Student Code: _____

19th INTERNATIONAL BIOLOGY OLYMPIAD

13th – 20th July, 2008

Mumbai, INDIA

THEORETICAL TEST – PART B

ANSWER KEY FOR THE JURY

CELL BIOLOGY (26 points)

5 2+1+2 = 5

1. (~~2 x 3~~ = ~~6~~ points)

   a. Answer: 0.33×10^{-8} M — 2

   b. Answer: 1.36×10^{-3} m — 1

   c. Answer: 2.27×10^{11} cells — 2

2. (0.5 x 6 = 3 points)

	Organ/Cell	SER extensively present	SER not extensively present	Function/s (if extensively present)
a.	Adrenal gland	√		I
b.	Sebaceous glands	√		I
c.	Intestinal villi	√		I
d.	Muscles	√		III
e.	Liver	√		II and/or IV
f.	Pancreas		√	

3. (0.5 x 4 = 2 points)

Situation I: A

Situation II: B

Situation III: B

Situation IV: A

4. (2 + 1 = 3 points)

a. Answer: 40 %

b. Answer: 1.5

5. (0.5 x 5 = 2.5 points)

1	2	3	4	5
E / A	A / E	B	C	D

6. (0.5 x 8 = 4 points)

I. 5.6

II. 6.3

III. 0.5

IV. 0.21

V.

	True	False
a.	√	
b.		√
c.		√
d.	√	

7. (1 x 3 = 3 points)

I.

a.	b.	c.	d.
		√	

II.

a.	b.	c.	d.
√			

III.

a.	b.	c.	d.
	√		

8. (0.5 x 5 = 2.5 points)

Protein	Mode of regulation			
	I	II	III	IV
A		√		
B				√
C	√			
D		√	√	

9. (0.5 x 8 = 4 points)

No.		Answer
I	Cell/s that is/are not alive when functional.	A, B, F
II	Plasmodesmata can be found associated with this/these cell/s.	C, D, E
III	When you eat potato, you eat the tissue formed of this/these cell/s.	D
IV	Cell/s that harden/s the nut skin.	F

10. (0.5 x 3 = 1.5 points)

Graph	Plant type
A	II
B	III
C	I

11. (0.5 x 4 = 2 points)

(A)

Region	Water potential
P	- 1 atm
Q	- 5 atm
R	- 8 atm

(B)

a.	b.	c.	d.
	√		

12. (1 for each row x 4 = 4 points)

	Chlamydomonas	Cyano-bacteria	Green-sulphur bacteria	Purple-sulphur bacteria
Phototrophic autotrophs	√	√	√	√
Photosystem II absent			√	√
Respiratory enzymes located on plasma membrane		√	√	√
Chlorophyll *a* as the major photosynthetic pigment	√	√		

13. (0.5 x 7 = 3.5 points)

Process	+ / —
1	—
2	+
3	+
4	—
5	+
6	+
7	—

14. (2 points)

a.	b.	c.	d.
		√	

15. (0.5 x 4 = 2 points)

	P	Q	R	S
Liver				√
Brain	√			
Thymus			√	
Gonads		√		

16. (0.5 x 4 = 2 points)

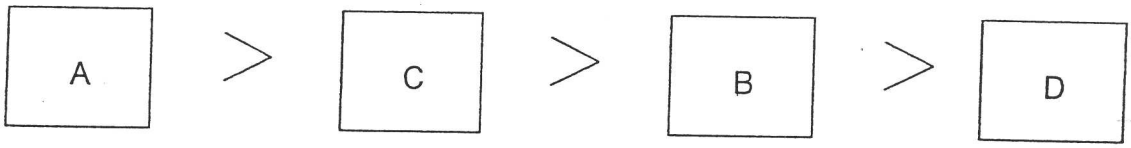
	True	False
a.		√
b.		√
c.	√	
d.	√	

17. (0.5 x 4 = 2 points)

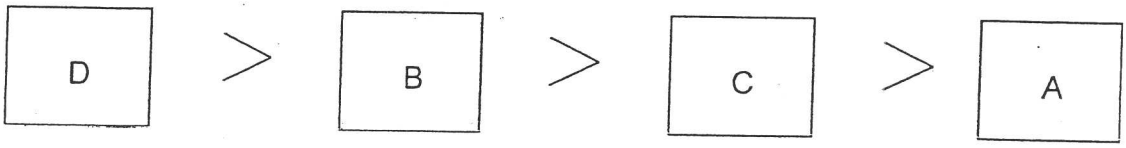
Set	Condition	True	False
I	Curve I. Normal blood pH and Curve II. Acidosis	√	
II	Curve I. 40°C and Curve II. 30°C		√
III	Curve I. Elephant hemoglobin and Curve II. Cat hemoglobin	√	
IV	Curve I. Fetal hemoglobin and Curve II. Maternal hemoglobin	√	

18. (1 x 2 = 2 points)

Surface area per unit volume of the body



Total volume of blood in the body



19. (1 + 1 + 0.5 x 6 = 5 points)

a.

a.	b.	c.	d.
	√		

b.

a.	b.	c.	d.
		√	

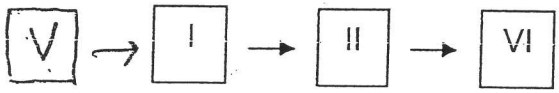
c.

Options	True	False
a.		√
b.	√	
c.		√
d.	√	
e.		√
f.		√

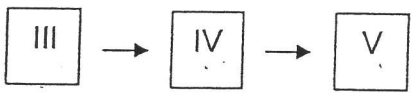
3.5

20. (0.5 x 6 = 3 points)

A.



B.



21. (2 points)

Answer: 27/64 or 0.4219

22. (0.5 x 4 = 2 points)

	I	II	III
Lactose hydrolysis by β-galactosidase			√
Reduction of *lac* repressor's affinity for the *lac* operator		√	
Binding of the CAP-cAMP complex to the *lac* promoter		√	
Utilization of glucose	√		

23. (2 points)

Answer: 43.52 %

24. (2 points)

Answer: 1/6 or 0.1667

25. (2 points)

Answer: 9

26. (1 x 2 = 2 points)

a.

Yes	No
√	

b. Answer: 0.24

27. (1 x 2 = 2 points)

a. Answer: 0.5192

b. Answer: 0.3696

28. (2 points)

Answer: 1/10 or 0.1

29. (1 x 2 = 2 points)

I.

a.	b.	c.	d.
		√	

II.

a.	b.	c.	d.
	√		

18.6 kDa

30. (1 + 0.5 x 3 = 2.5 points)

(A)

p	
q	
r	√

(B)

Distance between *p* and *q*	28.5 mu
Distance between *p* and *r*	17.5 mu
Distance between *q* and *r*	11 mu

31. (0.5 x 3 = 1.5 points)

Growth curve Survivorship Curve Age Structure

P	Q	R	S	T	U
√			√	√	

SC	SC	AS
P	S	T

32. (1 x 3 = 3 points)

(A)

a.	b.	c.	d.
	√		

(B)

a.	b.	c.	d.
	√		

(C)

a.	b.	c.	d.
		√	

33. (0.5 x 4 = 2 points)

Number	A	B	Type of interaction
1.	+	0	II
2.	+	+	IV
3.	+	–	V
4.	+	+	

34. (1 x 4 = 4 points)

(A)

a.	b.	c.	d.
√			

(B)

a.	b.	c.	d.
		√	

(C)

a.	b.	c.	d.
√			

(D)

a.	b.	c.	d.
√			

35. (0.5 + 0.5 + 0.5 + 1 + 0.5 + 0.5 + 0.5 + 0.5 + 1 + 0.5 = 6 points)

(A)

I.

a.	b.	c.	d.
		√	

II.

a.	b.	c.	d.
√			

III. Answer: 8

IV. Answer: 0.72

V.

a.	√
b.	

(B)

I.

a.	b.	c.	d.
		√	

II.

a.	b.	c.	d.
	√		

III. Answer: 1

IV. Answer: 1.82 1·8, 1·8.

V.

a.	√
b.	

36. (2 points)

(A)

a.	
b.	√

(B)

a.	b.	c.	d.
		√	

37. (0.5 x 6 = 3 points)

(A)

		Opponent	
		Hawk	Dove
Attacker	Hawk	-25	+50
	Dove	0	+15

(B)

Statement	True	False
a.		√
b.		√

38. (0.5 x 4 = 2 points)

~~Physiological change~~ Behavioural traits	Option/s
A	IV and/or I
B	III
C	II
D	IV and/or I

Physiological changes.

39. (2 x 2 = 4 points)

(A)

a.	b.	c.	d.
		√	

(B)

a.	b.	c.	d.
			√

40. (2 points)

Taxon	Option
T3	VII
T2a	VIII or X or VI, respectively
T1a	XVI or XV or XIII, respectively

T2b	VIII or X or VI, respectively
T1b	XVI or XV or XIII, respectively
T2c	VIII or X or VI, respectively
T1c	XVI or XV or XIII, respectively

41. (2 points)

a.	b.	c.	d.
√			

42. (0.5 x 10 = 5 points)

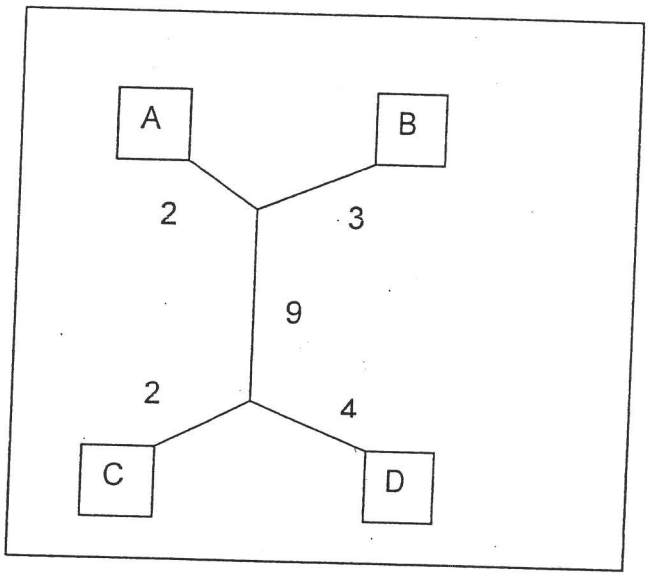
Group	Number	Group	Number
Annelida (Earthworms)	2	Mollusca (Snails)	5
Arthropoda (Crayfishes)	3	Mollusca (Squids)	1
Cnidaria (Jellyfishes)	7	Nematoda (Roundworms)	9
Echinodermata (Starfishes)	6	Platyhelminthes (Tapeworms)	10
Mollusca (Bivalvia)	4	Porifera (Sponges)	8

43. (1 + 3 = 4 points)

(A)

a.	b.	c.	d.
		√	

(B)



********** END OF PART B **********