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Student Code:		
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# 19th INTERNATIONAL BIOLOGY OLYMPIAD

 $13^{th} - 20^{th}$  July, 2008

Mumbai, INDIA



THEORETICAL TEST - PART B

**ANSWER KEY FOR THE JURY** 

## CELL BIOLOGY (26 points)

1.  $(2 \times 3 = 6)$  points)

a. Answer:

 $0.33 \times 10^{-8} M$  —  $\frac{3}{2}$ 

b. Answer:

1.36 x 10<sup>-3</sup> m

c. Answer:

2.27 x 10<sup>11</sup> cells —

#### 2. $(0.5 \times 6 = 3 \text{ points})$

	Organ/Cell	SER	SER not	Function/s
		extensively	extensively	(if extensively
		present	present	present)
a	Adrenal gland	V		I
b.	Sebaceous glands	<b>√</b> .		
C.	Intestinal villi	. √		1
d.	Muscles	√ ×	-	111
e.	Liver	√ · ·		II and/or IV
f.	Pancreas			
		y	٧	

3. 
$$(0.5 \times 4 = 2 \text{ points})$$

- Situation I:
- Α
- Situation II:
- R
- Situation III:
- В
- Situation IV:
- ٨

4. 
$$(2 + 1 = 3 points)$$

- a. Answer:
- 40.%
- b. Answer:
- 1.5

5. 
$$(0.5 \times 5 = 2.5 \text{ points})$$

1	2	3	4	5
E	A	В	С	D

- 6.  $(0.5 \times 8 = 4 \text{ points})$ 
  - 1. 5.6
  - II. 6.3
  - III. 0.5
  - IV. 0.21

V.

	True	False
a.	1	
b.		<b>√</b>
C.		1
d.	1	

7.  $(1 \times 3 = 3 \text{ points})$ 

1.

b.	C.	d.
	<b>√</b>	
		1

11.

a.	b.	C.	d.
1			

111.

a.	b.	C.	d.
	<b>V</b>		

#### 8. $(0.5 \times 5 = 2.5 \text{ points})$

Protein	Mode of regulation			
	1		111	IV
А				
В				1
С	1			5)
D		1	1	

#### 9. $(0.5 \times 8 = 4 \text{ points})$

No.		Answer
		-
1	Cell/s that is/are not alive when	A, B, F
	functional.	
11	Plasmodesmata can be found	C, D, E
	associated with this/these cell/s.	
	9	
III	When you eat potato, you eat	D
	the tissue formed of this/these	
	cell/s.	e .
	a .	
IV	Cell/s that harden/s the nut skin.	F

 $10.(0.5 \times 3 = 1.5 \text{ points})$ 

Graph	Plant type
Α	· []
В	. 111
С	

11.  $(0.5 \times 4 = 2 \text{ points})$ 

(A)

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

(B)

a.	b.	C.	d.
	1		

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

Chlamydomonas Cyano- Green- Purple- bacteria sulphur sulphur bacteria  Phototrophic autotrophs  Photosystem II absent  Respiratory enzymes located on plasma membrane  Chlorophyll a as the major photosynthetic pigment					
Phototrophic autotrophs  Photosystem II absent  Respiratory enzymes located on plasma membrane  Chlorophyll a as the major		Chlamydomonas	Cyano-	Green-	Purple-
Phototrophic autotrophs  Photosystem II absent  Respiratory enzymes located on plasma membrane  Chlorophyll a as the major			bacteria	sulphur	sulphur
Photosystem II absent  Respiratory enzymes located on plasma membrane  Chlorophyll a as the major				bacteria	bacteria
Respiratory enzymes located on plasma membrane  Chlorophyll a as the major	Phototrophic autotrophs	1	√.	1	V.
Respiratory enzymes located on plasma membrane  Chlorophyll a as the major				ď	-
Respiratory enzymes located on plasma membrane  Chlorophyll a as the major				*	
plasma membrane  Chlorophyll <i>a</i> as the major	Photosystem II absent			1	V
plasma membrane  Chlorophyll <i>a</i> as the major	*				in
plasma membrane  Chlorophyll <i>a</i> as the major		-			1
Chlorophyll $a$ as the major $\sqrt{}$	Respiratory enzymes located on	ľ	V-~	1:	V
	plasma membrane	s		, L	,
photosynthetic pigment	Chlorophyll a as the major	√-	1		
	photosynthetic pigment			, ,	* ,

13. (0.5 x 7 = 3.5 points)

Process	+/-
1	
2	+
3	+
4	
5	+
6	+
7	_

d.	C.	b.	a.
	<b>√</b>		
	,		

15.  $(0.5 \times 4 = 2 \text{ points})$ 

	P	Q	R	S
Liver				1
Brain	1			
Thymus			1	
Gonads		1		

16.  $(0.5 \times 4 = 2 \text{ points})$ 

	True	False
a.		1
b.		V
C.	1	
d.	<b>V</b>	

## 17. (0.5 x 4 = 2 points)

Set	O = == 1'1'		
Joet	Condition	True	False
	*		
	Curve I. Normal blood pH and Curve II. Acidosis	1	
	F. C.	1 7	
	•		
11	Curve I. 40°C and Curve II. 30°C		-
	Journal In Grand Guive II. 30 C		1 1
	a ·		,
111	0		
111	Curve I. Elephant hemoglobin and Curve II. Cat hemoglobin	1	
		γ	
	•		
IV	Curve I. Fetal hemoglobin and Curve II. Maternal hemoglobin		
	gram and darve in Material Hemoglobili	V	
	•		
		1	1

18. (1 x 2 = 2 points)

Surface area per unit volume of the body

$$oxed{A}$$
  $oxed{C}$   $oxed{C}$   $oxed{B}$   $oxed{D}$ 

Total volume of blood in the body

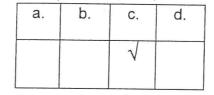
$$_{\rm D}$$
  $>$   $_{\rm B}$   $>$   $_{\rm C}$   $>$   $_{\rm A}$ 

19. 
$$(1 + 1 + 0.5 \times 6 = 5 \text{ points})$$

a.

a.	b.	C.	d.
	1		





	Name of Street	
	STATE OF THE PARTY	C
3	/	

Options	True	False
a.		1
b.	1	
c.		<b>√</b>
d.	√	
e.	ı	<b>V</b>
f.		$\sqrt{}$

3.5  
20. 
$$(0.5 \times 6 = 3)$$
 points)

Α

$$\boxed{\bigvee} \rightarrow \boxed{\downarrow} \rightarrow \boxed{\downarrow}$$

В.

$$\boxed{\parallel} \longrightarrow \boxed{\vee} \longrightarrow \boxed{\vee}$$

Answer: 27/64 or 0.4219

22. (0.5 x 4 = 2 points)

	1	11	III
Lactose hydrolysis by β-galactosidase			V
**************************************			
Reduction of <i>lac</i> repressor's affinity for the <i>lac</i> operator		1	
Binding of the CAP-cAMP complex to the lac promoter	e	. 1	
Utilization of glucose	1		

#### 23. (2 points)

Answer: 43.52 %

#### 24. (2 points)

Answer: 1/6 or 0.1667

25. (2 points)

Answer: 9

0

b. Answer: 0.24

27. 
$$(1 \times 2 = 2 \text{ points})$$

a. Answer: 0.5192

b. Answer: 0.3696

Answer: 1/10 or 0.1

a.	b.	C.	ď.
		<b>V</b>	

II. ·

a.	b.	C.	d.
	1		
	18		

18.6 KDa

30.  $(1 + 0.5 \times 3 = 2.5 \text{ points})$ 

(A)

p	
q	
r	√

(B)

Distance between <i>p</i> and <i>q</i>	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 Survivedship Age

Curvi

P

Q

R

S

T

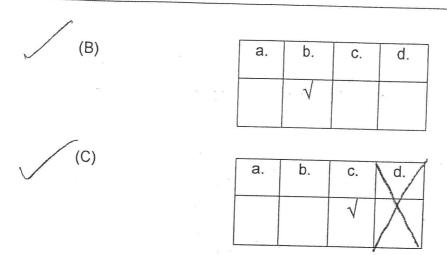
U

1 56	TSC	TAS
190	and the same of the	STATE CHARGE
4	2	1
A	1	1
1	CHESTON OF THE PARTY OF THE PAR	A KING THE PROPERTY OF

32. (1 x 3 = 3 points)

(A)

a.	b.	C.	d.
	$\sqrt{}$		



33.  $(0.5 \times 4 = 2 \text{ points})$ 

Number	Α	В	Type of
			interaction
1.	+	0	11
2:	. +	+	IV
3.	+	_	V
4.	+	+	FCHS
			7

34. (1 x 4 = 4 points)
(A)

a.	b.	C.	d.
$\sqrt{}$			

(B)		7		
	a.	b.	C.	d.
			1	
(C)				
)	a.	b.	C.	d.
	1			
(D)			•	
	a.	b.	C.	d.
	1			

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

(A)



a.	b.	C.	d.
		1	
			9

11.

a.	b	C.	d.
1			

o III. Answer: 8

\ IV. Answer: 0.72



a.	V
b.	

a.	b.	C.	d.
		1	

II. 3

a.	b.	C.	d.
	1		

ill. Answer: 1

IV. Answer: 1.82 1.8, 1.8.



(A)

a.	
b.	1

· (B)

a.	b.	C.	d.
		V	

37.  $(0.5 \times 6 = 3 \text{ points})$ 

(A)

		Opponent	
ži d		Hawk	Dove
Attacker	Hawk	-25	+5.0
п	Dove	, 0	+15

(B)

Statement	True	False
a.		1
b.		\ \ \

#### 38. $(0.5 \times 4 = 2 \text{ points})$

(S)		,
		- thursidaginal
Physiological change	Option/s	To Alla
K-Ehrineal weeks	L. Committee	Charles.
A	IV and/or I	
·		
В	111	N N
C	11	
		-
D .	IV and/or I	

39.  $(2 \times 2 = 4 \text{ points})$ 

(A)

a.	b.	C.	d.
	8	1	

(B)

a.	b.	C.	d.
			1
1			

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

a.	b.	C.	d.
1	В		10

## 42. $(0.5 \times 10 = 5 \text{ points})$

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

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## 43. (1 + 3 = 4 points)

(A)

a.	b.	C.	d.
	,	√	×

(B)

