Fluorometer self-user training

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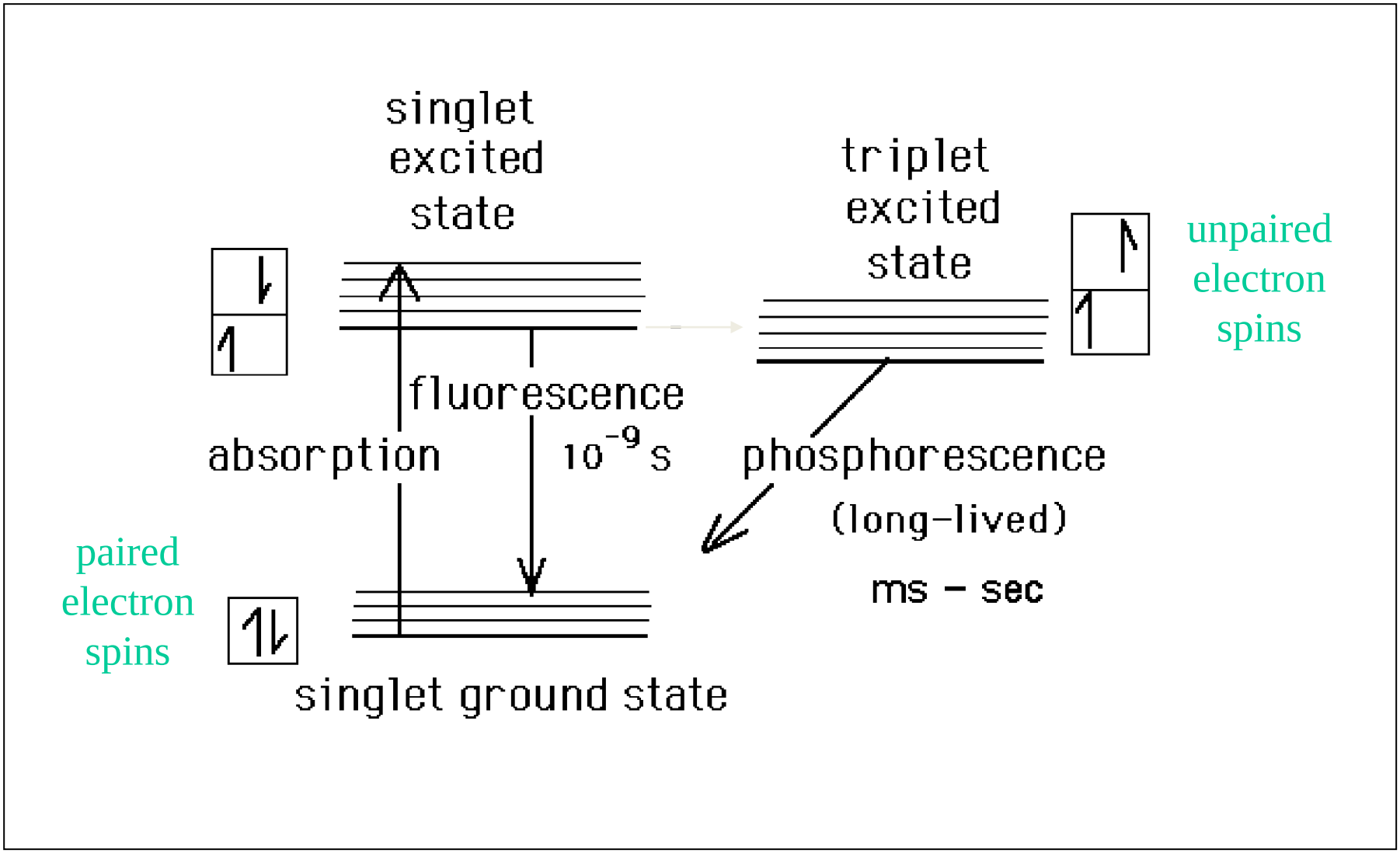
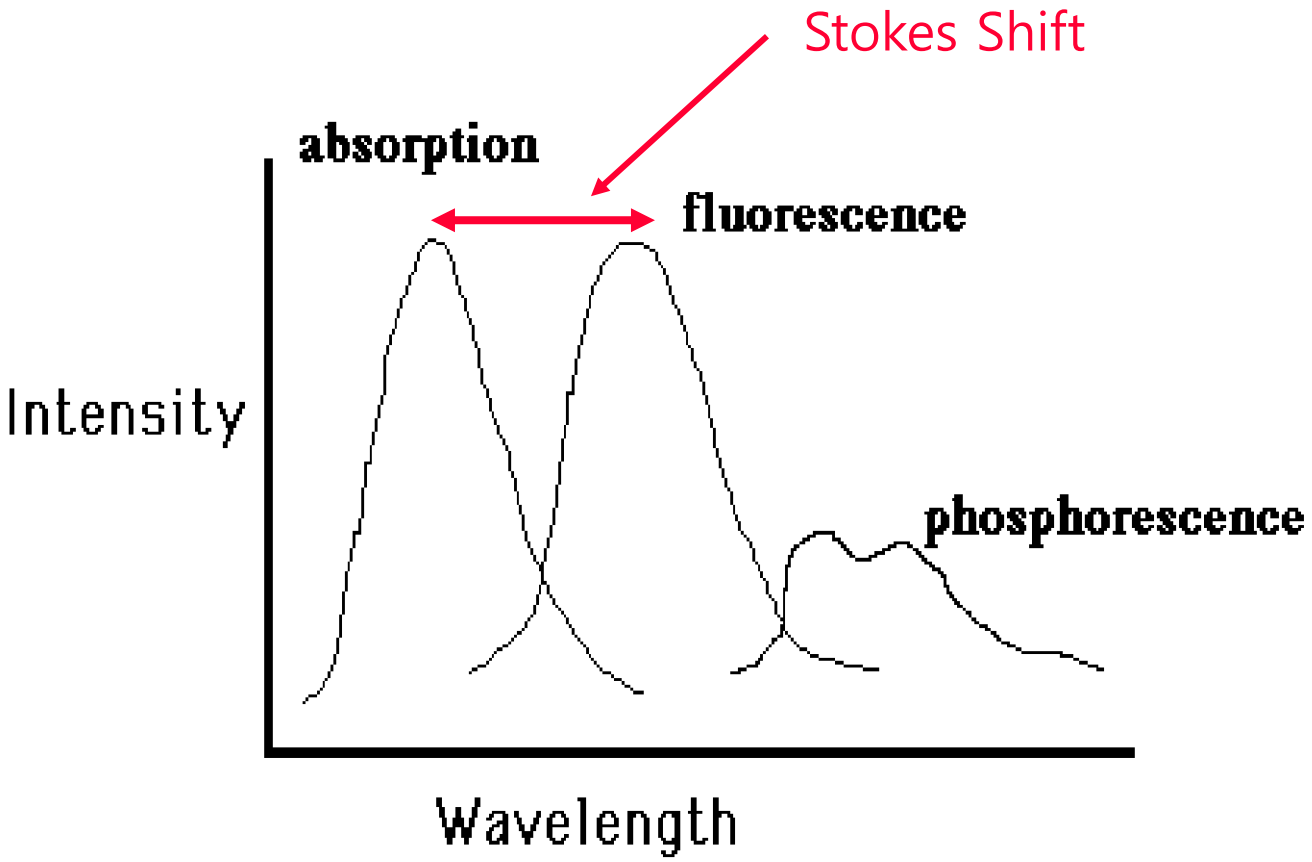
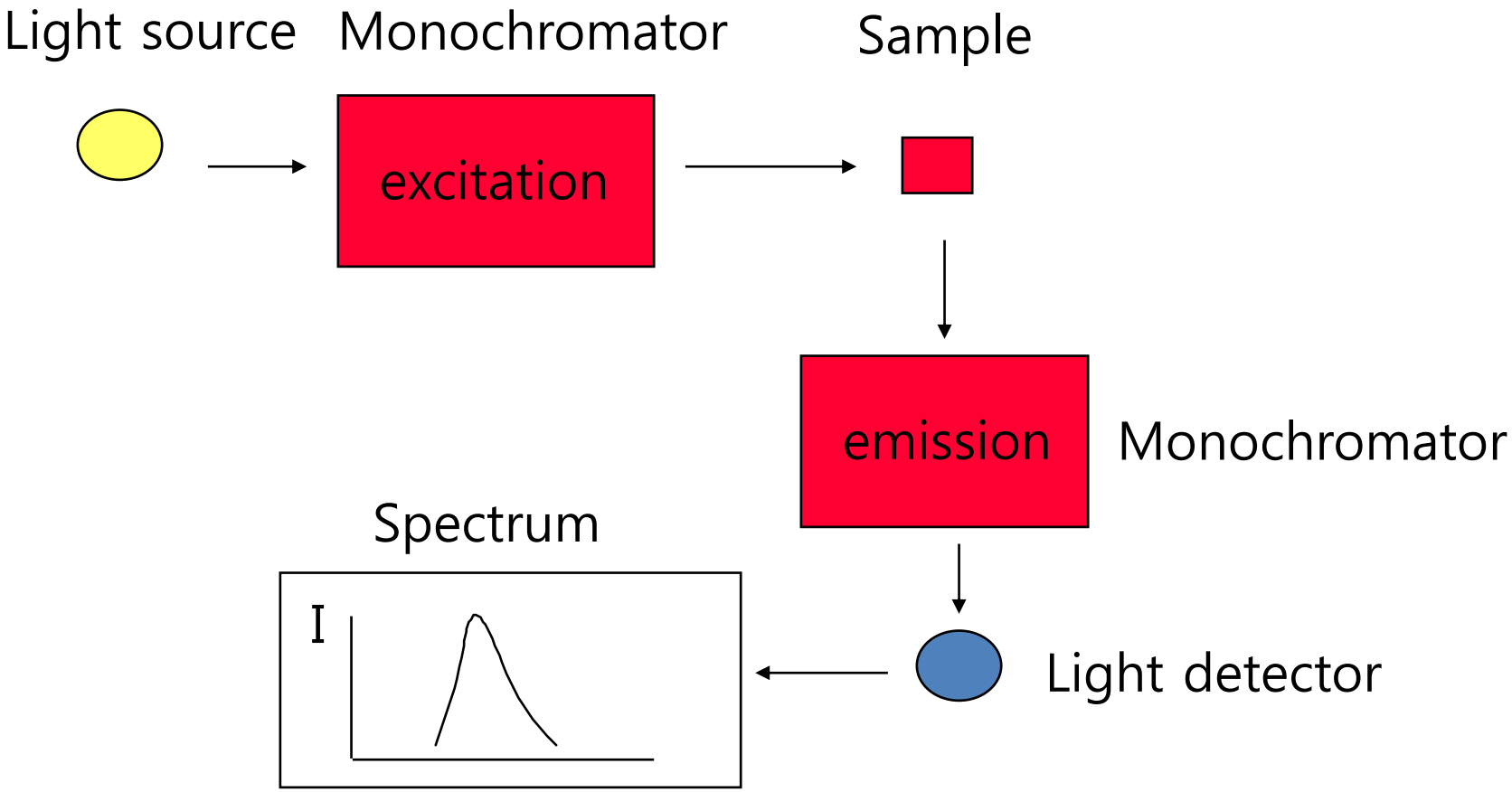
Photoluminescence Processes



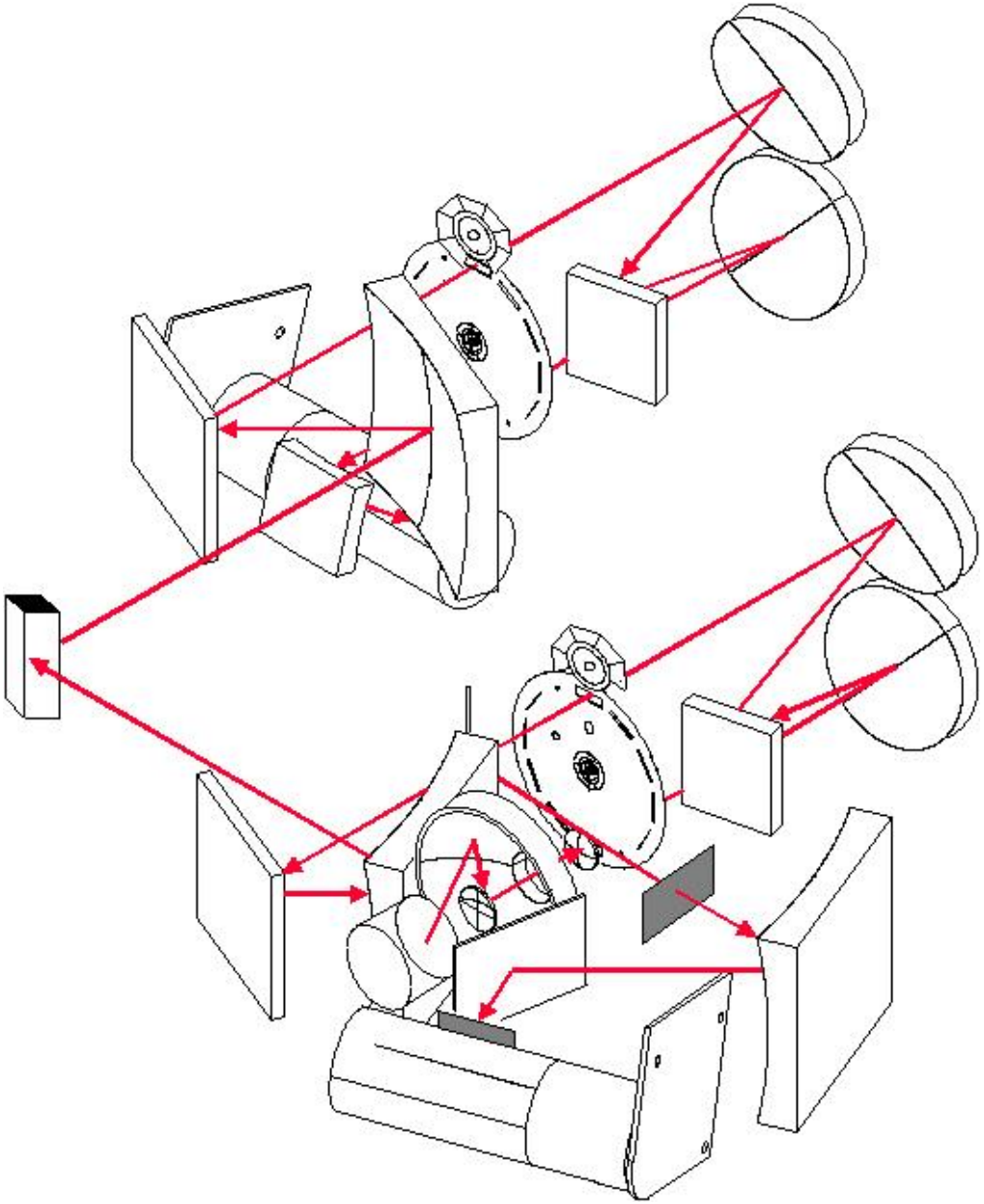
Absorption, Fluorescence, Phosphorescence spectra



Fluorescence Spectrophotometer



Schematic of Fluorometer



Fluorescence Quantum Yield (ϕ_{fl})

$$\phi_{fl} = \frac{\text{No. of photons emitted}}{\text{No. of photons absorbed}}$$

$$0 \leq \phi_{fl} \leq 1$$

- Depends on material and conditions
  - e.g. temperature, solvent, viscosity

Specifications

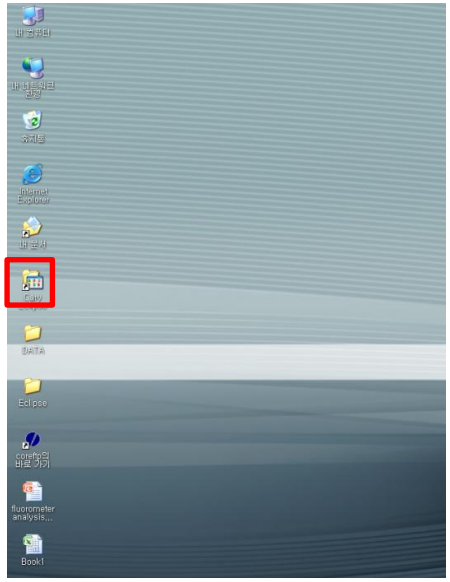
		Fluorometer	Spectrofluorometer
Sample		Liquid	Liquid, Solid/ QY
Light source		Xe pulsed lamp (75 kW)	Xe pulsed lamp (150 kW)
Wavelength ranges	Excitation	200~900 nm	200~850 nm/ 350~800 nm*
	Emission	200~900 nm	200~850 nm/ 350~800 nm*
Detector		Photomultiplier tube	Photomultiplier tube
Wavelength accuracy		< 1.5 nm	< 1.0 nm
Limiting resolution		1.5 nm	1.0 nm
Filter		O	X
Liquid cell		10 mm (2.5mL)	1 mm (0.25mL)

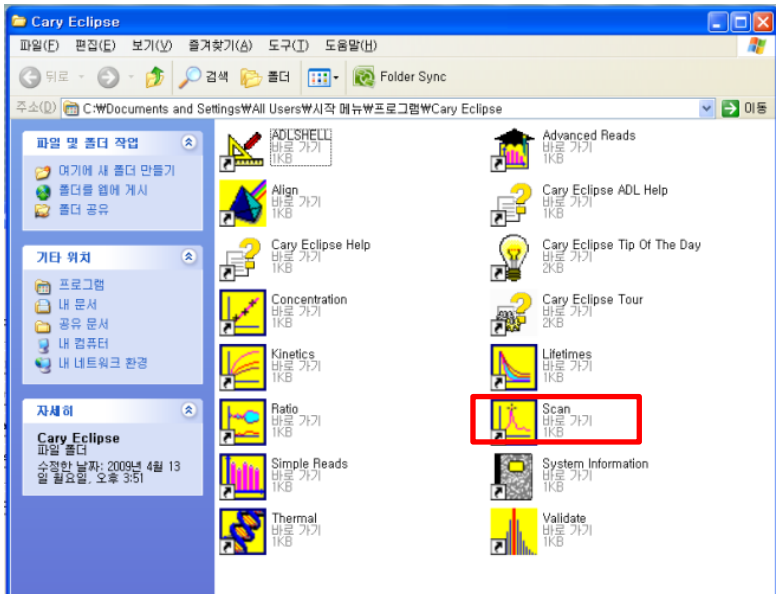
*Integrating sphere with quantum efficiency program

Manual - Fluorometer

1. Switch on→ warm up (10 min)

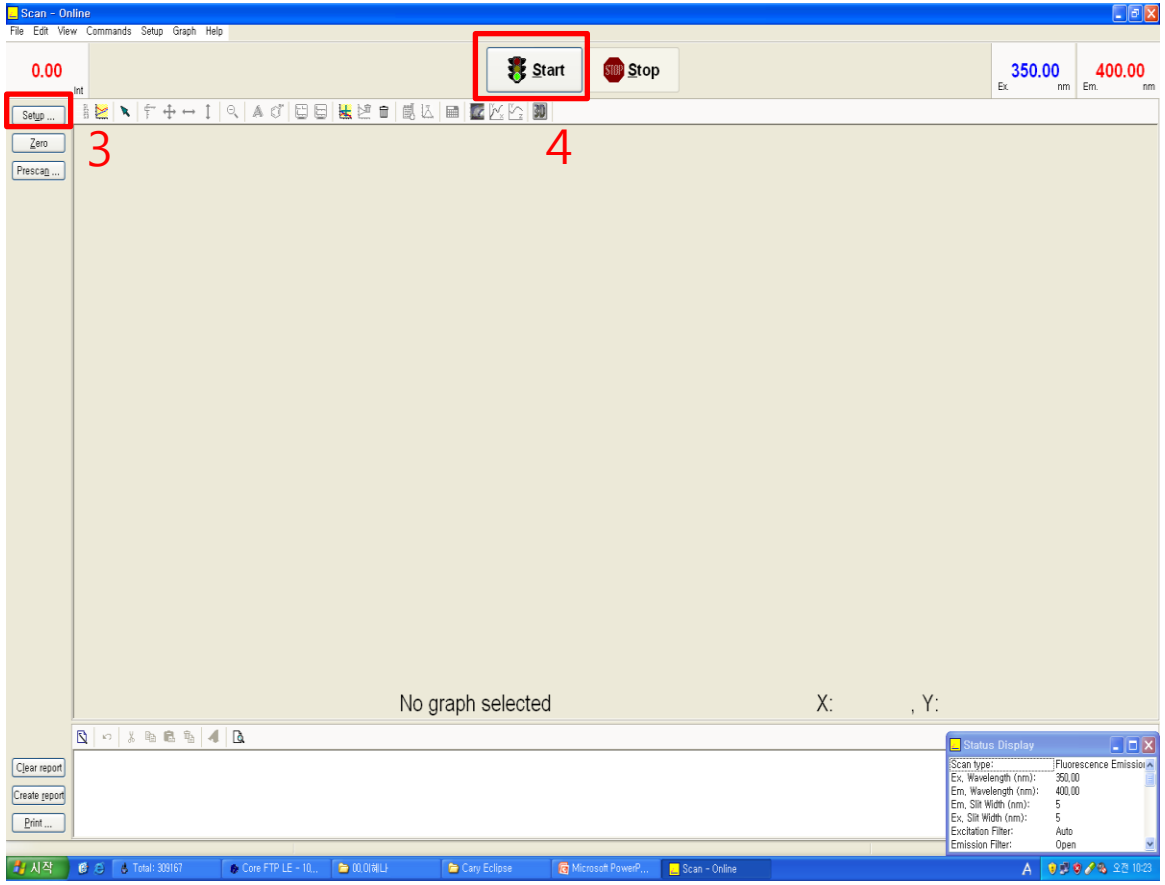
2. Cary Eclipse→ Scan START

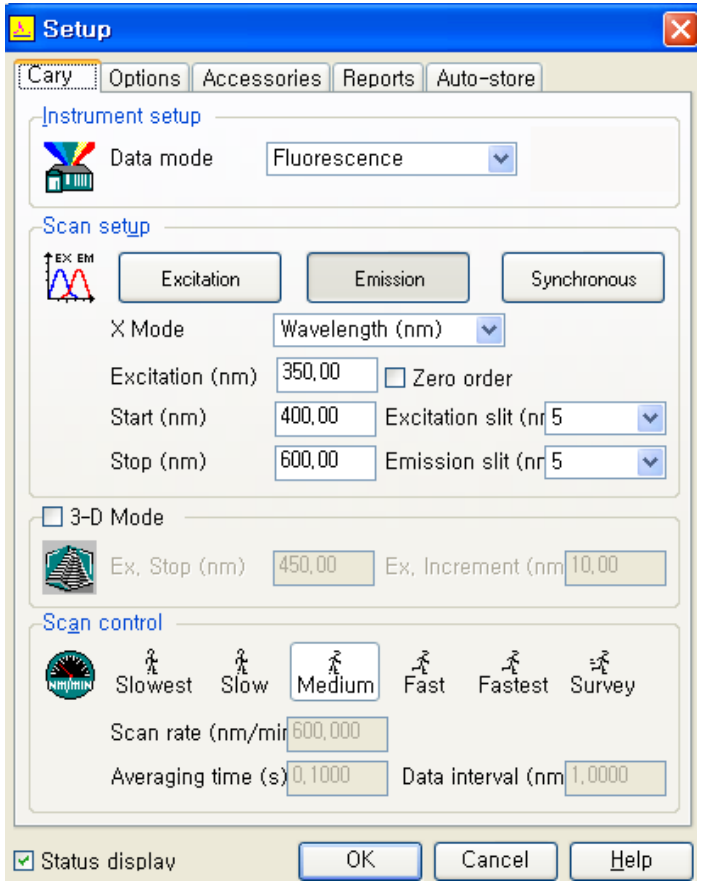




Manual - Fluorometer

3. Set up change

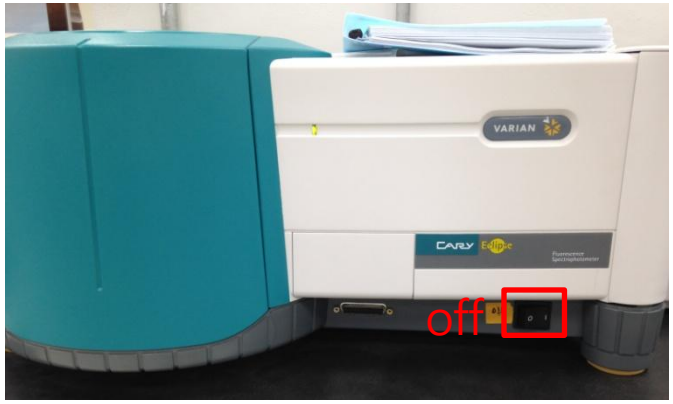




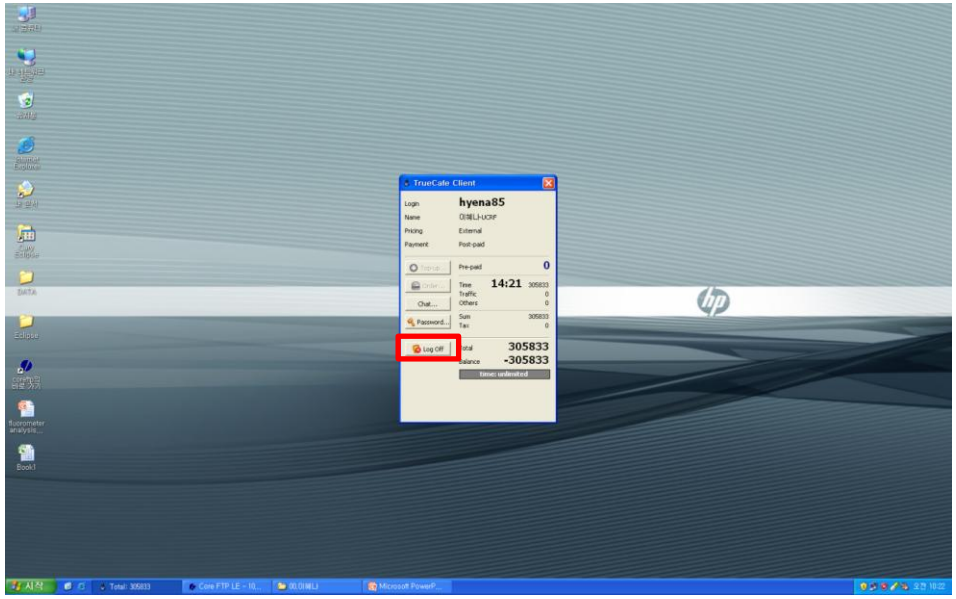
4. Start click

Manual - Fluorometer

5. Switch off

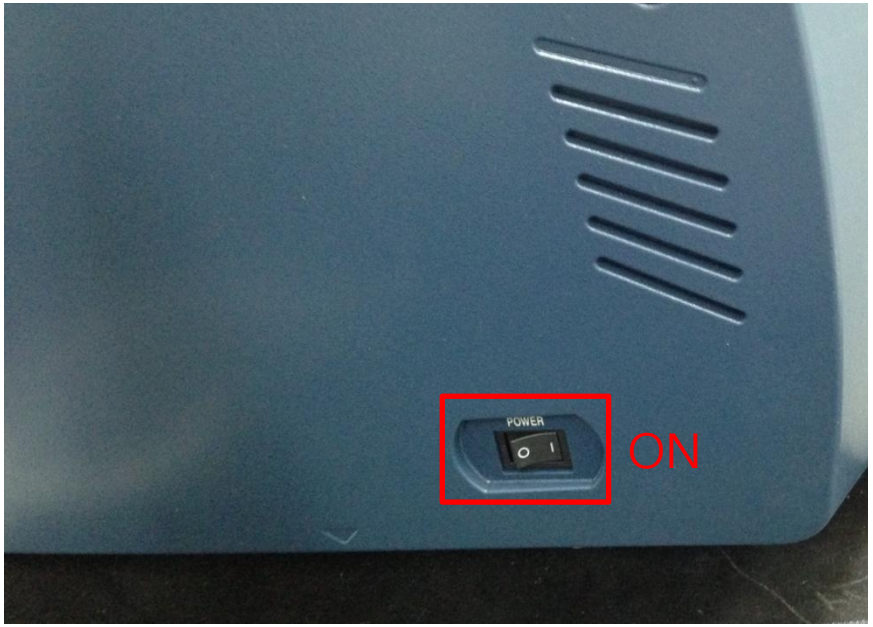


6. Log off True Cafe



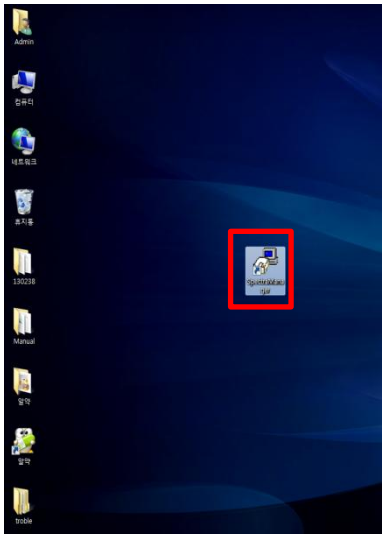
Manual - Spectrofluorometer

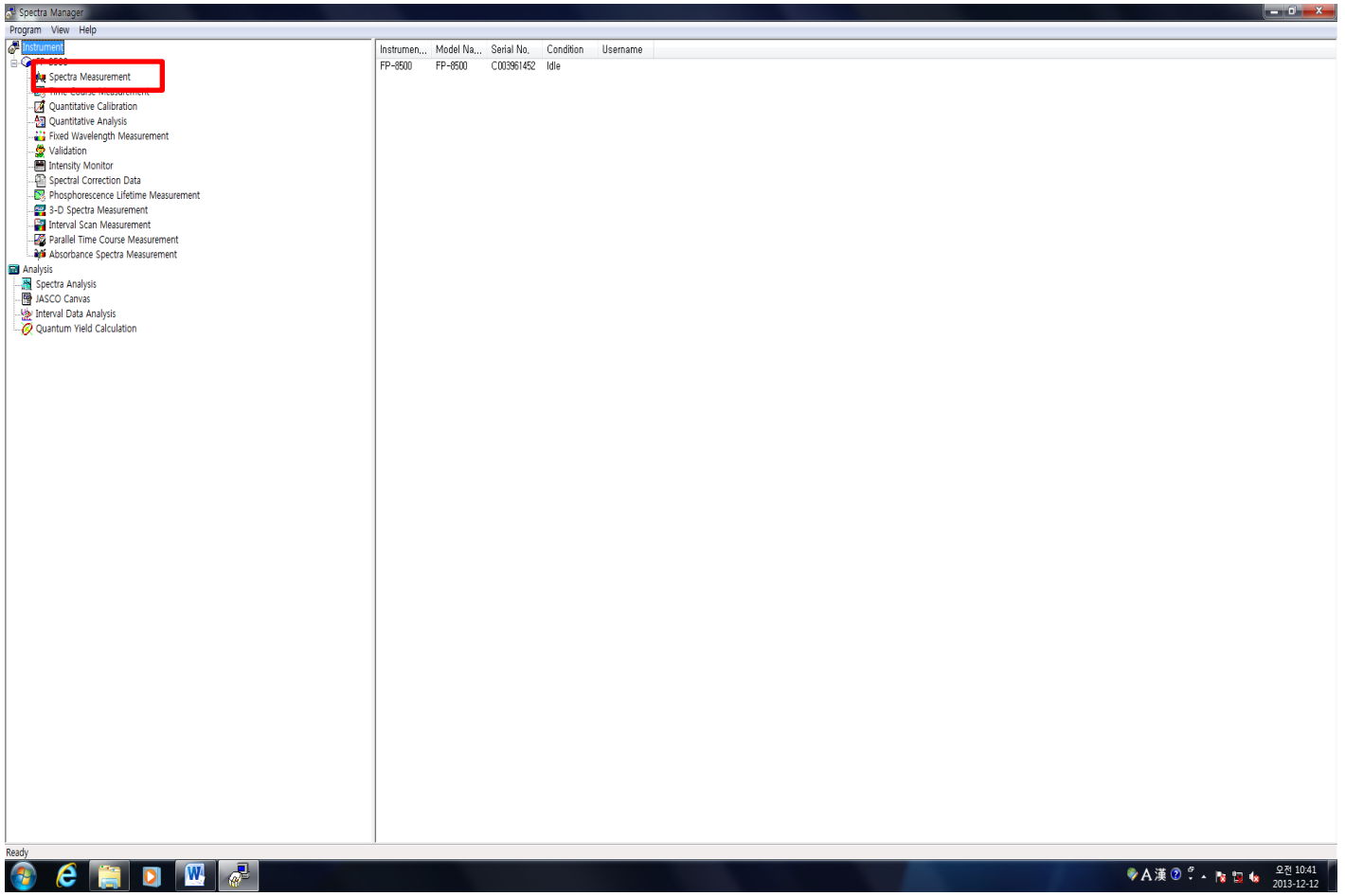
1. Switch on→ warm up (10 min)



Manual - Spectrofluorometer

2. Spectra Manager Pro. START→ Spectra Measurement click

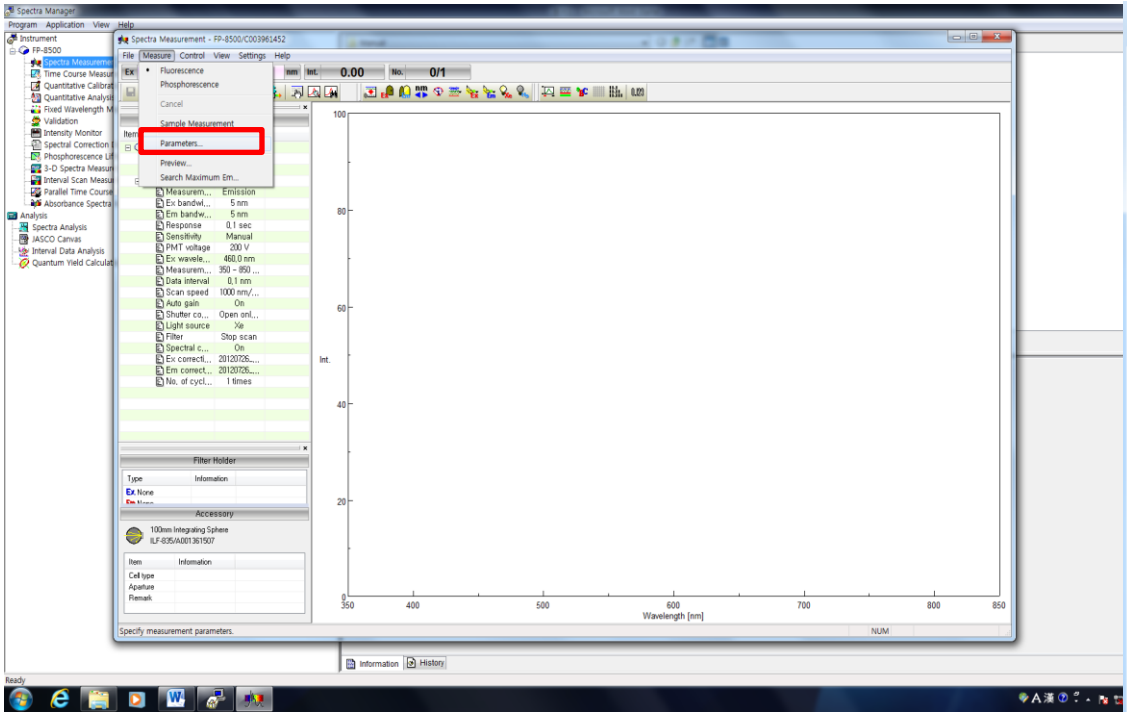


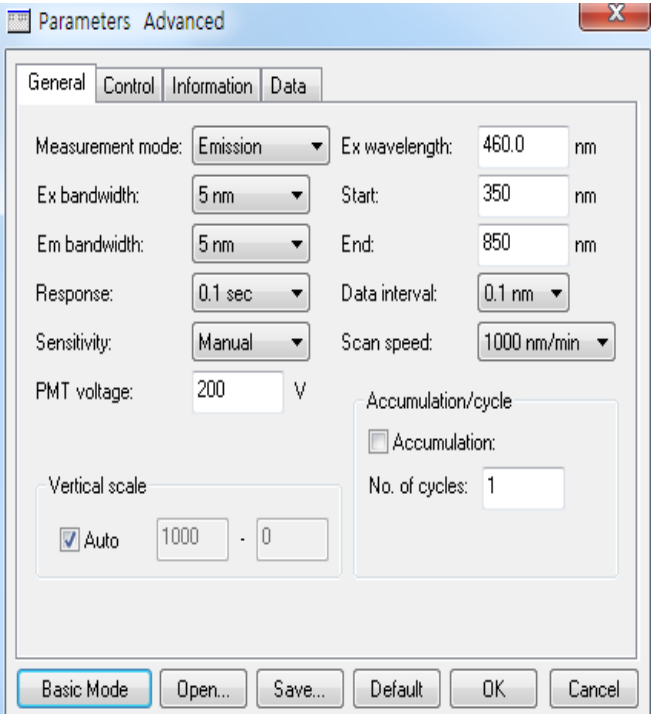


Manual - Spectrofluorometer

3. Measure→ Parameters change

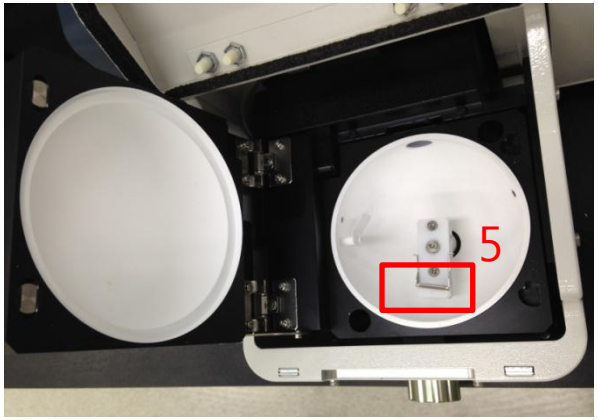
-Measurement mode : Emission
-Ex. Wavelength
-Ex. bandwidth : 5 nm, Em. bandwidth : 5 nm
(시료의 intensity가 낮은 경우 bandwidth를 늘려 intensity를 높일 수 있다.)
-Start : 300 nm, Stop : 850 nm
(적분구를 사용하는 경우 350 nm ~ 800 nm 범위에서 scan 가능)
-Response : 0.1 sec, Data interval : 0.1 nm, Scan speed : 1000 nm/min or 500 nm/min
(resolution에 영향을 미치는 조건)
-Sensitivity : Medium
(Max. intensity : 10,000이 넘는 경우 sensitivity를 Low 또는 Manual을 선택한다.)
-No. of cycles : 반복측정 횟수



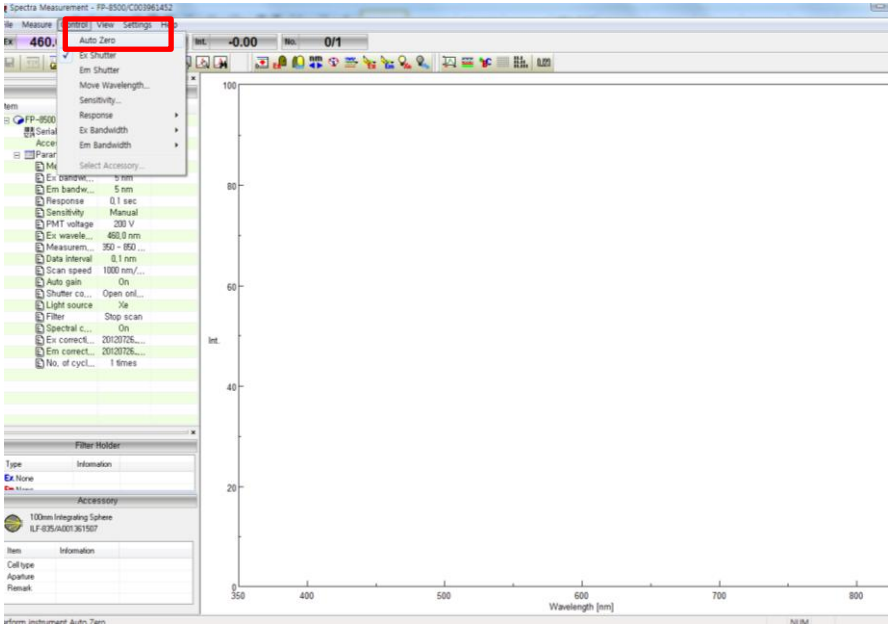


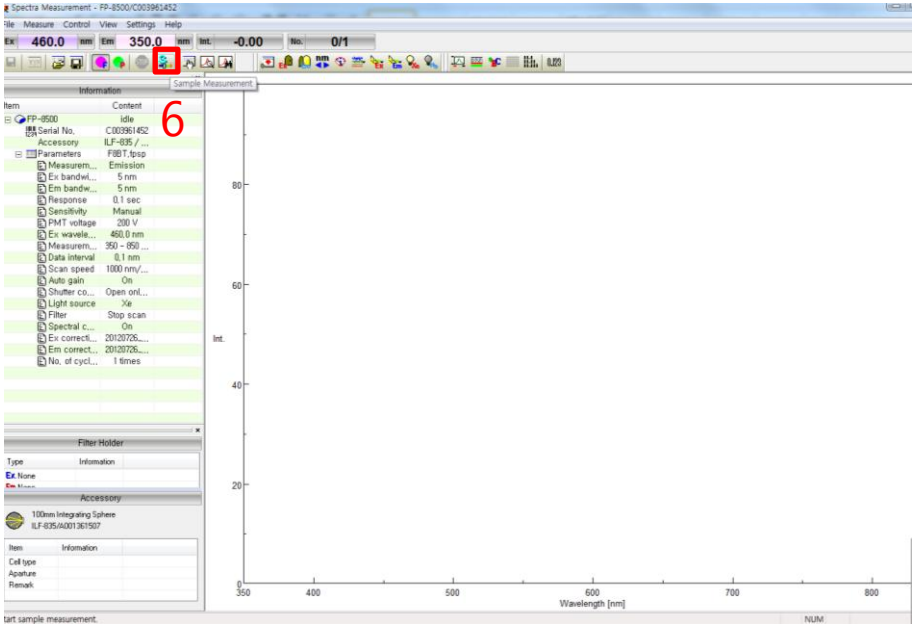
Manual - Spectrofluorometer

4. Control→ Auto Zero click
5. Reference(background) insert
6. Sample Measurement click



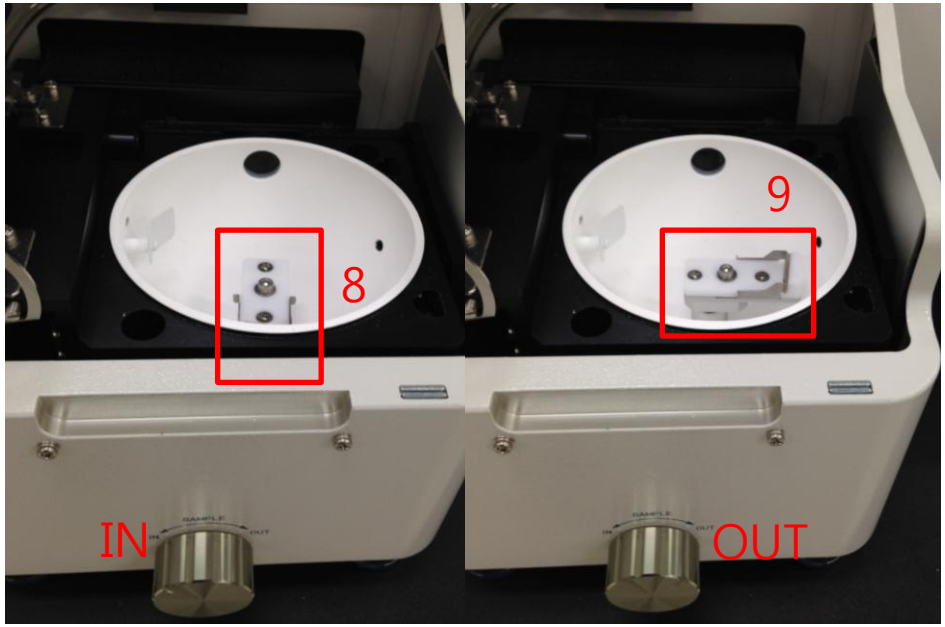
4

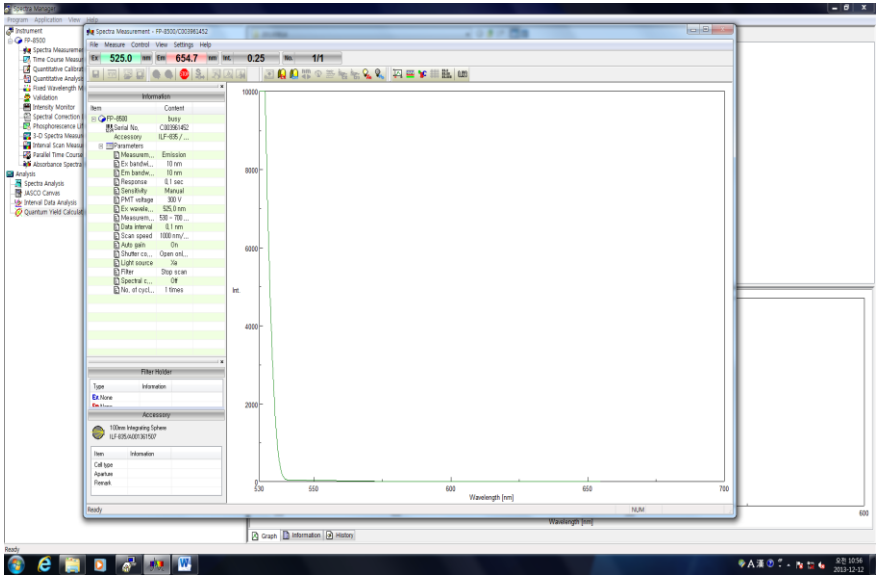




Manual - Spectrofluorometer

7. Sample insert(coated layer = forward)
8. Sample Measurement click(Direct = sample IN)
9. Sample Measurement click(Indirect = sample OUT)

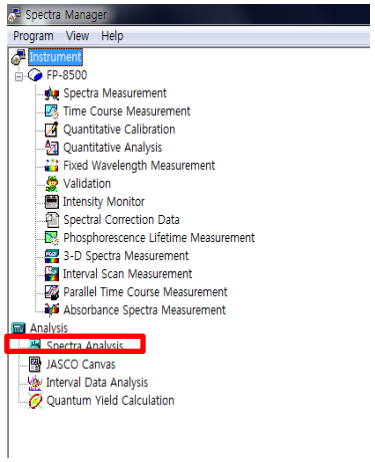


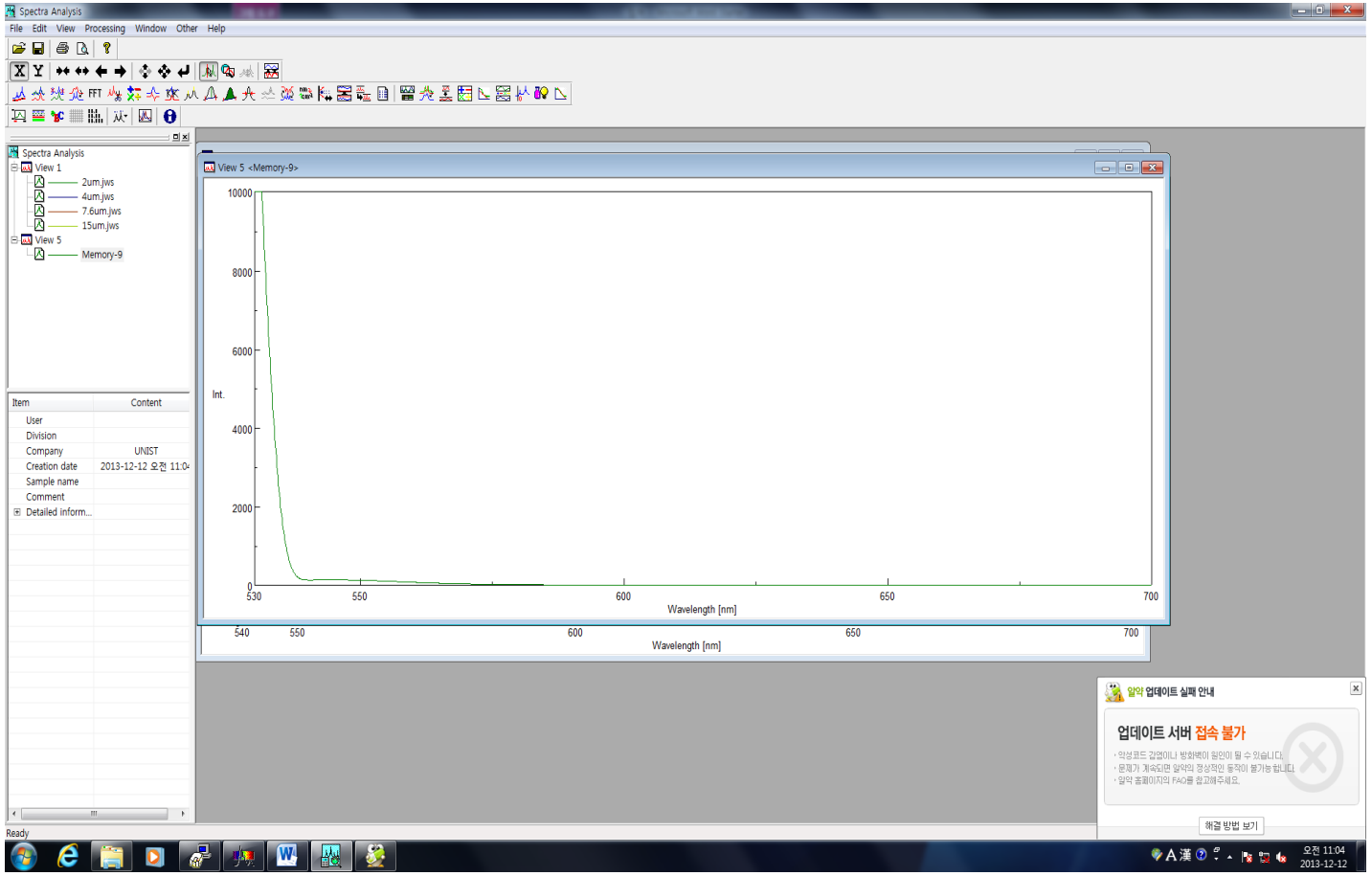


Manual - Spectrofluorometer

10. Data save in Spectra Analysis

-Correction → Baseline, Smoothing, Noise Elimination
-Peak Processing → Peak Find, Peak Height, Peak Area
-X unit, Y unit conversion
-Overlay : View 2의 spectrum을 View 1을 drag 한다.

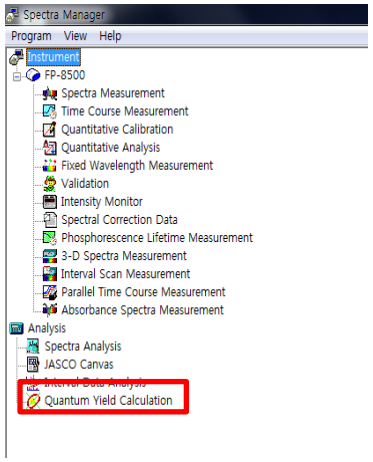


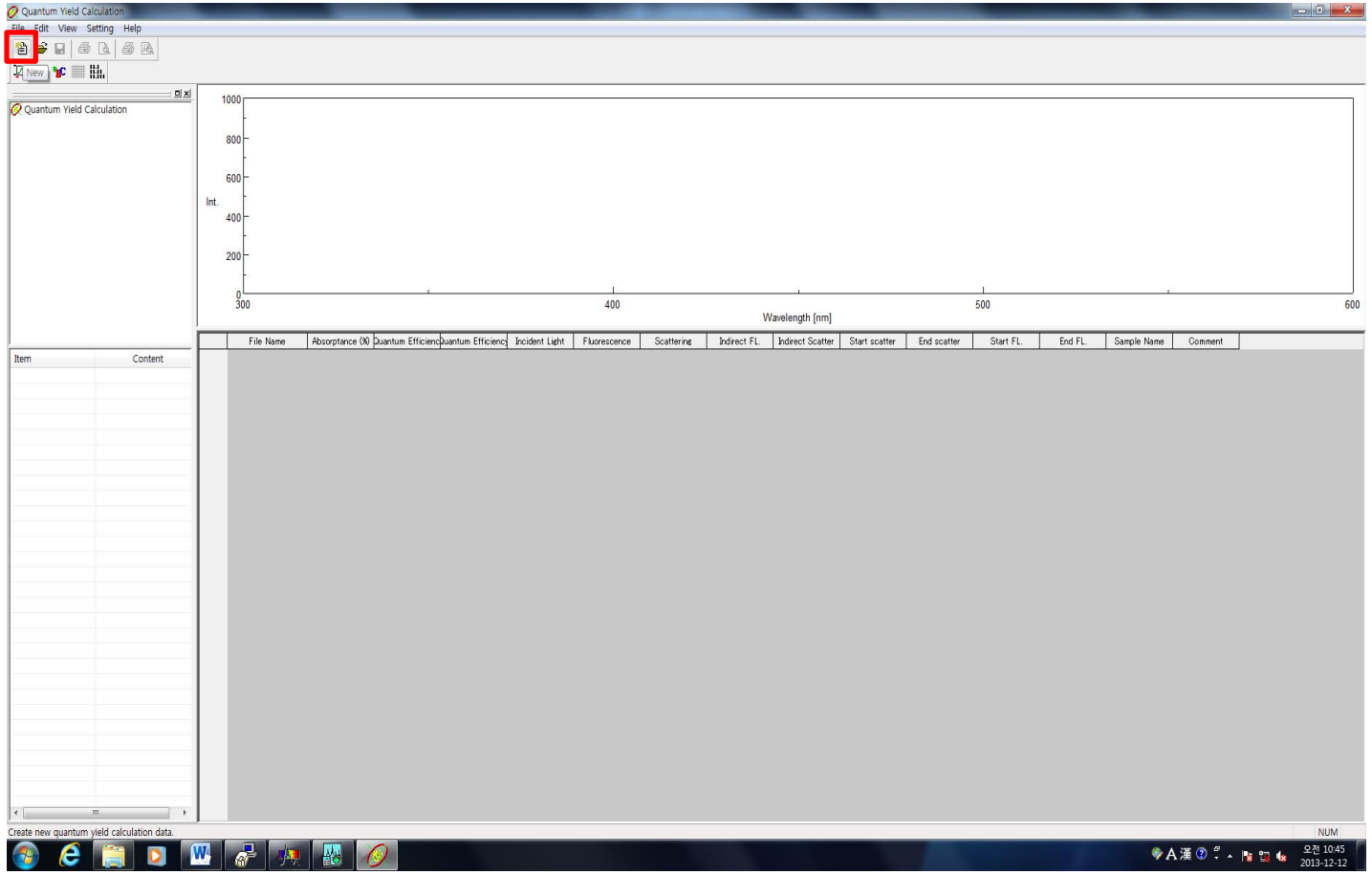


Manual - Spectrofluorometer

11. Quantum Yield Calculation click

1) File→ New click

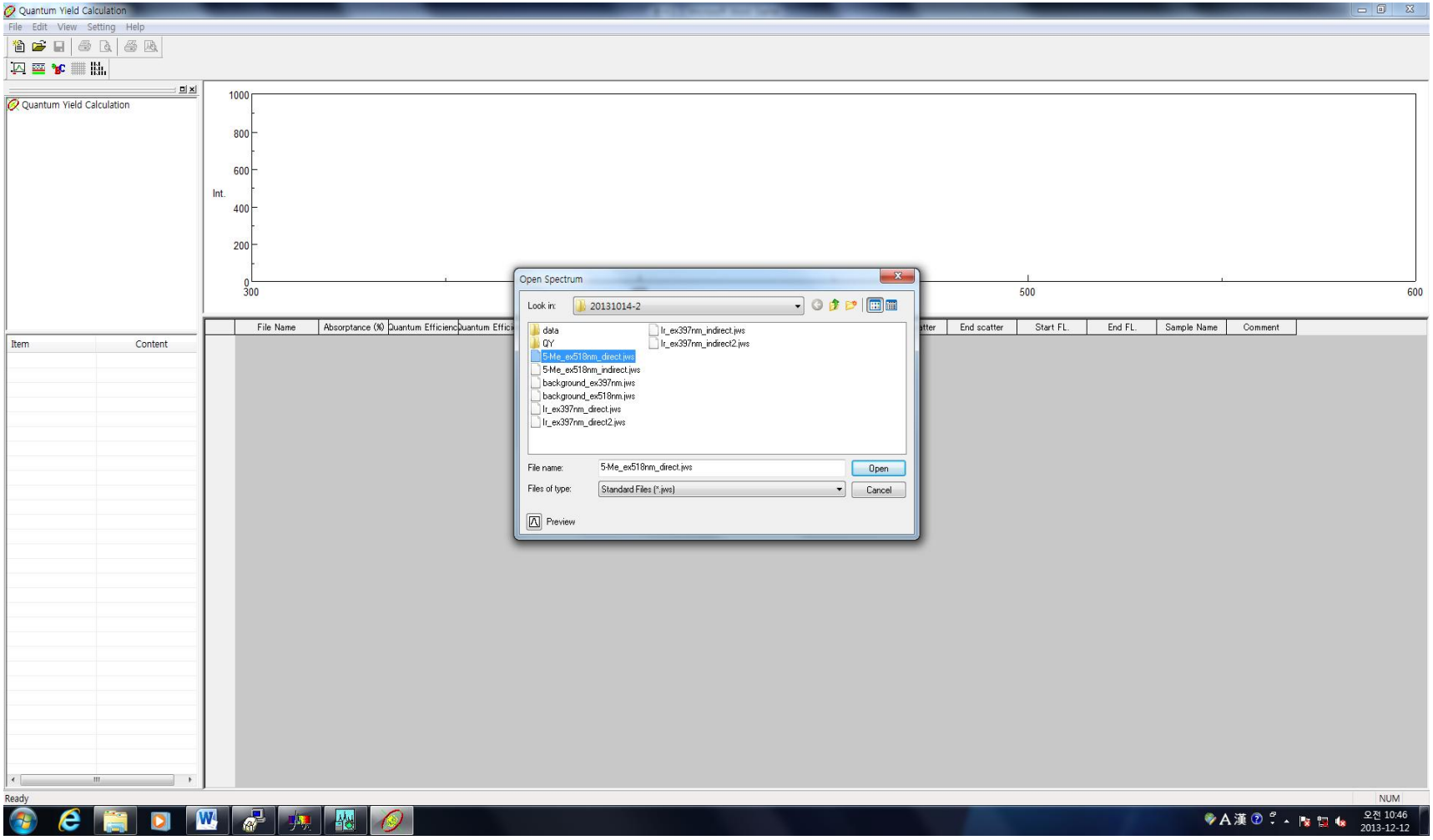




Manual - Spectrofluorometer

11. Quantum Yield Calculation click

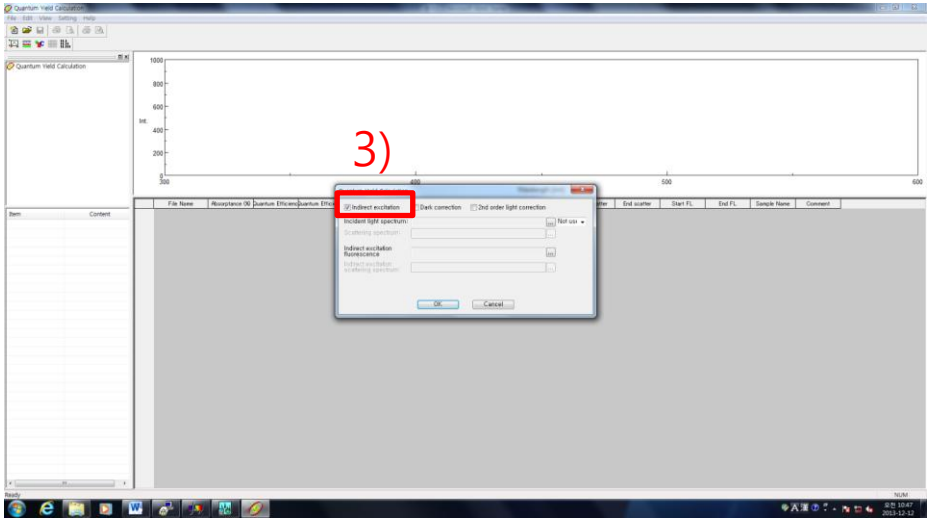
2) Select 'Direct sample data'

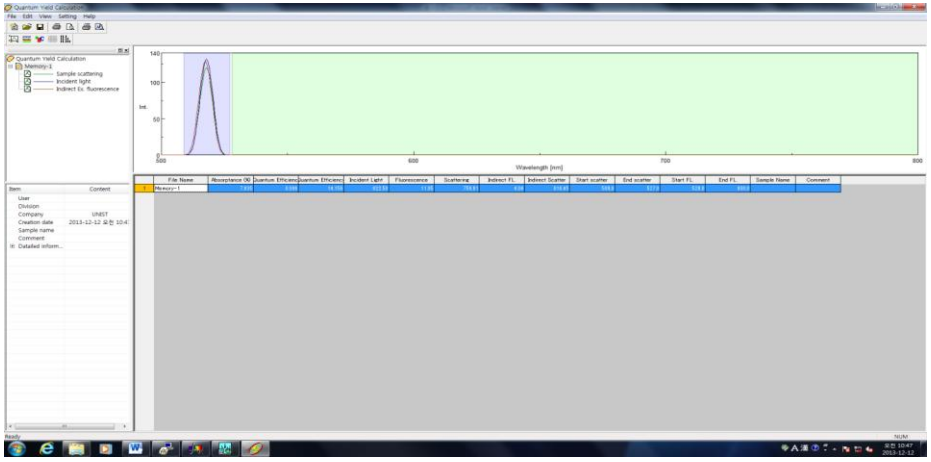


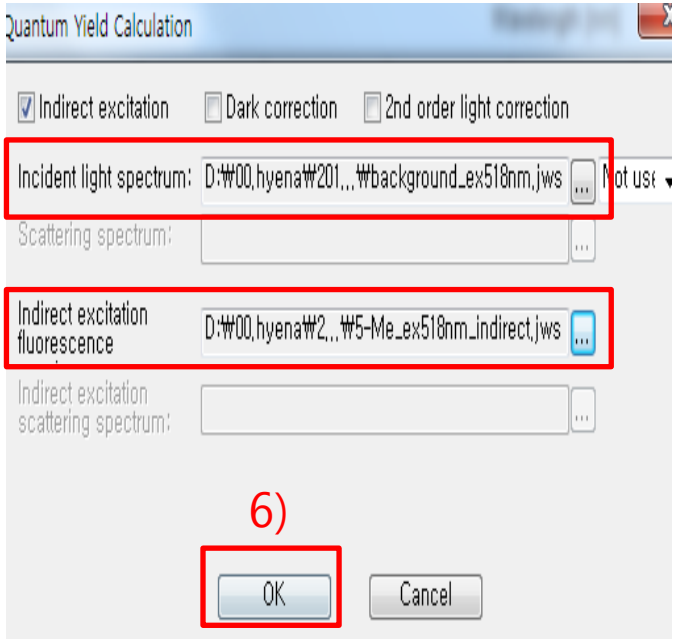
Manual - Spectrofluorometer

11. Quantum Yield Calculation click

3) Check Indirect excitation
4) Select 'Reference data' in Incident
5) Select 'Indirect sample data' in Indirect
6) OK click

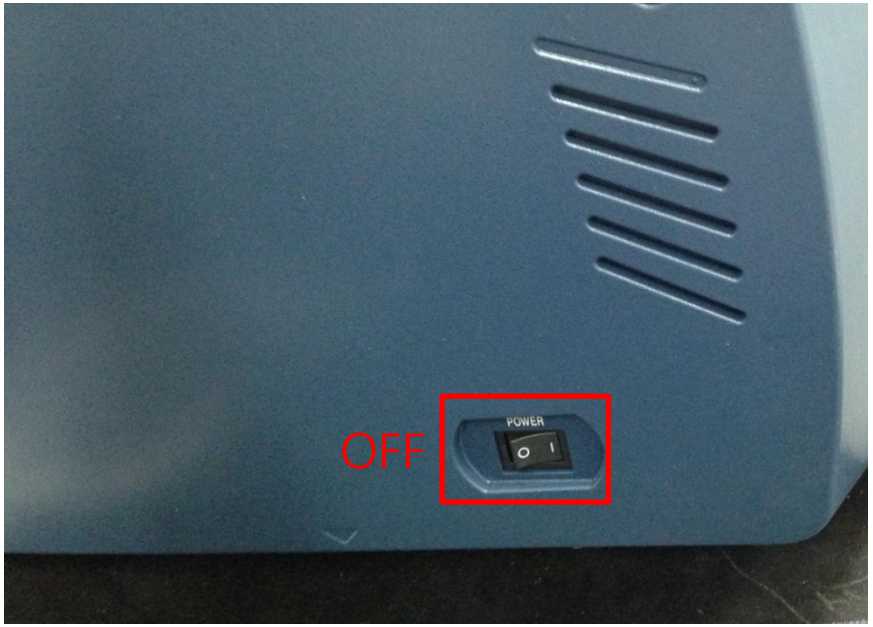


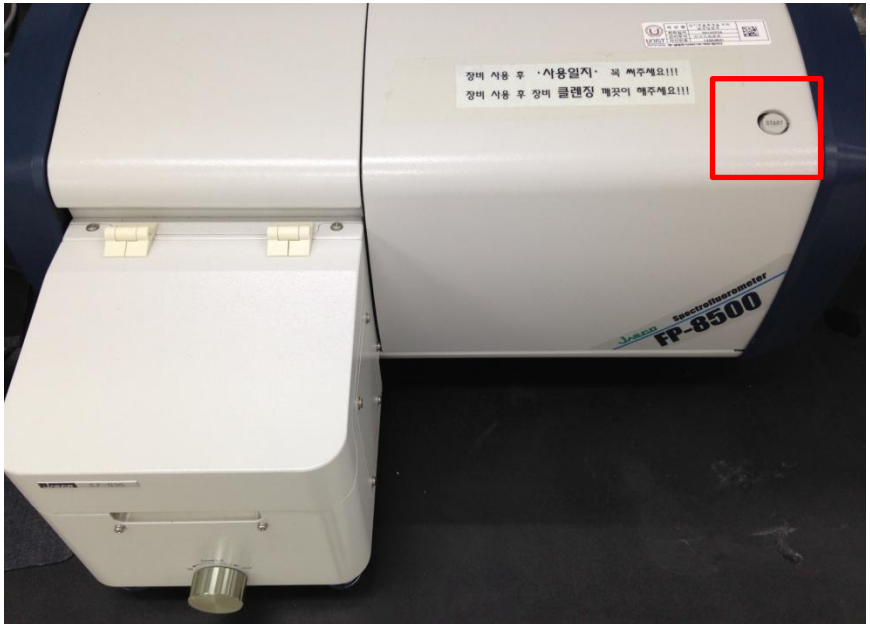




Manual - Spectrofluorometer

12. Switch off





Cautions

1. Switch off

2. Don't contaminate equipment with your sample

3. Fill in the sheet

UNIST

A Record of Equipment Use

Approval	Manager

Fluorometer

Equipment				
University or Company				
Client	Department (Supervisor)		Position	
	Name		Contact number	
	E-mail	(Please write the contact number and e-mail address in case of an outside client.)		
User	Department (Supervisor)		Position	
	Name		Contact number	
Date	From ( ) Month - ( ) Day - ( ) Year to ( ) Month - ( ) Day - ( ) Year (Total use time : hours minutes, [: - :])			
Sample		No. of samples		
Details about use of equipment				
Details about use of hazardous materials				

Equipment state (problem and repair)	Cleanliness	Good	Poor

Charge

		Fluorometer	Spectrofluorometer
UNIST students	Client(70%)	14,000/hr	14,000/hr
	Self-user(50%)	10,000/hr	10,000/hr

True Café using time	Charging time
0.1~0.5 hr	0.5 hr
0.6~1.0 hr	1.0 hr
1.1~1.5 hr	1.5 hr
1.6~2.0 hr	2.0 hr
…	…