



全光譜分析儀Multiskan GO 的技術原理及應用

Grace Li 202510



岑祥

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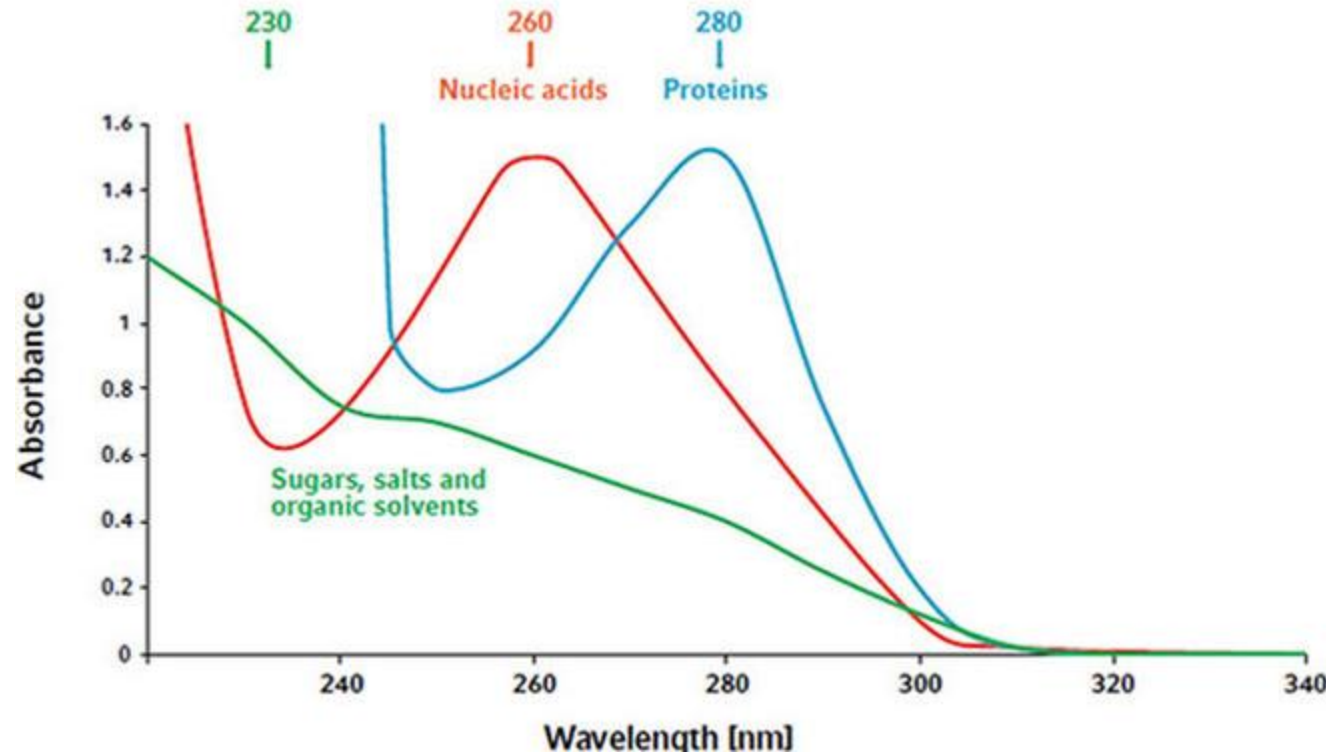
- Absorbance
- Application
- Introduction of Multiskan GO
- Operation



Absorbance

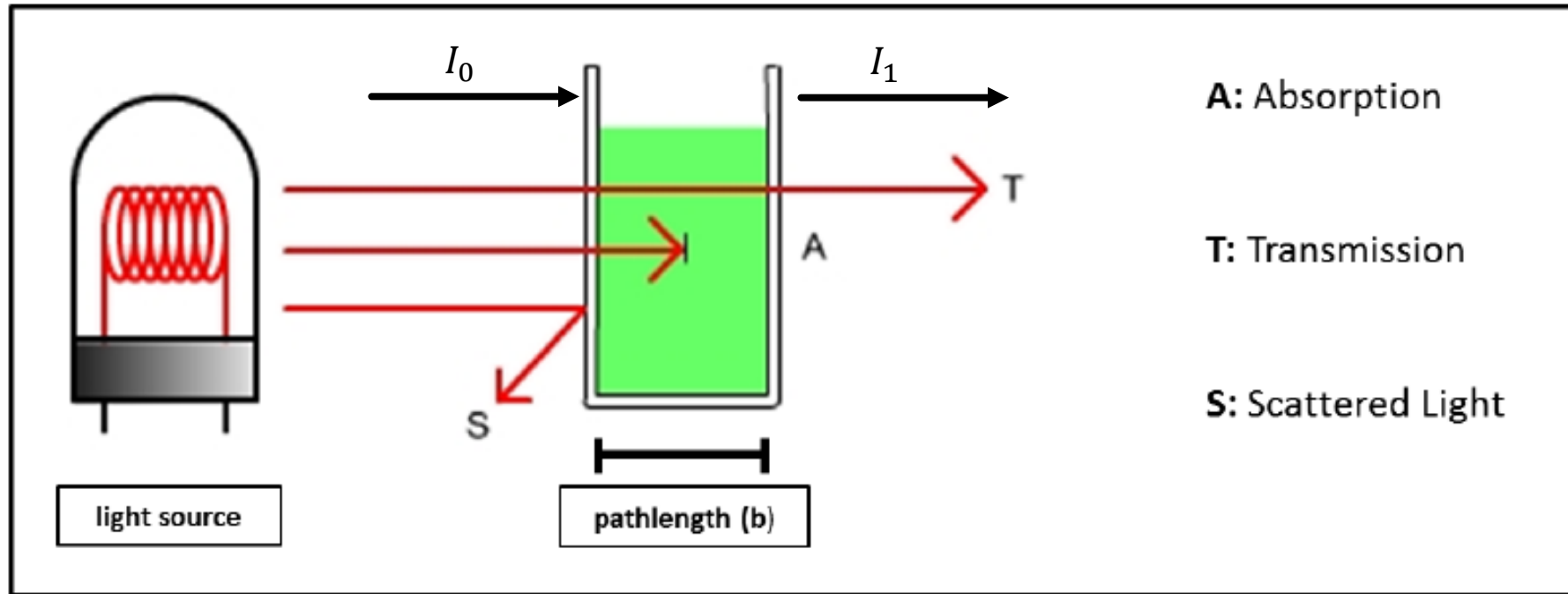
Why measure absorbance ?

In biology and chemistry, the principle of absorbance is used to **quantify absorbing molecules in solution.**





Absorbance



$$\text{Transmittance}[T] = \frac{I_1}{I_0}$$

$$\text{Absorbance}[A] = -\log_{10} \left[\frac{I_0}{I_1} \right] = -\log_{10} \left[\frac{1}{T} \right]$$



Absorbance

Absorbance[A][O.D.]	Transmittance[T%]
0	100%
1	10%
2	1%
3	0.1%
4	0.01%
5	0.001%

That means a sample with:

- > 1 O.D. allows 10% of light to be transmitted through the sample
- > 2 O.D. allows 1% of light to be transmitted through the sample
- > 3 O.D. allows 0.1% of light to be transmitted through the sample
- > 4 O.D. allows 0.01% of light to be transmitted through the sample

$$\text{Transmittance}[T] = \frac{I_1}{I_0}$$

$$\text{Absorbance}[A] = -\log_{10} \left[\frac{I_0}{I_1} \right] = -\log_{10} \left[\frac{1}{T} \right]$$



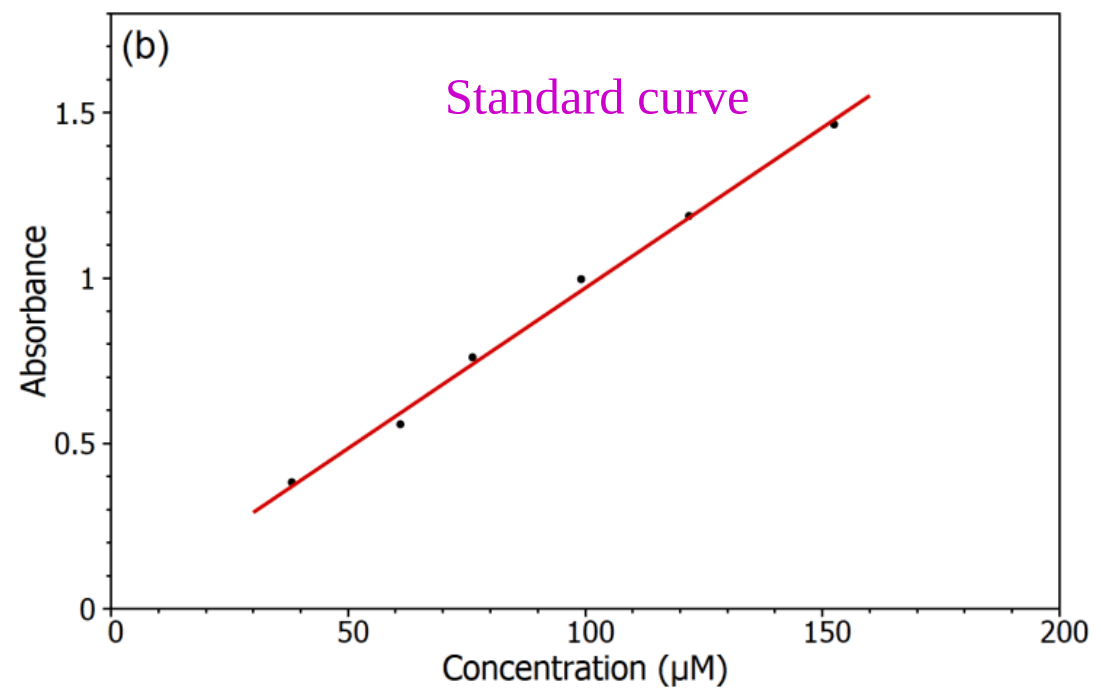
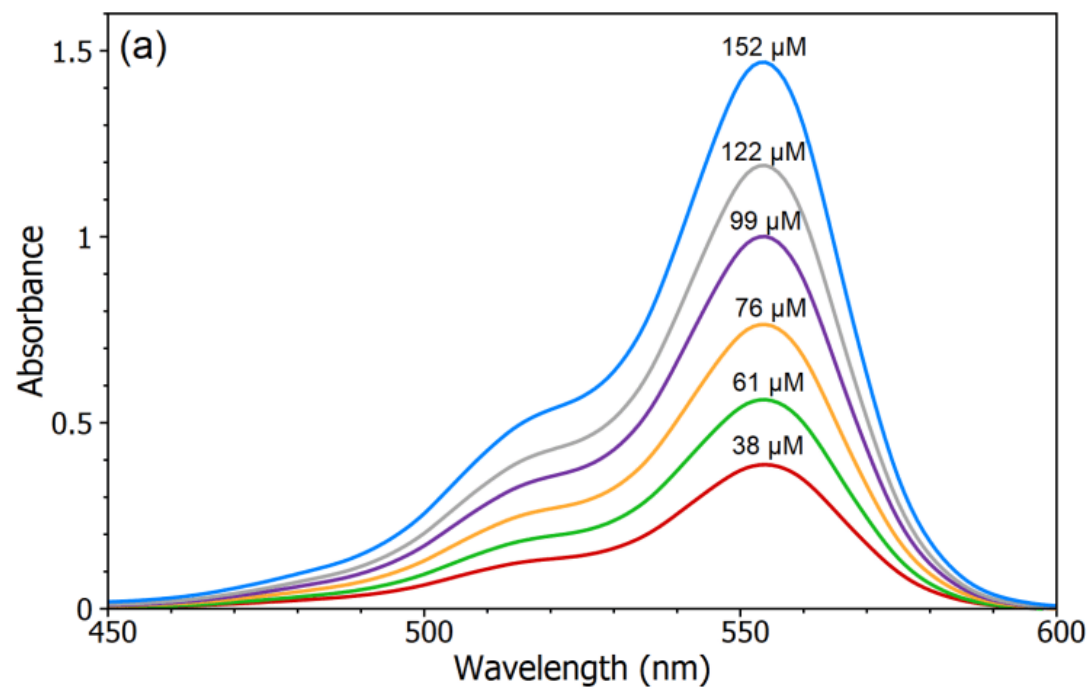
Absorbance

$$A = \epsilon c l$$

A
 ϵ
 c
 l

The Beer's law

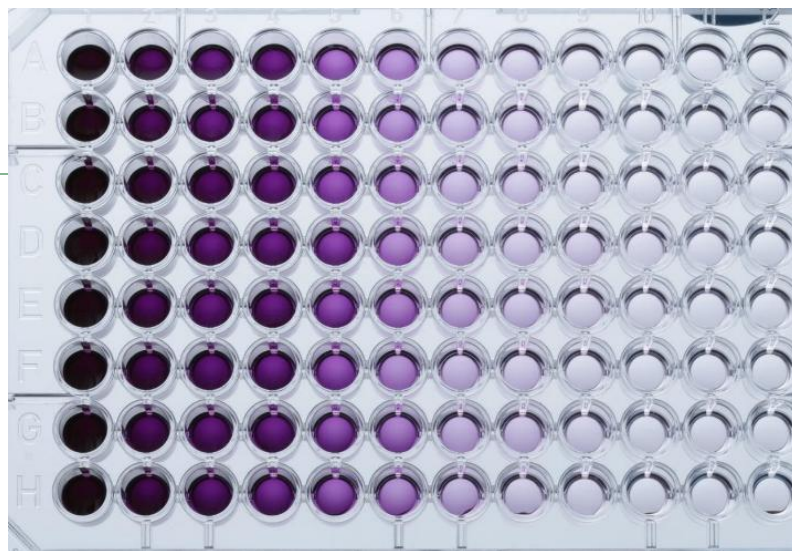
Absorbance	
Molar absorption coefficient	$M^{-1}cm^{-1}$
Molar concentration	M
optical path length	cm





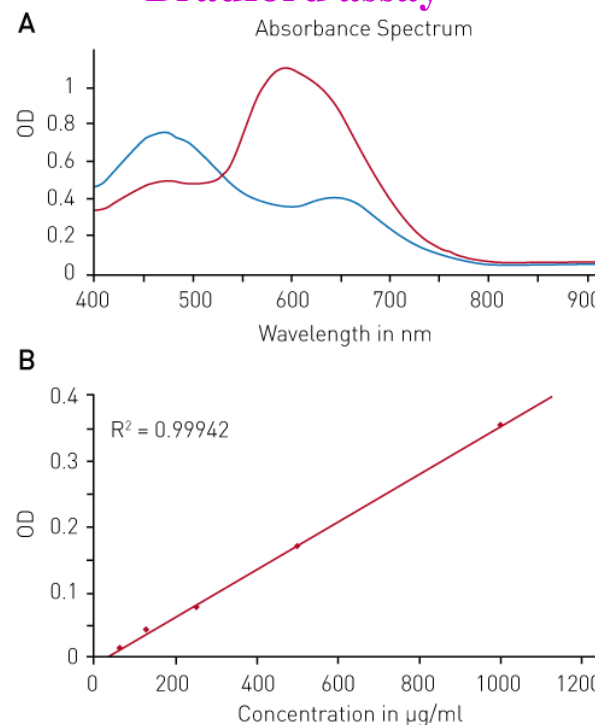
Experiment

- ELISA
- Cell viability(MTT)
- Bradford/BCA
- DNA/Protein (260 nm / 280 nm)
- Microbial growth (OD 600 nm)

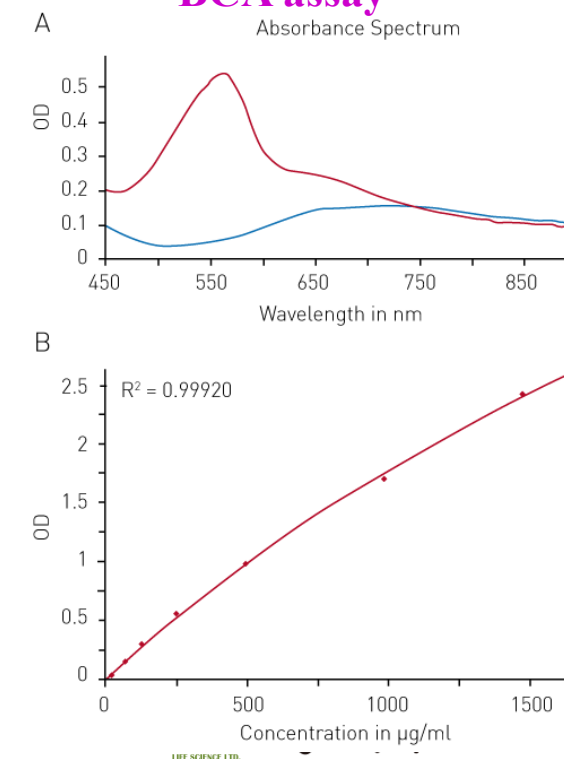


Cell viability(MTT Assay)

Bradford assay



BCA assay



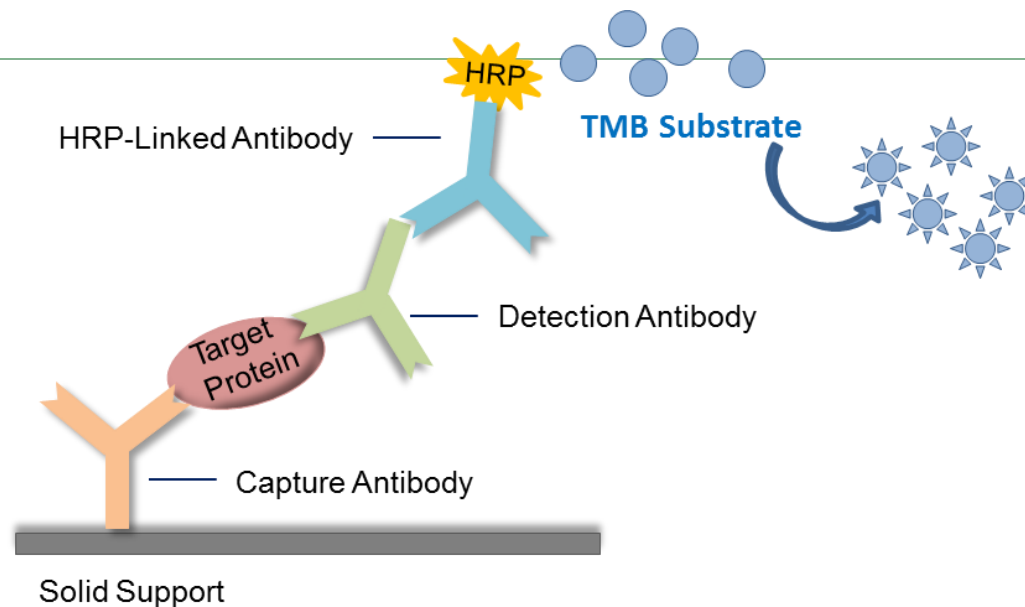


Application

ELISA

To detect specific protein by antibody

Usually measure 450 or 405 nm



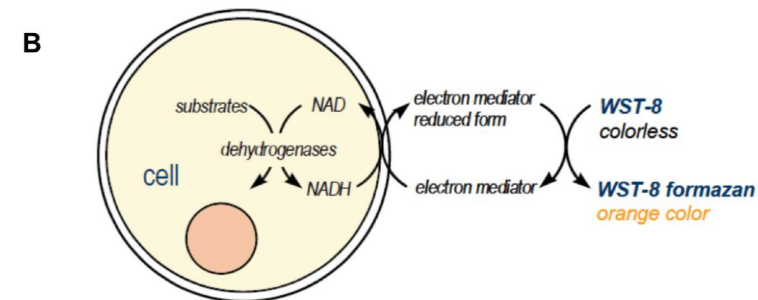
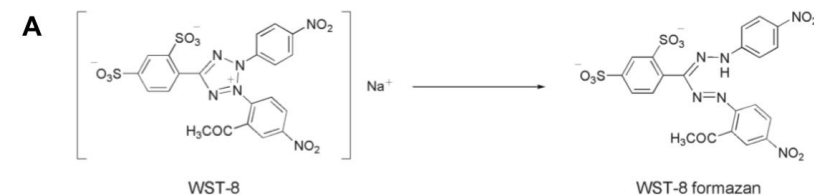
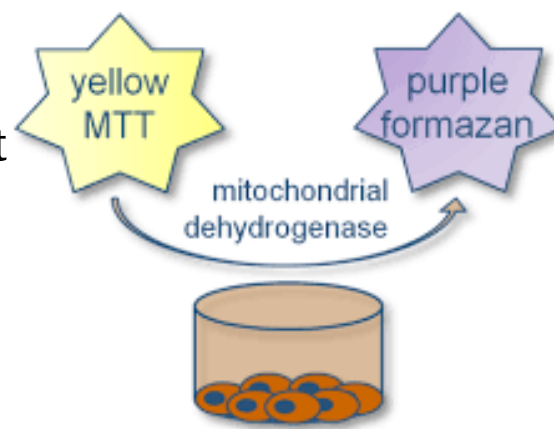
Cell viability CCK-8 and MTT

To check the vial cell number by specific reagent

Usually measure 450 and 570 nm

MTT = 570nm

CCK-8 = 450nm



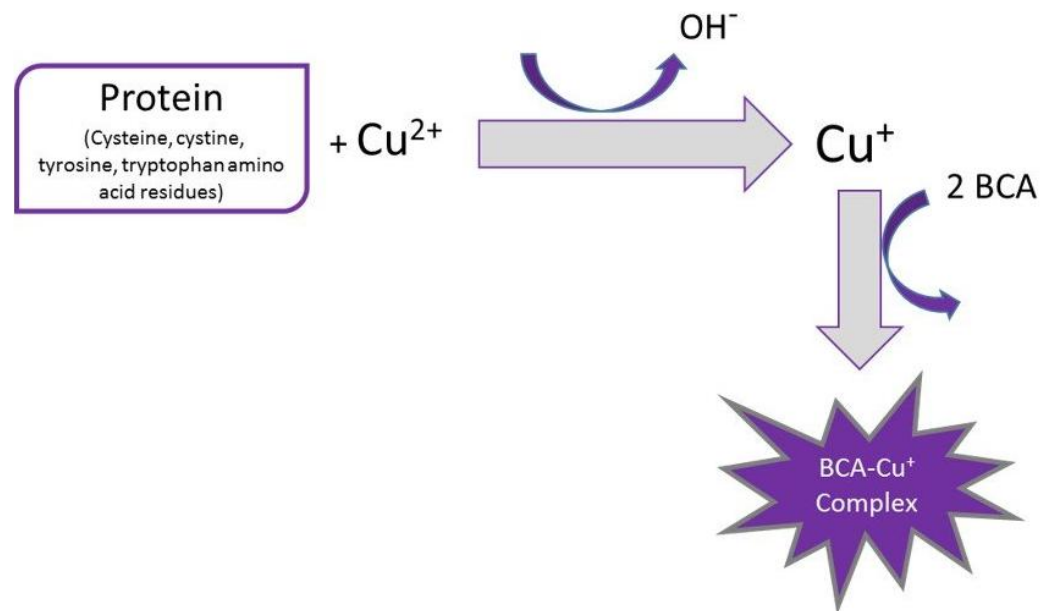


Application

BCA

To quantify protein in unknown sample

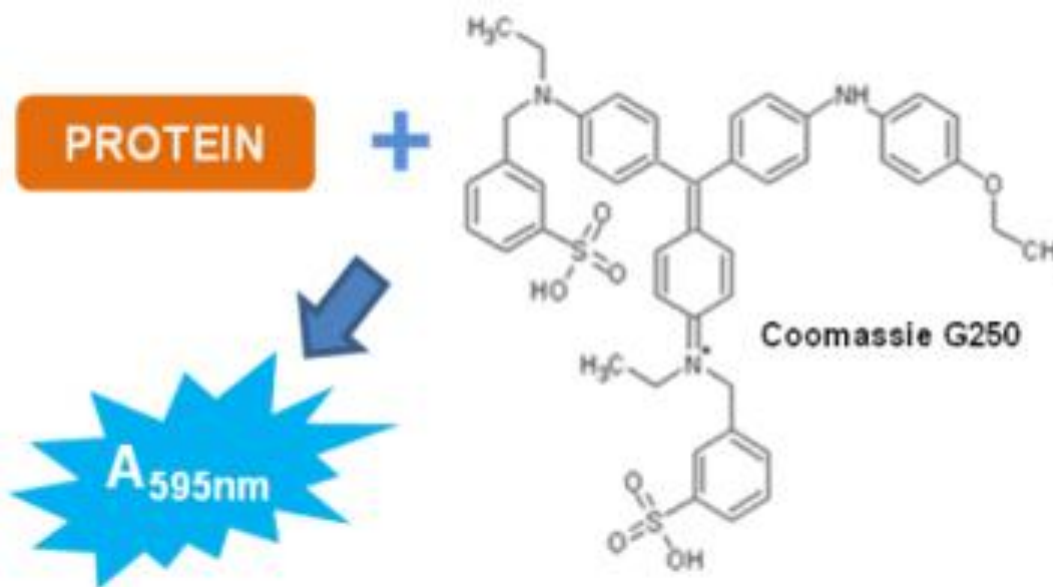
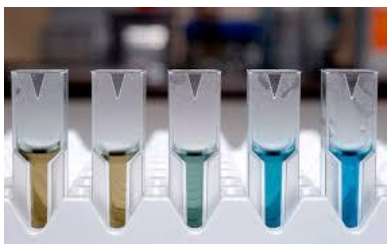
Usually measure **562 nm**



Bradford

To quantify protein in unknown sample

Usually measure **595 nm**





Introduction of Multiskan GO

Multiskan GO

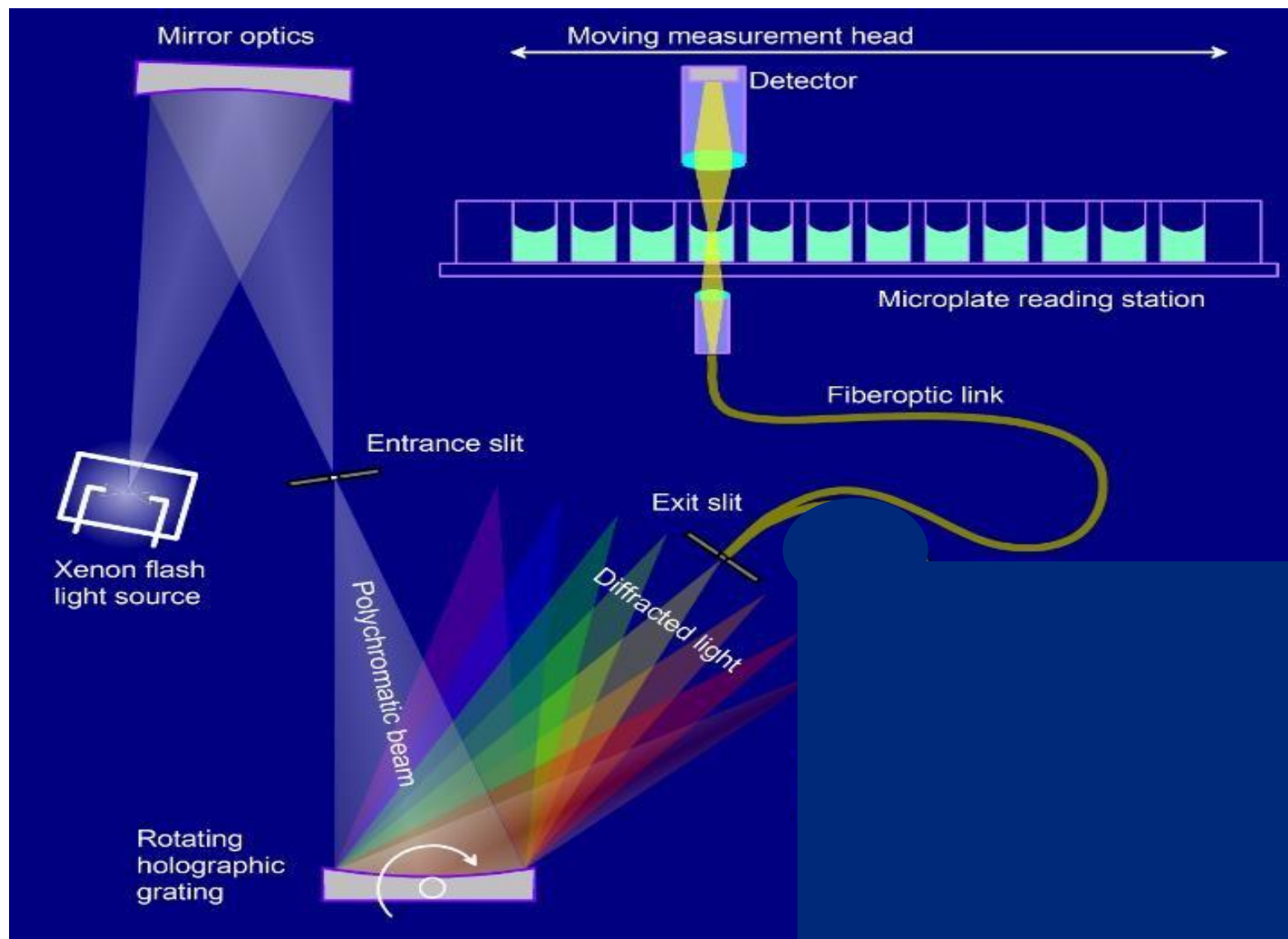
Wavelength	200 -1000 nm
Reads	96- and 384-well plates
Shaker	V
Incubation	up to +45°C
Reading speed	96-well plate in ~ 6 seconds
Spectrum	~10 seconds





Introduction of Multiskan GO

Monochromator based system with adjustable wavelength





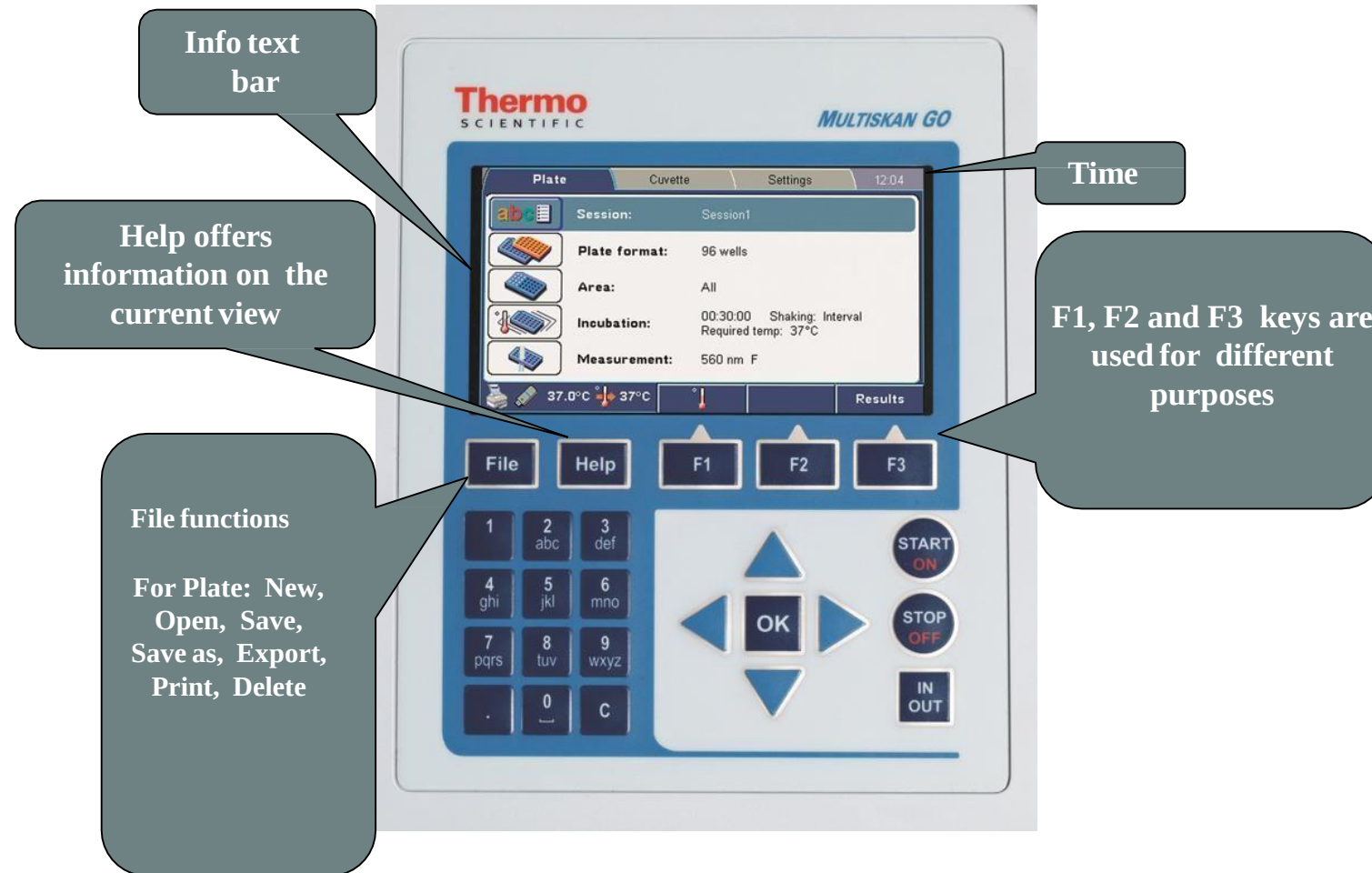
Operation

- User Interface tabs
 - **Plate:**
defines protocol for the plate measurement
 - **Settings:**
configuration settings
 - Configuration, Date & Time, Status report





Operation





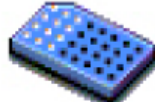
Operation-Plate measurement

- Selecting “Plate format”

Plate 13:04

 **Session:** Session12 *

 **Plate format:** 96 wells
384 wells

 **Area:** All

 **Incubation:** 00:00:00 Shaking: No
Required temp: No

 **Measurement:** 450 nm, 620 nm F

  22.0°C **Accept** **Cancel**



Operation-Plate measurement

- Selecting “Area”

Plate

13:04

Session: Session12 *

Plate format: 96 wells
384 wells

Area: All

Incubation: 00:00:00 Shaking: No
Required temp: No

Measurement: 450 nm, 620 nm F

22.0°C

Accept

Cancel



Plate

12:45

	1	2	3	4	5	6	7	8	9	10	11	12
A												
B												
C												
D												
E												
F												
G												
H												

Selected area:
C3 - F7

22.0°C

Accept

Cancel

Clear



Operation-Plate measurement

- Setting “Measurement”

Plate 13:04

 **Session:** Session12 *

 **Plate format:** 96 wells
384 wells

 **Area:** All

 **Incubation:** 00:00:00 Shaking: No
Required temp: No

 **Measurement:** 450 nm, 620 nm F

  22.0°C **Accept** **Cancel**



Operation-Plate measurement

Measurement types

Single

Plate 12:15

Measurement parameters

Type: **Single** Mode: Fast

Wavelength (nm): 450

Session1*

Use the arrow keys to scroll the view

	1	2	3	4	5	6	7	8	9	10	11	12
A	0.014	0.112	0.276	0.589	0.293	0.316	0.126	-0.031	0.092	0.429	0.031	-0.018
B	0.167	0.022	0.082	0.629	-0.037	-0.018	1.867	0.099	-0.053	1.278	0.415	0.422
C	1.008	0.051	0.318	0.625	0.273	0.567	0.188	0.563	-0.043	0.050	1.020	0.841
D	0.370	-0.007	0.272	-0.007	0.214	0.507	0.780	0.157	1.099	0.056	0.344	0.438
E	0.175	0.076	0.559	0.416	0.360	0.321	0.077	0.911	0.105	0.346	0.024	0.234
F	-0.027	0.425	0.757	0.968	0.481	0.347	1.533	-0.003	0.453	0.015	0.744	0.012
G	0.247	0.133	0.591	0.324	0.163	0.109	0.860	0.289	0.799	0.034	0.111	0.226
H	0.224	1.021	0.075	1.488	0.200	0.422	0.135	0.017	0.642			

Multiple

Plate 12:17

Measurement parameters

Type: **Multiple** Mode: Fast

Wavelength 1 (nm): 320

Wavelength 2 (nm): 260

Wavelength 3 (nm): 280

Result for each wavelength

320 nm, 260 nm, 280 nm

	1	2	3	4	5	6	7	8	9	10	11	12
A	0.329	0.310	0.474	1.105	0.040	0.241	-0.001	1.080	0.079	1.883	0.880	0.409
B	0.520	0.105	0.432	0.840	0.050	0.537	1.311	-0.040	0.439	0.428	0.662	0.465
C	0.058	0.87	0.126	0.701	1.037	0.531	-0.009	0.468	-0.021	0.134	1.536	0.094
D	0.314	0.044	0.012	0.211	0.179	0.148	0.072	-0.002	0.812	0.169	0.306	0.142
E	0.215	0.229	-0.045	-0.049	0.234	0.041	0.241	-0.003	0.065	0.250	0.303	0.449
F	0.217	0.409	0.506	0.448	0.155	0.062	0.504	0.395	0.225	0.039	0.260	0.276
G	0.380	0.992	0.061	0.423	-0.012	0.162	1.352	0.618	0.094	0.304	0.817	0.538
H	0.190	0.046	-0.017	0.414	0.163	1.436	0.598	0.381	-0.042	-0.001	0.035	-0.008
I	0.210	-0.005	0.054	0.194	0.161	0.139	0.253	0.523	1.876	1.321	0.415	0.643
J	1.072	0.333	0.567	0.732	2.052	1.474	0.228	0.328	-0.038	0.752	-0.032	0.402
K	0.168	0.555	0.233	0.208	0.571	0.022	0.440	0.760	0.094	0.157	0.034	-0.001
L	0.798	0.488	-0.048	0.294	-0.049	0.794	0.150	0.730	0.605	0.065	0.139	

Spectrum

Plate 19:02

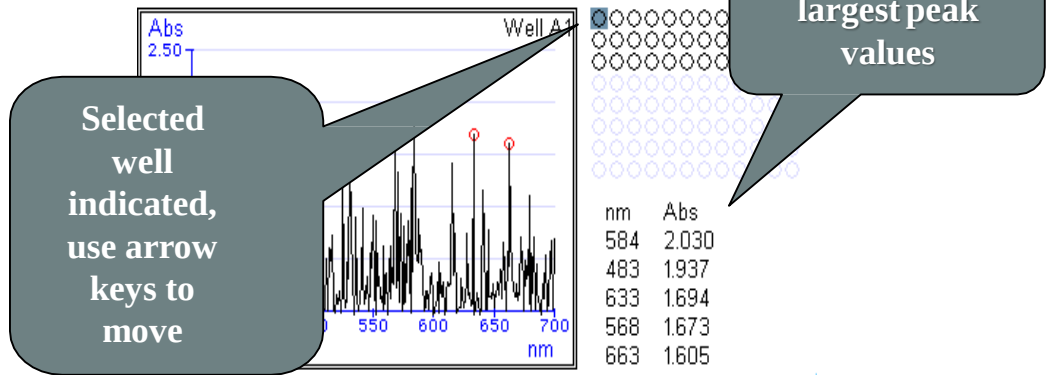
Measurement parameters

Type: **Spectrum** Mode: Fast

Start wavelength (nm): 400

End wavelength (nm): 700

Step (nm): 1



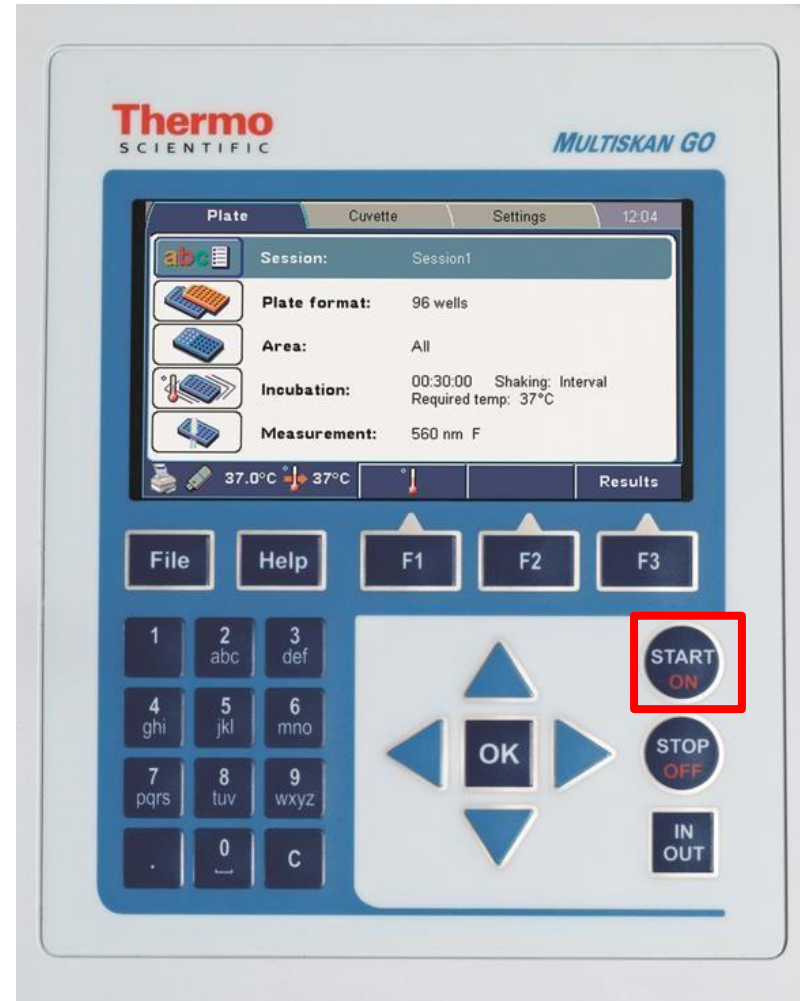
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Operation-Plate measurement

- **“START”** Measurement





Operation-Plate measurement

■ “Saving” Result

Plate 11:44

test4 450 nm F

	1	2	3	4	5	6	7	8	9	10	11	12
A	0.050	0.679	0.148	0.543	0.774	0.265	0.671	0.379	0.215	0.055	0.584	0.522
B	0.126	0.112	1.100	0.056	0.722	0.161	0.166	0.112	0.188	0.85		
C	0.218	1.297	0.114	0.197	0.183	0.043	0.490	0.243	0.442	0.19		
D	0.167	0.090	0.046	0.199	0.071	1.081	0.306	0.346	0.240	0.40		
E	0.643	0.313	0.284	0.423	0.145	0.880	0.259	0.751	0.853	0.19		
F	0.091	0.291	0.094	0.235	0.445	0.740	0.543	0.127	0.288	0.640	0.179	
G	0.337	0.634	0.375	0.046	0.054	0.769	0.772	0.058	0.441	0.45	0.401	
H	0.463	0.161	0.270	1.391	0.130	0.640	1.542	0.492	0.548	1.007	0.290	

22.1°C

Export Save As Close

File Help F1 F2 F3

USB
connected

New
Open
Save
Save As

Export
Print

Delete

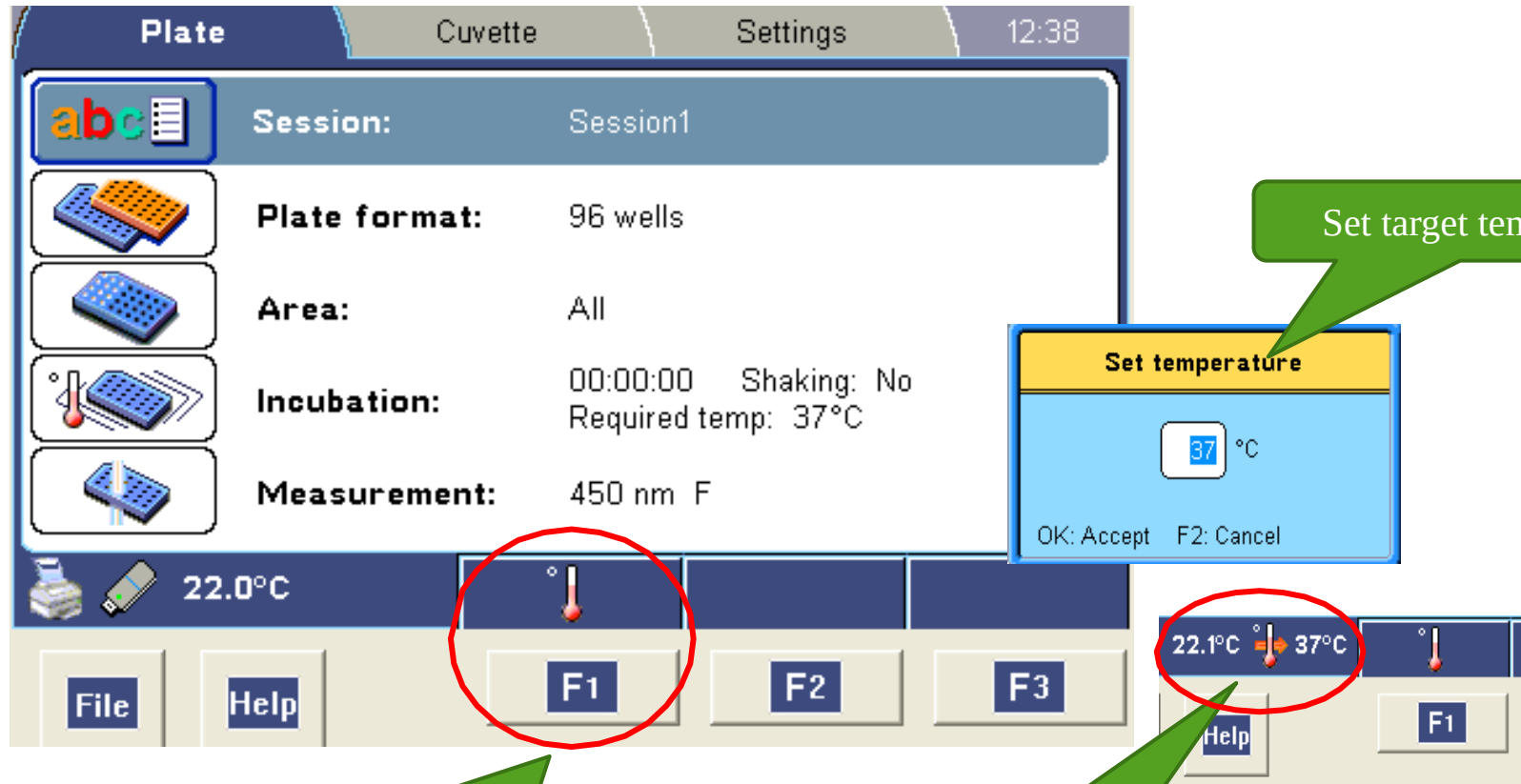
- Export plate Session(s)
 - Export current session
 - F1 (Export)

- Save the plate Session:
 - F2 (Save as)
 - File -> Save or Save as



Operation-Incubator

■ “Incubation”



- The incubator temperature can be controlled using F1 key

Instrument and Target temperature



Operation

Skant Software

New Session - SkanIt 3.2

Home Layout Protocol Results Reports

Fill With... Edit... Paste New Plate Show Original...
Fill Wizard... Delete Delete Plate Preview...
Copy Rename Plate
Fill Samples Plates Layout Start

NUNC, F-bottom, 96

	1	2	3	4	5	6	7
A	Cal_0001 1/2 Assay 1000	Cal_0001 2/2 Assay 1000	Un_0001 1/2 Assay	Un_0001 2/2 Assay			
B	Cal_0002 1/2 Assay 500	Cal_0002 2/2 Assay 500	Un_0002 1/2 Assay	Un_0002 2/2 Assay			
C	Cal_0003 1/2 Assay 250	Cal_0003 2/2 Assay 250	Un_0003 1/2 Assay	Un_0003 2/2 Assay			
D	Cal_0004 1/2 Assay 125	Cal_0004 2/2 Assay 125	Un_0004 1/2 Assay	Un_0004 2/2 Assay			
E	Cal_0005 1/2 Assay 62.5	Cal_0005 2/2 Assay 62.5	Un_0005 1/2 Assay	Un_0005 2/2 Assay			
F	Cal_0006 1/2 Assay 31.25	Cal_0006 2/2 Assay 31.25	Un_0006 1/2 Assay	Un_0006 2/2 Assay			
G			Un_0007 1/2 Assay	Un_0007 2/2 Assay			
H			Un_0008 1/2 Assay	Un_0008 2/2 Assay			

Description:

Multiskan GO 1510-01541 - Not connected

Connect

New Session_7 - SkanIt 3.2

Home Layout Protocol Results Reports

Blank Subtraction Basic Statistics Pathlength Correction Spectral Analysis Kinetics PreCalculation Merge Data Graph Quality Control User-Defined Equation Curve Fit Effective Dose R/I Data Normalization Qualitative Classification PLA Parallel Line Analysis Automatic Save

Basic Reduction Processing Export Start

Results

New Session_7

450nm

curve fit

Parameters Graph Table List

Show options Export Open in Excel Print

	1	2	3	4	5	6	7	8	9	10	11	12
A	Cal_0001 1/2 1000 1e+03	Cal_0001 2/2 1000 1e+03	Un_0001 1/2 1:1 877	Un_0001 2/2 1:1 356								
B	Cal_0002 1/2 500 500	Cal_0002 2/2 500 500	Un_0002 1/2 1:1 910	Un_0002 2/2 1:1 273								
C	Cal_0003 1/2 250 250	Cal_0003 2/2 250 250	Un_0003 1/2 1:1 781	Un_0003 2/2 1:1 705								
D	Cal_0004 1/2 125 125	Cal_0004 2/2 125 125	Un_0004 1/2 1:1 265	Un_0004 2/2 1:1 439								
E	Cal_0005 1/2 62.5 62.5	Cal_0005 2/2 62.5 62.5	Un_0005 1/2 1:1 186	Un_0005 2/2 1:1 98.2								
F	Cal_0006 1/2 31.25 31.3	Cal_0006 2/2 31.25 31.3	Un_0006 1/2 1:1 572	Un_0006 2/2 1:1 403								
G			Un_0007 1/2 1:1 603	Un_0007 2/2 1:1 195								
H			Un_0008 1/2 1:1 63.5	Un_0008 2/2 1:1 102								

Multiskan GO SIMULATOR - Connected

Disconnect

Target: 20.0°C Plate: 20.4°C Cuvette: 21.1°C

admin



Operation-Plate measurement

■ Setting “Microplate”

New Session - SkanIt 3.2

Home Layout Protocol Results Reports

Fill With Fill Wizard... Edit... Paste Delete Copy New Plate Delete Plate Rename Plate Show Original... Preview... Start

NUNC, F-bottom, 96

Plate 1

	1	2	3	4	5	6	7	8	9	10	11	12
A	Cal_0001 1/2 Assay 1000	Cal_0001 2/2 Assay 1000	Un_0001 1/2 Assay	Un_0001 2/2 Assay								
B	Cal_0002 1/2 Assay 500	Cal_0002 2/2 Assay 500	Un_0002 1/2 Assay	Un_0002 2/2 Assay								
C	Cal_0003 1/2 Assay 250	Cal_0003 2/2 Assay 250	Un_0003 1/2 Assay	Un_0003 2/2 Assay								
D	Cal_0004 1/2 Assay 125	Cal_0004 2/2 Assay 125	Un_0004 1/2 Assay	Un_0004 2/2 Assay								
E	Cal_0005 1/2 Assay 62.5	Cal_0005 2/2 Assay 62.5	Un_0005 1/2 Assay	Un_0005 2/2 Assay								
F	Cal_0006 1/2 Assay 31.25	Cal_0006 2/2 Assay 31.25	Un_0006 1/2 Assay	Un_0006 2/2 Assay								
G			Un_0007 1/2 Assay	Un_0007 2/2 Assay								
H			Un_0008 1/2 Assay	Un_0008 2/2 Assay								

Description: Zoom: 100%

Multiskan GO 1510-01541 - Not connected Connect

22 admin



Operation-Plate measurement

■ Setting "Layout"

New Session - SkanIt 3.2

Home Layout Protocol Results Reports

Fill With Fill Wizard... Edit... Paste Delete Copy New Plate Delete Plate Rename Plate Show Original... Preview... Start

NUNC, F-bottom, 96 Plate 1

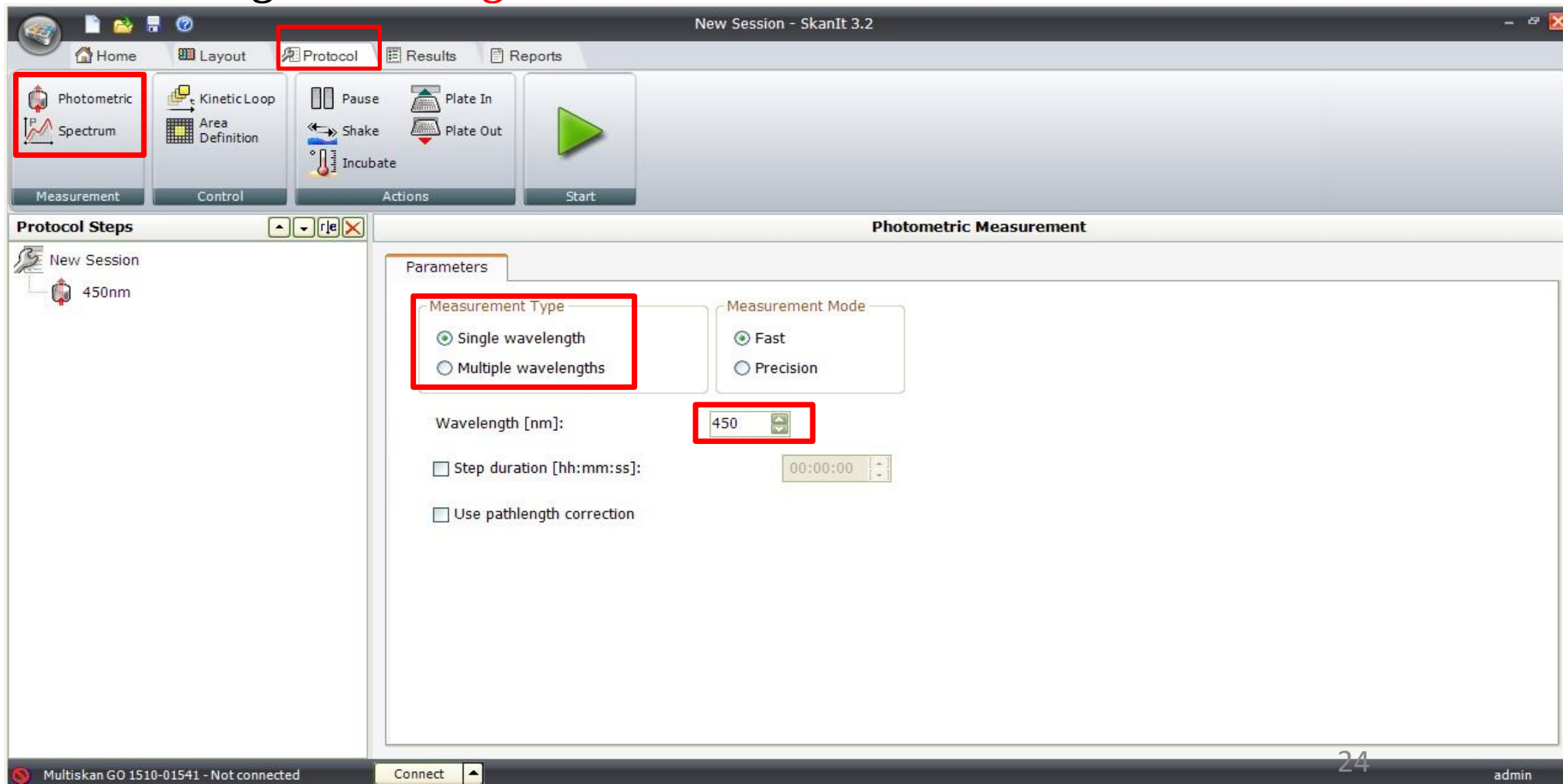
	1	2	3	4	5	6	7	8	9	10	11	12
A	Cal_0001 1/2 Assay 1000	Cal_0001 2/2 Assay 1000	Un_0001 1/2 Assay	Un_0001 2/2 Assay								
B	Cal_0002 1/2 Assay 500	Cal_0002 2/2 Assay 500	Un_0002 1/2 Assay	Un_0002 2/2 Assay								
C	Cal_0003 1/2 Assay 250	Cal_0003 2/2 Assay 250	Un_0003 1/2 Assay	Un_0003 2/2 Assay								
D	Cal_0004 1/2 Assay 125	Cal_0004 2/2 Assay 125	Un_0004 1/2 Assay	Un_0004 2/2 Assay								
E	Cal_0005 1/2 Assay 62.5	Cal_0005 2/2 Assay 62.5	Un_0005 1/2 Assay	Un_0005 2/2 Assay								
F	Cal_0006 1/2 Assay 31.25	Cal_0006 2/2 Assay 31.25	Un_0006 1/2 Assay	Un_0006 2/2 Assay								
G			Un_0007 1/2 Assay	Un_0007 2/2 Assay								
H			Un_0008 1/2 Assay	Un_0008 2/2 Assay								

Description: Zoom: 23

Multiskan GO 1510-01541 - Not connected Connect admin

Operation-Plate measurement

■ Setting “Wavelength”



The screenshot displays the SkanIt 3.2 software interface for a 'New Session'. The 'Protocol' tab is selected in the top navigation bar. In the left sidebar, the 'Photometric' and 'Spectrum' options are highlighted with a red box. The main window shows the 'Photometric Measurement' parameters. A red box highlights the 'Measurement Type' section, where 'Single wavelength' is selected. Another red box highlights the 'Wavelength [nm]' field, which is set to 450. The 'Measurement Mode' section shows 'Fast' is selected. The 'Step duration [hh:mm:ss]' is set to 00:00:00, and 'Use pathlength correction' is unchecked. The bottom status bar shows 'Multiskan GO 1510-01541 - Not connected' and a 'Connect' button.

Protocol Steps

- New Session
- 450nm

Parameters

Measurement Type

- ☒ Single wavelength
- ☐ Multiple wavelengths

Measurement Mode

- ☒ Fast
- ☐ Precision

Wavelength [nm]: 450

☐ Step duration [hh:mm:ss]: 00:00:00

☐ Use pathlength correction

Multiskan GO 1510-01541 - Not connected

Connect

Operation-Plate measurement

■ “START” Measurement

The screenshot displays the SkanIt 3.2 software interface for a 'New Session'. The top menu bar includes Home, Layout, Protocol, Results, and Reports. The main toolbar is divided into four sections: Measurement (Photometric, Spectrum), Control (Kinetic Loop, Area Definition), Actions (Pause, Shake, Incubate, Plate In, Plate Out), and a 'Start' button highlighted with a red rectangle. The 'Protocol Steps' panel on the left shows a 'New Session' with a '450nm' measurement. The 'Photometric Measurement' parameters are configured as follows:

- Measurement Type:** ☒ Single wavelength, ☐ Multiple wavelengths
- Measurement Mode:** ☒ Fast, ☐ Precision
- Wavelength [nm]:** 450
- Step duration [hh:mm:ss]:** 00:00:00
- Use pathlength correction:** ☐

The bottom status bar shows 'Multiskan GO 1510-01541 - Not connected', a 'Connect' button, the page number '25', and the user 'admin'.

■ Using “Curve fit” icon

New Session_7 - SkanIt 3.2

Home Layout Protocol Results Reports

Blank Subtraction Basic Statistics Pathlength Correction Basic

Spectral Analysis Kinetics Reduction

PreCalculation Merge Data Graph Processing

Quality Control User Defined Equation **Curve Fit**

Effective Dose R/I Data Normalization Qualitative Classification

PLA Parallel Line Analysis

Automatic Save Export Start

Results

New Session_7

450nm

curve fit

Parameters Graph Table List

Value

Concentration

lin log

3D

lin log

$y = 0.00432x + 0$

Plate	Well	Sample	Concentration	Original [Abs]	Fitted [Abs]	Residual
Parameters						
Fit type: Linear Polynomial: $y = ax + b$						
Transformation: Meas. linear Conc. linear						
Parameters:						
a		b		c	d	e
0.00432		0		不是一個數字	不是一個數字	不是一個數字
Coeff. of determ. R2: 不是一個數字						

Multiskan GO SIMULATOR - Connected

Disconnect

Target: 20.0°C Plate: 20.4°C Cuvette: 21.1°C

26 admin

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Operation-Plate measurement

- Sample concentration will be calculate **automatically**

New Session_7 - SkanIt 3.2

Home Layout Protocol Results Reports

Blank Subtraction Basic Statistics Pathlength Correction Basic

Spectral Analysis Kinetics Reduction

PreCalculation Merge Data Graph Processing

QC Quality Control User-Defined Equation Curve Fit

ED Effective Dose R/I Data Normalization Qualitative Classification

PLA Parallel Line Analysis

Automatic Save Export Start

Results

New Session_7

450nm curve fit

Parameters Graph Table List

Show options Export Open in Excel Print

	1	2	3	4	5	6	7	8	9	10	11	12
A	Cal_0001 1/2 1000 1e+03	Cal_0001 2/2 1000 1e+03	Un_0001 1/2 877	Un_0001 2/2 356								
B	Cal_0002 1/2 500 500	Cal_0002 2/2 500 500	Un_0002 1/2 910	Un_0002 2/2 273								
C	Cal_0003 1/2 250 250	Cal_0003 2/2 250 250	Un_0003 1/2 781	Un_0003 2/2 705								
D	Cal_0004 1/2 125 125	Cal_0004 2/2 125 125	Un_0004 1/2 265	Un_0004 2/2 439								
E	Cal_0005 1/2 62.5 62.5	Cal_0005 2/2 62.5 62.5	Un_0005 1/2 186	Un_0005 2/2 98.2								
F	Cal_0006 1/2 31.25 31.3	Cal_0006 2/2 31.25 31.3	Un_0006 1/2 572	Un_0006 2/2 403								
G			Un_0007 1/2 603	Un_0007 2/2 195								
H			Un_0008 1/2 63.5	Un_0008 2/2 102								

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Multiskan GO SIMULATOR - Connected Disconnect Target: 20.0°C Plate: 20.4°C Cuvette: 21.1°C admin



Operation-Plate measurement

■ “Export” Result

New Session_7 - SkanIt 3.2

Home Layout Protocol Results Reports

Basic Reduction Processing Export Start

Blank Subtraction Basic Statistics Pathlength Correction Spectral Analysis Kinetics PreCalculation Merge Data Graph Quality Control User-Defined Equation Curve Fit Effective Dose R/I Data Normalization Qualitative Classification Parallel Line Analysis Automatic Save

Results

New Session_7

450nm

curve fit

Parameters Graph Table List

Show options Export Open in Excel Print

	1	2	3	4	5	6	7	8	9	10	11	12
A	Cal_0001 1/2 1000 1e+03	Cal_0001 2/2 1000 1e+03	Un_0001 1/2 1:1 877	Un_0001 2/2 1:1 356								
B	Cal_0002 1/2 500 500	Cal_0002 2/2 500 500	Un_0002 1/2 1:1 910	Un_0002 2/2 1:1 273								
C	Cal_0003 1/2 250 250	Cal_0003 2/2 250 250	Un_0003 1/2 1:1 781	Un_0003 2/2 1:1 705								
D	Cal_0004 1/2 125 125	Cal_0004 2/2 125 125	Un_0004 1/2 1:1 265	Un_0004 2/2 1:1 439								
E	Cal_0005 1/2 62.5 62.5	Cal_0005 2/2 62.5 62.5	Un_0005 1/2 1:1 186	Un_0005 2/2 1:1 98.2								
F	Cal_0006 1/2 31.25 31.3	Cal_0006 2/2 31.25 31.3	Un_0006 1/2 1:1 572	Un_0006 2/2 1:1 403								
G			Un_0007 1/2 1:1 603	Un_0007 2/2 1:1 195								
H			Un_0008 1/2 1:1 63.5	Un_0008 2/2 1:1 102								

✓ Multiskan GO SIMULATOR - Connected Disconnect Target: 20.0°C Plate: 20.4°C Cuvette: 21.1°C admin



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Thanks for your attention



岑祥

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