Theoretical Test Paper 1

Answer Key

1. (1.8 points)

a	b	c	d	e	f
✓	✓	✓	×	✓	×

2. (1.8 points)

Cell	Mitochondria present	Functions (a – d) if present
Sperm cell		
Brown fat cell		
Red muscle fibers		
Intestine epithelia		

3. (0.9 points)

Lowest Tm	Medium Tm	Highest Tm
a	c	b

4. (2 points)

Condition	I	II	III	IV
Cell fate	a	b	b	a

5. (4.2 points)

5.1. (3.6 points)

Heptapeptide	pH 1 net charge	pH 7 net charge	pH 12 net charge
Peptide A Asp-Ala-Glu-Asp-Gly-Ser-Ser	+1	-3	-4
Peptide B Gly-Lys-Asp-Ala-Ala-Ser-Gly	+2	0	-2
Peptide C Ser-Lys-Ser-Lys-Gly-Asp-Ala	+3	+1	-2

5.2. (0.6 points)

pH 1	pH 7	pH 12
×	✓	×

6. (0.5 points)

a	b	c	d	e
×	✓	×	×	×

7. (0.9 points)

7.1. (0.4 points)

a	b	c	d
×	×	×	×

7.2. (0.5 points)

The number is 92.

8. (1.8 points)

8.1. (0.6 points)

Bacterium A	Bacterium B	Bacterium C
×	✓	×

8.2. (0.6 points)

C > B > A

8.3. (0.6 points)

a	b	c
✓	×	×

9. (1 point)

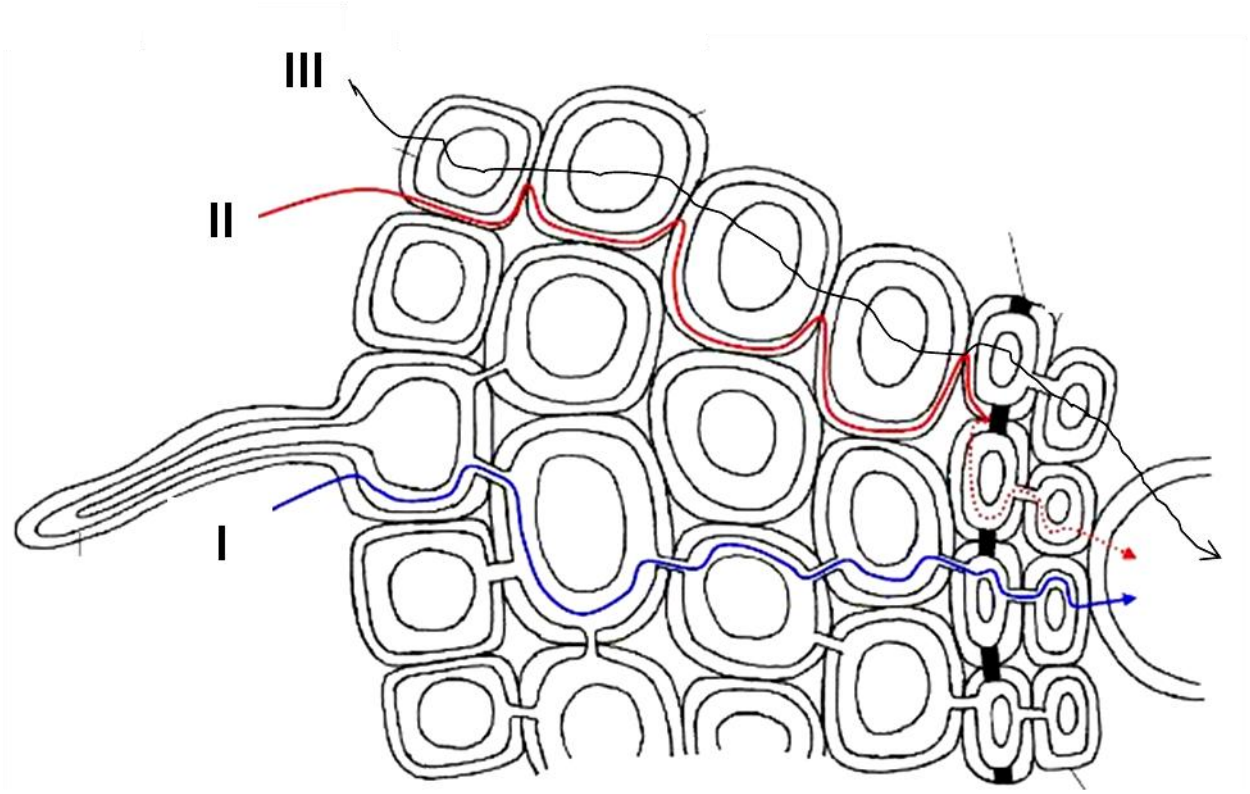
i	ii	iii	iv	v
×	×	✓	✓	✓

10. (4.6 points)

10.1. (1.6 points)

A	B	C	D	E	F	G	H
6	4	9	12	11	17	14	8

10.2. (3 points)



11. (3 points)

1	2	3	4	5	6	7	8	9	10
G	H	B	A	C	I	D	J	F	E

12. (1.4 points)

a	b	c	d	e	f	g
×	×	×	✓	×	✓	✓

13. (1.2 points)

a	b	c
✓	×	✓

14. (1.0 points)

a	b	c	d	e
✓	×	×	×	✓

15. (1.5 points)

Most primitive	Intermediate	Most modern
B	C	A

16. (1.8 points)

1	2	3	4	5	6	7	8	9
E	A	B	H	G	I	C	J	D

17. (1.5 points)

III ⇒ IV ⇒ II ⇒ V ⇒ VII

18. (1.6 points)

18.1. (0.8 points)

A > C > B > D

18.2. (0.8 points)

D > B > C > A

19. (1.6 point)

Animal	Amphibians	Reptiles	Birds	Mammals
I	×	×	✓	✓
II	×	×	✓	×

20. (2.6 points)

Animal	Frog	Salmon	Crayfish	Lizard	Earthworm	Dragonfly
Circulatory system	×	×	✓	×	×	✓
Respiratory organ	a, c	b	b	a	c	d

21. (2 points)

a	b	c	d	e	f	g	h	i	j
✓	✓	×	×	✓	×	×	✓	✓	×

22. (0.8 point)

Saliva secreted/day (litres)	< 0.75	0.75 – 1.5	10 – 12	130 – 180
Animal	a	b	c	d

23. (0.8 point)

	Allergy	Pseudoallergy
a	✓	×
b	✓	×
c	✓	✓
d	✓	×

24. (0.6 points)

a	b	c
✓	×	×

25. (1.2 points)

A	B	C	D
I	II	III	IV

26. (2.4 points)

26.1. (1.2 points)

I	II	III	IV
d	a	b	c

26.2. (1.2 points)

GI tract surface area/ body surface area ratio			
0.6:1	1.2:1	2:1	3:1
a	b	c	d

27. (0.9 points)

I	II	III
c	a	b

28. (2.4 points)

Part of water column / Habitats					Swimming speed	
Surface	Middle	Bottom	Sea grass beds	Rock crevices	Fast	Slow
F	D, H	A, C, E	G	B	D, H	A, G

29. (3 points)

29.1. (1 point)

L/D < 1	b
θ > 45°	b

29.2. (2 points)

a	b	c	d	e
✓	×	×	✓	✓

30. (2 points)

30.1. (1 point)

The minimum number of enzymes needed to produce α-MSH = 3.

30.2. (1 point)

The minimum number of enzymes needed to produce β-MSH = 3.

31. (1.5 points)

a	b	c	d	e
✓	×	×	×	✓

32. (1.2 points)

a	b	c	d	e	g
×	×	×	✓	×	✓

33. (1.2 points)

a	b	c	d
×	×	×	✓

34. (4.8 points)

34.1. The expected ratio = _____ 9:3:3:1 (1 point)

Phenotype	Observed	Expected
Purple flowers, long pollen grains	296	
Purple flowers, round pollen grains	19	
Red flowers, long pollen grains	27	
Red flowers, round pollen grains	85	
Total number of progenies	427	

(1 points)

χ^2 value = _____ (2 points)

34.2. (0.8 points)

Complimentary epistasis	Dominant epitasis	Linkage	Maternal inheritance
×	×	✓	×

35. (2.3 points)

35.1. (1.5 points)

	homozygous	heterozygous	wild type
%	25	50	25

35.2. (0.8 points)

a	b	c	d
×	×	✓	×

36. (1.1 point)

36.1. (0.6 points)

	Homozygous dominant	Heterozygous	Homozygous recessive
Normal	×	×	✓
Creepers	×	✓	×

36.2. (0.5 points)

Normal	Short wings	Short legs	Short wings and legs	Lethal
×	×	×	×	✓

37. (2 points)

37.1. (1 point)

The fraction expected is = 2/3.

37.2. (1 point)

The fraction expected is = 1/12.

38. (3 points)

38.1. (2 points)

The estimated enzyme activity of X (R271Q/E290K) is ≈ 16.5 (any value between 15 to 17).

The estimated enzyme activity of Y (Y424C/ R158Q) is ≈ 30 (any value between 28 to 32).

38.2. (1 point)

The critical range is somewhere between 10 % to 25 % of normal activity.

39. (2 points)

	Cross	Progeny ratio (purple to green)				
		3:1	9:7	15:1	1:7	1:1
i.	ChsA chsA ChsJ chsJ C1C1 **X** ChsA chsA ChsJ chsJ C1C1	×	✓	×	×	×
ii.	ChsA chsA ChsJ chsJ C1c1 **X** chsA chsA chsJ chsJ c1c1	×	×	×	✓	×

40. (0.6 point)

a	b	c
×	×	✓

41. (2.7 points)

41.1. (1.8 points)

Vombatus	Tyr	Asp	Arg
Notoryctes	Leu	STOP	Pro

41.2. (0.9 points)

a	b	c
×	-	✓

42. (3 points)

42.1. (2 points)

a	b	c	d	e
×	×	✓	✓	-

42.2. (1 point)

Line	Taxon
○·····	EM

43. (1.8 points)

a	b	c	d	e	f
✓	✓	×	×	✓	-

44. (1.2 points)

a	b	c	d	e	f
✓	×	✓	✓	✓	×

45. (1.8 points)

a	b	c	d	e	f	g	h	i
✓	×	✓	✓	✓	✓	✓	✓	✓

46. (2.8 points)

a	b	c	d	e	f	g
×	✓	✓	×	✓	✓	✓

47. (1.2 points)

I	II	III	IV	V	VI
e	f	c	b	d	a

48. (1.2 points)

Type of plastids	Taxa
Two-membrane rhodoplast	d
Two-membrane chloroplast	a
Four-membrane rhodoplast	c
Three-membrane chloroplast	b

49. (2.6 points)

49.1. (0.2 points)

Answer: ___A1____.

49.2. (0.2 points)

Answer: ____f_____.

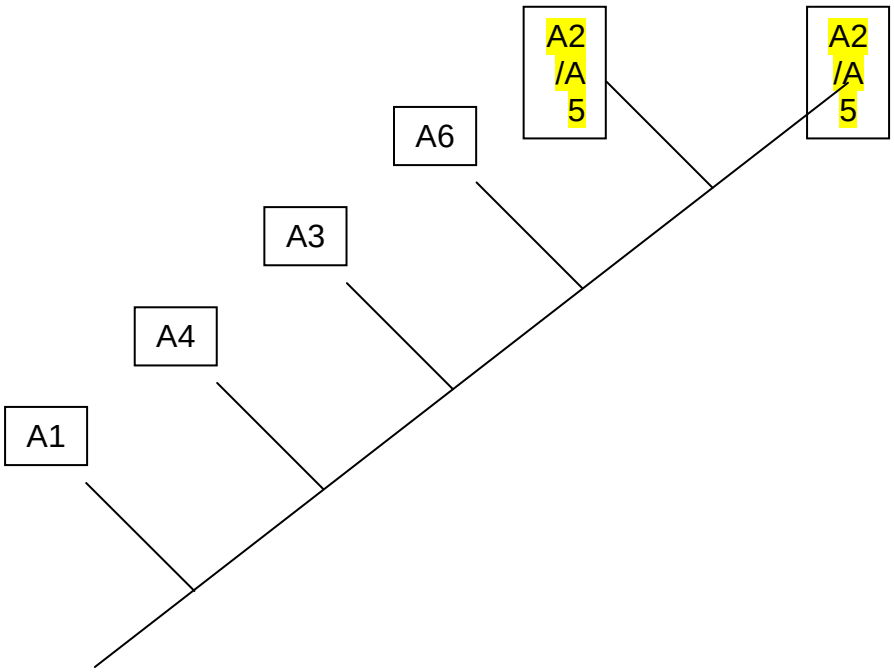
49.3. (0.2 points)

Answer: ____e_____.

49.4. (0.2 points)

Answer: ____b_____.

49.5. (1.8 points)



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