ROLL NO:								

Candidate must write code on the title page of answer book

1. Please check this question paper contains 9 printed pages
2. Code number given in the right hand side of the question paper should be written on the title page of the answer book by the candidate.
3. Please check that this question paper contains 33 of questions
4. Please write down the serial number of question papers before attempting it
5. Fifteen minutes are allotted to read this question paper during this time student will read the question papers and will not write any answer during this time

PRE BOARD EXAMINATION 2021

BIOLOGY (04)

Time Allowed: 3.00Hrs. Maximum Marks: 70

General Instructions:

1. This question paper contains two **parts A and B.** Each part is compulsory. Part A carries 24 marks and Part B carries 56 marks.
2. **Part A** has objective Type Questions and **Part B** has descriptive type questions.
3. Both part A and B have choices.

Part A:

1. It consists of two sections – **I and II.**
2. Section I comprises of 16 very short answers type questions.
3. Section II contains 2 case studies. Each case study comprises of 5 case based MCQs. An examinee is to attempt **any 4 out of 5 MCQs.**
4. Internal choice is provided in **5** questions of section-**I**. Moreover internal choices have been given in both questions of section –**II** as well.

Part B:

1. It consists of three sections – **III, IV and V.**
2. Section III comprises of 10 questions of **2 marks** each.
3. Section IV comprises of 7 questions of **3 marks** each.
4. Section V comprises of 3 questions of **5 marks** each.
5. Internal choice is provided in **3** questions of section- III, 2 questions of section of – IV and 3 question of section-V. You have to attempt only one of the alternatives in all such questions.

PART –A

Section - I (16x1=16)

Questions in this section carry 1 mark each.

1. Show that the function f: $R \rightarrow R$ given by $f(x) = x3$ is injective. [*1*]

OR

What is the range of the function $f(x) = \frac{|x-1|}{(x-1)}$

2. If f: R → R be defined by $f(x) = (3 - x^3)^{\frac{1}{3}}$, then find $fof(x)$. [1]

OR

$If\ f: \{1, \infty) \rightarrow [2, \infty)\ is\ given\ by\ f(x) = x + \frac{1}{x}\ then\ Find\ f - 1(x)$

3. A relation R in the set of real numbers R defined as $R = \{ (a, b) : \sqrt{a} = b \}$ is a function or not. Justify. [1]

OR

An equivalence relation R in A divides it into equivalence classes 1 , $A2$, $A3$. What is the value? of $A1UA2UA3\ and\ A1 \cap A2 \cap A3$?

4. If $A\ and\ B$ are symmetric matrices, prove that $AB - BA$ is a skew –symmetric matrix. [1]

5. Find the value of A = $[aij]2x2 \quad where\ aij = 1\ if\ i \neq j\ and\ aij = 0\ \ if\ i = j$

OR

If $(x) = \begin{bmatrix} cosx & -sinx & 0 \\ sinx & cosx & 0 \\ 0 & 0 & 1 \end{bmatrix}$, show that $F(x)F(y) = F(x + y)$.

6. $If \begin{bmatrix} a+4 & 3b \\ 8 & -6 \end{bmatrix} = \begin{bmatrix} 2a+2 & b+2 \\ 8 & a-8b \end{bmatrix}$ write the value of $a - 2b$. [1]

7. Find$\int \left(\frac{1-x}{1+x^2}\right)^2 e^x dx$ [1]

OR

Find the value of $\int_0^{\frac{\Pi}{2}} \log(tanx)dx$

8. Find the area bounded by the parabola $y = x2\ and\ y = |x|$ [1]

9. Find the differential equation of all non- vertical lines in a plane

OR

Differentiate $log\ (1 + x2)\ w.r.t. tan - 1x$

10. The vector $(AB)^{\rightarrow} = 3i + 5j + 4k\ and\ (AC)^{\rightarrow} = 5i - 5j + 2k$ are sides of a ΔABC, then find the length of the median A. **[1]**

11. Find the projection of vector $\vec{a} = 2i - j + k$ along $\vec{b} = i + 2j + 2k$ [1]

12. What is the value of $(sin\phi + cos\phi)$ if ϕ is the angle between the vectors $4(i - j)$ and $i + j + k$ **[1]**

13. Find the direction cosines of the normal to XZ-plane? [1]

14. If A(1,-2,-8), B(5,0,-2) and C(11,3,7) are collinear find the ratio in which B divides AC [1]

15. If $P(B) = \frac{1}{3}$ and $P(AuB) = \frac{13}{21}$ then find value of P(A) [1]

16. A box containing 100 bulbs, 10 are defective. Find the probability that out of a sample of 5 bulbs, none is defective. [1]

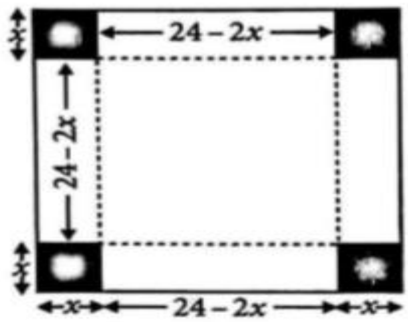
SECTION – II **(2x4 =8)**

Questions in this section carry 1 mark each.

Both the case study based questions are compulsory. Attempt any 4 sub –parts from each question.

17 (i-v) and 18 (i-v)

17. A man has an expensive square shape piece of golden board of size 24 cm is to be made into a box without top by cutting from each corner and folding the flaps to form of a box. [4]



I. Volume of open box formed by folding up the flap:

a) $4(x^3-24x^2+144x)$ b) $4(x^3-34x^2+244x$

c) x^3-24x^2+144x d) $4x^3-24x^2+144x$

ii. in the first derivative test, if $\frac{dy}{dx}$

changes its sigh from positive to negative as x increases through $\mathbf{c_1}$, then function attains a:

a) Local maxima at $x = c1$ b) Local minima at $x = c1$

c) Neither maxima nor minima at $x = c1$ d) None

iii. What should be the side of the square piece to be cut from each corner of the board to be hold the maximum volume?

$a)\ 14cm \quad b)\ 12cm\ c)\ 4cm \qquad d)\ 5cm$

iv. What should be the maximum volume of open box?

a)1034cm^3 b) 1024cm^3

c) 1204cm^3 d) 4021cm^3

v. The smallest value of the polynomial x^3-18x^2+96x in [0,9] is

A) 126 b) 0 c) 135 d) 160

18. A shopkeeper sells three types of flower seeds A_1 ,A_2, and A_3. They are sold as a mixture where the proportions are 4:4:2 respectively. The germination rates of the three types of seeds are 45%, 60%, 35%. [**4**]

Based on the above information answer the following questions:

i.The probability of a randomly chosen seed to germinate

a) 0.69 b) 0.39 c) 0.49 d) 0.59

ii. The probability that the seed will not germinate given that the seed is of type A_3

a) 0.15 b) 0.65 c) 0.75 d) 0.55

iii. The probability that the seed is of the type A_2 given that a randomly chosen

Seed does not germinate.

a) $\frac{22}{51}$ $b)\frac{55}{51}$ $c)\ \frac{51}{16}$ $d)\frac{16}{51}$

iv. Calculate the probability that it is of the type A_1 given that a randomly chosen seed does not germinate

$a)$ 51/22 b) 22/51 c) 16/51 d) 7/51

v. The probability that it will not germinate given that the seed is of type A_1

a)$\frac{55}{100}$ $b)\frac{65}{100}$ c)$\frac{35}{100}$ $d)\frac{45}{100}$

PART-B

SECTION – III **(10x2=20)**

Questions in this section carry 2 marks each.

19. Solve the equation $\tan^{-1}2x+\tan^{-1}3x=\frac{\pi}{4}$ [**2**]

20. If $A=\begin{bmatrix}3 & -5\\ x & 2\end{bmatrix}$ and $A^2-5A-14i=0$ then find the value of x [**2**]

OR

If $P=\begin{bmatrix}-1 & 0\\ 0 & 1\end{bmatrix}$ and $f(x)=2x^2+x-3$, then find the value of f(p)

21. Find the value of k so that the following function is continuous at $x = 0$ [**2**]

$F(x) = \begin{cases} \frac{tan2x}{x}, if\ x \neq 0 \\ k \quad if x = 0 \end{cases}$

22. Find the equation of the normal curve $2y = x2$, which passes through the point (2,1) [2]

23. Evaluate $\int \frac{x^4-1}{x^2(x^4+x^2+1)^{\frac{1}{2}}}dx$ [2]

OR

Evaluate $\int(\sin(logx) + \cos(logx))dx$

24. Find the area bounded by the curve $x^2=4y$ and the line x= 4y-2 [2]

25. Find the value of the following $\tan^{-1}(1)+\cos^{-1}(-\frac{1}{2})+\sin^{-1}(-\frac{1}{2})$ [2]

26. If $\vec{a}, \vec{b}, \vec{c}$ be three vectors such that $|\vec{a}|$=2 , $|\vec{b}|$=3 and $|\vec{c}|$=6 , each of these vectors is perpendicular to the sum of other two vectors then find $|\vec{a} + \vec{b} + \vec{c}|$. [2]

27. Using vector method , prove that the parallelograms lying on the same base and between the same parallels are equal in area. [2]

28. If A and B each three coins. Find the probability that both get the same number of heads. [2]

OR

Bag I contains 3 red and 4 black balls and Bag II contains 4 red and 5 black balls. One ball is transferred from Bag I to Bag II and then a ball is drawn from Bag II. The ball so drawn is found to be red in colour. Find the probability that the transferred ball is black.

SECTION-IV (7x3=21)

All questions are compulsory. In case of internal choices attempt any one.

29. Show that each of the relation R in the set A={x∈ Z: $0 \leq x \leq 12$}, given by R = {(a,b):[a-b] is a multiple of 4} is an equivalence relation . find the set of all elements related to 1. [3]

30. Find $\frac{dy}{dx}$ when $y=(\tan x)^{\cot x} + (\cot x)^{\tan x}$ [3]

31. Find the points of discontinuity , if any of the function $f(x) = \begin{cases} \frac{sinx}{x}, & if\ x < 0 \\ x+1, & if x \geq 0 \end{cases}$ [3]

OR

Differentiate $\sin^{-1}\{\frac{2^{x+1}.3^x}{1+36^x}\}$ with respect to x.

32. Find the interval in function $f(x) = \frac{3}{2}x^4 - 4x^3 - 45x^2 + 51$ is increasing or decreasing [3]

33. Evaluate: $\int \frac{2x^{12}+5x^9}{(x^5+x^3+1)^3}dx$ [3]

34. Find the area of the region included the parabola $y2 = 3x$ and the circle $x2 + y2 - 6x = 0$ lying in the 1st quadrant. [3]

OR

Find the area of the region included between $y2 = 9x\ and\ y = x$

35. Solve the differential equation $\frac{dy}{dx} + \frac{y}{2x} = 3x^2$ [3]

SECTION –V (3x5=15)

Questions in this section carry 5 marks each

36. A class has 15 students whose ages are 14, 17, 15, 14, 21, 17, 19, 20, 16, 18, 20, 17, 16, 19 and 20 years. One student is selected in such a manner that each has the same chance of being chosen and the age X of the selected student is recorded. What is the probability distribution of the random variable X? Find mean, variance and standard deviation of X.

OR

A student answers a multiple choice question with 5 alternatives, of which exactly one is correct. The probability that he knows the correct is p, $0 < p < 1$. If he does not know the correct answer, he randomly ticks one answer. Given that he has answered the question correctly, then find the probability that he did not tick the answer randomly [5]

37. Find the vector equation of the line passing through the point (1, 2, 3) and parallel to the planes [**5**]
$\vec{r}.(\hat{\imath} - \hat{\jmath} + \widehat{2k}) = 5$ and $\vec{r}.(3\hat{\imath} + \hat{\jmath} + \hat{k}) = 6$.

OR

Show that the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-4}{5}=\frac{y-1}{2} = z$ intersect. Find their point of intersection.

38. A wholesale dealer deals in two kinds, A and B (say) of mixture of nuts. Each kg of mixture contains 60 grams of almonds, 30 grams of cashew nuts and 30 grams of hazel nuts. Each kg of mixture B contains 30 grams of almonds, 60 grams of cashew nuts and 180 grams of hazelnuts. The remainder of both mixtures is per nuts. The dealer is contemplating to use mixtures A and B to make a bag which will contain at least 240 grams of almonds, 300 grams of cashew nuts and 540 grams of hazel nuts. Mixture A costs ₹ 8 per kg. and mixture B costs ₹ 12 per kg. Assuming that mixtures A and B are uniform, use graphical method to determine the number of kg. of each mixture which he should use to minimize the cost of the bag.

OR

A company manufactures two types of sweaters: type A and type B. It costs Rs 360 to make a type A sweater and Rs 120 to make a type B sweater. The company can make at most 300 sweaters andspend at most Rs 72000 a day. The number of sweaters of type B cannot exceed the number of sweaters of type A by more than 100. The company makes a profit of Rs 200 for each sweater of type A and Rs 120 for every sweater of type B. Formulate this problem as a LPP to maximise the profit of the company.