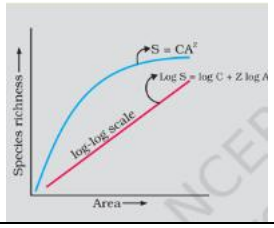
Bhartiya Shiksha Board

Sample Quest on Paper Biology (152)

Marking Scheme

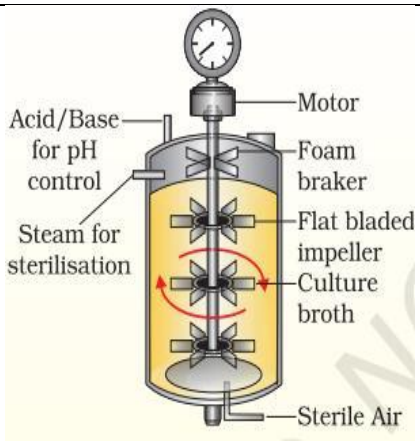
Q. No.	Expected Answer / Value Points	Distribut on of Marks	
1.	(b) Ant podal, Polar nuclei, Egg cell, Synergid	1	
2.	(a) Flower colour- Red/white	1	
3.	(c) *Escherichia coli*	1	
4.	(d) CO_2	1	
5.	(b) *Papaver somniferum*	1	
6.	(c) Bone marrow	1	
7.	(d) Wine	1	
8.	(b) *Hind II*	1	
9.	(a) *cryIAb*	1	
10.	(b) Fungi and the roots of higher plants.	1	
11.	(d) Product vity	1	
12.	(b) Mineralisat on	1	
13.	(a) Both Assert on (A) and Reason (R) are true and Reason (R) is the correct explanat on for Assert on (A).	1	
14.	(b) Both Assert on (A) and Reason (R) are true but Reason (R) is not correct explanat on for Assert on (A).	1	
15.	(c) Assert on (A) is true but Reason R is false.	1	
16.	(d) Assert on (A) is false but Reason R is true.	1	
17.	(a) (i) LH acts at the Leydig cells and st mulates synthesis and secret on of androgens/ Androgens, in turn, st mulate the process of spermatogenesis. (ii) FSH acts on the Sertoli cells and st mulates secret on of some factors which help in the process of spermiogenesis.	1 1	2
18.	The cause of this genet c disorder is the presence of an addit onal copy of the chromosome number 21 (trisomy of 21). The af ected individual is short statured with small round head, furrowed tongue and part ally open mouth. Palm with characterist c palm crease. Physical, psychomotor and mental development is retarded. (any two)	1 ½ X 2	2
19.	(a) Australian marsupials are considered a classic example of adapt ve radiat on because, start ng from a common ancestor, they diversif ed into many dif erent forms to occupy various ecological niches in Australia.	2	2
20.	A - the large holes in 'Swiss cheese' B- *Saccharomyces cerevisiae* C- immunosuppressive agent in organ-transplant pat ents D- *Monascus purpureus* **OR**	½ x 4	2

	Benign tumors normally remain conf ned to their original locat on/ cause lit le damage. malignant tumor cells grow very rapidly/ invading and damaging the surrounding normal t ssues		
21..	(i) rop, (ii) Hind III, EcoR I, BamH I, Sal I, Pvu II, Pst I, Cla I (any 2), (iii) amp^R and tet^R (any one)	½ x 4	2
22.	(a) (i) - It is a 'once a week' pill with very few side ef ects. - Its contracept ve value is high. - It is non-steroidal. (Any two) (ii) Developed by scient sts at Central Drug Research Inst tute (CDRI) in Lucknow, India **OR** (b) A- Zygote, Ploidy- diploid/(2n) B- Primary endosperm nucleus (PEN), Ploidy- haploid/(3n) C- Ant podal cells (degenerat ng), Ploidy- haploid (n)	1x2 1 ½ x2 ½ x2 ½ x2	3
23.	(i) Inheritance**:** Autosomal recessive trait. (ii) Enzyme def ciency: Lack of enzyme convert ng phenylalanine to tyrosine. (iii) Consequences: Accumulat on → phenylpyruvic acid format on → mental retardat on, excret on in urine.	1 x 3	3
24.	(a) (i) Base pairs: 3164.7 million bp. (ii) Chromosome 1 has most genes (2968) / Y has the fewest (231) genes. (iii) Repet t ve sequences/SNPs: Important for chromosome structure, evolut on, and disease associat on studies. OR (b) (i) Gene migrat on (gene f ow) and allele frequency: - When individuals migrate from one populat on to another, they bring new alleles into the new populat on and remove them from the original one. / This alters allele frequencies in both populat ons, leading to gene f ow if migrat on occurs repeatedly. (ii) Gene f ow: Change in allele frequency due to migrat on of individuals between populat ons. Genet c drif : Random change in allele frequency occurring by chance, especially in small populat ons, without migrat on.	1 x 3 1 1 1	3 3
25.	(i) Sources: Bacteria, fungi, cyanobacteria. (Any two) (ii) Examples: *Rhizobium* (symbiot c nitrogen f xat on), *Azospirillum* & *Azotobacter* (free-living nitrogen f xat on), Glomus (mycorrhiza for phosphorus absorpt on, resistance, tolerance). (Any two) (iii) Importance: Organic farming, soil fert lity, reduced chemical fert liser use. (Any two)	1 x 3	

26.	(i) RNAi mechanism: RNA interference silences specif c mRNA using complementary double-stranded RNA, prevent ng translat on. (ii) Applicat on in tobacco plants: Agrobacterium vectors introduced nematode-specif c genes that produced sense and ant sense RNAs, forming dsRNA to silence nematode mRNA. (iii) Outcome: The nematode Meloidogyne incognita could not survive, making the transgenic tobacco plant pest-resistant.	1 x 3	3
27.	Mutualism: An interact on where both species benef t from the relat onship. Example: Bees and f owering plants — bees get nectar for food, while plants get pollinated. / Lichens- represent mutualist c relat onship between a fungus and photosynthesising algae or cyanobacteria. / The mycorrhizae are associat ons between fungi and the roots of higher plants. The fungi help the plant in the absorpt on of essent al nutrients from the soil while the plant in turn provides the fungi with energy-yielding carbohydrates. (Any one) Commensalism: An interact on where one species benef ts and the other is neither harmed nor benef ted. Example: An orchid growing as an epiphyte on a mango branch, and barnacles growing on the back of a whale benef t while neither the mango tree nor the whale derives any apparent benef t. / The cat le egret and grazing cat le in close associat on. / The interact on between sea anemone that has st nging tentacles and the clown f sh that lives among them -- (Any one)	½ + 1 ½ + 1	3
28.	• Humboldt observed that species richness increases with area, but only up to a limit. • The relat onship follows a rectangular hyperbola, expressed as: $S = C A^z$ • On a logarithmic scale, it becomes a straight line: log S = log C + Z log A *(alternate answer)*  	1 x 3	3
29.	(a) Male gametes are produced in pollen grains. (b) Genet c variat on is ensured through fert lizat on, where gametes from dif erent parents combine. (c) Sequence af er pollinat on: . Pollen grains land on the st gma. . Pollen tube grows through the style to reach the ovule.	1 1 2	4

	. Male gametes travel through the tube, fert lize the egg cell, forming a zygote. . The zygote develops into an embryo, and the ovule matures into a seed. OR (c) Locat on of gamete format on: - Male gametes form in the anther (pollen grains). - Female gametes form in the ovule inside the ovary. - This arrangement ensures that pollen can be transferred to the st gma. - Allow fert lizat on to occur ef ciently within the f ower.	½ x 4 ½ x 4	
30.	(a) A- Ant gen binding site, B- Heavy chain (b) IgA, IgM, IgE, IgG (Any two) (c) Humoral immune response- The response by ant bodies found in the blood, this is ant body mediated. Cell-mediated immune response- T-lymphocytes mediate CMI. OR (c) (i) The B-lymphocytes, (ii) Cell-mediated immune response is responsible for the graf reject on.	½ x 2 ½ x 2 2 2	4
31.	(a) A- Sperm, B- Cells of corona radiata, C- Zona pellucida, D- Perivitelline space (b) sperm itself induces changes in the membrane that block the entry of addit onal sperms. (c) The acrosome secret on enables the sperm to penetrate the zona pellucida and plasma membrane of the ovum. This triggers complet on of the second meiot c division, forming a haploid ovum that fuses with the sperm nucleus to produce a diploid zygote. OR Double Fert lizat on in Angiosperms: - In angiosperms, the pollen tube carries two male gametes into the embryo sac. - One male gamete fuses with the egg cell → forms diploid zygote (2n). - The other male gamete fuses with the two polar nuclei in the central cell → forms triploid endosperm (3n). Signif cance: - Ensures format on of zygote (future embryo) and endosperm simultaneously. - Endosperm provides nourishment to the developing embryo. - Unique feature of angiosperms, contribut ng to their evolut onary success.	½ x 4 1 2 1 x 3 1 x 2	5
32.	(a) (i) The Human Genome Project (HGP) aimed to decode the ent re human DNA sequence (~3 billion base pairs). (ii) It required large-scale internat onal collaborat on involving scient sts from many countries. (iii) The project demanded huge f nancial investment (billions of dollars) and advanced technology.	1 x 3	5

	(iv) It generated an enormous amount of data, stored and analysed using powerful bioinformat cs tools. (v) Its outcomes had far-reaching applicat ons in medicine, biotechnology, and evolut onary biology. (Any three) (b) (i) Ident fy all the approximately 20,000-25,000 genes in human DNA (ii) Determine the sequences of the 3 billion chemical base pairs that make up human DNA (iiii) Store this informat on in databases (iv) Improve tools for data analysis (v) Transfer related technologies to other sectors, such as industries (vi) Address the ethical, legal, and social issues (ELSI) that may arise from the project. (Any 4) OR Sut on and Boveri's Proposal: They argued that chromosomes occur in pairs, and their pairing and separat on during meiosis leads to the segregat on of the factors (genes) they carry. Chromosomal Theory of Inheritance: Sut on combined chromosomal behaviour with Mendel's principles, concluding that genes are located on chromosomes and follow Mendelian laws. Experimental Verif cat on: Thomas Hunt Morgan used Drosophila melanogaster (fruit f y) to test this theory. Suitability of Drosophila: Flies had a short life cycle (~2 weeks), produced many progenies, showed clear sexual dimorphism, and displayed visible hereditary variat ons. Morgan's Findings: His experiments demonstrated that specif c traits are linked to part cular chromosomes, thereby conf rming the chromosomal theory of inheritance and explaining variat on in sexual reproduct on.	½ x 4 1 x 5	
33.	(i) A st rred-tank reactor is usually cylindrical or with a curved base to facilitate the mixing of the reactor contents. (ii) The st rrer facilitates even mixing and oxygen availability throughout the bioreactor. (iii) Air can be bubbled through the reactor. (iv) It has an agitator system, an oxygen delivery system and a foam control system, a temperature control system, pH control system. (v) sampling ports so that small volumes of the culture can be withdrawn periodically. *(Alternate answer-- the following diagram with proper labelling)*	1 x 5	5

	 **OR** Genet c modif cat on has: (i) made crops more tolerant to abiot c stresses (cold, drought, salt, heat). (ii) reduced reliance on chemical pest cides (pest-resistant crops). (iii) helped to reduce post-harvest losses. (iv) increased ef ciency of mineral usage by plants. (v) enhanced nutrit onal value of food, e.g., golden rice, i.e., Vitamin 'A' enriched rice. (vi) GM has been used to create tailor-made plants to supply alternat ve resources to industries, in the form of starches, fuels and pharmaceut cals. (Any f ve)	1 x 5 (any 5 labellings) 1 x 5	