20.7%
Total Marks	6	6	4	13	9	4	11	8	11	16	7	11	7	3	116	100%

KEY:

1(1) 1

Question No (Part No.) Allocated Marks

Note: (i) The policy of F.B.I.S.E. for knowledge based questions, understanding based questions and application based questions is approximately as follows:

- a) 30% knowledge based.
- b) 50% understanding based.
- c) 20% application based.

(ii) The total marks specified for each unit/content in the table of specification is only related to this model question paper.

(iii) The level of difficulty of the paper is approximately as follows:

- a) 40% easy
- b) 40% moderate
- c) 20% difficult