



COMMON PRE-BOARD EXAMINATION 2022-23

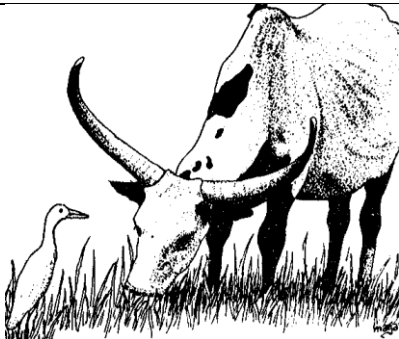
Subject: BIOLOGY-044 ANSWER KEY



Date:

General Instructions:

1. This question paper has five sections and 33 questions.
2. Section **A** has 16 questions of 1 mark each
3. Section **B** has 5 questions of 2 marks each
4. Section **C** has 7 questions of 3 marks each
5. Section **D** has 2 case-based questions of 4marks each
6. Section **E** has 3 questions of 5 marks each.
7. All questions are compulsory. 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.
8. Wherever necessary, neat and properly labelled diagrams should be drawn.

Q.No	SECTION A	Marks
1.	c) i-analogous ii-homologous iii-analogous	1
2	c)pancreas	1
3	d)i and ii	1
4	c) bottled juices are clarified by pectinases	1
5	c) wind	1
6	 b)commensalism	1
7	c) Chromosome 1 and Y	1
8	c) Excessive dosage of cocaine causes hallucinations.	1
9	d)standing crop	1
10	b)all are <i>ex situ</i> conservation methods.	1

11	b)expanding	1
12	d)a-BamH I b-Pvu II c-ampR d-Pvu I and Pst I	1
13	B.Both A and R are true and R is not the correct explanation of A	1
14	D.A is false but R is true	1
15	D.A is false but R is true	1
16	B.Both A and R are true and R is not the correct explanation of A	1
SECTION B		
17	Any 4 points,1/2 mark each. Biological control of pests and diseases.examples The very familiar beetle with red and black markings – the Ladybird, and Dragonflies are useful to get rid of aphids and mosquitoes, respectively. An example of microbial biocontrol agents that can be introduced in order to control butterfly caterpillars is the bacteria <i>Bacillus thuringiensis</i> . A biological control being developed for use in the treatment of plant disease is the fungus <i>Trichoderma</i> . Baculoviruses are pathogens that attack insects and other arthropods	2
18	a) Half mark each-Any 3-Placental villi,umbilical cord,amniotic fluid,embryo/foetus. 1 ½ b) supply of oxygen,nutrients,removal of wastes ½ mark	2
19	a)IgE-1mark b) Secodary response-1mark	2
20	Two different type of gametes in female,eg-bird-1 mark Two different type of gametes in male –human/drosophila-1 mark	2
21	Amazon forest-oxygen, pollination, aesthetic pleasure.(any two with explanation) (OR) Edward Wilson-1/2 mark. i.species diversity-1/2 ii. genetic diversity-1/2 iii. ecological diversity-1/2	2
SECTION C		
22	Abingdon tortoise in Galapagos Islands became extinct within a decade after goats were introduced on the island, apparently due to the greater browsing efficiency of the goats -competition-food Competition-superior species will eliminate the inferior one.(2+1)	3
23		3
24		3

	<p>a)X-Oestrogen,Y-Progesterone $\frac{1}{2} + \frac{1}{2} = 1$mark</p> <p>b)corpus luteum-produces progesterone,maintain endometrium $\frac{1}{2} + \frac{1}{2} = 1$ mark</p> <p>c)corpus luteum degenerates/(corpus albicans)1mark</p>	
25	<p>Write the significance of biotechnology in gene therapy with one example.</p> <p>Genetherapy –example ADA deficiency-steps in genetherapy 3marks.</p>	3
26	<p>Memory-based acquired immunity evolved in higher vertebrates based on the ability to differentiate foreign organisms (e.g., pathogens) from selfcells. While we still do not understand the basis of this, two corollaries of this ability have to be understood. One, higher vertebrates can distinguish foreign molecules as well as foreign organisms. Most of the experimental immunology deals with this aspect. Two, sometimes, due to genetic and other unknown reasons, the body attacks self-cells. This results in damage to the body and is called auto-immune disease. Rheumatoid arthritis which affects many people in our society is an auto-immune disease.</p>	3
27	<p>This principle says that allele frequencies in a population are stable and is constant from generation to generation. The gene pool (total genes and their alleles in a population) remains a constant. This is called genetic equilibrium. Sum total of all the allelic frequencies is 1.(1 mark) Five factors are known to affect Hardy-Weinberg equilibrium. These are gene migration or gene flow, genetic drift, mutation, genetic recombination and natural selection.2marks</p>	3
28	<p>Transcription Unit A transcription unit in DNA is defined primarily by the three regions in the DNA: (i) A Promoter (ii) The Structural gene (iii) A Terminator</p> <p>There is a convention in defining the two strands of the DNA in the structural gene of a transcription unit. Since the two strands have opposite polarity and the DNA-dependent RNA polymerase also catalyse the polymerisation in only one direction, that is, $5' \rightarrow 3'$, the strand that has the polarity $3' \rightarrow 5'$ acts as a template, and is also referred to as template strand. The other strand which has the polarity ($5' \rightarrow 3'$) and the sequence same as RNA (except thymine at the place of uracil), is displaced during transcription. Strangely, this strand (which does not code for anything) is referred to as coding strand.</p> <p>OR</p> <p>a) According to Chargaff's rule, DNA from any cell of any organisms should have a 1:1 ratio of pyrimidine and purine bases ($A=T$ and $G=C$). The given percent of cytosine is 20. So, the percent of guanine will also be 20, according to Chargaff's rule. Hence, Percent of $(C + G) = 20 + 20 = 40\%$ So, $100 = 40 + (A+T)$ $(A + T) = 100 - 40 = 60\%$ Hence, A is 30% and T is 30%. Therefore, the calculated percentage of adenine in DNA would be 30% if 20% of cytosine is present in DNA.1 mark</p> <p>b) tRNA has an anticodon loop that has bases complementary to the code, and it also has an amino acid acceptor end to which it binds to amino acids. tRNAs are specific for each amino acid (Figure 6.12). For initiation, there is another specific tRNA that is referred to as initiator tRNA. There are no tRNAs for</p>	3

	stop codons. In figure 6.12, the secondary structure of tRNA has been depicted that looks like a clover-leaf. In actual structure, the tRNA is a compact molecule which looks like inverted L.(2marks)	
	SECTION D	
29	<p>a)cellular barrier (1mark)</p> <p>b)Polymorphonuclear leucocytes –(1mark)</p> <p>c)Virus infected cells secrete proteins called interferons which protect non infected cells from further infection.(1mark)</p> <p>d)<i>Salmonella typhi</i>(1mark)</p> <p>OR</p> <p>d) <i>Streptococcus pneumoniae</i> / <i>Haemophilus influenza</i>(1mark)</p>	4
30	<p>a) Autosomal recessive-sickle cell anaemia /cystic fibrosis or any other example- 1mark</p> <p>b)aa-recessive disease-1 mark</p> <p>c) Aa-heterozygous</p> <p>OR</p> <p>c)Autosomal dominant</p>	4
	SECTION E	
31	<p>i. Slaughtered cattle/pig-developed allergy in some patients-1/2mark</p> <p>ii.rDNA technique (1/2 mark)</p> <p>iii. In mammals, including humans, insulin is synthesised as a pro-hormone (like a pro-enzyme, the pro-hormone also needs to be processed before it becomes a fully mature and functional hormone) which contains an extra stretch called the C peptide. This C peptide is not present in the mature insulin and is removed during maturation into insulin. In 1983, Eli Lilly an American company prepared two DNA sequences corresponding to A and B, chains of human insulin and introduced them in plasmids of E. coli to produce insulin chains. Chains A and B were produced separately, extracted and combined by creating disulfide bonds to form human insulin.(3marks)</p> <p>iv) In mammals, including humans, insulin is synthesised as a pro-hormone (like a pro-enzyme, the pro-hormone also needs to be processed before it becomes a fully mature and functional hormone) which contains an extra stretch called the C peptide. This C peptide is not present in the mature insulin and is removed during maturation into insulin.(1marks)</p> <p style="text-align: center;">OR</p> <p>a)PCR – PCR stands for Polymerase Chain Reaction. In this reaction, multiple copies of the gene (or DNA) of interest is synthesised in vitro using Polymerase chain reaction (PCR) : Each</p>	5

	<p>cycle has three steps: (i) Denaturation; (ii) Primer annealing; and (iii) Extension of primers. Repeated amplification is achieved by the use of a thermostable DNA polymerase (isolated from a bacterium, Thermus aquaticus), which remain active during the high temperature induced denaturation of double stranded DNA.(3marks)</p> <p>b)Chitinase -the DNA is enclosed within the membranes, we have to break the cell open to release DNA along with other macromolecules such as RNA, proteins, polysaccharides and also lipids. This can be achieved by treating fungus with chitinase.(2mark)</p>	
32	<p>a) oogenesis.a-secondary oocyte,b-second polar body.(1mark)</p> <p>b) (i) oogenesis-foetal development,spermatogenesis-puberty. (ii) Number of gametes produced by each primary spermatocyte –secondariespermatocyte/no polar body/secondary spermatocyte into spermatids and then into spermatozoa(4)(1 mark)</p> <p>primary oocyte –secondary oocyte and polarbody-secondary oocyte-ovum and second polar body.single ovum.(1mark)</p> <p>(c) FSH acts on the gamete-producing cells to regulate gametogenesis. LH acts on the endocrine or hormone-producing cells, stimulating release of steroid sex hormones.GnRH-LH and FSH. LH-leydig cells-androgens.FSH—sertoli cells-secretion of factors.Females-follicular development and secretion of estrogen. (2marks)</p> <p style="text-align: center;">OR</p> <p>P-Plumule Q-cotyledon(1mark)</p> <ul style="list-style-type: none"> • b) Autogamy – Pollination takes place within the same flower wherein the pollen grains from the anther are transferred to the stigma of the same flower-1mark Cleistogamous/chasmogamous flowers(1mark) • Geitonogamy – In this type of pollination, the pollen grains are transferred from the anther to the stigma of a different flower but of the same plant(1mark) • Xenogamy – It is the transfer of pollen grains from the anther to the stigma of a different plant.(1mark) 	5
33	<p>Gene regulation in prokaryotes can be explained with the help of the Lac Operon model. Here the alteration in physiological and environmental conditions can be observed leading to an alteration in expression in prokaryotes. It was observed by Jacob and Monod. The lac operon consists of:</p> <ul style="list-style-type: none"> • Regulatory gene <i>i</i> – It codes for the repressor protein. • <i>z</i> gene – It codes for beta-galactosidase which catalyzes the hydrolysis of lactose into glucose and galactose. • <i>y</i> gene – It codes for permease which regulates the lactose permeability in the cell. • <i>a</i> gene – It codes for transacetylase which assists the enzyme beta-galactosidase. <p>Hence, all these genes help in lactose metabolism. In lac operon, lactose acts as an inducer. If lactose is provided in the medium for the bacteria, the regulatory gene is activated. The inducer will bind to the repressor protein and render it inactive which allows transcription of the operon. Thus, the lac operon is negatively regulated in this case.</p>	5

OR

Hershey and Chase found that when bacteriophages containing ^{32}P (radioactive), were allowed to infect nonradioactive bacteria, all the infected cells became radioactive and, in fact, much of the radioactivity was passed on to the next generation of bacteriophages. Radioactive phages were allowed to attach to E. coli bacteria. Then, 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 was 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 proteins did not enter the bacteria from the viruses. DNA is therefore the genetic material that is passed from virus to bacteria.