

Indian National Biology Olympiad (INBO) -2025

Homi Bhabha Centre for Science Education (HBCSE-TIFR)

Answer Booklet

Time: 2 hrs

ROLL NO. – –

Max. Marks: 300

- Please write the last four digits of your roll number on the top of **every page of this answer booklet** in the space provided.
- Before starting, please ensure that you have received a copy of the answer booklet containing a total of 13 numbered sheets.
- **This answer booklet must be returned to the invigilator.**
- Do not write anything on the question paper. All rough work can be done in the space provided at the end of this answer booklet.

Signature of Invigilator: _____

(Do not write anything below this line.)

	X	Y	Not attempted	
Section A				3X - Y =
Section B				3X =
Total score =				

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SECTION A

Q. No.	a	b	c	d	Q. No.	a	b	c	d
1.			✓		15.		✓		
2.		✓			16.		✓		
3.		✓			17.			✓	
4.		✓			18.				✓
5.				✓	19.		✓		
6.				✓	20.				✓
7.			✓		21.	✓			
8.		✓			22.		✓		
9.	✓				23.				✓
10.	✓				24.	✓			
11.				✓	25.	✓			
12.			✓		26.				✓
13.				✓	27.		✓		
14.	✓								

	X	Y	Not attempted	
Section A				3X - Y =

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SECTION B

CELL BIOLOGY (18 Points)

28. (2 points)

Answer: _____816_____kDa

Calculations:

$$88000/110 = 800 \text{ amino acids} \times 3 = 2400 \text{ nucleotides} \times 340 = 816 \text{ kDa}$$

29. (2.5 points)

	a.	b.	c.	d.	e.
True			✓		
False	✓	✓			
Cannot be concluded				✓	✓

30. (2 points)

	a.	b.	c.	d.
Possible		✓		✓
Not possible	✓		✓	

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31. (2 points)

	a.	b.	c.	d.
True		✓		
False	✓		✓	✓

32. (3 points)

(A)

Location of the protein	Cytosolic	Trans membrane	Secretory
		✓	

(B)

Likely site of phosphorylation	C	S2	N	Y
		✓		✓

(C)

Likely site of glycosylation	C	S1	N	Y
		✓	✓	

33. (2.5 points)

	a.	b.	c.	d.	e.
Correct	✓				✓
Incorrect		✓	✓	✓	

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34. (2 points)

Answer: _____ 445 - 446 _____ minutes

Calculations:

$$\text{Total cells} = 15+7+8+7+5+88 = 130$$

$$\text{Cells in mitosis} = 42$$

$$42/130 = 0.323 \times (23 \times 60) = 445.74$$

35. (2 points)

	a.	b.	c.	d.
True	✓	✓	✓	
False				✓

PLANT SCIENCES (13.5 points)

36. (2 points)

a.	b.	c.	d.
	✓		

37. (2 points)

	a.	b.	c.	d.
Correct		✓	✓	✓
Incorrect	✓			

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38. (2 points)

- (i) M: ____ (e) ____
- (ii) N: ____ (c) ____
- (iii) O: ____ (g) ____
- (iv) P: ____ (j) ____

39. (4 points)

Pollination by	Type/s of flower/s
Bat	ii, iii, iv, v
Bird	vii
Insect*	i, ii, iv
Wind	vi

**Marks will not be deducted if (vii) is additionally written for Insect.*

40. (2 + 1 + 0.5 = 3.5 points)

(A)

	Pressure potential (Ψ_p)	Solute potential (Ψ_s)	Water potential (Ψ_w)
Cell P (at equilibrium after immersion)	0.082	-0.732	-0.65
Cell Q (at equilibrium after immersion)	0.17	-0.82	-0.65

(B)

Answer: 0.088 MPa

(C)

a.	b.	c.
		✓

ANIMAL SCIENCES (11 points)

41. (4 points)

(A) Answer: ___2160___ mL O₂/min

Calculations:
 Cardiac output (CO) = HR x SV = 150 bpm x 80 mL/beat = 12000 mL = 12 L
 oxygen delivered to the tissues per minute = CO x VO₂ = 12 L x 180 mL O₂/L = 2160 mL O₂/min

(B) Answer: ___9600___ mL/min

Calculations:
 Minute Ventilation = V_T x RR = 600 mL x 20 breaths/min = 12000 mL/min
 AV = 12000 mL/min x 80% = 9600 mL/min

42. (2 points)

	a.	b.	c.	d.
Correct		✓	✓	
Incorrect	✓			✓

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43. (2 points)

a.	b.	c.	d.
		✓	

44. (3 points)

I: Green Crab: ____ i, iii and vi ____

II: Mussel: ____ ii ____

III: Grass Shrimp: ____ viii ____

GENETICS & EVOLUTION (11 points)

45. (2 points)

	a.	b.	c.	d.
True		✓	✓	✓
False	✓			

46. (2 points)

(A)

a.	b.	c.	d.
			✓

(B) Answer: ____0____ %

(C) Answer: ____100____ %

(D) Answer: ____25____ %

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47. (2 points)

Answer: ____9/64 or 0.1406 or 14.06%____

Calculations:

Probability of Normal/Albinism/Albinism: $\frac{3}{4} \times \frac{1}{4} \times \frac{1}{4} = \frac{3}{64}$
 Albinism/Normal/Albinism: $\frac{1}{4} \times \frac{3}{4} \times \frac{1}{4} = \frac{3}{64}$
 Albinism/Albinism/Normal: $\frac{1}{4} \times \frac{1}{4} \times \frac{3}{4} = \frac{3}{64}$
 $\frac{3}{64} + \frac{3}{64} + \frac{3}{64} = \frac{9}{64}$

48. (2 points)

	a.	b.	c.	d.
Correct		✓	✓	✓
Incorrect	✓			

49. (3 points)

Genetic Map:

ECOLOGY (7 points)

50. (2 points)

	a.	b.	c.	d.
Has positive effect	✓		✓	
Does not have positive effect		✓		✓

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51. (3 points).

- a. Floral induction : _____ T, U _____
- b. Both heat and human vision: _____ T _____
- c. Germicidal: _____ P, Q, R _____

52. (2 points)

	a.	b.	c.	d.
True				
False	✓	✓	✓	✓

ETHOLOGY (6.5 points)

53. (4.5 points)

Condition	Relationship 1	Genetic relatedness (r_1)	Preference ($>$, $<$ or $=$)	Relationship 2	Genetic relatedness (r_2)
(i)	Queen with her daughter's sons	0.25	$<$	Queen with her own sons	0.5
(ii)	Non egg laying worker with egg laying sister's sons	0.375	$>$	Non egg laying worker with brother	0.25
(iii)	Egg laying worker with brother	0.25	$<$	Egg laying worker with own son	0.5

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54. (2 points)

	a.	b.	c.	d.
True			✓	
False	✓	✓		✓

BIOSYSTEMATICS (6 points)

55. (2 points)

	a.	b.	c.	d.
True	✓	✓	✓	
False				✓

56. (4 points)

1: ___W___

2: ___W___

3: ___T___

4: ___V___

*******END OF SECTION B*******

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Last four digits of your Roll No. –

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ROUGH WORK