25th INTERNATIONAL BIOLOGY OLYMPIAD

5 – 13 July, 2014

INDONESIA

PRACTICAL TEST 1

CELL & MOLECULAR BIOLOGY

ANSWER KEY

Total points: **64.5**

Duration: 90 minutes

COUNTRY:	.....
STUDENT ID:	.....

Task (64.5 points)

Plasmid Identification and Telomere Analysis

Part A. Confirmation of plasmid sample X, Y, and Z by restriction analysis and DNA electrophoresis. (40 points)

Q 1.1. 8 points

For row 4 & 5 – 6 points; 1 series with two enzyme and 1 series *Eco*RI

For row 2 – 1 point if students fill 1 (µl) for every cell

For row 1 - 1 point for correct volume of water to add up to final volume of 10 µl

Table I. Design of Experiment for Plasmid Identification

No.	Reagents	Series 1 (Volume in µL)			Series 2 (Volume in µL)		
		Plasmid 1	Plasmid 2	Plasmid 3	Plasmid 1	Plasmid 2	Plasmid 3
		S1	S2	S3	S4	S5	S6
1	Sterile water	7	7	7	6	6	6
2	10 X Restriction buffer solution	1	1	1	1	1	1
3	DNA Plasmid	1	1	1	1	1	1
4	*Eco*RI*	1	1	1	1	1	1
5	*Hin*dIII*	0	0	0	1	1	1
	Volume total	10	10	10	10	10	10

* If the enzyme is used in the reaction, add 1 µL enzyme

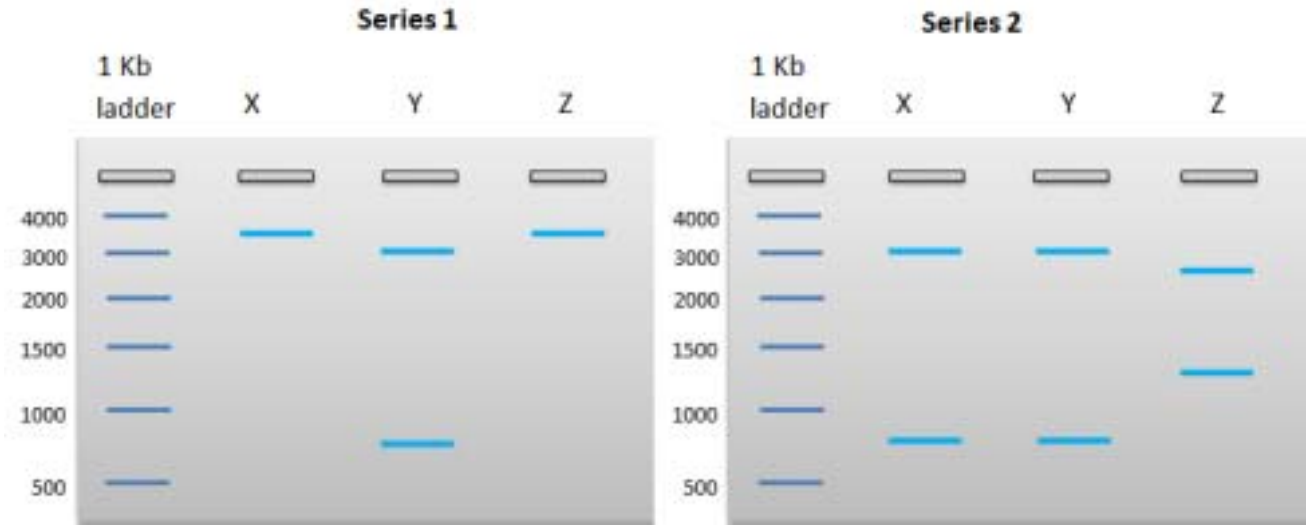
Or

No.	Reagents	Series 1 (Volume in µL)			Series 2 (Volume in µL)		
		Plasmid 1	Plasmid 2	Plasmid 3	Plasmid 1	Plasmid 2	Plasmid 3
		S1	S2	S3	S4	S5	S6
1	Sterile water	6	6	6	7	7	7
2	10 X Restriction buffer solution	1	1	1	1	1	1
3	DNA Plasmid	1	1	1	1	1	1

4	***Eco*RI***	**1**	**1**	**1**	**1**	**1**	**1**
5	***Hin*dIII***	**1**	**1**	**1**	**0**	**0**	**0**
	Volume total	**10**	**10**	**10**	**10**	**10**	**10**

Q1.2 Answers . (6 points – 1 points each lane)

enzymes	Series 1	Series 2
HindIII A	√	
EcoR1	√	√

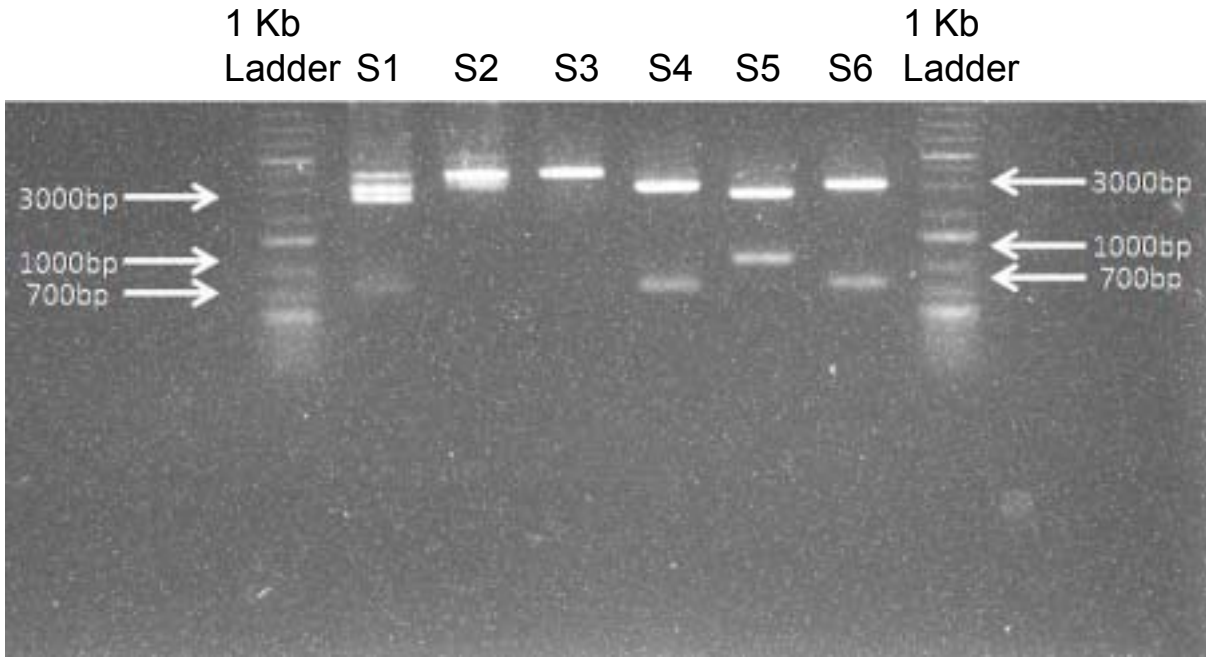


Q 1.3 DNA Electrophoresis Result of Plasmid Restriction Experiment (26 points):

1 point for each ladder (1x2)

4 points for each lane (4x 6) :

- **1 point for the presence of DNA and**
- **3 points for correct sized band**



- Attach photograph of gel here

1 point for each lane of ladder

3 points for each correct lane (or none)- partial digest , if the correct bands are thicker than the uncorrect one. Points are given based on the filled table 1 (error carried forward where applicable)

Code in problem sheet	Plasmid 1	Plasmid 2	Plasmid 3
Real size	3750	3786	3600
EcoRI restriction	3000 + 750	3786 (linearized)	3600 (linearized)
HindIII restriction	3750	3786 (linearized)	uncut
EcoRI + HindIII restriction	3000 + 750	2686 + 1100	2862 + 738

Part B. Cell reproduction and telomere analysis of *Paramaecium* (24.5 points)

Q 2.1. (1 points x 2 = 2 points)

Culture	Binary Fission	Conjugation
A	√	-
B	√	√

Q 2.2. (2.5 points)

Day	Cell Concentration (Cell/mL)			Average cell concentration (cells/mL) N (Q2.2)	Log of Average cell concentration
	A	B	C		
0	1	1	1	1	0.00
1	8	10	16	11	1.05
2	80	120	128	109	2.04
3	640	960	1024	875	2.94
4	5760	7680	10240	7893	3.90

$$N = N_0 2^n$$

$$\text{Log } N = \log N_o + n \log 2$$

$$\text{Log } N - \log N_0 = n \log 2$$

$$n = (\text{Log } N - \log N_0)/\log 2$$

n = fission rate (per day)

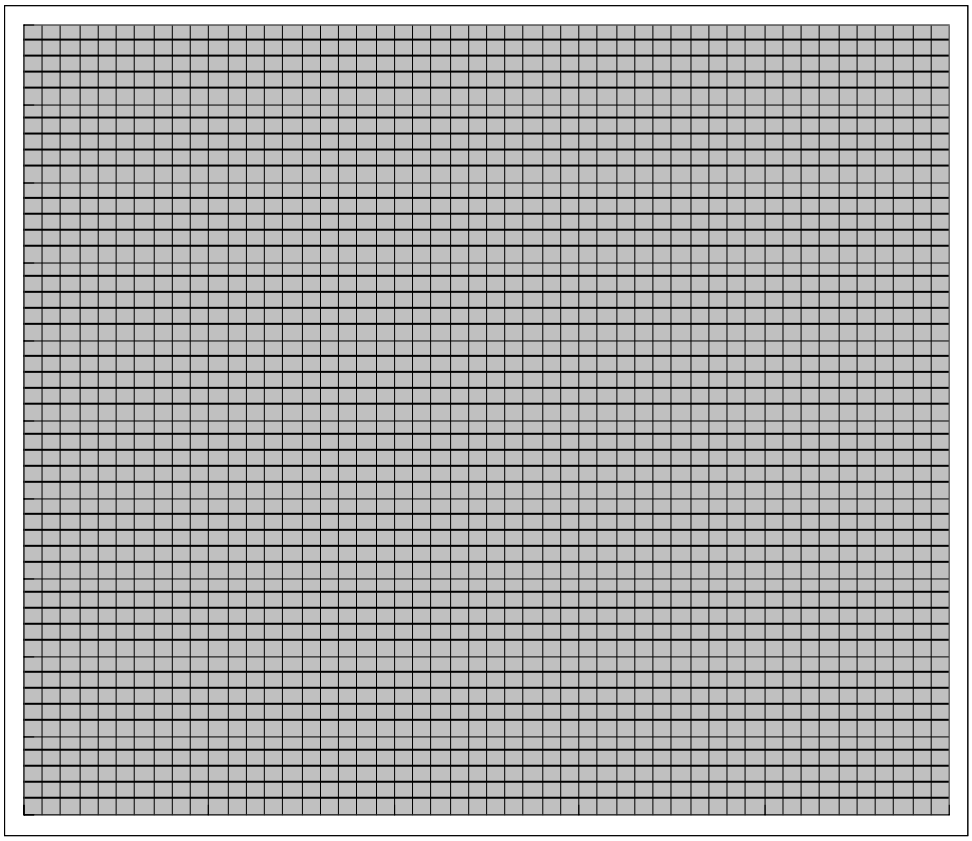
x = day;

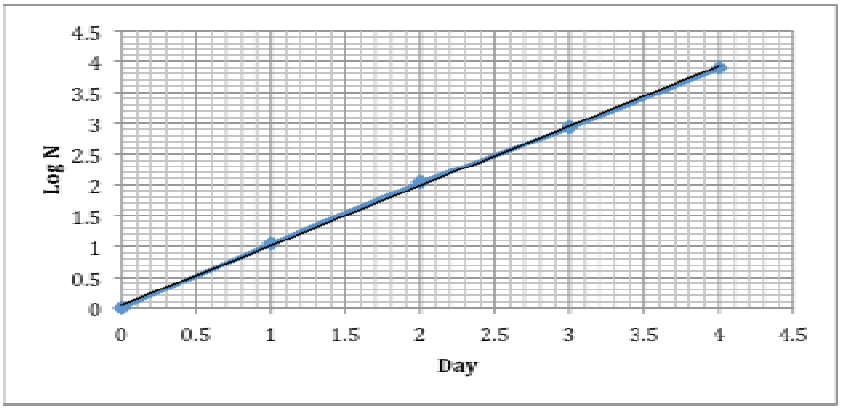
N = average cell number

G= 1 day/fission rate ➔

Graph 8 points:

- **Axis X and Y : 2 points (1 point for each axis)**
- **5 points : 1 point for each value of log N**
- **1 point for drawing the line**





Q 2.3 (12 points)

No.	True	False
a	√	
b		√
c		√
d	√	
e		√
f		√