

CRFS WORKSHOP

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100 QUESTIONS ...

2 Hours ...

What do I need to do to pass ?



Mastering Multiple Choice

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- The **10-second technique** that instantly enables 1 in 3 students to increase their grades on multiple choice exams (p.34)
- The test-taking system that guarantees you **finish every single exam on time**, and gets you better grades at the same time (p.29)
- The **proven psychology principle** specifically applicable to multiple choice exams that will dramatically increase your recall during the exam (p.22)
- The **permanent solution to test anxiety**, panic, and "blanking" (p.31)
- The 4 critical study strategies that can **cut your study time in half** (p.24)
- The **simple formula that tells you exactly when to guess**, even on tests that subtract marks for wrong answers (p.27)
- How to nail your next test **even if you're a slow reader** (p. 45)

What do I need to do to pass ?

Know the syllabus

Do practice questions



Exam technique

Why is the correct answer correct?

Why are incorrect answers incorrect ?

Consider the concept behind the question –
think beyond facts

Carefully consider the wording of the question
eg. “choose the best alternative”
indicates that there may be no perfect
answer.

Characteristics of measuring devices

Quality assurance in the respiratory laboratory

Lung mechanics

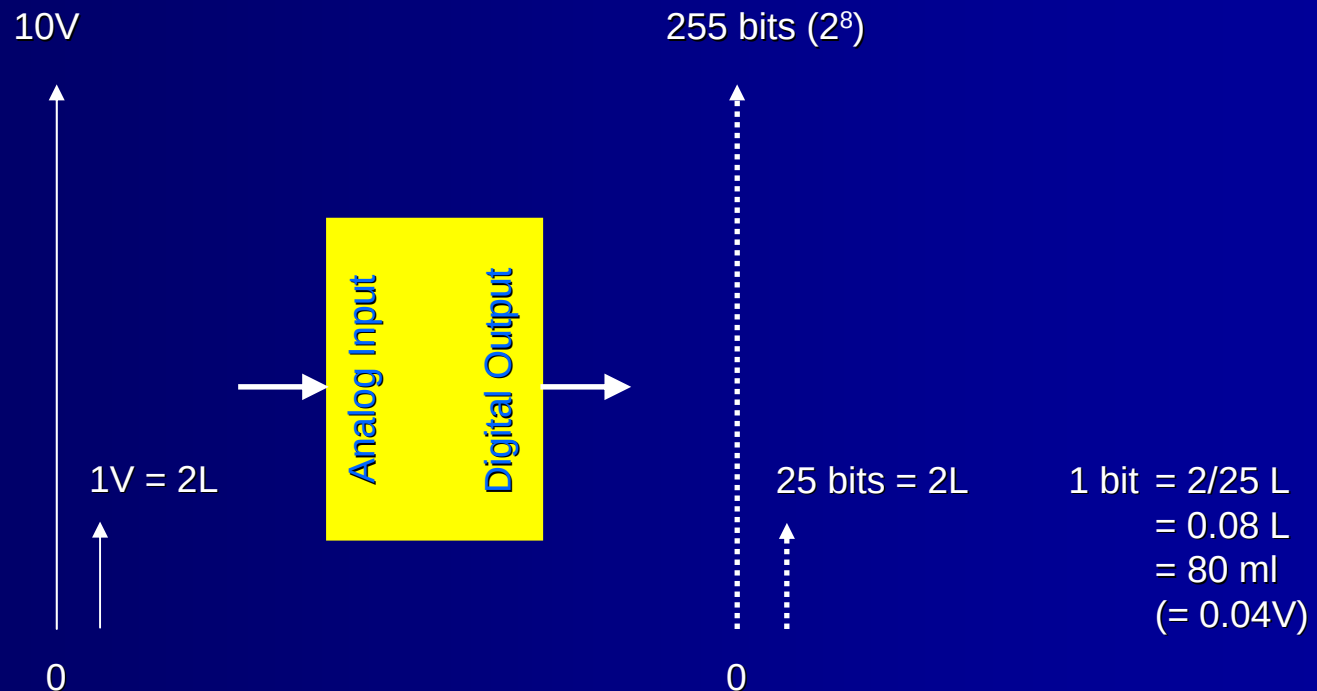
Characteristics of measuring devices ... 1

- Q) A computer using an 8 bit analog to digital converter is set for a voltage range of 0 to 10 volts. If it is attached to a spirometer that produces 1 volt for every 2L of volume displacement, what is the smallest volume increment that the converter can detect?
- A. 20 ml
 - B. 40 ml
 - C. 60 ml
 - D. 80 ml

TOPIC: Analog to digital conversion - amplitude resolution

Analog to Digital Conversion – Amplitude Resolution

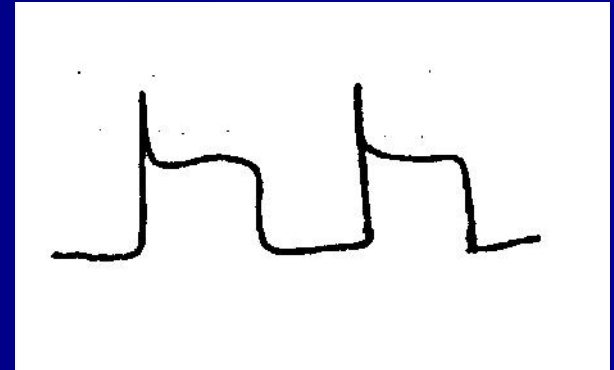
- 0 to 10V full scale input
- 8 bit resolution



Characteristics of measuring devices ... 2

Q) A square wave signal is applied to a strip chart recorder and the tracing below is obtained. What does the tracing indicate?

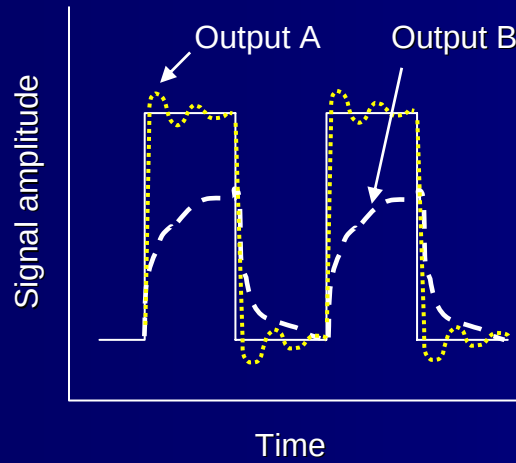
- A. Overshoot
- B. Undershoot
- C. Damping
- D. Sine wave generation



TOPIC: Frequency response

Frequency Response

Square Wave Input



Output A –
Overshoot
Ringing
Under-damped

Output B –
Undershoot
Slow response
Phase delay
Over-damped

Characteristics of measuring devices ... 3

Q) Which of the following devices has the highest frequency response ?

- A. Wedge spirometer
- B. Turbine peak flowmeter
- C. Water-sealed spirometer
- D. Differential pressure pneumotachograph

TOPIC: Frequency response

Frequency Response of Spirometers & Flow Devices

Major influencing factors –

- Mass (inertia)
- Frictional resistance
- Compliance (rigidity)

Increasing
frequency
response



Differential pressure pneumotachograph
Turbine peak flowmeter
Wedge spirometer
Water-sealed spirometer

Characteristics of measuring devices ... 4

Q) A response in which the output is a straight line function of the input is descriptive of -

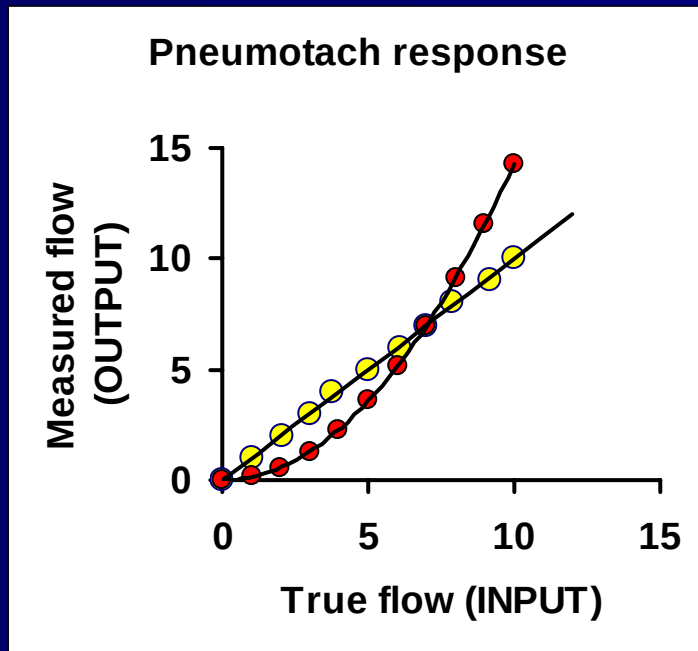
- A. Linearity
- B. Maximum gain
- C. Frequency response
- D. Hysteresis

TOPIC: Instrument characteristics

Instrument characteristics

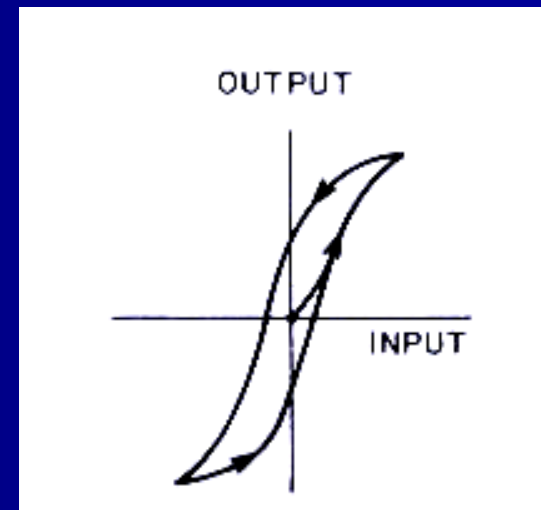
Linearity of Input–Output Response

Linear, non-linear



Hysteresis

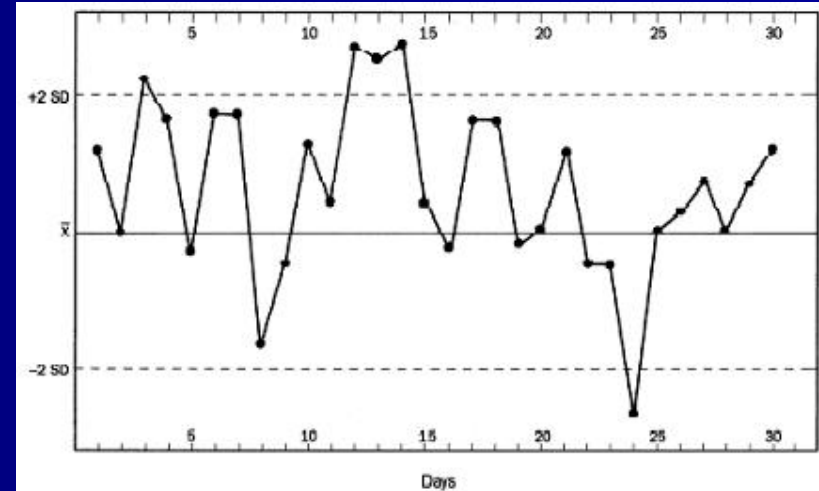
Output response depends on the direction of change of the input



Quality control ... 1

Q) The Levy-Jennings plot shown indicates which of the following for the blood gas control runs for days 5 to 10 ?

- A. A shift
- B. A trend
- C. In-control
- D. Random error



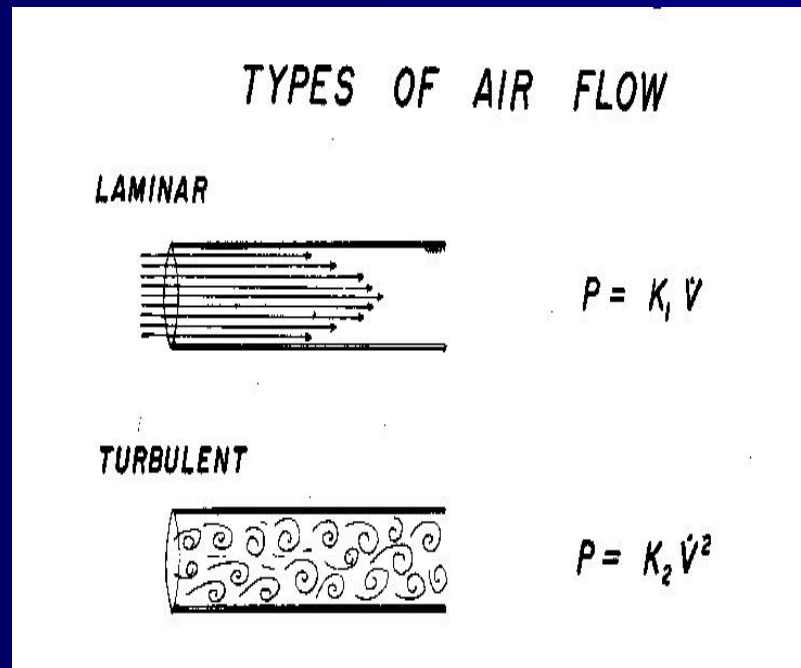
Lung mechanics 1

Q) Laminar flow in the airways is ...

- A. Little affected by gas viscosity and strongly affected by gas density
- B. Strongly affected by gas viscosity and little affected by gas density
- C. Strongly affected by gas viscosity and density
- D. Dependant only upon the airway size

TOPIC: Flow of gas through a tube

Flow of air through tubes



Laminar flow

- Flow is streamlined, all molecules move longitudinally
- Velocity profile is parabolic
- Pressure (force) is proportional to flow
- Also proportional to gas viscosity
- Poiseuille's Law

$$\Delta P = \frac{\dot{V} 8 \eta l}{\pi r^4}$$

Turbulent flow

- Molecules move sideways as well as forwards (eddies)
- Velocity profile is even
- Pressure (force) is proportional to square of flow
- Also proportional to gas density



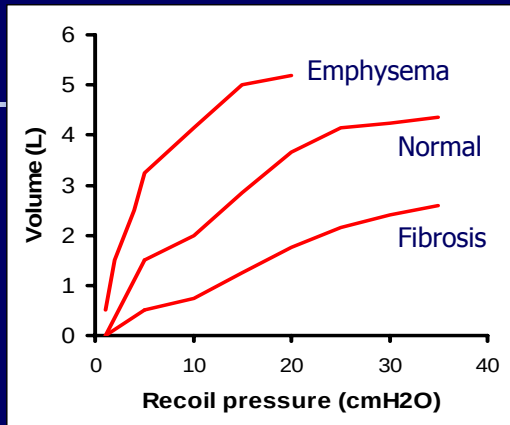
Lung mechanics 2

Q) The pressure-volume curve of the lung is a graphical representation of lung volume plotted against ...

- A. Pleural pressure
- B. Elastic recoil pressure of the lung
- C. Oesophageal pressure
- D. Alveolar pressure

TOPIC: Lung compliance

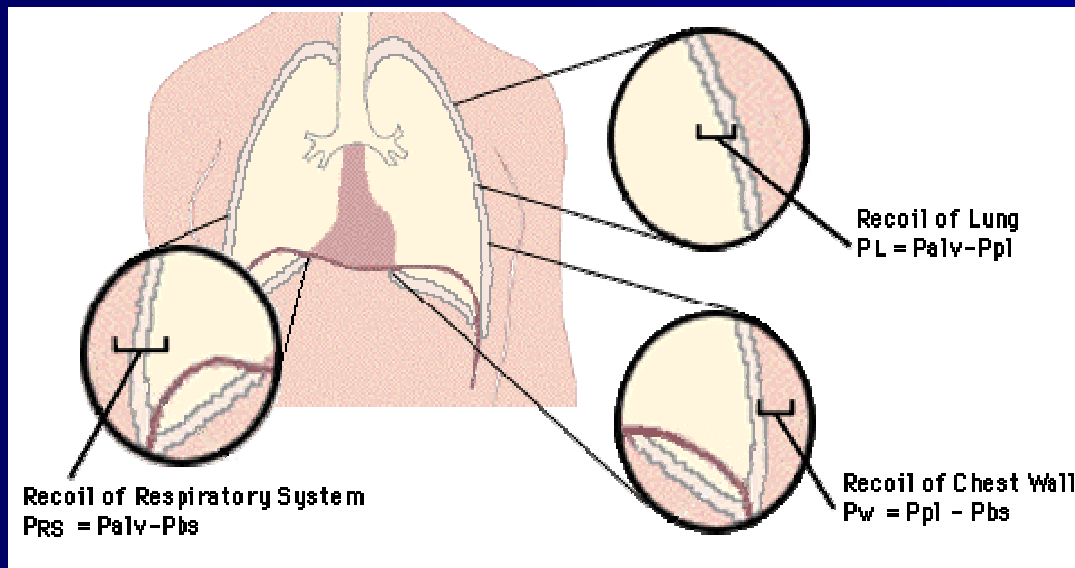
Lung Compliance



$$\text{Recoil pressure} = \text{Alveolar} - \text{pleural pressure}$$

Estimated by mouth pressure when relaxed against closed shutter

Estimated by oesophageal balloon



Lung mechanics 2

Q) The pressure-volume curve of the lung is a graphical representation of lung volume plotted against ...

- A. ~~Pleural pressure~~
- B. Elastic recoil pressure of the lung ✓
- C. ~~Oesophageal pressure~~
- D. ~~Alveolar pressure~~

TOPIC: Lung compliance

Lung mechanics 3

Q) After an upright normal subject takes a vital capacity breath of 100% O₂, the N₂ concentration at the apex exceeds that at the base of the lung because ...

- A. Airway closure at the base delays filling of that region
- B. Airway resistance of the lower zones is high
- C. The ventilation-perfusion ratio is high at the apex
- D. The apical alveoli expand less than those at the base

TOPIC: Lung compliance, ventilation distribution

- Q) After an upright normal subject takes a vital capacity breath of 100% O₂, the N₂ concentration at the apex exceeds that at the base of the lung because ...
- A. Airway closure at the base delays filling of that region

Nope ...

This has the opposite effect by –

1. Limiting delivery of O₂ to the bases and reducing dilution of resident N₂
2. Basal N₂ would therefore be increased relative to the apex rather than decreased

- Q) After an upright normal subject takes a vital capacity breath of 100% O₂, the N₂ concentration at the apex exceeds that at the base of the lung because ...
- B. Airway resistance of the lower zones is high

Nope ...

Lower zone airway resistance is not high

- Q) After an upright normal subject takes a vital capacity breath of 100% O₂, the N₂ concentration at the apex exceeds that at the base of the lung because ...
- C. The ventilation-perfusion ratio is high at the apex

Nope ...

V/Q is high at the apex ... true

BUT, apical ventilation is in fact lower than the bases.

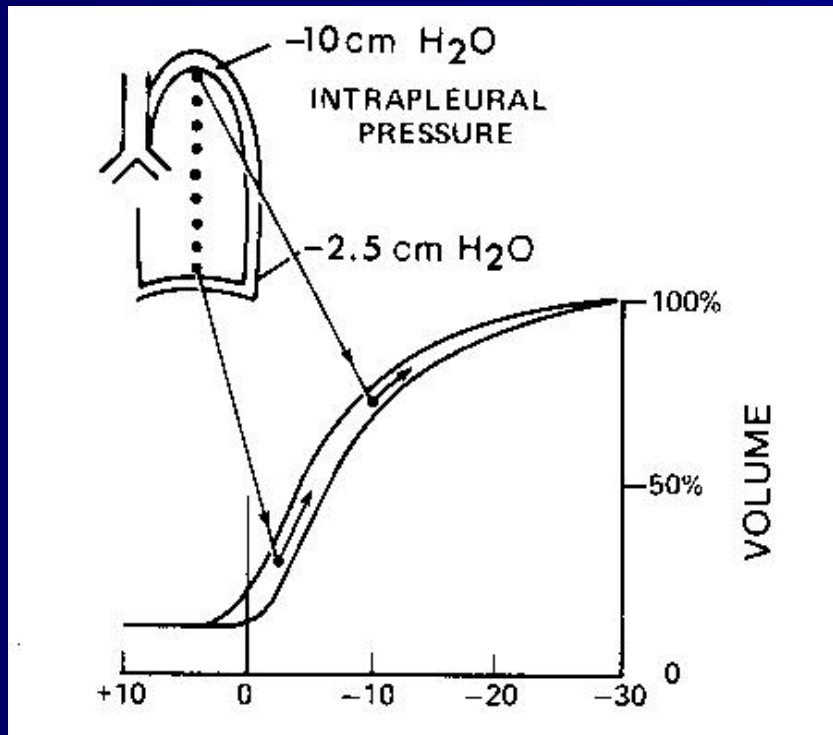
Even if the high V/Q did reflect a high V rather than a low Q, you would expect the opposite effect (ie a low N₂)

Ventilation alone affects the distribution of inspired O₂ between the apex and base.

Q) After an upright normal subject takes a vital capacity breath of 100% O₂, the N₂ concentration at the apex exceeds that at the base of the lung because ...

D. The apical alveoli expand less than those at the base

Correct ...



Weight of the lungs reduces pleural pressure at the bases

Apex more expanded and therefore less compliant than base

Apex increases volume at a slower rate than bases during inspiration -> less dilution of N₂ by O₂ and therefore higher N₂ concentration