BI 121, Lab 6 Pulmonary Function Testing (PFT)

I. Attendance

II. Pulmonary Function Test/PFT

A. What? Measure of static & dynamic lung function
B. Why? Picture of lung health; absence, presence, progression of disease (eg asthma, emphysema); effectiveness of drugs
C. How? Complete PFT with computer or dinosaur spirometer

III. Crucial Clinical Measures

A. VC vital capacity = FVC forced vital capacity amount of air exhaled after maximal inhalation
B. $FEV_{1.0}$ = How much of VC in 1 second? $[FEV_{1.0}/FVC] \times 100$
   If ≥ 75-80% (0.75-0.80) –> clinically normal
   If ≤ 40-50% –>obstructive disease (eg, asthma)

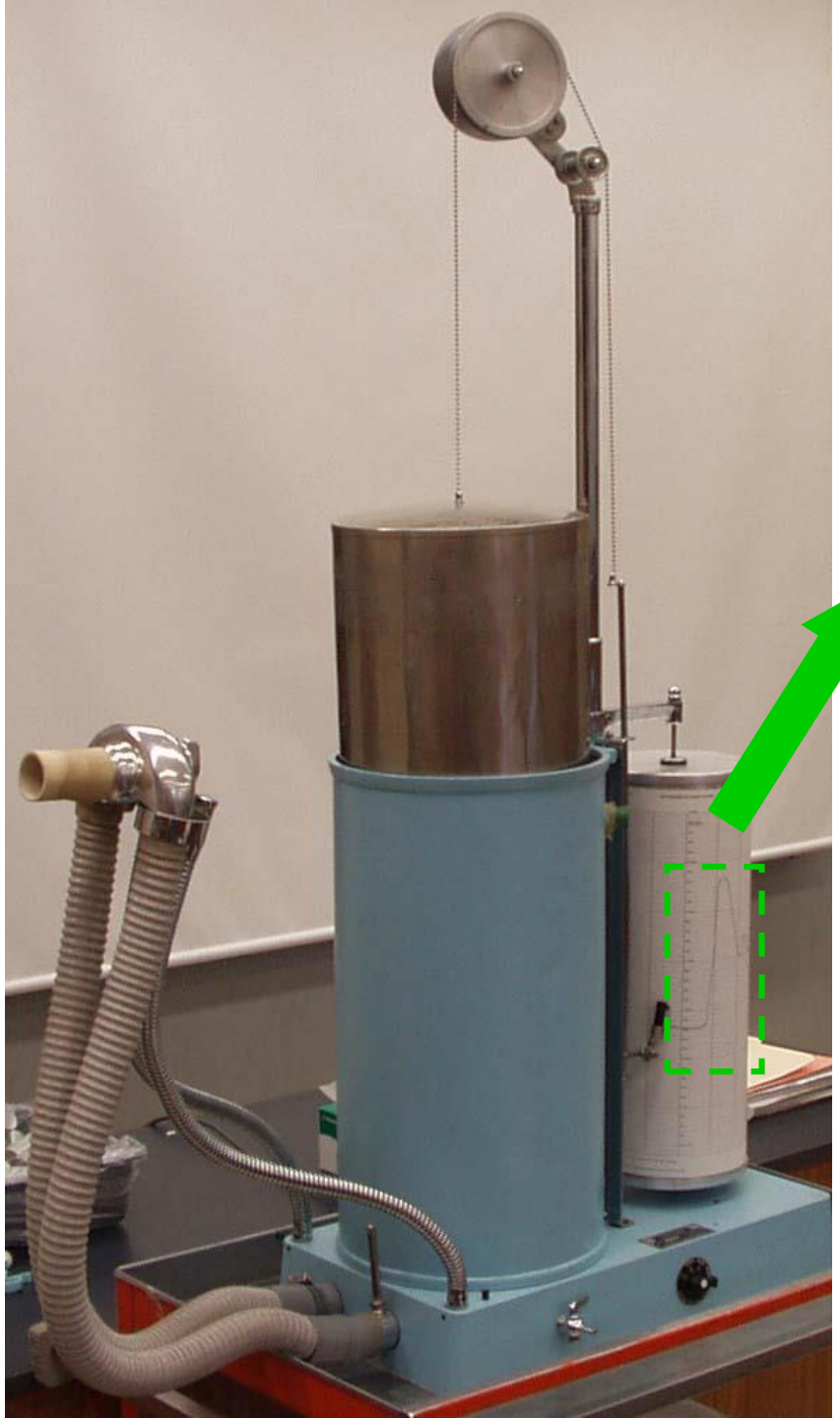
IV. Your Goals

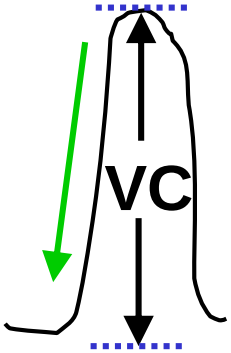
♀ ♂

A. Estimate your VC & $FEV_{1.0}$ → Use nomogram pp 6-6 or 6-7 LM
B. Measure these values accurately w/computer PFT LabChart
C. Compare *estimated* with actually *assessed* values to determine whether you're within a healthy range.

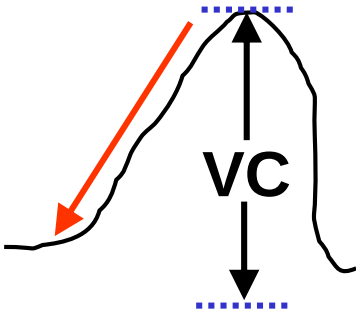
Respirometer → measures ***complete*** ***Pulmonary Function Test*** ***or PFT***!

NB: Should be able to blow out ≥ 75 - 85% of VC/FVC in 1 second! That's $FEV_{1.0}$/FVC ≥ 0.75 – 0.85. If less, may indicate asthma or other lung disease.



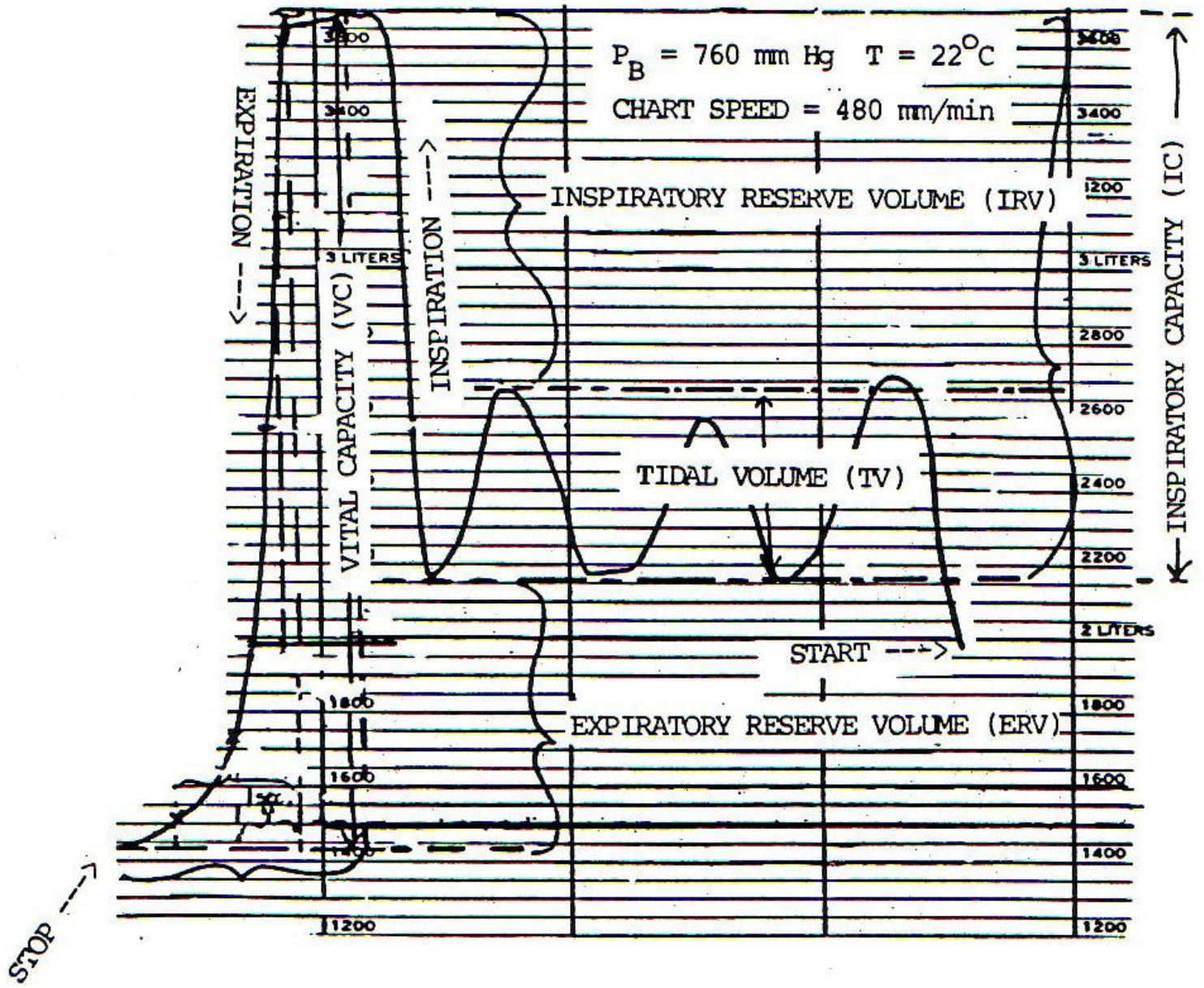


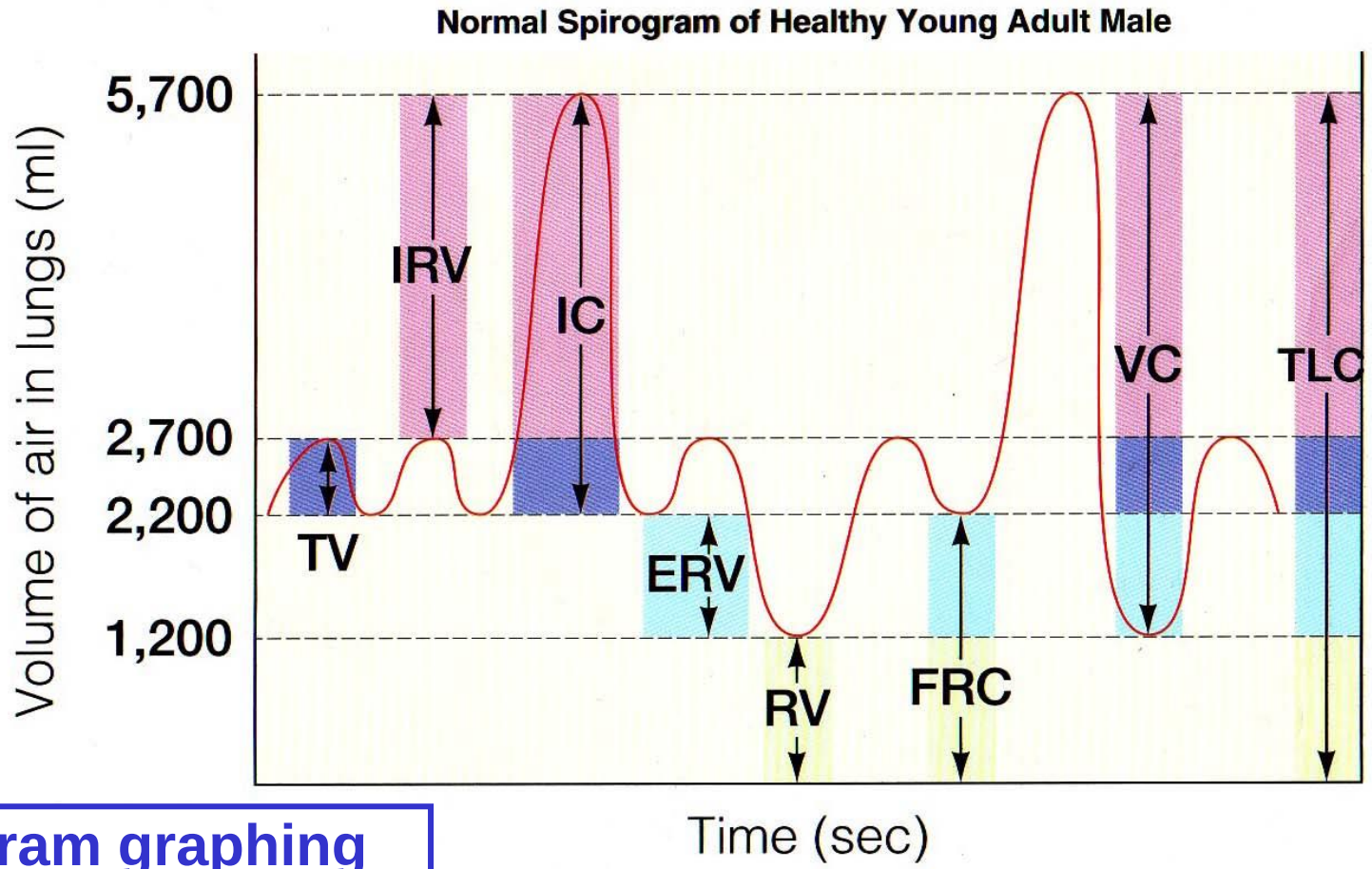
Normal = Steep



Abnormal = Flatter Downslope (eg, Asthma)

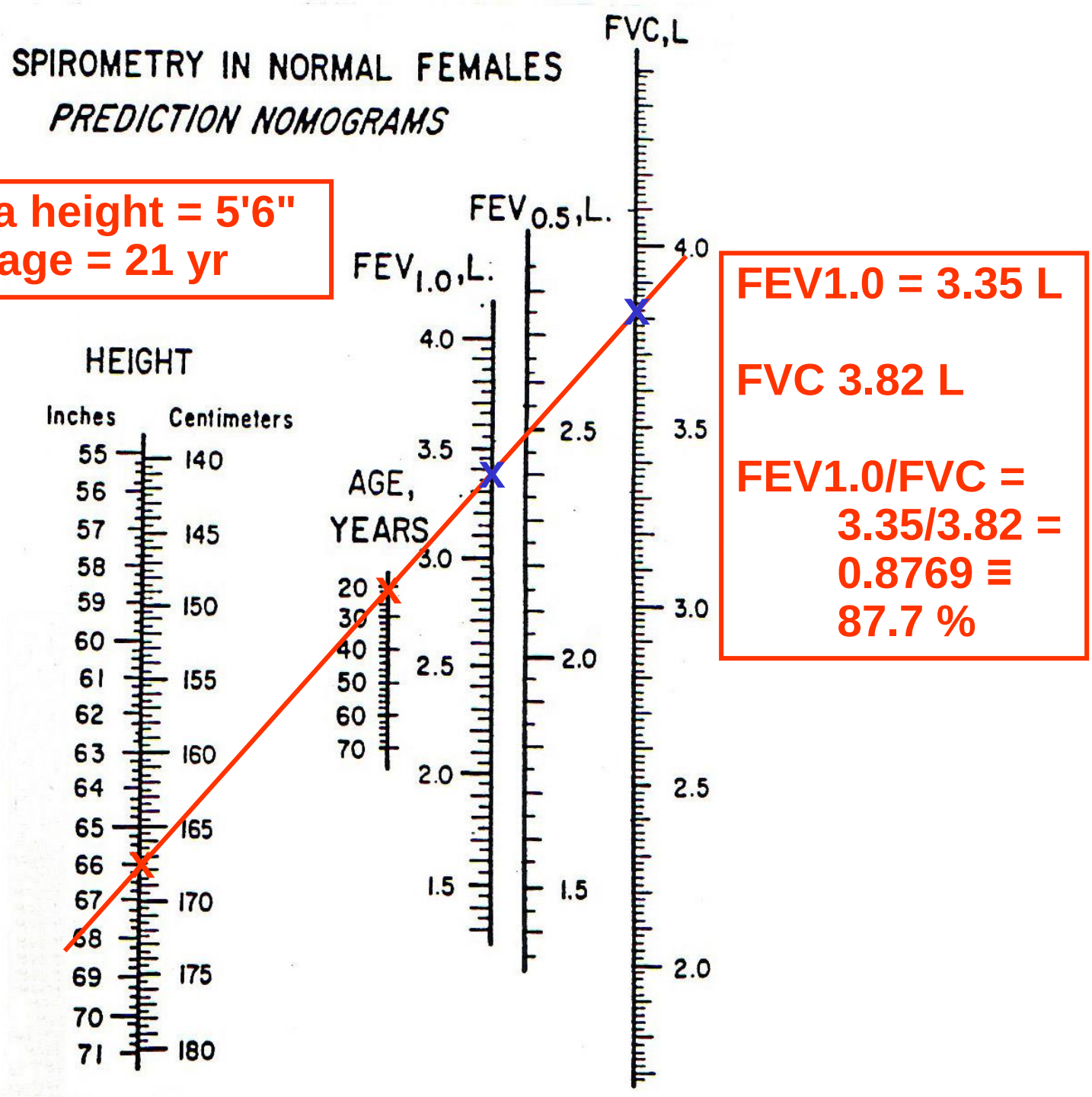
Sample PFT from Collins 13.5 L Respirometer



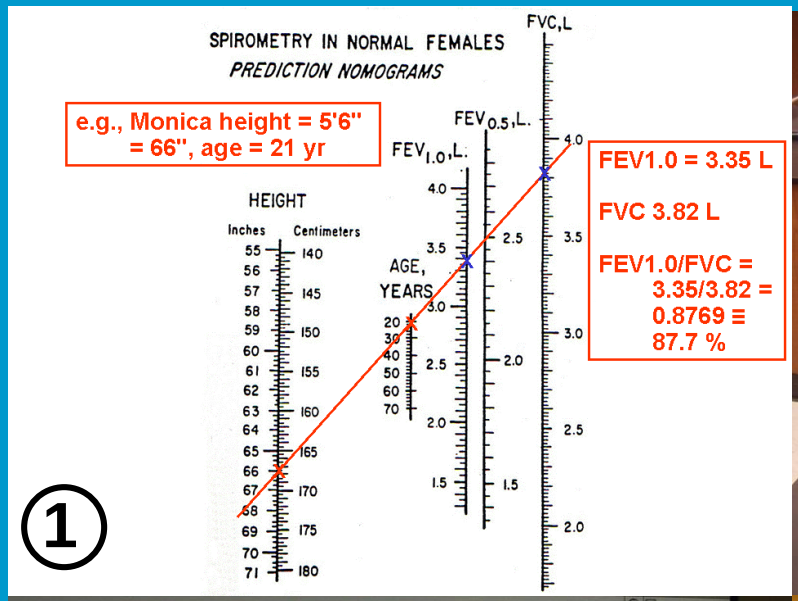


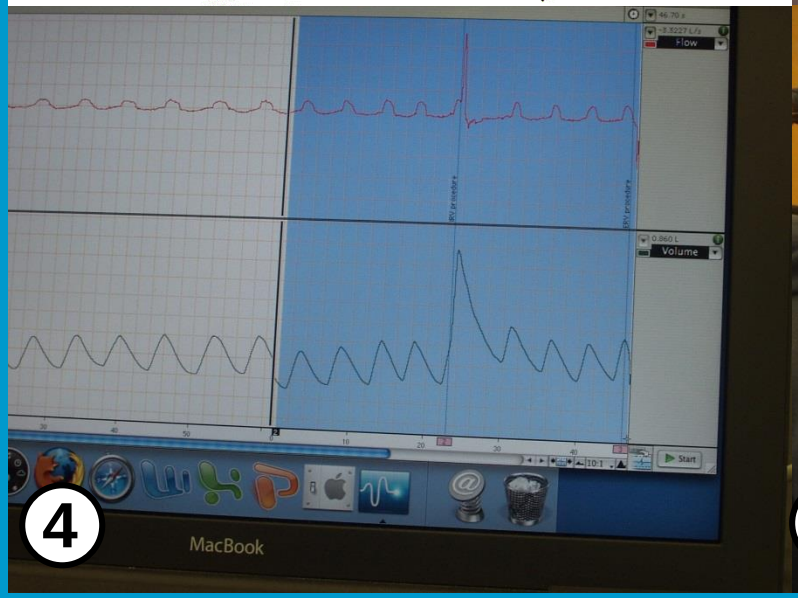
Spirogram graphing complete *PFT* from computer simulation.

TV = Tidal volume (500 ml)
IRV = Inspiratory reserve volume (3,000 ml)
IC = Inspiratory capacity (3,500 ml)
ERV = Expiratory reserve volume (1,000 ml)
RV = Residual volume (1,200 ml)
FRC = Functional residual capacity (2,200 ml)
VC = Vital capacity (4,500 ml)
TLC = Total lung capacity (5,700 ml)


SPIROMETRY IN NORMAL FEMALES
PREDICTION NOMOGRAMS
e.g., Monica height = 5'6"
= 66", age = 21 yr
HEIGHT
Inches
Centimeters
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
140
145
150
155
160
165
170
175
180
AGE, YEARS
20
30
40
50
60
70
FEV1.0, L.
4.0
3.5
3.0
2.5
2.0
1.5
FEV0.5, L.
2.5
2.0
1.5
FVC, L
4.0
3.5
3.0
2.5
2.0
FEV1.0 = 3.35 L
FVC 3.82 L
FEV1.0/FVC =
3.35/3.82 =
0.8769 ≡
87.7 %

①Estimate, ②Setup, ③Assess, ④Compare





How to put together?

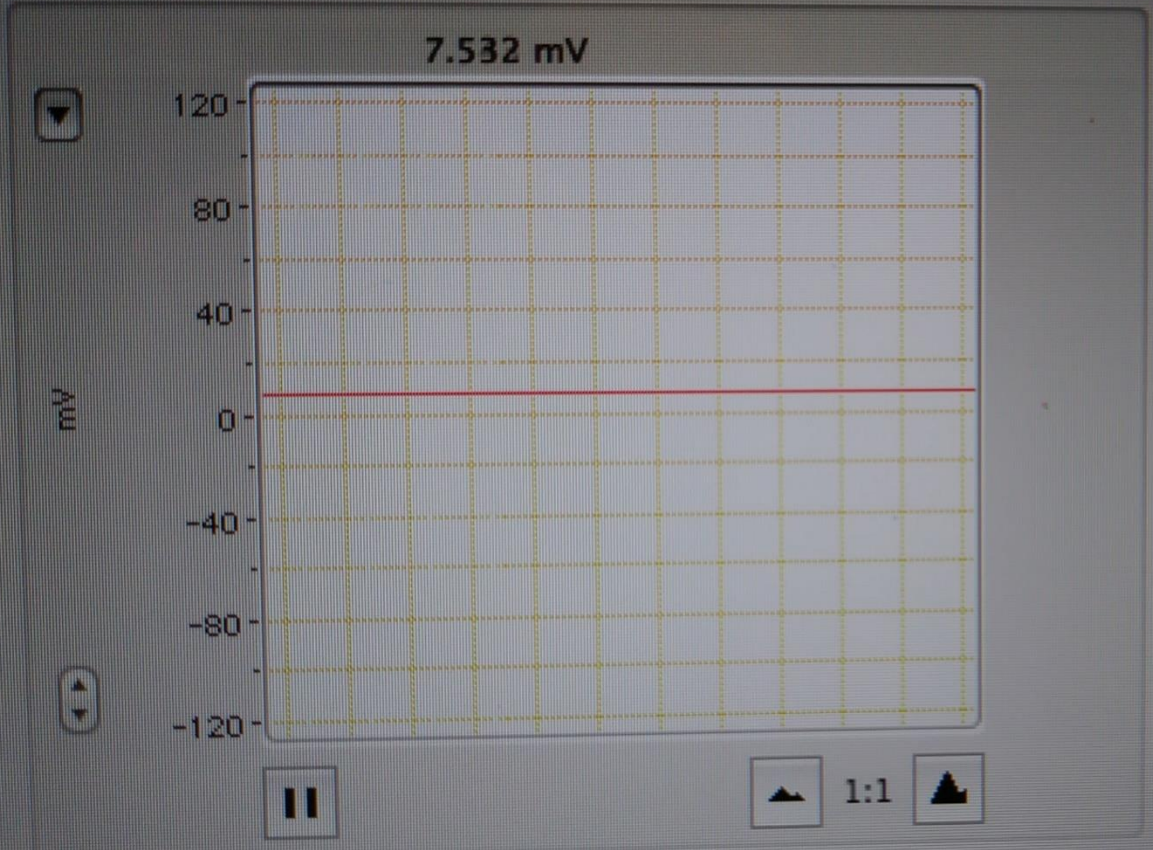

Viola!!


Calibration is crucial in
all physiology testing!

Data Pad | Comments | Window | Layout | Spirometry

Spirometer Pod

Input 1: Spirometer Pod



Range: 500 mV

Low Pass: 10 Hz

Zero

☑ Invert

☑ Anti-alias

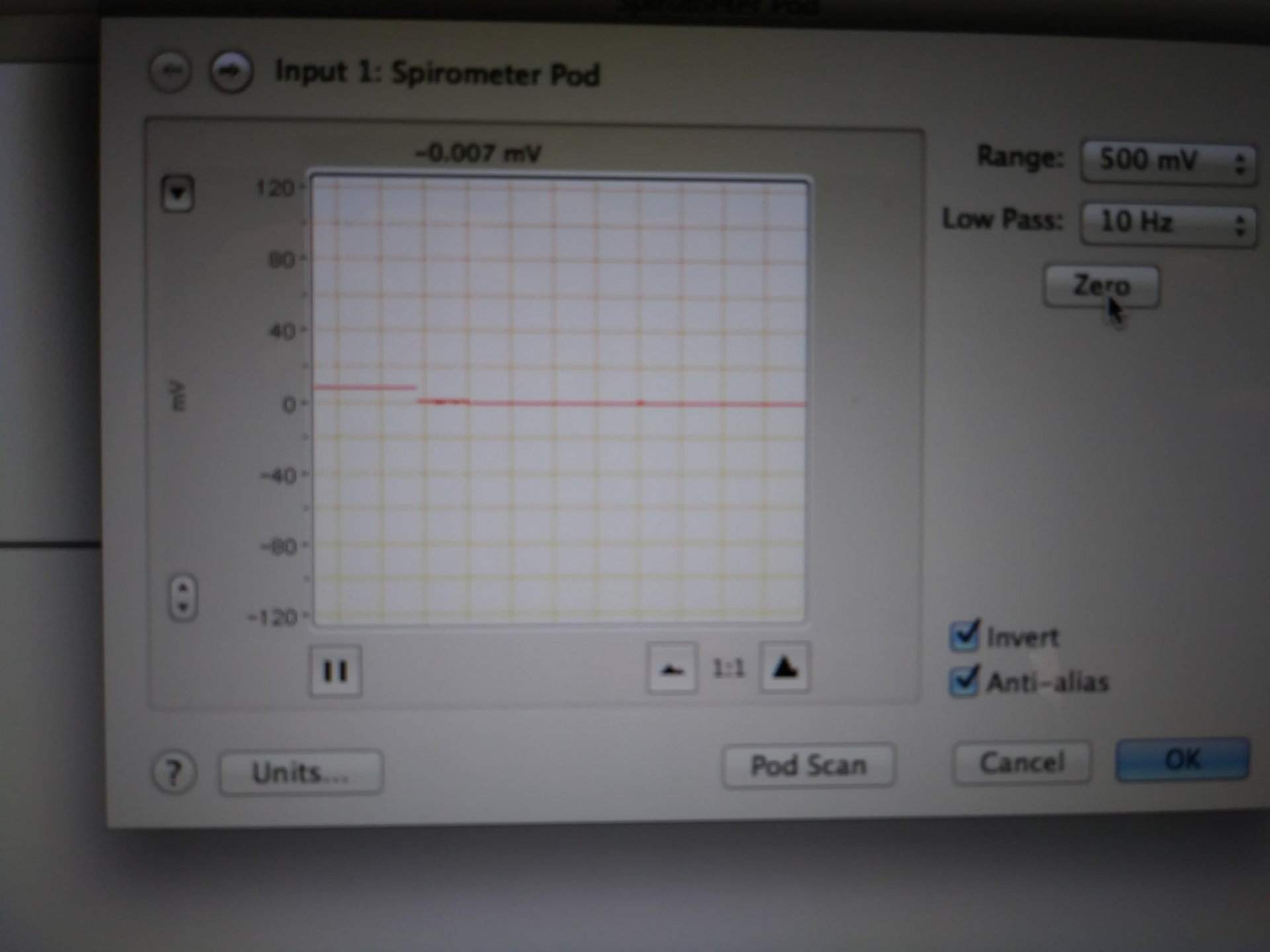
?

Units...

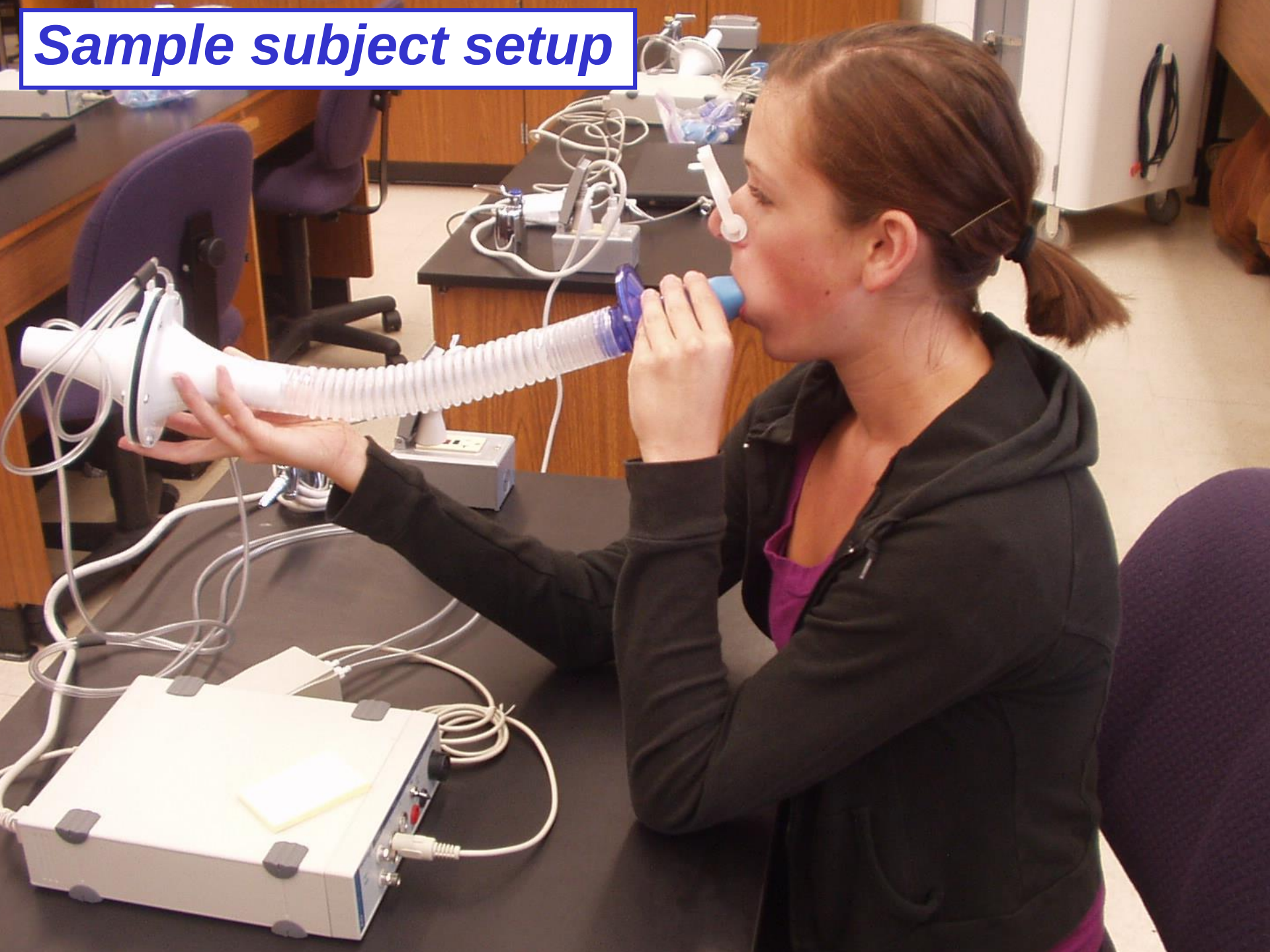
Pod Scan

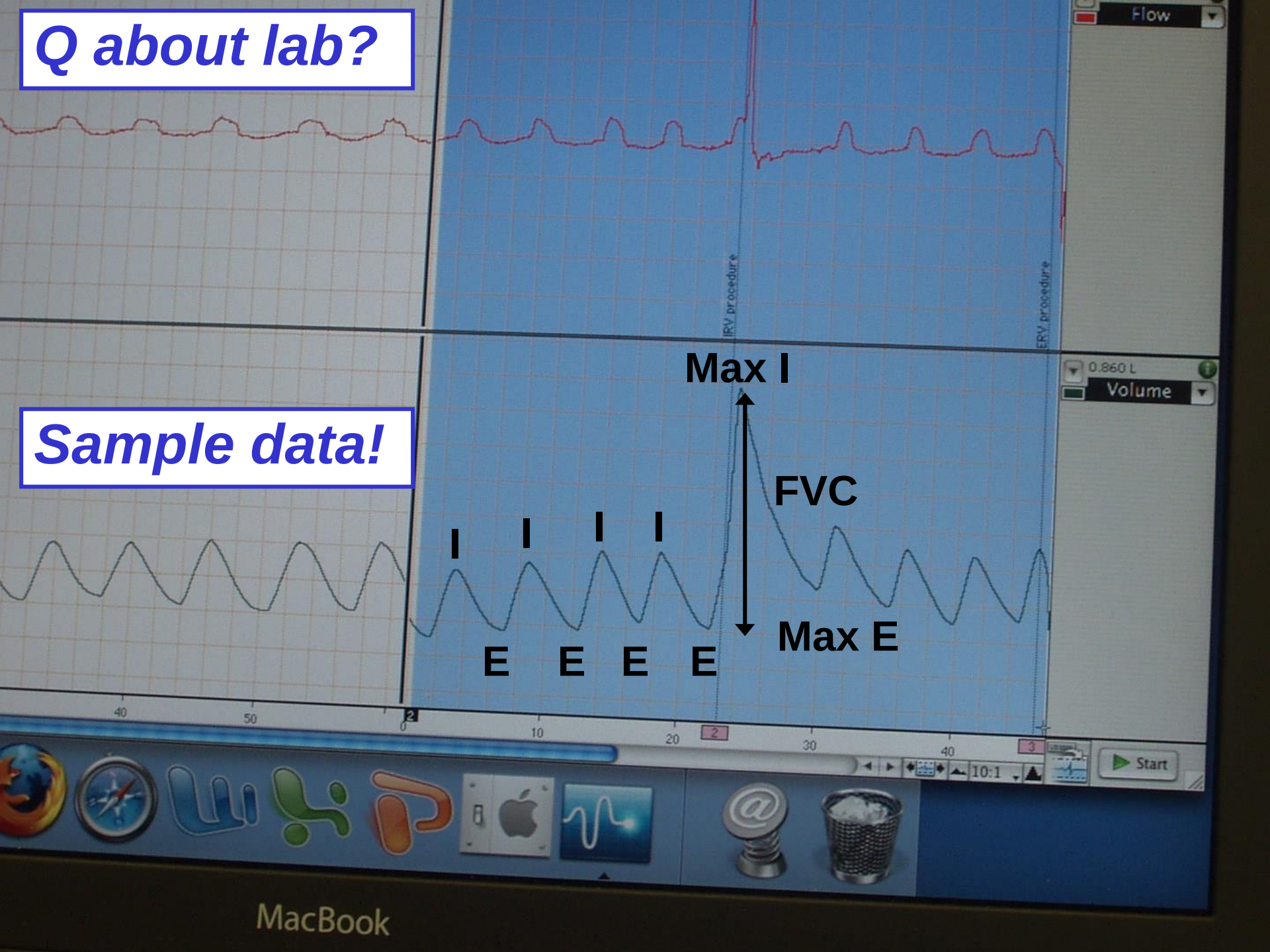
Cancel

OK


Input 1: Spirometer Pod
-0.007 mV
120
80
40
0
-40
-80
-120
mV
1:1
Range:
500 mV
Low Pass:
10 Hz
Zero
Invert
Anti-alias
Units...
Pod Scan
Cancel
OK

Sample subject setup




Q about lab?
Sample data!
Flow
Volume
0.860 L
IRV procedure
ERV procedure
Max I
FVC
Max E
I I I I
E E E E
Start
MacBook


Spirometry Report
Flow channel Flow Volume channel Volume
Data selection 18.63 s (0.31 min)
Inspirations 5 PIF 4.02 L/s (241.1 L/min)
Expirations 4 PEF 10.02 L/s (601 L/min)
$\dot{V}_E$ 0.22 L/s (13.4 L/min) FVC 3.56 L
V_T 0.89 L FEV_1 3.09 L
f 0.28 Hz (16.6/min) FEV_1/FVC 87%