

Ans 1.	Meiosis	1
Ans 2.	Group of cells in the embryo would not modify to form specialized tissues and organs to form an organism.	1
Ans 3.	<i>Strobilanthus kunthiana</i> .	1
Ans 4.	Juvenile phase.	1
Ans 5.	<p>Sperm (n) + Egg (n) <math>\xrightarrow{\text{fertilization}}</math> Female [queen/ worker] (2n) (<math>\frac{1}{2} + \frac{1}{2}</math>)</p> <p>Unfertilized egg (n) <math>\xrightarrow{\text{Parthenogenesis}}</math> male [drone] (n). (<math>\frac{1}{2} + \frac{1}{2}</math>)</p>	2
Ans 6.	During gamete transfer in moss, a large number of male gametes (antherozoids) fail to reach the female gamete (egg). To compensate this loss of male gametes during gamete transport, the number of male gametes produced is several thousand times the number of female gametes produced. (1+1)	2
Ans 7.	Cucurbits are monoecious plants since both male and female flowers are present on the same plant. Papaya are dioecious plants since male and female flowers are present on separate plants. (1+1)	2
Ans 8.	<p>a) Meiocytes (gamete mother cells) are diploid, whereas Gametes are haploid.(1)</p> <p>b) In whiptail lizard, the female gamete undergoes development to form a new organism without fertilization. (1)</p>	2
Ans 9.	Sexual reproduction is a better mode of reproduction since it leads to variations in organisms which increase their chances of survival. It also leads to evolution of new species. (1+1)	2
Ans 10.	<p>a) Gametes are haploid though the parent plant body from which they arise may be either haploid a diploid. A haploid parent produces gametes by mitosis, and a diploid parent produces gametes by meiosis. (1/2 X4)</p> <p>b) Protists and Monerans. (1/2+1/2)</p>	3
Ans 11.	<p>a) Offsprings of oviparous animals are extremely vulnerable to predators threatening their survival up to adulthood. (1)</p> <p>b) Vegetative propagules are the units of vegetative propagation such as runner, rhizome, sucker, tuber, offset and bulb, which are capable of giving rise to new offspring. Eg- Eyes of potato, Rhizome of ginger, Bulbil of Agave, offset of water hyacinth (any two) (<math>\frac{1}{2} + \frac{1}{2}</math>)</p>	3
Ans 12.	<p>a) Chlamydomonas – Zoospores, Penicillium -Conidia, Sponge- Gemmules, Hydra - Buds (1/2X4)</p> <p>b) Zoospore may be haploid/ diploid, a sexual reproductive structure. Zygote is diploid, formed by the union of male and female gamete during sexual reproduction. (1+1)</p> <p>c) Cladophora, Chara (any other relevant example) (1/2 + <math>\frac{1}{2}</math>)</p>	5
Ans 13.	<p>a) Into the surrounding medium (water). (1)</p> <p>Advantage : Organisms exhibiting external fertilization show great synchrony between the sexes and release a large number of gametes into the surrounding medium (water) in order to enhance the chances of syngamy. (1)</p> <p>Disadvantage : Offsprings are extremely vulnerable to predators threatening their survival up to adulthood. (1)</p> <p>b) i) <b>Oestrous Cycle</b> : Cyclical changes in reproductive organs during reproduction in non-primate mammals like cows, sheep, rats, dogs, tiger, deer etc.</p> <p><b>Menstrual cycle</b> : Cyclical changes in reproductive organs during reproduction in primates like monkeys, apes and humans. (1)</p> <p>ii) <b>Seasonal breeders</b> –Mammals (esp. those living in natural, wild conditions) exhibiting cyclic changes in their reproductive organs only during favourable seasons in their reproductive phase, <b>Continuous breeders</b> – Mammals who are reproductively active throughout their reproductive phase. (1)</p>	5

THE ASIAN SCHOOL, DEHRADUN (Marking Scheme)

CLASS 12 SUBJECT –BIOLOGY CHAPTER 2 – Sexual Reproduction In Flowering Plants MM-30

Ans 1	Since Banana is formed without fertilization.	1
Ans 2.	By a mucilaginous covering.	1
Ans 3.	Brinjal has chasnogamous flowers- with exposed anther and stigma, Beans have Cleistogamous flowers- which do not open at all even after maturity. (1+1)	2
Ans 4.	Check Fig 2.7 (d), Page No- 25 of NCEFT 6 labellings. (1/2x6)	3
Ans 5.	a) Some species of Asteraceae and grasses (any 1 eg) (1/2) Apomixis. (1/2) b) i) In many Citrus and Mango varieties, some of the nucellar cells surrounding the embryo sac start dividing, protrude into the embryo sac and develop into many embryos (Polyembryony). (1) ii) In some species, the diploid egg cell is formed without reduction division and develops into embryo without fertilization. (1)	3
Ans 6.	a) <b>Syngamy</b> Male gamete(n) + Female gamete (n) → Zygote (2n) (1) <b>Triple Fusion</b> Male gamete(n) + 2 polar nuclei (2n) → PEN(3n) (1) b) Check fig 2.13 (a), page 34 of NCERT – (i) Micropylar end (towards degenerating synergids), ii) PEC, (iii) Zygote (iv) Antipodal cells (1/2 x 4) c) Check figure 2.13, (b) page 34 of NCERT - Globular Embryo (1)	5
Ans 7.	a) This facilitates the entry of oxygen and water into the seed during germination. (1) b) Endosperm provides assured nutrition to the developing embryo. (1) c) In apple and cashew, thalamus contributes to fruit formation. (1) d) Integuments of ovules harden as tough protective seed coats. (1) e) Groundnut seeds are exalbuminous since these have no residual endosperm as it is completely consumed during embryo development. Castor seeds are albuminous since these retain a part of endosperm as it is not completely used up during embryo development. (1)	5
Ans 8.	a) Check fig 2.3 (a) page 22 of NCERT, 6 labellings ( 1/2 x 6) b) i) In some species, pollen release and stigma receptivity are not synchronized. ii) Anther and stigma are placed at different positions. iii) Self – incompatibility- A genetic mechanism that prevents self –pollen from fertilising the ovules by inhibiting pollen germination. iv) Production of Unisexual flowers (any other relevant point) (1/2x4)	5
Ans 9.	a) Check Fig 2.8 (a) , (b) and (c) page 26 of NCERT. (4) b) To prevent contamination of its stigma with unwanted pollen. (1)	5

Ans1	200 sperms	1
Ans 2	<p style="text-align: center;">Hypothalamus</p> <p style="text-align: center;">↓ GnRH (1/2)</p> <p style="text-align: center;">Anterior Pituitary Gland</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>↓ LH (1/2)</p> <p>acts on Leydig cells</p> <p>↓</p> <p>Stimulates the synthesis and secretion of androgens (1/2)</p> <p>↓</p> <p>Stimulate Spermatogenesis</p> </div> <div style="text-align: center;"> <p>↓ FSH (1/2)</p> <p>acts on Sertoli cells</p> <p>↓</p> <p>Stimulates the secretion of some factors (1/2)</p> <p>↓</p> <p>help in Spermiogenesis</p> </div> </div>	2
Ans 3.	<p>The signal from fully developed foetus and Placenta/ Foetal- ejection reflex induces mild uterine contraction. (1/2) oxytocin hormone. (1/2)</p> <p>Oxytocin acts on the uterine muscle and causes stronger uterine contractions, (1/2) which in turn stimulates further secretion of oxytocin(1/2). The stimulatory reflex between the uterine contraction and oxytocin secretion continues resulting in stronger and stronger contractions. (1/2) This leads to expulsion of the baby out of the uterus. (1/2)</p>	3
Ans 4.	<p>Sperm + Ovum → Zygote (2n) <math>\xrightarrow{\text{mitosis / cleavage}}</math> 2,4,8,16 blastomeres. (1/2). The embryo with 8 blastomeres (morula) continues to divide and transforms into blastocyst (1/2). The blastomeres in the blastocyst are arranged into an outer layer called 'trophoblast' (1/2) and an inner group of cells attached to the trophoblast called the 'inner cell mass' (1/2). The trophoblast layer then gets attached to the endometrium and the inner cell mass gets differentiated as the embryo (1/2). After attachment, the uterine cells divide rapidly and cover the blastocyst. The blastocyst gets implanted in the endometrium of the uterus. (1/2)</p>	3
Ans 5.	<p>a) After implantation, (1/2) finger like projections appear on the trophoblast called 'chorionic villi', which are surrounded by the uterine tissue and maternal blood. (1/2) The chorionic villi and uterine tissue become interdigitated with each other and jointly form a structural and functional unit between developing embryo and maternal body called Placenta (1/2)</p> <p>b) Through an umbilical cord (1/2)</p> <p>c) Placenta produces several hormones like hCG, hPL, estrogens, progestogens. The increased production of these hormones during pregnancy is essential for supporting the foetal growth, metabolic changes in the mother and maintenance of pregnancy. (1/2+1/2)</p>	3
Ans 6	Check fig 3.6, page 48 of NCERT, 6 labellings. (1/2x6)	3
Ans 7	<p>a) X = Luteinising hormone/LH (1/2) Y = Follicle Stimulating Hormone/FSH (1/2)</p> <p>b) i) Follicular phase/ Proliferative phase (1/2)</p> <p>ii) Ovulatory phase (1/2)</p> <p>iii) Lateal phase (1/2)</p> <p>c) i) FSH and LH are secreted from anterior pituitary which stimulate the growth of ovarian follicles and secretion of estrogens by them. The endometrium of uterus regenerates through proliferation. (1/2+1/2)</p> <p>ii) Both LH and FSH attain a peak level in the middle of cycle. Rapid secretion of LH</p>	5

	<p>leading to its maximum level during the mid- cycle called 'LH surge' induces rupture of Graafian follicle and thereby release of ovum (ovulation) (<math>1/2</math>)</p> <p>iii) The remaining parts of the Graafian follicle transform as corpus luteum. The corpus luteum secretes large amounts of progesterone which is essential for maintenance of the endometrium. (<math>1/2+1/2</math>)</p>	
Ans 8	<p>a) Check fig 3.7, page 49 of NCERT (any four labellings) (<math>1/2 \times 4 = 2</math>)</p> <p>b) Check fig 3.8 (b) page 49 of NCERT (3)</p>	5
Ans 9	<p>a) Check fig 3.8 (a), page 49 of NCERT (2)</p> <p>b) Check fig 3.5, page 47 of NCERT (3)</p>	5

**THE ASIAN SCHOOL, DEHRADUN (Marking Scheme)**

**CLASS 12**

**SUBJECT –BIOLOGY**

**CHAPTER- 4 Reproductive Health**

**MM-30**

Ans1	Ovulation and the menstrual cycle do not occur, during the period of intense lactation following parturition. ( $\frac{1}{2} + \frac{1}{2}$ )	1
Ans2	It contains a non-steroidal preparation, with very few side- effects and high contraceptive value. (1 + 1)	2
Ans3	Copper releasing IUDs- Cu ion released suppress sperm motility and the fertilizing capacity of sperms. ( $\frac{1}{2} + \frac{1}{2}$ ) Hormone releasing IUDs make the uterus unsuitable for implantation and the cervix hostile to sperms. ( $\frac{1}{2} + \frac{1}{2}$ )	2
Ans4	Oral contraceptives contains small doses of either progestogens or progestogen- estrogen combinations. ( $\frac{1}{2} + \frac{1}{2}$ ) They inhibit ovulation and implantation as well as alter the quality of cervical mucus to prevent the entry of sperms. ( $\frac{1}{2} + \frac{1}{2}$ )	2
Ans5	User- friendly, easily available, effective, reversible with no or least side- effects, should not interfere with the sexual drive, desire and or the sexual act of the user. (any four points) ( $\frac{1}{2} \times 4$ )	2
Ans6	To get rid of unwanted pregnancies either due to casual unprotected intercourse or failure of the contraceptive used during coitus or rapes, MTPs are also essential where continuation of pregnancy could be harmful or even fatal either to the mother or to the foetus or both. (1+1)	2
Ans7	Terminal method to prevent any more pregnancies, surgical intervention blocks gamete transport and thereby prevent conception. Vasectomy in males : a small part of the vas deferens is removed or tied up through a small incision on the scrotum. (1+1)	2
Ans8	a) Amit is right because sperm donation can help infertile couples to have children. ( $\frac{1}{2} + \frac{1}{2}$ ) b) Inability of the male partner to inseminate the females, very low sperm count. ( $\frac{1}{2} + \frac{1}{2}$ ) c) Courage, compassion for others. (or any other relevant point) ( $\frac{1}{2} + \frac{1}{2}$ )	3
Ans9	a) Introduction of sex-education in schools should be encouraged to provide right information to the young so as to discourage children from believing in myths and having misconceptions about sex- related aspects. b) Proper information about reproductive organs, adolescence and related changes, safe and hygienic sexual practices, STD, AIDS etc. would help people to lead a reproductively healthy life. c) Educating people especially fertile couples and those in marriageable age group, about available birth control options, care of pregnant mothers, post- natal care of the mother and child, importance of breast- feeding, equal opportunities for the male and female child etc. would address the importance of bringing up socially conscious healthy families of desired size. (any other relevant points) ( $\frac{1}{2} \times 6$ )	3
Ans10	a) Avoid sex with unknown partners/ multiple partners. b) Always use condoms during coitus. c) In case of doubt, one should go to a qualified doctor for early detection and get complete treatment if diagnosed with disease. (1 + 1+1)	3
Ans11	A foetal sex – determination test based on the chromosomal pattern in the amniotic fluid surrounding the developing embryo. (1) <b>Advantage</b> : It is done to know the genetic disorder in the foetus. (1) <b>Disadvantage</b> - People are misusing the technique for knowing the sex of the child which is increasing female foeticides. (1)	3
Ans12	<b>Test tube baby programme/ IVF</b> - ova from the wife/ donor (female) and sperms from the husband/ donor (male) are collected and are induced to form zygote under simulated conditions in the lab. <b>ZIFT</b> - The zygote/ early embryos (with upto 8 blastomeres) are then transferred into the fallopian tube. <b>IUT</b> - Embryos with more than 8 blastomeres are transferred into the Uterus to complete its further development. <b>GIFT</b> - Transfer of an ovum collected from a donor into the fallopian tube of another female who cannot produce one, but can provide suitable environment for fertilization and further development. <b>ICSI</b> - Formation of an embryo by directly injecting a sperm into the ovum. <b>Artificial Insemination (AI)</b> : Semen is collected either from the husband or a healthy donor and is artificially introduced either into the vagina or into the uterus (IUI) of the female. (any five methods) (1X5)	5

Ans1	When the two genes are tightly linked on the same chromosome.	1
Ans2	Aneuploidy	1
Ans3	Male fruitfly (XY sex chromosome) and female fowl (ZW sex chromosome) produce two different types of gametes. ( $1/2+1/2$ ) Female fruitfly (XX sex chromosome) and male fowl (ZZ sex chromosome) produce similar gametes. ( $1/2+1/2$ )	2
Ans4	a) Recessive ( $1/2$ ) b) Autosomal ( $1/2$ ) c) Third child = aa ( $1/2$ )                                    fourth child = Aa ( $1/2$ ) (any other alphabet can be used)	2
Ans5	<b>Mutation 'A'</b> – GAG mutates to GAA – Both the codons code for Glutamic acid – no change in shape of RBC ( $1/2+1/2$ ) <b>Mutation B-</b> GAG mutates to GUG- substitution of Glutamic acid by Valine at the 6 <sup>th</sup> position of the beta globin chain of the haemoglobin – change in shape of RBC (sickle shaped) / Sickle cell Anaemia. ( $1/2+1/2$ )	2
Ans6	Walter Sutton and Theodor Boveri. ( $1/2$ ) <b>Similarities :</b> i) both genes (Mendelian factors) and chromosomes occur in pairs in a diploid cell. ( $1/2$ ) i) Genes as well as chromosomes segregate at the time of gamete formation such that only one of each pair is transmitted to a gamete. ( $1/2$ ) ii) Independent pairs of genes/ chromosomes segregate independently of another pair. ( $1/2$ )	2
Ans7	Test cross ( $1/2$ ) <b>Case I</b> Phenotypes of Parents → Purple flower X White flower ↓ Genotypes of Parents → pp (homozygous)                                    pp ↓ Gametes → P                                    P ( $1/2$ ) ↓ Offsprings → Pp                                    All purple flowers ( $1/2$ )  If the offsprings produced are 100% purple flowers, the parent would be homozygous dominant. <b>Case II</b> Phenotypes of Parents → Purple flower X White flower ↓ Genotypes of Parents → Pp (Heterozygous)                                    pp ↓ Gametes → P                                    p                                    P ( $1/2$ ) ↓ Offsprings → Pp                                    pp Purple Flower                                    White Flower ( $1/2$ ) If the offsprings obtained are purple and white flowers in 1:1 ratio, the parent would be heterozygous dominant. ( $1/2$ )	3

Ans8

Phenotypes of Parents → Red Flower X White Flower

Genotypes of Parents →  $RR$   $rr$  ( $1/2$ )

Gametes →  $R$   $r$

F<sub>1</sub> Generation →  $Rr$  ( $1/2$ )  
All pink flowers

On selfing F<sub>1</sub> plants -

Phenotypes → Pink Flower X Pink Flower

Genotypes →  $Rr$   $Rr$  ( $1/2$ )

Gametes →  $R$   $r$   $R$   $r$

F<sub>2</sub> Generation →

Gametes	R	r
R	RR (Red)	Rr (Pink)
r	Rr (Pink)	rr (White)

Phenotypic Ratio = Genotypic Ratio = 1 : 2 : 1

Incomplete Dominance – Pink flowers (intermediate colour) produced in F<sub>1</sub> generation. ( $1/2$ )

Mendelian inheritance – Complete Dominance – ‘R’ is completely dominant over ‘r’, therefore Red (Rr) flowers are produced in F<sub>1</sub> Generation. ( $1/2$ )

Ans9

a) Parents → Mother X Father

Blood Groups → A B

Genotypes →  $I^A i$   $I^B i$  ( $1/2$ )

Gametes →  $I^A$   $i$   $I^B$   $i$  ( $1/2$ )

Offsprings →

Gametes	$I^A$	$i$
$I^B$	$I^A I^B$ (AB)	$I^B i$ (B)
$i$	$I^A i$ (A)	$ii$ (O)

b) Alfred Strurtevant used the frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes and mapped their position on the chromosome. (1)

Ans10

On the basis of Pedigree analysis

Parents → Normal Father X Carrier Mother

Genotypes →  $XX$   $XX^h$  ( $1/2$ )

Gametes →  $X$   $Y$   $X$   $X^h$  ( $1/2$ )

Offsprings →

Gametes	$X$	$Y$
$X$	$XX$ (Normal female)	$XY$ (Normal Male)
$X^h$	$XX^h$ (Carrier Female)	$X^h Y$ (Haemophilic Male)

Phenotypic Ratio = Genotypic Ratio = 1 : 1 : 1 : 1

Ans11 Klinefelter's Syndrome, Karyotype of 47, XXY, overall masculine development, Gynaecomastia, Sterile individuals. ( $1/2 \times 6$ ) 3

Ans 12 Phenotypes of Parents  $\rightarrow$  Homozygous Tall Green seeds X Dwarf Yellow Seeds. 5

Genotypes of Parents  $\rightarrow$   $TTyy$   $ttYY$  ( $1/2$ )

Gametes  $\rightarrow$   $Ty$   $tY$

F<sub>1</sub> Generation  $\rightarrow$   $TtYy$  ( $1/2$ )

100 % Tall plants with yellow seeds ( $1/2$ )

On selfing F<sub>1</sub> plants

Gametes  $\rightarrow$   $TY$   $Ty$   $tY$   $ty$   $TY$   $Ty$   $tY$   $ty$  ( $1/2$ )

F<sub>2</sub> Generation

Gametes	$TY$	$Ty$	$tY$	$ty$
$TY$	$TTYy$ (Tall plant with yellow seed)	$TTYy$ (Tall plant with yellow seed)	$TtYy$ (Tall Plant with yellow seeds)	$TtYy$ (Tall Plant with yellow seed)
$Ty$	$TTYy$ (Tall plant with yellow seed)	$TTYy$ (Tall plant with Green seed)	$TtYy$ (Tall; plant with yellow seed)	$Ttyy$ (Tall plant with Green seed)
$tY$	$TtYy$ (Tall plant with yellow seed)	$TtYy$ (Tall plant with yellow seed)	$ttYY$ (Dwarf plant with yellow seed)	$ttYy$ (Dwarf plant with yellow seed)
$ty$	$TtYy$ (Tall plant with yellow seed)	$Ttyy$ (Tall plant with Green seed)	$ttYy$ (Dwarf plant with yellow seed)	$ttyy$ (dwarf plant with green seed)

Phenotypic Ratio = 9 : 3 : 3 : 1 ( $1/2$ ) (2)



Ans 1	30%		1
Ans2	<p>(<math>1/2 \times 4</math>)</p>		2
Ans3.	<p>a) <math>\text{NH}_4\text{Cl}</math> (Ammonium Chloride) (<math>1/2</math>)</p> <p>b) To check if DNA replication was semiconservative. (<math>1/2</math>)</p> <p>c) By centrifugation in a cesium chloride density gradient. (<math>1/2</math>)</p> <p>d) After 20 min, the culture had an intermediate density and after 40 min, the culture had equal amounts of hybrid DNA and light DNA. (<math>1/2 + 1/2</math>)</p> <p>e) DNA replicates semiconservatively. (<math>1/2</math>)</p>		3
Ans4	<p>a) RNA polymerase II (<math>1/2</math>)</p> <p>b) hnRNA has non- functional introns in between the functional exons. To remove introns, it undergoes changes. (<math>1/2 + 1/2</math>)</p> <p>i) <b>Capping</b> : <math>^m\text{Gppp}</math> is added to 5'end. (<math>1/2</math>)</p> <p>ii) <b>Tailing</b> : Poly A tail (adenylate residues) are added at 3'end in template independent manner. (<math>1/2</math>)</p> <p>iii) <b>Splicing</b> : Introns are removed and exons are joined in a defined order. (<math>1/2</math>)</p>		3
Ans5	<p><b>Unambiguous</b> : one codon codes for only one aminoacid (1)</p> <p><b>Universal</b> : A particular codon coding for an amino acid is same for all organisms except in mitochondria and protozoans. (1)</p> <p><b>Degenerate</b> – Some aminoacids are coded by more than one codon. (1)</p>		3
Ans6	<p>DNA finger printing :</p> <p>i) Isolation of DNA ii) Digestion of DNA by restriction endonucleases (iii) separation of DNA fragments by electrophoresis (iv) transferring (blotting) of separated DNA fragments to synthetic membranes, such as nitrocellulose or nylon (v) hybridization using labelled VNTR probe (vi) detection of hybridized DNA fragments by autoradiography. The autoradiogram gives many bands of differing sizes, which give a characteristic pattern for an individual DNA. (<math>1/2 \times 6</math>)</p>		3
Ans7	<p>a) Frederick Griffith (1928) conducted experiments with <i>Streptococcus pneumoniae</i> (a bacterium causing pneumonia). He observed 2 strains of this bacterium - one forming smooth shiny colonies (S – type) with capsule, while other forming rough colonies ( R- type) without capsule. (<math>1/2</math>)</p> <p>S-strain <math>\rightarrow</math> injected into mice <math>\rightarrow</math> Mice died (<math>1/2</math>)</p> <p>R-strain <math>\rightarrow</math> injected into mice <math>\rightarrow</math> Mice lived (<math>1/2</math>)</p> <p>Heat-killed S- strain <math>\rightarrow</math> injected into mice <math>\rightarrow</math> mice lived (<math>1/2</math>)</p> <p>Heat- killed S-strain + Live R - strain <math>\rightarrow</math> injected into mice <math>\rightarrow</math> mice died (<math>1/2</math>)</p> <p>He concluded that heat- killed S- strain bacteria caused a transformation of R- strain bacteria into S-strain bacteria.</p> <p>b) They purified biochemicals (proteins, DNA, RNA etc) from heat- killed S- cells to see which ones could transform live R- cells into S –cells. They discovered that protein- digesting</p>		5

	<p>enzymes (proteases) and RNA- digesting enzymes (RNases) did not affect transformation, so the transforming substance was not a protein or RNA. Digestion with DNAase did inhibit transformation, suggesting that the DNA caused the transformation. They concluded that DNA is the hereditary material. (<math>1/2 \times 4</math>)</p>	
Ans8	<p>Alfred Hershey and Martha Chase worked with bacteriophages. They grew some viruses on a medium that contained radioactive phosphorus (<math>^{32}\text{P}</math>) and some others on medium that contained radioactive sulphur (<math>^{35}\text{S}</math>). Viruses grown in the presence of radioactive phosphorus contained radioactive DNA similarly viruses grown on radioactive sulphur contained radioactive protein. Both the radioactive phages were allowed to attach to <i>E-coli</i> bacteria separately. As the infection proceeded, the viral coats were removed from the bacteria by agitating them in a blender. The virus particles were separated from the bacteria by spinning them in a centrifuge. Bacteria which were infected with viruses that had radioactive DNA were radioactive, indicating that DNA was the material that passed from the virus to the bacteria. Bacteria that were infected with viruses that had radioactive proteins were not radioactive. This indicates that DNA is the genetic material that is passed from virus to bacteria. (<math>1/2 \times 10</math>)</p> <p>Or it can be shown through diagram. Check fig. 6.5, page 102 of NCERT</p>	5
Ans9	<p>The lac operon consists of a Promoter (P), Operator (O), a regulatory gene (i) and three structural genes (z,y and a). Lactose is the inducer in lac operon and it regulates switching on and off the operon. (1)</p> <p>In the absence of Lactose (inducer), i gene regulates and produces Repressor mRNA which translates the Repressor protein. The repressor protein binds to the operator region (O) and prevents RNA polymerase from transcribing the operon. As a result, the operon is switched off. (1+1)</p> <p>OR it can be shown through diagram. (Check fig 6.14 page 117 of NCERT).</p> <p>In the presence of Lactose, the repressor is inactivated by interaction with the inducer. The repressor fails to bind to the Operator region . The RNA polymerase binds to the Promoter and transcribes lac mRNA. Lac mRNA produces 3 enzymes- <math>\beta</math> - galactosidase, permease and transacetylase. The lac operon is switched on. (1+1)</p> <p>Or it can be shown through diagram. ( check fig 6.14 page 117 of NCERT)</p>	5

**THE ASIAN SCHOOL, DEHRADUN (Marking Scheme)**

**CLASS 12**

**SUBJECT –BIOLOGY**

**CHAPTER- 7 Evolution**

**MM-30**

Ans 1	Ichthyosaurs	1								
Ans 2	Wings of butterfly and birds are not anatomically similar structures though they perform similar functions. Hence, they are called analogous organs. Analogous organs are a result of convergent evolution. (1+1)	2								
Ans 3	Lobefins were fish – like animals with stout and strong fins that could move on land and go back to water. Lobefins evolved into first amphibians that lived on both land and water. These were ancestors of modern day frogs and salamanders. (1+1)	2								
Ans 4	Original stock of seed- eating birds, radiated to different habitats, many other forms with altered beaks arose, enabling them to become insectivours and vegetarian finches. ( $\frac{1}{2} \times 4$ )	2								
Ans 5	Natural selection can lead to <b>stabilization</b> ( in which more individuals acquire mean character value), <b>directional change</b> (more individuals acquire value other than the mean character value) or <b>disruption</b> (more individuals acquire peripheral character value at both ends of the distribution curve). (1+1+1)	3								
Ans 6	<b>Branching descent</b> - different species descending from the common ancestor get adapted in different habitats. E.g. Darwin’s finches- varieties of finches arose from seed- eaters / Australian marsupials evolved from common marsupial. (1 + $\frac{1}{2}$ ) Natural Selection- A process in which heritable variations enable better survival of a species to reproduce in large number. E.g. White – moth surviving before the industrial revolution and black-moth surviving after industrial revolution/ long- necked giraffe survived during evolution/ DDT-resistant mosquitoes survive. (1 + $\frac{1}{2}$ )	3								
Ans 7	In England, before industrial revolution, thick growth of white- coloured lichen covered the trees, white- winged moths were able to camouflage themselves and survived, dark-winged moths were picked up by predators, so there were more white- winged moths than dark- winged moths. ( $\frac{1}{2} + \frac{1}{2} + \frac{1}{2}$ ) After industrial revolution, tree trunks became dark due to industrial smoke and soots, dark- winged moths were able to camouflage in black background and survived, white-winged moths were picked up by predators, therefore there were more dark- winged moths than white- winged moths. ( $\frac{1}{2} + \frac{1}{2} + \frac{1}{2}$ )	3								
Ans 8	a) The allele frequencies in a population are stable and is constant from generation to generation. ( $\frac{1}{2}$ ) b) Let there be two alleles ‘A’ and ‘a’ in a population. The frequencies of alleles ‘A’ and ‘a’ are ‘p’ and ‘q’ respectively. The frequency of ‘AA’ individual in a population is ‘p <sup>2</sup> ’. The frequency of ‘aa’ individual in a population is ‘q <sup>2</sup> ’.The frequency of ‘Aa’ individual in a population is ‘2pq’. Hence, P <sup>2</sup> + 2pq + q <sup>2</sup> = 1. (2) c) Change of frequency of alleles in a population would be interpreted as resulting in evolution. ( $\frac{1}{2}$ )	3								
Ans 9	a) It is a process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography. (1) b) When more than one adaptive radiation appeared to have occurred in an isolated geographical area, it is called convergent evolution. Placental mammals in Australia exhibit adaptive radiation in evolving into varieties of such placental mammals each of which appears to be ‘similar’ to a corresponding marsupial. (1 +1)	3								
Ans 10	a) Lobefins, frogs, salamanders, reptiles. (1)    b) Coelocanth ( $\frac{1}{2}$ ) c) Shrews ( $\frac{1}{2}$ )    d) Reptiles lay eggs on land, lay thick- shelled eggs which do not dry up in sun unlike those of amphibians. ( $\frac{1}{2} + \frac{1}{2}$ )	3								
Ans 11	i) Mutations cause evolution. ii) New species originate (speciation) due to large mutation. iii) Mutations are random and directionless (1+1+1)	5								
	<table border="1"> <thead> <tr> <th>Darwinian Theory</th> <th>Hugo de Vries Theory</th> </tr> </thead> <tbody> <tr> <td>i) Minor variations cause evolution.</td> <td>i) Mutations cause evolution</td> </tr> <tr> <td>ii) Variations are small and directional</td> <td>ii) Mutations are random and directionless.</td> </tr> <tr> <td>iii) Evolution was gradual</td> <td>iii) Single step large mutations cause evolution (any two points) (1+1)</td> </tr> </tbody> </table>	Darwinian Theory	Hugo de Vries Theory	i) Minor variations cause evolution.	i) Mutations cause evolution	ii) Variations are small and directional	ii) Mutations are random and directionless.	iii) Evolution was gradual	iii) Single step large mutations cause evolution (any two points) (1+1)	
Darwinian Theory	Hugo de Vries Theory									
i) Minor variations cause evolution.	i) Mutations cause evolution									
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**THE ASIAN SCHOOL, DEHRADUN (Marking Scheme)**

**CLASS 12**

**SUBJECT –BIOLOGY**

**CHAPTER- 8 Human Health and Disease**

**MM-30**

Ans 1	Histamine and Serotonin. ( $\frac{1}{2} + \frac{1}{2}$ )	1
Ans 2	Tetanus is caused by a microbe which has a deadly and fast action. (1) Action of vaccine is slow and this delay may become fatal. Therefore, antitoxins are administered which neutralize the effect of the bacterial toxin. (1)	2
Ans 3	a) Bone marrow. ( $\frac{1}{2}$ ) b) The lymphocytes produced migrate to secondary lymphoid organs like spleen, lymph nodes, tonsils etc. ( $\frac{1}{2}$ ). They provide the sites for interaction of lymphocytes with the antigen and produce an immune response. (1)	2
Ans 4	Cellular barriers include leucocytes (WBC) of our body like polymorpho-nuclear leucocytes (PMNL-neutrophils) and monocytes and natural killer cells in the blood as well as macrophages in tissues can phagocytose and destroy microbes. (1) Cytokine barriers include interferons secreted by virus- infected cells, which protect non- infected cells from further viral infection. (1)	2
Ans 5	a) <i>W. bancrofti</i> and <i>W. malayi</i> . ( $\frac{1}{2} + \frac{1}{2}$ ) b) They cause a slowly developing chronic inflammation of the organs in which they live for many years, usually the lymphatic vessels of the lower limbs, the genital organs are also often affected, resulting in gross deformities. [Elephantiasis/ Filariasis]. ( $\frac{1}{2}$ ) c) The pathogens are transmitted to a healthy person through the bite by the female mosquito vectors. ( $\frac{1}{2}$ )	2
Ans 6	<b>Benign tumors</b> : remain confined to their original location and do not spread to other parts of the body, cause little damage, does not show metastasis, non- cancerous tumor. (two points) <b>Malignant tumors</b> : spread to other body parts, more fatal to the body, shows metastasis, cancerous tumor. (two relevant points). (1+1)	2
Ans 7	a) Our immune system is capable to differentiate between 'self' and non-self' cells/ tissues.(1) The graft is a non- self tissue which may be rejected by our immune system. So to prevent the rejection, immunosuppressants are taken after the transplant. ( $\frac{1}{2}$ ) b) Cell mediated immunity. ( $\frac{1}{2}$ )	2
Ans 8	a) Normal cells show a property called 'contact inhibition' ( $\frac{1}{2}$ ) by virtue of which contact with other cells inhibits their uncontrolled growth. ( $\frac{1}{2}$ ) b) Several genes called 'cellular oncogenes' (c-onc) or 'proto oncogenes' have been indentified in normal cells (1) which, when activated under certain conditions, could lead to oncogenic transformation of cells. (1)	3
Ans 9.	a) Source – extracted from the latex of poppy plant <i>papaver somniferum</i> , ( $\frac{1}{2}$ ) it is a depressant and slows down body functions. ( $\frac{1}{2}$ ) b) Source - coca plant <i>Erythroxylum coca</i> , ( $\frac{1}{2}$ ) it interferes with the transport of the neurotransmitter dopamine/ it has potent stimulating action on CNS, producing a sense of euphoria and increased energy/ excessive dosage causes hallucinations (any 1 point). ( $\frac{1}{2}$ ) c) Source- inflorescences of the plant <i>Cannabis sativa</i> ( $\frac{1}{2}$ ), adverse effects on cardiovascular system of the body. ( $\frac{1}{2}$ )	3
Ans 10	After getting into the body of person, the virus enters into macrophages ( $\frac{1}{2}$ ) where RNA genome of the virus replicates to form viral DNA ( $\frac{1}{2}$ ) with the help of enzyme reverse transcriptase ( $\frac{1}{2}$ ). The viral DNA gets incorporated into host cell's DNA and directs the infected cells to produce virus particles. ( $\frac{1}{2}$ ) The macrophages continue to produce virus and in this way acts like a HIV factory. Simultaneously, HIV enters into helper T-lymphocytes ( $T_H$ ), replicates and produce progeny viruses. ( $\frac{1}{2}$ ). The progeny viruses released in the blood attack other helper T- lymphocytes leading to a progressive decrease in the number of helper T- lymphocytes in the body of the infected person. ( $\frac{1}{2}$ )	3

Ans 11	<p>a) Gametocyte (<math>\frac{1}{2}</math>)</p> <p>b) The parasites (sporozoites) initially reproduce asexually in liver cells and then attack RBC, bursting them. This causes cycle of fever and chills due to release of toxic chemical substance 'haemozoin'. (<math>\frac{1}{2}</math>)</p> <p>c) Female Anopheles mosquito takes up gametocytes with blood meal (<math>\frac{1}{2}</math>)</p> <p style="text-align: center;">↓</p> <p>Fertilisation and development takes place in the mosquito's Intestine (<math>\frac{1}{2}</math>)</p> <p style="text-align: center;">↓</p> <p>Mature infective stages (sporozoites) escape from intestine and migrate to the mosquito salivary glands. (<math>\frac{1}{2}</math>)</p> <p style="text-align: center;">↓</p> <p>Ready to infect another human through mosquito's bite (<math>\frac{1}{2}</math>)</p>	3
Ans 12	<p>a- Internal bleeding, muscular pain, fever, anaemia and blockage of the intestinal passage. (any two points) (<math>\frac{1}{2} + \frac{1}{2}</math>)</p> <p>b- Microsporium/ Trichophyton/ Epidermophyton (<math>\frac{1}{2}</math>)</p> <p>c- <i>Salmonella typhi</i> (<math>\frac{1}{2}</math>)</p> <p>d- Sustained high fever (39-40°C), weakness, stomach pain, constipation, headache and loss of appetite. (<math>\frac{1}{2} + \frac{1}{2}</math>)</p> <p>e- <i>Streptococcus pneumoniae/ Haemophilus influenza.</i> (<math>\frac{1}{2}</math>)</p> <p>f- alveoli of lungs get with fluid leading to respiratory problems, fever, chills, cough, headache. (any two points) (<math>\frac{1}{2} + \frac{1}{2}</math>)</p> <p>g- <i>Entamoeba histolytica.</i> (<math>\frac{1}{2}</math>)</p>	5

**THE ASIAN SCHOOL, DEHRADUN (Marking Scheme)**

**CLASS 12 SUBJECT –BIOLOGY CHAPTER- 9 Strategies for Enhancement in Food Production MM-30**

Ans 1.	SCP/ produces food rich in protein, minerals, fats, carbohydrate and vitamins/ reduces environmental pollution. (any two points) ( $\frac{1}{2}+\frac{1}{2}$ )	1
Ans 2.	a = Pusa Gaurav ( $\frac{1}{2}$ ) b = Aphids ( $\frac{1}{2}$ ) c= Pusa Sawani/ Pusa A-4 ( $\frac{1}{2}$ ) d = shoot and Fruit borer. ( $\frac{1}{2}$ )	2
Ans 3.	<i>Apis indica</i> (1) .This increases pollination efficiency and improves the yield- beneficial both from the point of view of crop yield and honey yield. ( $\frac{1}{2}+\frac{1}{2}$ )	2
Ans 4	Male and female animals of two different related species are mated (1) eg : Mule formed by a cross between male donkey and female horse. (1)	2
Ans 5.	Screening germplasm for resistance sources, hybridization of selected parents, selection and evaluation of the hybrids, and testing and release of new varieties. ( $\frac{1}{2} \times 4$ )	2
Ans 6.	a) Meristem (apical and axillary) ( $\frac{1}{2}$ ) b) Meristem (which is free of virus) can be removed from a diseased plant, grown in vitro containing nutrient medium with carbon sources such as sucrose and inorganic salts, vitamins, amino acids and growth regulators like auxins, cytokinins etc, to obtain virus – free plants. (1) c) Micro- propagation / Tissue culture. ( $\frac{1}{2}$ )	2
Ans 7.	Breeding crops with higher levels of vitamins and minerals, or higher protein and healthier fats. (1) Maize hybrids contain twice the amount of amino acids, lysine and tryptophan( $\frac{1}{2}$ ), wheat variety, Atlas 66, has a high protein content. ( $\frac{1}{2}$ )	2
Ans 8.	North India- <i>Saccharum barberi</i> . ( $\frac{1}{2}$ ) South India- <i>Saccharum officinarum</i> . ( $\frac{1}{2}$ ) <i>Saccharum barberi</i> had poor sugar content and yield ( $\frac{1}{2}+\frac{1}{2}$ ) <i>Saccharum officinarum</i> had thicker stems and higher sugar content. ( $\frac{1}{2}+\frac{1}{2}$ )	3
Ans 9.	a) In plants bearing bisexual flowers, the anthers are removed from the flower bud before they dehisce. This step is called 'Emasculation'( $\frac{1}{2}$ ). Emasculated flowers are covered with a bag of butter paper, to prevent contamination of its stigma with unwanted pollen. ( $\frac{1}{2}$ ) This process is called 'Bagging'. When the stigma of bagged flower attains receptivity, mature pollen grains are dusted on the stigma ( $\frac{1}{2}$ ), and the flowers are 'rebagged', and the fruits allowed to develop. ( $\frac{1}{2}$ ) b) If the female parent produces unisexual flowers, there is no need for emasculation. The female flower buds are bagged before the flowers open. When the stigma becomes receptive, pollination is carried out using the desired pollen and the flower rebagged. ( $\frac{1}{2}+\frac{1}{2}$ )	3
Ans 10.	A cow is administered hormones, with FSH- like activity, to induce follicular maturation and super ovulation to produce 6-8 eggs per cycle, the animal is either mated with an elite bull or artificially inseminated. The fertilized eggs at 8-32 celled stages are recovered non- surgically and transferred to surrogate mothers. ( $\frac{1}{2} \times 6$ )	3
Ans 11.	Continued inbreeding causes inbreeding depression ( $\frac{1}{2}$ ). It reduces fertility and even productivity in cattle. ( $\frac{1}{2}$ ) Advantages : i) develops purelines/ homozygosity. ( $\frac{1}{2}$ ) ii) Helps in accumulation of superior genes and elimination of less desirable genes. ( $\frac{1}{2}$ ) It can be overcome by mating the selected animals of the breeding population with unrelated superior animals of the same breed/ out breeding ( $\frac{1}{2}$ ). This helps restore fertility and yield. ( $\frac{1}{2}$ )	3
Ans 12.	a = Himgiri ( $\frac{1}{2}$ ) b = Leaf and stripe rust, hill bunt (any 1) ( $\frac{1}{2}$ ) c = Pusa swarnim (Karan rai) ( $\frac{1}{2}$ ) d = white rust ( $\frac{1}{2}$ ) e = Pusa Shubhra, Pusa Snowball K – I (any 1) ( $\frac{1}{2}$ ) f = Black rot and curl blight black rot (any 1) ( $\frac{1}{2}$ ) g = cowpea ( $\frac{1}{2}$ ) h =Bacterial blight ( $\frac{1}{2}$ ) i = Pusa sadabahar ( $\frac{1}{2}$ ) j = Chilly mosaic virus, Tobacco mosaic virus and leaf curl. (any 1) ( $\frac{1}{2}$ )	5

**THE ASIAN SCHOOL, DEHRADUN (Marking Scheme)**

**CLASS 12**

**SUBJECT –BIOLOGY**

**CHAPTER- 10 Microbes in Human Welfare**

**MM-30**

Ans 1	It improves its nutritional quality by increasing vitamin B <sub>12</sub> ( <sup>1/2</sup> ), it checks disease- causing microbes in our stomach. ( <sup>1/2</sup> )	1
Ans 2.	Methanogens ( <sup>1/2</sup> ), substrate- cellulosic material/ cowdung/ agricultural waste. ( <sup>1/2</sup> )	1
Ans 3.	Yeast- <i>Monascus purpureus</i> ( <sup>1/2</sup> ), it acts by competitively inhibiting the enzyme responsible for synthesis of cholesterol. ( <sup>1/2</sup> )	1
Ans 4.	Aphids and mosquitoes. ( <sup>1/2</sup> + <sup>1/2</sup> )	1
Ans 5.	<i>Streptococcus</i> (bacterium) ( <sup>1/2</sup> ), it is used as a 'clot buster' for removing clots from the blood vessels of patients who have undergone myocardial infarction leading to heart attack. ( <sup>1/2</sup> )	1
Ans 6.	<i>Trichoderma polysporum</i> (fungus) ( <sup>1/2</sup> ), it is used as an immunosuppressive agent in organ transplant patients. ( <sup>1/2</sup> )	1
Ans 7.	Glomus	1
Ans 8.	Methanogens are the bacteria that grow anaerobically ( <sup>1/2</sup> ) on cellulosic material/ cow dung ( <sup>1/2</sup> ), and produce large amount of methane along with CO <sub>2</sub> and H <sub>2</sub> . ( <sup>1/2</sup> ) Example : Methanobacterium ( <sup>1/2</sup> )	2
Ans 9.	The dough which is used for making bread, is fermented ( <sup>1/2</sup> ) using baker's yeast ( <i>Saccharomyces cerevisiae</i> ). (1)	2
Ans 10.	BOD refers to the amount of oxygen that would be consumed if all the organic matter in one litre of water were oxidized by bacteria (1). The greater the BOD of a water sample, more is its polluting potential. (1)	2
Ans 11.	Because microbes like bacteria and fungi are used in their production ( <sup>1/2</sup> ). Eg- Cyclosporin A, citric acid, acetic acid, butyric acid, lactic acid, lipase, Ethanol, pectinases, proteases, Streptokinase, statins (any two examples.) ( <sup>1/2</sup> + <sup>1/2</sup> )	2
Ans 12.	a = Acetic acid ( <sup>1/2</sup> ), b = fungus ( <sup>1/2</sup> ), c = <i>Aspergillus niger</i> ( <sup>1/2</sup> ), d = <i>Clostridium butylicum</i> ( <sup>1/2</sup> ).	2
Ans 13.	Large holes in 'Swiss Cheese' are due to the production of a large amount of CO <sub>2</sub> (1), by a bacterium named <i>Propionibacterium sharmanii</i> . (1)	2
Ans 14	a) Chemical fertilisers have significantly increased Environmental pollution/ soil pollution, reducing its quality. Therefore, farmers use biofertilisers which enrich the nutrient quality of the soil. (1) b) <i>Anabaena</i> fix atmospheric nitrogen, thus enriching the nitrogen content in the soil. (1) Mycorrhiza is the symbiotic association between fungus and roots of higher plants. The fungal symbiont absorbs phosphorus from soil and passes it to the plant. (1)	3
Ans 15.	Nucleopolyhedrovirus. ( <sup>1/2</sup> ) The viruses are excellent candidates for species- specific ( <sup>1/2</sup> ), narrow spectrum insecticidal applications ( <sup>1/2</sup> ), show no negative impacts on plants, mammals, birds, fish or even on non- target insects( <sup>1/2</sup> ). This is especially desirable when beneficial insects are being conserved to aid in an overall integrated pest management (IPM) programme( <sup>1/2</sup> ), or when an ecologically sensitive area is being treated. ( <sup>1/2</sup> )	3
Ans 16.	Primary Treatment : i) Filtration: Floating debris is removed by sequential filtration. ( <sup>1/2</sup> ) ii) Sedimentation: the grit (soil and small pebbles) are removed. ( <sup>1/2</sup> ) All solids that settle from the 'Primary Sludge', and the supernatant forms the 'Effluent'( <sup>1/2</sup> ). The effluent from the primary settling tank is taken for secondary treatment. Secondary / Biological treatment : The primary effluent is passed into large aeration tanks where it is constantly agitated mechanically and air is pumped into it( <sup>1/2</sup> ). This allows vigorous growth of useful aerobic microbes into 'flocs'( <sup>1/2</sup> ). While growing, these microbes consume the major part of the organic matter in the effluent. This significantly reduces the BOD of the effluent( <sup>1/2</sup> ). The effluent is then passed into a settling tank where the bacterial 'flocs' are allowed to sediment. This sediment is called 'activated sludge'( <sup>1/2</sup> ). A small part of the activated sludge is pumped back into the aeration tank to serve as the inoculum ( <sup>1/2</sup> ). The remaining part of the sludge is pumped into large tanks called 'anaerobic sludge digesters'. Here, anaerobic bacteria digest the bacteria and fungi in the sludge( <sup>1/2</sup> ). During this digestion, bacteria produce a mixture of gases such as CH <sub>4</sub> , H <sub>2</sub> S and CO <sub>2</sub> , which form 'biogas' that can be used as a source of energy as it is inflammable ( <sup>1/2</sup> ). The effluent from the secondary treatment plant is generally released into natural water bodies.	5

Ans1	A selectable marker helps in identifying and eliminating non- transformants ( $1/2$ ), and selectively permitting the growth of the transformants. ( $1/2$ )	1
Ans 2	The first letter of the name comes from the genus ( $1/2$ ) and the second two letters come from the species of the prokaryotic cell which they were isolated ( $1/2$ ), the letter 'R' is derived from the name of strain, ( $1/2$ ) Roman numbers following the name indicate the order in which the enzymes were isolated from that strain of bacteria. ( $1/2$ )	2
Ans 3	Any protein encoding gene that is expressed in a heterologous host is called a recombinant protein. (1). Bioreactors are vessels in which raw materials are biologically converted into specific products, individual enzymes etc. using microbial plant, animal or human cells. A bioreactor provides the optimal conditions for achieving the desired product by providing optimum growth conditions (temperature, $p^H$ , substrate, salts, vitamins, oxygen) (1)	2
Ans 4	By treating the bacterial cells with lysozyme ( $1/2$ ). RNA can be removed by treatment with ribonuclease, ( $1/2$ ) proteins can be removed by treatment with protease, other molecules can be removed by appropriate treatments ( $1/2$ ) and purified DNA ultimately precipitates out after the addition of chilled ethanol. ( $1/2$ )	2
Ans 5	a) A recombinant DNA is inserted into the coding sequence of an enzyme, $\beta$ - galactosidase( $1/2$ ), the presence of chromogenic substrate ( $1/2$ ) gives blue coloured colonies if the plasmid in the bacteria does not have an insert (non- recombinant colonies) ( $1/2$ ). Presence of insert results into insertional inactivation of the $\beta$ - galactosidase and the colonies do not produce any colour, these are identified as recombinant colonies. ( $1/2$ ) b) Because presence of insert results into insertional inactivation of the enzyme $\beta$ - galactosidase(1).	3
Ans 6	i) Denaturation : The double- stranded DNA is denatured by applying high temperature of $95^{\circ}C$ for 15 sec. Each separated single -stranded strand now acts as a template for DNA synthesis. (1) ii) Annealing: Two sets of primers are added which anneal to the 3'end of each separated strand. (1) iii) Extension : DNA polymerase extends the primers by adding nucleotides complementary to the template provided in the reaction. ( $1/2$ ) A thermostable DNA polymerase (Taq polymerase) is used in the reaction which can tolerate the high temperature of the reaction. ( $1/2$ ) All these steps are repeated in many times to obtain several copies of desired DNA. Or Check fig 11.6, page 202 of NCERT	3
Ans 7.	By treating the bacterial cell with specific concentration of a divalent cation, such as calcium, which increases the efficiency with which DNA enters the bacterium through pores in its cell wall. ( $1/2$ ) DNA can then be forced into such cells by incubating the cells with r – DNA on ice, ( $1/2$ ) followed by placing them briefly at $42^{\circ}C$ ( heat shock), ( $1/2$ ) and then putting them back on ice. This enables the bacteria to take up the recombinant DNA. ( $1/2$ ) Or i) Micro-injection- r-DNA is directly injected into the nucleus of an animal cell. ii) Biolistics/ Gene gun – Plant cells are bombarded with high velocity micro-particles of gold / tungsten coated with DNA. iii) Disarmed Pathogen vectors: When disarmed pathogen vectors are allowed to infect the cell, it transfers r-DNA into the host cell. (any 2 methods) (1 +1) It is essential to make bacterial cells 'competent' since DNA is a hydrophilic molecule and therefore it cannot pass through cell membranes. (1)	3
Ans 8.	<i>Agrobacterium tumefaciens</i> is able to deliver a piece of 'T-DNA' ( $1/2$ ) to transform normal plant	3



	cells into a tumor ( $1/2$ ) and direct these tumor cells to produce the chemicals required by the pathogen( $1/2$ ). The Ti plasmid of Agrobacterium has now been modified into a cloning vector( $1/2$ ) which is no more pathogenic to the plants ( $1/2$ ) but is still able to use the mechanisms to deliver genes of our interest into a variety of plants. ( $1/2$ )	
Ans 9	Check fig 11.4, page 199 of NCERT a) 2 restriction sites ( $1/2+1/2$ ) b) Ori and rop genes ( $1/2+1/2$ ) c) An antibiotic resistant gene (1)	3
Ans 10	Gel electrophoresis ( $1/2$ ), negatively charged DNA fragments are forced to move towards the anode under an electric field through agarose gel, ( $1/2$ ) the DNA fragments separate according to their size through sieving effect provided by the agarose gel. Hence smaller the fragment size, the farther it moves. ( $1/2$ ) The separated fragments can be visualized after staining the DNA with ethidium bromide followed by exposure to UV radiation ( $1/2$ ), bright orange coloured bands of DNA are observed( $1/2$ ). The separated bands of DNA are cut out from the agarose gel and extracted from the gel piece (elution). ( $1/2$ )	3
Ans 11.	a) Check fig 11.1, page 196 of NCERT (4) b) Exonucleases remove nucleotides from the ends of the DNA whereas, endonucleases make cuts at specific positions within the DNA. (1)	5

**THE ASIAN SCHOOL, DEHRADUN (Marking Scheme)**

**CLASS 12**

**SUBJECT –BIOLOGY**

**CHAPTER- 12 Biotechnology & Its Application MM-30**

Ans1	It produced protein- enriched milk that contained the human alpha lactalbumin and was nutritionally a more balanced product for human bodies than natural cow-milk. ( $\frac{1}{2} + \frac{1}{2}$ )	1
Ans 2	cryIIAc/cryIIAb control the cotton bollworms, cryIAb controls corn borer. ( $\frac{1}{2} + \frac{1}{2}$ )	1
Ans 3	Transposons are mobile genetic elements that replicate via an RNA intermediate.	1
Ans 4	i) PCR is used to detect HIV in suspected AIDS patients. ii) It is being used to detect mutations in genes in suspected cancer patients too. iii) It is used to identify many other genetic disorders (any two points). ( $\frac{1}{2} + \frac{1}{2}$ )	1
Ans 5	A plasmid is an autonomously replicating circular extra- chromosomal DNA.	1
Ans 6	Human protein $\alpha - 1$ - antitrypsin.	1
Ans 7	GM crops are more tolerant to abiotic stresses (cold, drought, salt, heat) , have reduced reliance on chemical pesticides, help to reduce post harvest losses, have increased efficiency of mineral usage by plants, have enhanced nutritional value of food, e.g. Vitamin 'A' enriched rice. (any four points) ( $\frac{1}{2} \times 4$ )	2
Ans 8	GEAC makes decisions regarding the validity of GM research, and the safety of introducing GM- organism for public services. (1+1)	2
Ans 9	Biopiracy should be prevented because it refers to the use of bio-resources by MNCs and other organizations without proper authorization from the countries and people concerned without compensatory payment. (1) The Indian Parliament has cleared the second amendment of the Indian Patents Bill, that takes such issues into consideration, including patent terms emergency provisions and research and development initiative. (1)	2
Ans 10	Recombinant DNA technology, Polymerase chain reaction and Enzyme linked Immuno-sorbent Assay. These techniques serve the purpose of early diagnosis of diseases. ( $\frac{1}{2} \times 4$ )	2
Ans 11	a) Cause : deletion of the gene for ADA (1), immune system is affected. ( $\frac{1}{2}$ ) b) Retroviral vector (1), lymphocytes ( $\frac{1}{2}$ ).	3
Ans 12	<i>Bacillus thuringiensis</i> produces protein crystals which contain a toxic insecticidal protein. The Bt toxin protein exists as inactive protoxins in <i>Bacillus</i> ( $\frac{1}{2}$ ) but once an insect ingest the inactive toxin, it is converted into an active form of toxin due to the alkaline P <sup>H</sup> of the gut which solubilise the crystals ( $\frac{1}{2}$ ). The activated toxin binds to the surface of midgut epithelial cells ( $\frac{1}{2}$ ) and create pores ( $\frac{1}{2}$ ) that cause cell swelling and lysis ( $\frac{1}{2}$ ) and eventually cause death of the insect ( $\frac{1}{2}$ ).	3
Ans 13	a) <i>Meloidegryne incognitia</i> . (1) b) Using <i>Agrobacterium</i> vectors, ( $\frac{1}{2}$ ) nematode-specific genes are introduced into the host plant, ( $\frac{1}{2}$ ) it produces both sense and anti-sense RNA in the host cells, ( $\frac{1}{2}$ ) these two RNAs being complementary to each other form a dsRNA ( $\frac{1}{2}$ ) that initiates RNAi ( $\frac{1}{2}$ ) and thus, silence the specific mRNA of the nematode ( $\frac{1}{2}$ ) , the parasite cannot survive in a transgenic host expressing specific interfering RNA ( $\frac{1}{2}$ ), the transgenic plant therefore gets itself protected from the parasite ( $\frac{1}{2}$ )	5
Ans 14	a) Proinsulin consists of two short polynucleotide chains: chain A and chain B, that are linked together by disulphide bridges. It also contains an extra stretch called the C peptide. Mature insulin consists of two short polypeptide chains : chain A and chain B, that are linked together by disulphide bridges. It does not contain C peptide. (1) b) Eli Lilly, an American company prepared two DNA sequences corresponding to A and B ( $\frac{1}{2}$ ), chains of human insulin ( $\frac{1}{2}$ ) and introduced them in plasmids of <i>E.coli</i> to produce insulin chains ( $\frac{1}{2}$ ). Chain A and B were produced separately ( $\frac{1}{2}$ ), extracted ( $\frac{1}{2}$ ) and combined by creating disulfide bonds to form human insulin. ( $\frac{1}{2}$ ) c) Insulin was earlier extracted from pancreas of slaughtered cattle and pigs. It caused some patients to develop allergy or other types of reactions to the foreign protein. (1)	5

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**CLASS 12**

**SUBJECT –BIOLOGY**

**CHAPTER- 13 Organisms and Populations**

**MM-30**

Ans1	Death rate = $8/80 = 0.1$ individuals per fruitfly per week.	1
Ans 2	The loss of unnecessary sense organs, presence of adhesive organs or suckers to cling on to the host, loss of digestive system and high reproductive capacity. ( $1/2 \times 4$ )	2
Ans 3	Heat loss or heat gain is a function of surface area. Since small animals have a larger surface area relative to their volume, they tend to lose body heat very fast when it is cold outside, then they have to expend much energy to generate body heat through metabolism. ( $1/2 \times 4$ )	2
Ans 4	Predation acts as conduits for energy transfer across trophic levels, it keeps prey population under control, Predators help in maintaining species diversity in a community (any two points). (1 + 1)	2
Ans 5	a) Some species of insects and frogs ( $1/2$ ) are cryptically coloured (camouflaged) to avoid being detected easily by the predator. ( $1/2$ ). b) Some are poisonous and therefore avoided by the predators. The Monarch butterfly ( $1/2$ ) is highly distasteful to its predator (bird) because of a special chemical present in its body. ( $1/2$ ) (Any other relevant point).	2
Ans 6	a) Commensalism ( $1/2$ ) b) Brood parasitism ( $1/2$ ) c) Commensalism ( $1/2$ ) d) Parasitism ( $1/2$ ) e) Mutualism ( $1/2$ ) f) Commensalism ( $1/2$ ).	3
Ans 7	In fungi, thick-walled spores are formed which help them to survive unfavourable conditions. Zooplankons enter diapause, a state of suspended development, under unfavourable conditions. Bears go into hibernation during winter by escaping in time. (1+1+1)	3
Ans 8	a) The population size tells us a lot about (i) its status in the habitat, (ii) whatever ecological processes we wish to investigate in a population, be it the outcome of competition with another species, the impact of a predator or the effect of a pesticide application (iii) whether population is increasing or declining (any 2 points) ( $1/2 + 1/2$ ) b) By physical counting, the percent cover or biomass, from relative densities, counting pugmarks, counting faecal pellets. (any four points) (1x4) = 4	5
Ans 9	a) Check fig. 13.5, page 230 of NCERT (1 + 1) b) Condition i) $-\frac{dN}{dt} = rN \left[ \frac{K-N}{K} \right]$ ( $1/2$ ) Condition ii) $-\frac{dN}{dt} = rN$ ( $1/2$ ) c) Logistic growth curve, since resources for growth for most animal populations are finite and become limiting sooner or later. (1) d) Every ecosystem or environment or habitat has limited resources to support a particular maximum number of individuals called its carrying capacity (K). (1)	5
Ans 10	a) It states that two closely related species competing for the same resources cannot co-exist indefinitely and the competitively inferior one will be eliminated eventually. (1) Example: i) The Abington tortoise in Galapagos islands become extinct within a decade after goats were introduced on the island, apparently due to the greater browsing efficiency of the goats. (1) Example: ii) On the rocky sea coasts of Scotland, the larger and competitively superior barnacle <i>Balanus</i> dominates the intertidal area, and excludes the smaller barnacle <i>Chathamalus</i> from that zone. (1) b) This may be true if resources are limiting but not otherwise. ( $1/2$ ) c) Resource partitioning- if two species compete for the same resource, they could avoid competition by choosing, for instance, different times for feeding or different foraging patterns. ( $1/2$ ) Example : Five closely related species of warblers living on the same tree were able to avoid competition and co-exist due to behavioural differences in their foraging activities. (1)	5

**THE ASIAN SCHOOL, DEHRADUN (Marking Scheme)**

**CLASS 12**

**SUBJECT –BIOLOGY**

**CHAPTER- 14 Ecosystem**

**MM-30**

Ans 1	Because a considerable amount of GPP is utilized by plants in respiration.	1
Ans 2	Standing state – It is the amount of nutrients, such as carbon, nitrogen, phosphorus, calcium etc, present in the soil at any given time. Standing crop- It is a mass of living material at a particular time at each trophic level.	1
Ans 3	Since some soil or sediment is present, secondary succession is faster than the Primary succession.	1
Ans 4	Because the biomass of fishes far exceeds that of phytoplanktons.	1
Ans 5	Detrivore- Organisms that feed on detritus and break them into smaller particles e.g. earthworm. Decomposer- Organisms that break down complex organic matter into inorganic substances by secreting enzymes.eg : Some bacteria and fungi. (Difference = 1) (e.g = $(\frac{1}{2} + \frac{1}{2})$ )	2
Ans 6.	It is the rate of formation of new organic matter by consumers. (1) Productivity depends on a variety of environmental factors, availability of nutrients and photosynthetic capacity of plants. (any 2 factors) $(\frac{1}{2} + \frac{1}{2})$	2
Ans 7	In a particular climatic condition, decomposition rate is slower if detritus is rich in lignin and chitin, (1) and quicker, if detritus is rich in nitrogen and water-soluble substances like sugars (1). Decomposition is largely an oxygen- requiring process $(\frac{1}{2})$ . Anaerobiosis inhibit decomposition. $(\frac{1}{2})$	3
Ans 8	i) It does not take into account the same species belonging of two or more trophic levels. (1) ii) It assumes a simple food chain, something that almost never exists in nature; it does not accommodate a food web. (1) iii) Saprophytes are not given any place in ecological pyramids even though they play a vital role in the ecosystem. (1)	3
Ans 9	In primary succession in water, the pioneers are the small phytoplanktons, $(\frac{1}{2})$ they are replaced with time by free-floating angiosperms, $(\frac{1}{2})$ then by rooted hydrophytes, $(\frac{1}{2})$ , sedges, $(\frac{1}{2})$ , grasses $(\frac{1}{2})$ and finally the trees. $(\frac{1}{2})$ . The climax community would be a forest with time, the water body is converted into land.	3
Ans 10	a) The rate at which the amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis (1). It is expressed in terms of $g^{-2} yr^{-1} / (Kcalm^{-2}) yr^{-1}$ . (1) b) Gross primary productivity of an ecosystem is the rate of production of organic matter during photosynthesis. Net primary productivity is the available biomass for the consumption to heterotrophs/ $GPP-R= NPP$ . (1)	3
Ans 11	<b>Fragmentation</b> : Detrivores (e.g earthworm) break down detritus into smaller particles. (1) <b>Leaching</b> : Water- soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts. (1) <b>Catabolism</b> : Bacterial and fungal enzymes degrade detritus into simpler inorganic substances- (1). <b>Humification</b> :Accumulation of humus in soil that is highly resistant to microbial action and undergoes decomposition at an extremely slow rate. (1) <b>Mineralisation</b> : The humus is further degraded by some microbes and release of inorganic nutrients occur by the process of mineralisation. (1).	5
Ans 12	a) In primary succession on rocks, lichens secrete acids to dissolve rock $(\frac{1}{2})$ , helping in weathering $(\frac{1}{2})$ and soil formation $(\frac{1}{2})$ . The later pave way to some very small plants like bryophytes, $(\frac{1}{2})$ which are able to take hold in the small amount of soil. They are with time, succeeded by bigger plants $(\frac{1}{2})$ , and after several more stages, ultimately a stable climax forest community is formed. $(\frac{1}{2})$ With time, the xerophytic habitat gets converted into a mesophytic habitat. b) i) Unlike carbon cycle, there is no respiratory release of phosphorus into atmosphere in Phosphorus cycle. (1) i) Atmospheric inputs of phosphorus through rainfall are much smaller than carbon inputs. (1)	5

**THE ASIAN SCHOOL, DEHRADUN (Marking Scheme)**

**CLASS 12**

**SUBJECT –BIOLOGY**

**CHAPTER- 15 Biodiversity and Conservation**

**MM-30**

Ans 1	Western Ghats.	1
Ans 2	A technique by which gametes of threatened species can be preserved in viable and fertile condition for long periods.	1
Ans 3	Biodiversity is a source of hybrids, GM plants, biopesticides, organic farming, biofertilisers, disease-resistant plants, improved varieties of plants (any two points) ( $\frac{1}{2} + \frac{1}{2}$ )	1
Ans 4	<p>i) <b>Genetic diversity</b> : Diversity at the genetic level. Example : India has more than 50,000 genetically different strains of rice/ 1,000 varieties of mango.</p> <p>ii) <b>Species diversity</b> : Diversity at the species level. Example : The western ghats have a greater amphibian species diversity than the Eastern Ghats.</p> <p>iii) <b>Ecological diversity</b> : Diversity at the ecosystem level. Example: India with its deserts, rain forests, coral reefs, mangroves, wetlands, estuaries, and alpine meadows has a greater ecosystem diversity than a Scandinavian country like Norway. (any two points with explanation) (1+1)</p>	2
Ans 5	A stable biological community should not show too much variation in productivity from year to year, it must be either resistant or resilient to occasional disturbances (natural or man-made), and it must also be resistant to invasions by alien species, communities should have greater biodiversity (more species) for greater stability. ( $\frac{1}{2} \times 4$ )	2
Ans 6	Biodiversity hot spots are the regions with very high levels of species richness and high degree of endemism (1). e.g Western Ghats and Sri Lanka, Indo Burma and Himalaya (any two examples) ( $\frac{1}{2} + \frac{1}{2}$ )	2
Ans 7.	The Amazon rain forest. (1) It is being cut and cleared for cultivating soya beans or conversion to grasslands for raising beef cattle. ( $\frac{1}{2} + \frac{1}{2}$ )	2
Ans 8	Sacred groves are the undisturbed forest patches where all the trees and wildlife are given total protection. Sacred groves are the last refuges for a large number of rare and threatened plants. (1) Sacred groves are found in Khasi and Jaintia hills in Meghalaya, Aravalli Hills of Rajasthan, Western Ghat regions of Karnataka and Maharashtra and the Sarguja, Chanda and Bastar areas of Madhya Pradesh. (any two regions). ( $\frac{1}{2} + \frac{1}{2}$ )	2
Ans 9.	<p>i) The Nile perch introduced into Lake Victoria in east Africa led eventually to the extinction of an ecologically unique assemblage of more than 200 species of a cichlid fish in the lake(1).</p> <p>ii) <i>Parthenium</i>, <i>Lantana</i> and water hyacinth (<i>Eichhornia</i>) are the exotic species of plants that have invaded the native species of India and caused environmental damage. (1)</p> <p>iii) Introduction of the African catfish <i>Clarias gariepinus</i> for aquaculture purpose is posing a threat to the indigenous catfishes in our rivers.(1)</p>	3
Ans 10	When a species becomes extinct, the plant and animal species associated with it in an obligatory ways also become extinct (1) Example : when a host fish species becomes extinct, its unique assemblage of parasites also meets the same fate. (or any other example) ( $\frac{1}{2}$ ) Three other causes of loss of biodiversity are : Habitat loss and fragmentation, ( $\frac{1}{2}$ ) over-exploitation of natural resources ( $\frac{1}{2}$ ) and alien species invasions ( $\frac{1}{2}$ ).	3
Ans 11	<p>i) Unlike temperate regions subjected to frequent glaciations in the past, tropical latitudes have remained relatively undisturbed for millions of years and thus, had a long evolutionary time for species diversification (ii) Tropical environments, unlike temperate ones, are less seasonal, relatively more constant and predictable. Such constant environments promote niche specialization and lead to a greater species diversity. (iii) There is more solar energy available in the tropics, which contributes to higher productivity, this in turn might contribute indirectly to greater diversity. (1+1+1)</p>	3
Ans 12.	<p>a) Check fig 15.2 , page 262 of NCERT. (<math>\frac{1}{2} + \frac{1}{2}</math>)</p> <p>b) The relation between species richness and area for a wide variety of taxa turns out to be a hyperbola. It shows that within a region species richness increases with increasing explored area, but only up to a limit. (<math>\frac{1}{2}</math>) Equation - <math>S = CA^z</math> (<math>\frac{1}{2}</math>) On a logarithmic scale, the relationship is a straight line described by the equation. (<math>\frac{1}{2}</math>)</p>	3

	<p><math>\log S = \log C + Z \log A</math> <sup>(1/2)</sup>  Where S = species richness, A = Area , C = Y-intercept, Z = slope of the line (regression coefficient)</p>	
Ans 13	<p>a) In-situ conservation and Ex-situ conservation <sup>(1/2+1/2)</sup>.  <b>In-situ conservation</b>- It involves protection of threatened plants and animals in their natural habitat <sup>(1/2)</sup> Example : biosphere reserves, national parks, sanctuaries, sacred groves etc. (any 1 e.g) <sup>(1/2)</sup>  <b>Ex-situ conservation</b> : Threatened plants and animals are taken out from their natural habitat and placed in special setting where they can be protected and given special care. <sup>(1/2)</sup>  Example : Zoological parks, botanical gardens, wildlife safari parks etc. (any 1 e.g) <sup>(1/2)</sup></p> <p>b) The current species extinction rates are estimated to be 100 to 1,000 times faster than in pre-human times<sup>(1/2)</sup>. It is due to human activities. <sup>(1/2)</sup></p> <p>c) When a host fish species becomes extinct, its unique assemblage of parasites also becomes extinct. (or any other relevant example)<sup>(1/2)</sup></p> <p>d) The conventional taxonomic methods are not suitable for identifying microbial species and many bacteria species are simply not culturable under laboratory conditions. This becomes a problem in studying their morphological, biochemical and other characterizations which are useful for their assessment. <sup>(1/2)</sup></p>	5

**CLASS 12**                      **SUBJECT –BIOLOGY**                      **C HAPTER- 16 Environmental Issues**                      **MM-30**

Ans 1	It is the phenomenon in which pollutants from man's activities like effluents from the industries and homes can radically accelerate the aging process.	1
Ans 2	Because lead in the petrol inactivates the catalyst used in catalytic converters, which convert harmful pollutants (CO, unburnt hydrocarbons, nitric oxide) to lesser harmful pollutants (CO <sub>2</sub> , H <sub>2</sub> O, N <sub>2</sub> ).	1
Ans 3	Montreal Protocol, an international treaty, was signed at Montreal (Canada) in 1987 (effective in 1989) to control the emission of ozone- depleting substances.	1
Ans 4	Ahmed Khan developed Polyblend, a fine powder of recycled modified plastic <sup>(1/2)</sup> . This mixture is mixed with the bitumen that is used to lay roads <sup>(1/2)</sup> . This enhanced the bitumen's water repellent properties, <sup>(1/2)</sup> and helped to increase road life by a factor of three. <sup>(1/2)</sup> Or Irreparable computers and other electronic goods produce e- waste <sup>(1/2)</sup> . E-wastes are buried in landfills <sup>(1/2)</sup> or incinerated <sup>(1/2)</sup> . Recycling <sup>(1/2)</sup> is the only solution for the treatment of e-waste.	2 2
Ans 5	An electrostatic precipitator removes over 99% particulate matter present in the exhaust from a thermal power plant <sup>(1/2)</sup> . It has electrode wires that are maintained at several thousand volts, <sup>(1/2)</sup> which produce a corona that releases electrons <sup>(1/2)</sup> . These electrons attach to dust particles giving them a net negative charge. <sup>(1/2)</sup> The collective plates are grounded and attract the charged dust particle. <sup>(1/2)</sup> The velocity of air between the plates must be low enough to allow the dust to fall. <sup>(1/2)</sup>	3
Ans 6.	a) The algal bloom was caused due to the presence of large amounts of nutrients in waste water. (1) b) It causes deterioration of water quality, fish mortality, decline in dissolved oxygen in water, some bloom- forming algae are extremely toxic to human beings and animals. (any three points <sup>(1/2)X3</sup> ) c) Accelerated Eutrophication <sup>(1/2)</sup>	3
Ans 7.	a) Biochemical Oxygen Demand <sup>(1/2)</sup> b) Microorganisms involved in biodegradation of organic matter in the receiving water body consume a lot of oxygen <sup>(1/2)</sup> , it results in decline in dissolved oxygen at a particular segment of a river near a sugar factory <sup>(1/2)</sup> , it will cause mortality of fish and other aquatic creatures. <sup>(1/2)</sup> c) When the amount of organic matter decreases and the microbes do not need oxygen for decomposition, the BOD decreases <sup>(1/2)</sup> . The aquatic organisms will start flourishing. <sup>(1/2)</sup>	3
Ans 8	Because DDT (a toxic substance) accumulated by an organism cannot be metabolised or excreted <sup>(1/2)</sup> and is thus passed on to the next higher trophic level. High concentrations of DDT disturb calcium metabolism in birds, <sup>(1/2)</sup> which causes thinning of eggshell <sup>(1/2)</sup> and their premature breaking <sup>(1/2)</sup> eventually causing decline in bird populations. <sup>(1/2)</sup> The phenomenon is 'Biomagnification'. <sup>(1/2)</sup>	3
Ans 9	i) Switching over the entire fleet of public transport from diesel to CNG ii) phasing out of old vehicles iii) use of unleaded petrol iv) use of low- sulphur petrol and diesel v) use of catalytic converters in vehicles (vi) application of stringent pollution-level norms for vehicles. <sup>(1/2)X6</sup>	3
Ans10	a) It prevents the entry of harmful UV rays from the sun. <sup>(1/2)</sup> b) Chlorofluorocarbons (CFCs) <sup>(1/2)</sup> CFCs discharged in the lower part of atmosphere move upward and reach stratosphere. In stratosphere, UV rays act on them releasing Cl atoms <sup>(1/2)</sup> , Cl degrades ozone <sup>(1/2)</sup> releasing molecular oxygen <sup>(1/2)</sup> , with these atoms acting merely as catalysts, <sup>(1/2)</sup> Cl atoms are not consumed in the reaction <sup>(1/2)</sup> . Hence, whatever CFCs are added to the stratosphere, they have permanent and continuing effects on ozone levels. <sup>(1/2)</sup> c) Depletion of ozone allows the entry of UV-B radiation to the Earth. UV-B damages DNA and causes mutation. It causes aging of skin, damage to skin cells and various types of skin cancer. In human eye, cornea absorbs UV- B radiation, and a high dose of UV-B causes	5

	inflammation of cornea, called 'snow-blindness', cataract etc. (any two points) ( $\frac{1}{2} + \frac{1}{2}$ )	
Ans 11	<p>a) CO<sub>2</sub> - 60% (<math>\frac{1}{2}</math>), CH<sub>4</sub> - 20% (<math>\frac{1}{2}</math>) CFCs-14%, N<sub>2</sub>O = 6% (<math>\frac{1}{2}</math>)</p> <p>b) El- Nino effect refers to the odd climatic changes due to rise in temperature (<math>\frac{1}{2}</math>). It leads to increased melting of polar ice caps, (<math>\frac{1}{2}</math>) rise in sea level (<math>\frac{1}{2}</math>) that can submerge many coastal areas, thus resulting in biodiversity loss. (<math>\frac{1}{2}</math>)</p> <p>c) Cutting down use of fossil fuel, improving efficiency of energy usage, reducing deforestation, planting trees and slowing down the growth of human population. (any two points) (<math>\frac{1}{2} + \frac{1}{2}</math>)</p>	5