OSDAV Public School, Kaithal

BIOLOGY-- XII

PRE BOARD EXAMINATION(25) **Set- B** **Time–3 hrs**

MM--70

General Instructions:

(i)All questions are compulsory.

(ii)The question paper has five sections and 33 questions. All questions are compulsory.

(iii)Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.

(iv)There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

(v)Wherever necessary, neat and properly labelled diagrams should be drawn.

SECTION- A

SECTION A

Q 1 Given below are four contraceptive methods and their modes of action. Select the correct match: **1**

S. No.	*Method*	*S. No*	*Mode of action*
a)	Condom	(i)	Ovum not able to reach Fallopian tube
b)	Vasectomy	(ii)	Prevents ovulation
c)	Pill	(iii)	Prevents sperm reaching the cervix
d)	Tubectomy	(iv)	Semen contains no sperms

(a) a)–(i) b)–(ii) c)– (iii) d)–(iv)

(b) a)–(ii) b)–(iii) c)–(iii) d) – (i)

(c) a)–(iii) b)–(iv) c)–(ii) d)–(i)

(d) a)–(iv) b)–(i) c)– (iii) d)–(ii)

Q 2 There is a gene which is responsible to control the shape of the seeds and the size of the starch grains and the nature of protein coat around The Seed. Which type of gene it would be:- **1**

a. Polymorphic gene b. Pleiotropic gene c. Multiple genes d. All of the above

Q 3 The following diagram shows a fragment of DNA which is going to be transcribed, the upper strand with polarity 3' to 5' is the template strand: **1**

3´ ATTGCC 5´

5´ TAACGG 3´

After transcription the mRNA can be represented by:

A. 5´ AUUGCC 3´ B. 5´ AUUGCC 3' C. 5´ UAACGG 3´ D. 5´ GGCAAU 3´

Q 4 What is the MINIMUM possibility of a dominant trait being expressed in the offspring after a test cross? **1**

(a) 25% (b) 50% (c) 75% (d) 100%

Q.5 How many meiotic divisions would be required for a plant that undergoes monosporic development to give rise to 200 functional eggs? **1**

A.50 B.200 C.800 D 400

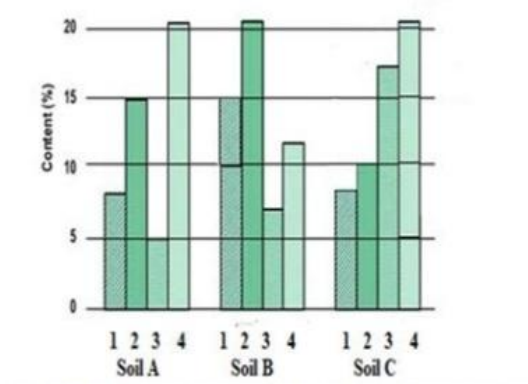
Q 6 The genetic material must fulfil certain criteria. Which one of the following is not such a criterion. **1**

a)It should Replicate
b) It should be chemically and Physically stable
c) It should mutate fast required for evolution
d) It should express in the form of Mendelian Characters

Q 7 The drugs used to quickly reduce the symptoms of allergy are **1**

(a) anti-histamine and adrenaline (b) histamine and thyroxine
(c) adrenaline and a-interferon (d) all of these

Q 8 Observe the contents 1,2,3 and 4 of soil samples A,B and C shown in the graph. If the temperature and soil moisture of all soil samples are identical, which soil sample (s) will show faster decomposition? **1**



1 indicates lignin content, 2 indicates chitin , 3 indicates Nitrogen content and 4 indicates sugar content

a) Soil Sample A b) Soil Sample B
c) Soil Samples A and B both d) Soil Sample C

Q.9 At a particular locus, the frequency of allele A is 0.8 and that of allele a is 0.2. What would be the frequency of heterozygotes in a random mating population at equilibrium? **1**

a) 0.32 b) 0.16 c) 0.24 d) 0.48

Q.10 In a certain species of insects, some have 13 chromosomes, and the others have 14 chromosomes.The 13 and 14 chromosome bearing organisms are **1**

a) males and females, respectively b) females and males, respectively
c) all males d) all females

Q.11 Match the items in Column-I and Column- II and choose the correct answer. **1**

	Column I		Column II
a	Ladybird	1	Methanobacterium
b	Mycorrhiza	2	Trichoderma
c	Biological control	3	Aphids
d	Biogas	4	Glomus

Which of the following is the correct option?

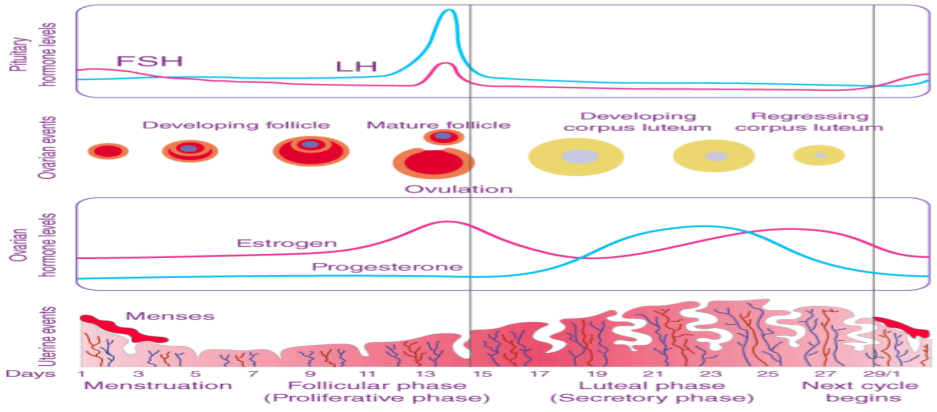
	A	B	C	D
a	1	4	3	2
B	3	4	2	1
C	4	1	2	3
D	3	2	1	4

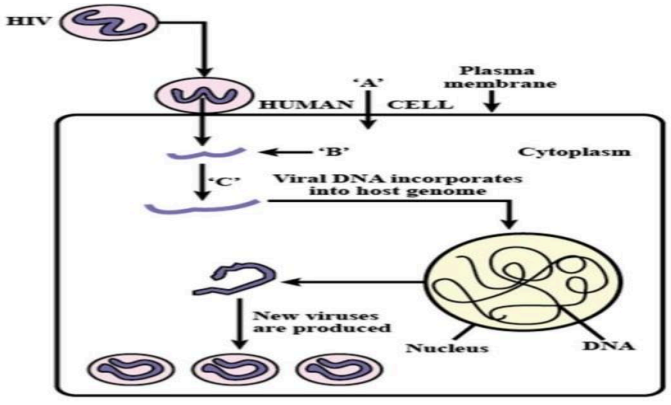
Q.12	What type of food chain is it? **dead animals → blowfly maggot → maggots → frog → snake** A)Decomposer food chain B)Predator food chain C)Grazing food chain D) detritus food chain	**1**
Q 13	**Q.No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:** **A. Both A and R are true and R is the correct explanation of A.** **B. Both A and R are true and R is not the correct explanation of A.** **C. A is true but R is false.** **D. A is False but R is true** **Assertion** : A colour-blind father will always have a colour-blind son. **Reason** : Genes causing colour blindness are passed through a sex chromosome	**1**
Q.14	**Assertion**: Cotyledon of the maize embryo is known as scutellum **Reason**: Scutellum is situated towards one side of embryonal axis	**1**
Q.15	**Assertion** : Most of the food chains generally have 3 or 4 trophic levels. **Reason:** Trophic efficiencies are generally about 10% in different ecosystems.	**1**
Q.16	**Assertion**- Vector should have many recognition sites for commonly used restriction enzymes. **Reason**- Lot of recognition sites generate several fragments, which make gene cloning easy.	**1**

SECTION-B

Q.17	A farmer while working on his farm was bitten by a poisonous snake. He was rushed to a nearby health centre where the doctor gave him an injection to save his life. (i) What did the doctor inject and why ? (ii) Name the kind of immunity provided by this injection.	**2**
Q 18	Explain the different steps involved in the secondary treatment of sewage	**2**
Q.19	Name the microbes that help production of the following products commercially. (a) Statin (b) Citric acid (c) Cyclosporin A (d) Butyric acid	**2**
Q.20	A specific plant species was introduced into Australia in 1920 and later it became invasive spreading over millions of hectares of rangeland. (a) Name the plant that was introduced into Australia and mention the reason for its uncontrollable growth. (b) State how its spread was eventually brought under control.	**2**
Q.21	The Bt is a short form of ubiquitous soil bacterium that is Gram Positive and spore forming.Name the insect that attacks cotton crops and causes a lot of damage to the crop. How do the Bt cotton plants overcome this problem and save the crop? Explain.	**2**

SECTION-C

Q.22	Observe the following diagram and answer the questions given below.  	**3**

	a) Why is follicular phase also known as the proliferative phase? b) What happens to corpus luteum if pregnancy does not occur? c) What ovarian changes take place during the luteal phase? d) At what time of Menstrual cycle LH surge occurs? e) What are the uterine changes that occur during menstrual phase?	
Q.23	A)Biomass of a standing crop of phytoplankton is 4 kg/m2 which supports a large standing crop of zooplankton having a biomass 11 kg/m2. This is consumed by small fishes having biomass 25 kg/m2 which are the consumed by large fishes with the biomass 37 kg/m2. Draw an ecological pyramid indicating the biomass at each stage and also name the trophic levels. Mention whether it is an upright or inverted pyramid. B) Use the information provided in the table given below to answer the following questions: a) Calculate the gross primary productivity. b) Analyse the trend in the Net Production from Producers to Top Carnivore. Give a reason for your observation.	**3**
Q.24	Two children A and B aged 4 and 5 years respectively visited a hospital with a similar genetic disorder.The girl A was provided enzyme replacement therapy and was advised to revisit periodically for further treatment.The girl B was, however, given a therapy that did not require revisit for further treatment. a) Name the ailments the two girls were suffering from? b) Why did the treatment provided to girl A required repeated visits? c) How was girl B cured permanently?	**3**
Q.25	A)You can see the honeybee visiting flowers in the given picture. Is its visit important for the flower? Give any three characteristics of the flower whom it is visiting.  B)It was found in a polyembryonic seed that some embryos were haploid and some were diploid. Analyse the possibilities for the formation of such embryos.	**3**
Q.26	Study the diagram showing the entry of HIV in to the human body and processes that are followed.  	**3**

Tropic level | Net Production($KJm^{-2}y^{-1}$) | Respiration ($KJm^{-2}y^{-1}$)

Tropic level	Net Production($KJm^{-2}y^{-1}$)	Respiration ($KJm^{-2}y^{-1}$)
Top Carnivore	50	35
Carnivores	420	378
Herbivores	4490	4041
Producers	45000	40,367

	(a) Name the human cell 'A' HIV enters into. (b) Mention the genetic material 'B' releases into the cell. (c) Identify the enzyme C. (d) Write the name of a test for detection of AIDS.	
Q 27	When a snapdragon plant bearing pink colour flower was selfed, it was found that 69 plants were having red coloured flowers. What would be the number of plants bearing pink flowers and white flowers? Show with the help of Punnett square. Identity the principle of inheritance involved in this experiment	**3**
Q.28	The Evil Quartet describes: (a) Rates of species extinction due to human activities. Explain how the population of organisms is affected by fragmentation of habitats. (b) Introduction of alien species has led to environmental damage and decline of indigenous species. Give any One example of how it has affected the indigenous species? (c) Could the extinction of Steller's sea cow be saved by man? Give any one reason to support your answer.	**3**

SECTION-D

Q.29 **CASE STUDY BASED QUESTION** — **4**

Placed below are case studies of some couples who were not able to have kids. These couples are not ready for adoption or taking gametes from donors. After thoroughly examining the cases, which Assisted Reproductive Technology will you suggest to these couples as a medical expert? Explain briefly with justification of each case.

Couple	Test reports of Female partner	Test reports of male partner
Couple 1	Normal reports	Normal sperms in testes, Missing connection in epididymis and Vas deferens
Couple 2	Blockage in the fallopian tube	Normal reports
Couple 3	Normal reports	Poor semen parameters in terms of count, motility and morphology
Couple 4	low ovarian reserve	Normal reports

Q.30 — **4**

Pollen viability is the capability of pollen to get mature and then fertilise and after fertilisation, it's the ability to develop into seed and fruit. Male gametophytes are pollen grains. They're made within microsporangia in anthers and discharged when the anther dehisces.

1. Write the factors Pollen viability is dependent upon.
2. Mention any two families whose pollen is viable for months.
3. How pollen grains are stored for a longer period?
4. Storage of pollen grains for longer periods is of any importance yes or no. Give reason in support of your answer.

SECTION-E

Q.31 — **5**

Explain the process of protein synthesis from processed m-RNA.

OR

Which methodology is used while sequencing the total DNA from a cell?Explain it in detail.

Q.32 — **5**

Explain in detail the various developmental stages of the zygote until implantation with suitable diagrams.

OR

Growth hormone injection treatment is prescribed for children who have been diagnosed with growth hormone (GH) deficiency and other conditions causing short stature and insufficient growth. This hormone is produced by the pituitary gland in humans so the gene for this hormone was isolated from the pituitary gland and introduced into phGH407 vectors for production. However, a problem with this was that the protein produced was 26 amino acids longer than the active growth hormone (24 amino acids long) and so this method could not be used.

	(a) Given that the amino acid sequence of the active growth hormone was known, use a diagram to explain how human growth hormone could be produced outside the body. (b) The vector consists of a lac gene which codes for the enzyme β-galactosidase. Describe how this gene can help with the selection of colonies containing the transgene	
Q.33	(i) Why is there a need to conserve biodiversity? (ii)White Bengal tigers are protected in special settings in zoological parks. Tiger reserves are maintained in Western Ghats.How do these two approaches differ from each other? (iii)What is the significance of cryopreservation techniques?	**5**

BIOLOGY-- XII
PRE BOARD EXAMINATION(2025) Set - B
ANSWER KEY AND MARKING SCHEME
SECTION A

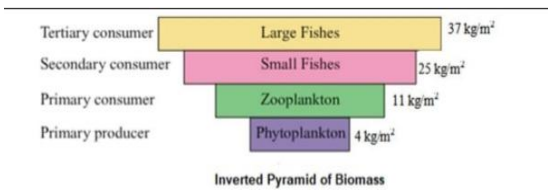
Q 1	C	**1**
Q 2	B	**1**
Q 3	C	**1**
Q 4	B	**1**
Q.5	B	**1**
Q 6	C	**1**
Q 7	A	**1**
Q 8	D	**1**
Q.9	A	**1**
Q.10	A	**1**
Q.11	B	**1**
Q.12	D	**1**
Q 13	D	**1**
Q.14	B	**1**
Q.15	A	**1**
Q.16	C	**1**

SECTION-B

Q.17	i)Antitoxin / Antivenoms / Preformed antibodies. - Whenever a quick immune response is required we need to directly inject preformed antibodies/ Antitoxins. - To neutralise snake venom quickly , ii)passive immunity is provided.	½ **1** ½
Q 18	Primary effluent is passed into large aeration tanks with constant mechanical agitation and air supply. Useful aerobic microbes grow rapidly and form flocs. Flocs while growing consume organic matter and thus reduce the biochemical oxygen demand (BOD), the effluent is passed into the settling tank. The bacterial flocs settle at the bottom of the tank and it forms activated sludge, a small part this is used as an inoculum in the aeration tank and the remaining part is passed into large tanks called anaerobic sludge digesters.	½ ½ **1**
Q.19	(a) Statin- Monascus purpureus (b) Citric acid- Aspergillus niger (c) Cyclosporin A- Trichoderma polysporum (d) Butyric acid – Clostridium butylicum	½ ½ ½ ½
Q.20	A)The prickly pear cactus was introduced to Australia in the early 1920s and spread rapidly across millions of hectares of rangeland. The cactus became invasive due to a combination of factors, including:	½

	• No natural predators: The cactus had no natural predators to control its population in the new environment. • No competitors: The cactus had no natural competitors in the new environment. • Lack of coevolved herbivores: There were no herbivores that had coevolved with the cactus to eat it. The cactus's spread negatively impacted native plant species. B) It was eventually brought under control by introducing a cactus-feeding moth from its natural habitat.	**1** ½
Q.21	Cotton boll worms Bacillus thuringiensis forms protein crystals contain a toxic insecticidal protein Bt toxin protein exist as inactive protoxins but once an insect ingest the inactive toxin it is converted in to an active form of toxin due to the alkaline pH of the gut which solubilize the crystal the activated toxin binds to the surface of epithelial cells and create pores that cause death of the insect	½ ½ ½ ½

SECTION-C

Q.22	a) The follicular phase in the menstrual cycle is also called proliferative phase because during this phase, the endometrium of the uterus regenerates and becomes thick through proliferation. Simultaneously, the primary follicles in the ovary grow to become a fully mature Graafian follicle. b) It will stop secreting progesterone and will degenerate. c)In the luteal phase, the corpus luteum forms on the ovary and secretes many hormones, most significantly progesterone, which makes the endometrium of the uterus ready for implantation of an embryo d)On the 14th day, LH levels reach its peak. This induces rupture of the Graafian follicle and release of the ovum (ovulation) e) If a pregnancy doesn't happen, the uterine lining sheds during a Menstrual period	**1** ½ ½ ½ ½
Q.23	 Inverted Pyramid of Biomass B)a) Gross Primary Productivity is 45000 + 40367 = 85367 KJm-2y-1 [1] b) Net production is gradually reducing as we move from producers to consumers due to heat loss/respiration /10% law.	**1** **1** **1**
Q.24	(a) Two girls are suffering from Severe Combined ImmunoDeficiency (SCID) which is caused by deficiency of adenosine deaminase (ADA). This disorder is caused due to the deletion of genes for adenosine deaminase. (b) Girl A, was treated by enzyme replacement therapy in which functional ADA is given to the patient by injection. The approach is not completely curative. The patient requires periodic infusion of enzyme replacement.	**1** **1**

	(c) Girl B must have been treated using gene-therapy where the gene isolate from marrow cells producing ADA was introduced into cells at an early embryonic stage for a possible permanent cure.	**1**
Q.25	A)Yes, a honeybee's visit helps in the pollination of the flower. This is an insect pollinated flower with following characteristic features. • Large • Brightly coloured. • If flowers are small, grouped into inflorescence. • High fragrance • Produce nectar • Sticky pollen and stigmatic surface • Provide rewards to animal pollinator such as nectar, food (pollen) or provide safe place for laying egg **(any three)** B)Embryo developed from the synergids haploid as the ploidy of the synergid is haploid. Embryo developed from the nucellus is diploid as the ploidy of the nucellus is diploid.	½ ½ ½ ½ **1**
Q.26	(a) Macrophage (b) RNA/Viral RNA (c) Reverse transcriptase (d) Enzyme linked immuno sorbent assay	½ **1** ½ **1**
Q 27	There will be 138 pink flower bearing plants and 69 white flower bearing plants. b) Pink (Rr) selfing **R** | **r** **R** | RR Red | Rr Pink **r** | Rr Pink | rr White Phenotypic ratio : red : pink : white 1 : 2 : 1 c) Incomplete dominance	½+½ **1** ½ ½
Q.28	When a large habitat is broken into small fragments due to various activities, mammals and birds require large territories and certain animals with migratory habitats are badly affected leading to population decline. b)Nile perch introduced in lake Victoria eventually lead to the extinction of an ecologically unique assemblage of more than200 species of Cichlid fishes /parthenium /waterhyacint /Lantana caused environmental damage and threat to our native species /or can write introduction of African catfish Clarias gariepinus, posing threat to the indigenous species c)Yes, Human sustainable harvesting could have prevented extinction of these animals.	**1** **1** **1**

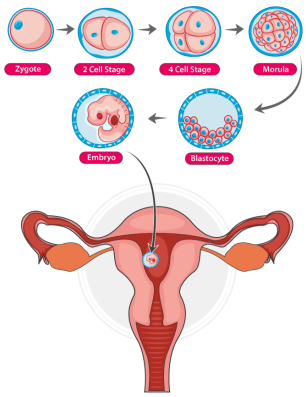
SECTION-D

Q.29	Couple 1: Normal reports of female, Normal sperms in testes, Missing connection in epididymis and Vas deferens in male. Assisted Reproductive Technology: Semen will be devoid of sperms in this case. So, In-vitro fertilisation (IVF) by collecting the sperms from epididymis, followed by ZIFT or IUT (Test Tube Baby) is suggested. ZIFT is transfer of zygote or early embryo up to 8 blastomeres in fallopian tube and IUT referto transfer of embryos with more than 8 blastomeres in uterus.	**1**

	Couple 2: Blockage in the fallopian tube in the female, Normal reports of male. Assisted reproductive Technology: Blockage of Fallopian Tube will not allow transfer of sperms to the site of fertilisation. In-vitro fertilisation (IVF) followed by IUT (Test Tube Baby). It would involve transfer of embryos with more than 8 blastomeres in the uterus. Couple 3: Normal reports of female, Poor semen parameters in terms of count, motility and morphology in male partner Assisted Reproductive Technology: Intracytoplasmic sperm injection (ICSI) in which sperm is directly injected into the ovum. Artificialinsemination procedure is used mainly when sperm have poor characteristics or low sperm count. Couple 4: Low ovarian reserve in female, Normal reports in male Assisted Reproductive Technology: In-vitro-fertilisation (IVF) by selection of normal blastocysts from ovary followed by Zygote intrafallopian transfer involving transfer of zygote or early embryos up to 8 blastomeres (ZIFT) or transfer of embryo with more than 8 blastomeres in the uterus	**1** **1** **1**
Q.30	1.Temperature & humidity 2. Rosaceae, Leguminosae and Solanaceae. 3. Pollen grains are stored in liquid nitrogen (-1960C). 4. Yes, stored pollen grains can be used in plant breeding programs.	½+ ½ **1** **1** **½+** ½

SECTION-E

Q.31	For initiation, the ribosome binds to the mature m RNA at the start codon (AUG) that is recognized by the initiator t - RNA. During elongation, charged t RNA sequentially binds to the appropriate codon in m- RNA with the anticodon present on tRNA. The ribosome moves from one codon to another adding amino acids one after the other to form polypeptide, i.e. translation. During termination, the release factor binds to stop codon (UAA, UAG, UGA), terminating translation and releasing the polypeptide chain. **OR** Methodology used - Sequence Annotation - total DNA from a cell is isolated, converted into random fragments of relatively smaller sizes and cloned in a suitable host using specialized vectors. The cloning results in amplification of each piece of DNA fragment. The fragments are sequenced using automated DNA sequencers, These sequences are then arranged based on some overlapping regions (present in them). This requires generation of overlapping fragments (for sequencing). Specialized computer based programmes are developed, and these sequences are subsequently annotated and assigned to each chromosome	**1/2×10 =5** **1** ½ ½ ½ ½ ½ ½ ½ ½
Q.32	When the zygote moves through the isthmus of the oviduct, the mitotic division is initiated and is called the cleavage towards the uterus to form 2,4,8,16 daughter cells called blastomeres. It is an embryo containing 8 to 16 blastomeres from the morula. It continues to transform and divide into blastocysts as it further approaches the uterus. In the blastocyst, the blastomeres are organized into an outer layer referred to as the trophoblast and the inner cell mass, which is an inner collection of cells attached to the trophoblast. This layer gets attached to the endometrium and the inner cell mass transforms into the embryo. After attachment, the cells of the uterus rapidly divide and covers up the entire blastocyst. This causes the blastocyst to implant in the endometrium of the uterus which	**1/2×6= 3**

	leads to conception.  **OR** (a) - From the amino acid sequence, the gene for growth hormone needs to be synthesised chemically. - The gene of interest is cut using a restriction enzyme and the same A restriction enzyme is used to cut the vector within the lac gene. - The gene obtained is inserted into the vector using a ligase. - These are transformed into E.coli cells/host cells for production. (b) - In recombinants, since the lac gene is inactivated, after insertion of the gene of interest, it does not produce the β-galactosidase enzyme which results in colourless colonies when a chromogenic substrate is added. - In non-recombinants, since the lac gene is still active, it produced the enzyme β-galactosidase which results in blue colonies when a chromogenic substrate is added	**2** **1×3=3** **2**
Q.33	**(i)The biodiversity needs to be conserved because of three categories:** . Narrow utilitarian includes most of the resources required for our day-io-day life, e.g. food, oil, clothes, firewood, drugs and medicines, industrial products all are derived from nature, thus needs to be conserved to reap more benefits. Broadly utilitarian includes most of the ecosystem services provided to us by nature. Such as release of oxygen and fixation of C02 by photosynthesis in plants, pollination and dispersal of seeds, etc. Therefore, for the continuation of these services biodiversity needs to be conserved. Ethical reasons as it becomes our moral duty to take care of all living species in our surroundings irrespective of their economic importance and pass this biological legacy to our future generations. (ii)White Bengal tigers are protected in special settings in zoological parks. This is called ex situ conservation, while tiger reserves are maintained in Western Ghats. This is called in situ conservation. (iii)Gametes of threatened species can be preserved in viable and fertile conditions for long. Plants are propagated by tissue culture methods. Eggs can be fertilised in vitro.(Any two)	**1** **1** **1** **1** **½+½**