

## 1. SPECTROPHOTOMETRY - 5 points

Q1.1 point (0.5 for the correct answer, 0.5 for the unit)	50 L·mol <sup>-1</sup> ·cm <sup>-1</sup>
Q2.1 point (0.5 for the correct answer, 0.5 for the unit)	7.6 mM

Q3. (2 points - Each correct answer 0.2 points)

Concentrations	Average of Absorbance	% RS
1 mg	0.17	70.69
500 µg	0.36	37.93
250 µg	0.43	25.86
125 µg	0.49	15.52
62.5 µg	0.54	6.90

Q4.1 point	1617-1618
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## 2. CHROMATOGRAPHY -4 points

Q1. 1.5 points (0.5 for each correct answer)	A	B	C
Chlorophyll a		X	
Chlorophyll b			X
β-carotene	X		

Q2.(0.5 points)	0.39
Q3.(0.5 points)	0.32
Q4.(0.5 points)	0.88

Q5.1 point (0.2 points for each correct answer)	A	B	C	D	E
T	X	X		X	
F			X		X

### 3. METABOLISM OF FATTY ACIDS -4.8 points

Q1.0.6 points - (0.2 points for each correct number, more than 3 letters will get 0 points)	1	2	4
Q2.0.4 points - (0.2 points for each correct number, more than 2 letters will get 0 points)	3	5	X

Q3.1 point (0.2 for each correct answer)	A	B	C	D	E
T		X			X
F	X		X	X	

### Q4.(2 points- 0.5 for each correct answer)

1.	6
2.	67.5
3.	19.5
4.	7

Q5. 0.8 points (0.2 for each correct answer)	A	B	C	D
T				X
F	X	X	X	

### 4. ENZYME KINETICS - 3 points

#### Q1.1 point (0.25 for each correct answer, there is only one matching for each row)

	graph 1	graph 2	graph 3	graph 4
Competitive inhibitor			X	
Noncompetitive inhibitor				X
Uncompetitive inhibitor	X			
Mixed inhibitor		X		

Q2. 0.5 points	3.5 mM
Q3. 0.5 points	2 mM
Q4. 0.5 points	1 mM

Q5. (0.5 points, only one correct answer)

A	B	C	D
	X		

**5. KEAP1-NRF2 MUTATIONAL ANALYSIS 2 - points**

Q1. 2 points (0.5 for each correct answer)	A	B	C	D
T			X	
F	X	X		X

**6. ROLE OF WNK1 IN EMC COMPLEX STABILITY - 3.5 points**

3.5 points (0.5 for each correct answer)	A	B	C	D	E	F	G
T		X	X			X	
F	X			X	X		X

**7. INTRACELLULAR TRANSPORT - 1 point**

Q1.1 point (0.2 for each correct answer)	A	B	C	D	E
T		X			X
F	X		X	X	

**8. POLLINATION OF FLOWERS - 1 point**

Q1.1 point (0.2 for each correct answer)	A	B	C	D	E
T	X	X		X	X
F			X		

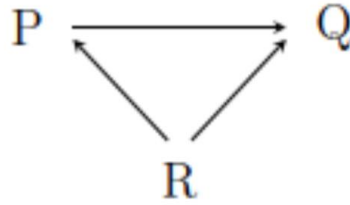
**9. WATER POTENTIAL- 3 points**

Q1. 1 point (0.5 for each correct answer)

Cell	$\Psi_s$ (MPa)	$\Psi_p$ (MPa)	$\Psi_w$ (MPa)
P	-8	2	...-6...
R	...-6...	2	-4

Q2. 0.5 points	-8 MPa
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**Q3. 1.5 points (0.5 points for each correct arrow)**



**10. PLANT TISSUE IDENTIFICATION AND FUNCTION 1 point**

**Q1. 0.4 points (only one correct answer)**

A	B	C	D
			X

**Q2. 0.6 points (0.2 for each correct answer)**

	A	B	C
T			X
F	X	X	

**11. POLLEN/OVULE RATIO IN PLANTS - 2 points**

**Q1. 1 point**

500

**Q2. 0.4 points (only one correct answer)**

A	B	C	D
	X		

**Q3. 0.6 points (0.2 for each correct answer)**

	A	B	C
T	X		
F		X	X

## 12. LIFE CYCLES OF PLANTS 3.8 points

Q1. 3.2 points (0.2 points for each correct answer)

Stage	Plant 1	Plant 2
Microgametophyte	H	VIII
Megagametophyte	E	I
Embryo of the sporophyte	C	VI
Mature sporophyte	A	V
Spore	F	II
Meiosis	G	IV
Fertilization	D	VII
Sporangium	B	III

Q2.0.6 points (0.2 for each correct answer)	A	B	C
T	X		
F		X	X

## 13. ANATOMY OF STEM AND ROOT 2.5 points

Q1.1.5 points(0.25 for each correct answer, each box must contain only one letter or number)	Dicotyledons	Monocotyledons
Root	<b>1</b>	<b>2</b>
Stem	<b>4</b>	<b>3</b>
Stele	<b>II</b>	<b>III</b>

Q2.1 point (0.25 for each correct answer)

I.	C
II.	A
III.	B
IV.	D

**14. MELVIN CALVIN'S DISCOVERY 1.4 points**

<b>Q1. 0.6 points (0.2 for each correct answer)</b>	<b>Species 1</b>	<b>Species 2</b>
<b>C<sub>3</sub></b>		<b>X</b>
<b>C<sub>4</sub></b>		<b>X</b>
<b>CAM</b>	<b>X</b>	

<b>Q2. 0.8 point (0.2 for each correct answer)</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>T</b>	<b>X</b>	<b>X</b>		<b>X</b>
<b>F</b>			<b>X</b>	

**15. IMMUNOGLOBULINS - 1.8 points**

<b>Q1. 1 point (0.25 for each correct answer, only one matching for each letter will be accepted as a correct answer)</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>I</b>		<b>X</b>		
<b>II</b>	<b>X</b>			
<b>III</b>				<b>X</b>
<b>IV</b>			<b>X</b>	

<b>Q2. 0.8 point (0.2 for each correct answer)</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>T</b>		<b>X</b>		
<b>F</b>	<b>X</b>		<b>X</b>	<b>X</b>

### 16. AUTONOMIC NERVOUS SYSTEM 3 points

Q1.1 point (0.25 for each correct row, only one matching for each letter will be accepted as a correct answer)	Acetylcholine	Noradrenaline (Norepinephrine)	Glutamine	GABA
X	X			
Y	X			
W		X		
Z	X			

Q2.2 points (0.4 for the complete correct answer for each row )

I.	Y,W
II.	X,Z
III.	X,Z
IV.	Y,W
V.	Y,W

### 17. HEMOGLOBIN SATURATION - 1.4 points

Q1.0.6 points (0.2 for each correct answer)

1.	B
2.	A
3.	C

Q2. 0.8 points (0.2 for each correct answer)	A	B	C	D
T	X	X	X	
F				X

### 18. KIDNEY METABOLISM - 5.3 points

Q1. 0.5 points(0.25 points for the one matching for each letter )	CREATININE	URIC ACID	UREA	AMINO ACID	PHOSPHATE ANION
W	X				
Z			X		

Q2. 0.5 points (0.25 points for each correct answer)

<b>X</b>	180 (g/day)
<b>Y</b>	150 (mEq/day)

Q3. 0.8 points (0.2 for each correct answer)	A	B	C	D
T		X		
F	X		X	X

Q4. 1.4 points (0.2 for each correct row, only one matching for each row will be accepted as a correct answer)

Q5.	A	B	C	D	E	F	G
Renal papilla		X					
Renal pyramid	X						
Minor calyx						X	
Renal capsule					X		
Major calyx							X
Cortex			X				
Medulla				X			

(The answer is correct even if A and D are interchanged)

Q5. 0.8 points (0.2 for each correctly matched row, one of the processes is not depicted in the graph, leave this row blank for full point)	A	B	C
Filtration			X
Reabsorption	X		
Secretion			
Excretion		X	



Q6. 0.5 points	0 mg/min
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Q7. 0.8 points (0.2 for each correct answer)	A	B	C	D
T	X		X	
F		X		X

**19. VISION- 1.5 points**

1.5 marks( 0.25 marks for each correct row, only one matching for each row will be accepted as a correct answer)

Q1.	A	B	C	D	E	F
1.		X				
2.			X			
3.				X		
4.						X
5.	X					
6.					X	

**20. PHYSIOLOGY OF CARDIOVASCULAR CIRCULATION - 4.2 points**

Q1. 0.6 points (0.2 for each correct answer)

Waves	Images
P	D
Q,R,S	F
T	B

Q2. 1 point(0.25 for each correct answer)

	Valves	Open	Close	Left
I	X		X	X
II	Z		X	X
III	W		X	
IV	Y		X	

Q3. 1 point

5.25 L/min.

Q4. 0.8 <i>point(0.2 for each correct answer)</i>	A	B	C	D
T	X		X	X
F		X		

Q5. 0.8 <i>point(0.2 for each correct answer)</i>	A	B	C	D
T	X	X		X
F			X	

**21. DIGESTIVE SYSTEM PHYSIOLOGY- 1 points**

Q1. 1 point (0.2 for each correct answer, only one matching for each row will be accepted as a correct answer)	I	II	III	IV	V
Maltase			X		
Lipase					X
Lactase	X				
Sucrase (Invertase)		X			
Dipeptidase				X	

**22. CARBOHYDRATE METABOLISM - 4 points**

Q1. 4 points (0.5 for each correct answer, only one matching for each letter (column) will be accepted as a correct answer)

Questions	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1.			X													
2.									X							
3.												X				
4.					X		X	X								
5.										X						
6.	X															
7.		X														
8.																X

**23. ACTION POTENTIAL - 1.4 points**

Q1.0.8 point (0.2 for each correct answer)

1.	Na <sup>+</sup>	A
2.	Ca <sup>2+</sup>	X
3.	K <sup>+</sup>	B
4.	Cl <sup>-</sup>	X

Q2. 0.6 points(0.2 points for each correct answer)	A	B	C
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T		X	
F	X		X

**24. TOBACCO MOSAIC VIRUS 2 points**

<p>Q1. 2 points (0.5 points for each correct answer)</p>	<p>1- Tyr – Tyr – Ser – Asp</p> <p>2- Arg – Tyr – Ser – Asp</p> <p>3- Cys – Tyr – Ser – Asp</p> <p>4- His – Tyr – Ser – Asp</p>
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**25- SOMATIC CELL HYBRIDIZATION 1 point**

Q1. 1 <i>point(0.25 for each correct answer)</i>	A	B	C	D
T		X		
F	X		X	X

**26. GENEALOGICAL METHOD. INBREEDING COEFFICIENT 3.1 points**

Q1. 1 point (only one correct answer will be accepted)

A.	Autosomal dominant	
B.	Autosomal recessive	
C.	X-linked dominant	
D.	X-linked recessive	
E.	Y-linked	
F.	Mitochondrial inheritance	
G.	Maternal effect	X

Q2. 0.6 points (each correct answer will get 0.2 points, every incorrect match will take 0.02 points)

	1	2	3	4	5	6	7	8
I								
II								
III								
IV	X	X	X					

Q3. 1.5 points (each correct row will get 0.5 points)

Inbred organisms	Inbreeding coefficient
IV-1	0.03125
IV-2	0.03125
IV-3	0.03125

## 27. ABC MODEL 4 points

Q1. 2.4 points (every correctly matched box gets 0.2 points, only one number for each box)

Samples	Organ identification code	The active part(s) of a "homeotic" gene model	Genotype code
<b>a</b>	1	7	14
<b>b</b>	3	10	15
<b>c</b>	6	9	15
<b>d</b>	5	8	15

Q2. 1 point (0.2 points for each correct answer, only one number for each box)

	Phenotype code
Determine the flower morphology of a plant with mutant genes <b>B</b> and <b>C</b> .	2
Determine the flower morphology of a plant with mutant gene <b>C</b> .	7

Determine the flower morphology of a plant with mutant genes <b>A, B</b> .	4
Determine the flower morphology of a plant with mutant gene <b>B</b> .	6
Determine the flower morphology of a plant with mutant gene <b>A, B, C</b> .	1

Q3. 0.6 points (0.2 points for each correct answer, only one matching for each row will be accepted)

	a	b	c
1.			<b>X</b>
2.	<b>X</b>		
3.		<b>X</b>	

## 28. LAC OPERON 3 points

Q1. 3 points (each correctly filled row is 0.5 points)

Genotypes		LACTOSE ABSENT			LACTOSE PRESENT		
		P	$\beta$ -gal	lacCZ	P	$\beta$ -gal	lacCZ
<b>1</b>	$I^+ O^+ Y^+ Z^-$	0	0	0	+	0	+
.							
<b>2</b>	$I^+ O^+ Y^- Z^-$	0	0	0	0	0	+
.							
<b>3</b>	$I^s O^+ Y^- Z^+$	0	0	0	0	0	0
.							
<b>4</b>	$I^+ O^c Y^+ Z^+$	+	+	0	+	+	0
.							
<b>5</b>	$I^- O^c Y^- Z^+$	0	+	0	0	+	0
.							
<b>6</b>	$I^s O^c Y^+ Z^-$	+	0	+	+	0	+
.							

### 29. DOUBLE FERTILIZATION (4.6 Points)

Only correctly written ratios and genotypes will get points. Each correctly filled box will earn 0.25 points

	Embryo	Endosperm
<b>Q1. 0.6 points</b>	X	X
<b>Q2. 1 points</b>	$\frac{1}{2} S_1S_3 : \frac{1}{2} S_3S_4$	$\frac{1}{2} S_1S_1S_3 : \frac{1}{2} S_4S_4S_3$
<b>Q3. 2 points</b>	$\frac{1}{4} S_1S_2 : \frac{1}{4} S_1S_4 :$ $\frac{1}{4} S_3S_2 : \frac{1}{4} S_3S_4$	$\frac{1}{4} S_1S_1S_2 : \frac{1}{4} S_1S_1S_4 :$ $\frac{1}{4} S_3S_3S_2 : \frac{1}{4} S_3S_3S_4$
<b>Q4. 1 points</b>	$\frac{1}{2} S_2S_4 : \frac{1}{2} S_3S_4$	$\frac{1}{2} S_2S_2S_4 : \frac{1}{2} S_3S_3S_4$

### 30. POPULATION GENETICS (2 Points)

Q1. 1 point for the correct row	D-0.55; d-0.45
Q2. 1 point for the correct row	DD-0.3025; Dd-0.495; dd-0.2025

### 31. EVOLUTION OF THE HEART -1 point

Q1. 1 point (0.2 for each correct answer)	A	B	C	D	E
T	X		X		X
F		X		X	

### 32. SHANNON INDEX -2 points

Q1. 1 point (0.2 for each correct answer)	A	B	C	D	E
T	X				X
F		X	X	X	

Q2.1 point	1.95
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### 33. MATRIPHAGY 2.2 points

Q1. 0.5 points	136
Q2.0.5 points	36
Q3.0.5 points	22
Q4.0.5 points	228 mg

Q5. 0.2 point. (only one correct answer)

A	B	C	D
X			

### 34. ECOLOGICAL RELATIONSHIPS - 1.5 points

1.5 points (0.25 points for each correct row, only one matching for each row will be accepted)

	A	B	C	D
Q1.		X		
Q2.	X			
Q3.				X
Q4.			X	
Q5.				X
Q6.			X	

### 35. HAMILTON'S RULE - 2 points

Q1. 0.5 points	0.4667
Q2. 0.5 points	66

Q3. 1 point (0.2 points for each correct answer)	A	B	C	D	E
T	X		X		X
F		X		X	