Respiratory

RE01 [Mar96] Which of the following is a normal characteristic of lung?

A. 3,000,000 alveoli 500m alveoli
B. Alveolar diameter 3 mm 200micrometers
C. External surface area: 10 m2 2.5m2
D. Alveolar surface area: 5 to 10 m2 50-100m2 surface area
E. None of the above

RE02 [Mar96] [Mar99] [Apr01] A young man collapses one lung. His ABGs on room air would be:

A. pO2 80, pCO2 50 mmHg?
B. pO2 50, pCO2 80 mmHg
C. pO2 50, pCO2 50 mmHg
D. ?

RE02 [Jul96]] [Mar97] The ABGs in a healthy young 70kg male with one collapsed lung are:

A. paO2 50 mmHg, pCO2 25 mmHg
B. paO2 95 mmHg, pCO2 40 mmHg?
C. paO2 60 mmHg, pCO2 45 mmHg
D. paO2 60 mmHg, pCO2 25 mmHg

RE03 [Mar96] [Mar99] [Feb04] Pulmonary vascular resistance:

A. Is minimal at FRC
B. ?Increases/?decreases with increase in lung volume
C. Increases with elevated CVP
D. ?
E. ?

RE03b [Jul00] [Feb12] Pulmonary vascular resistance is increased in :

A. Increase in pulmonary arterial pressure
B. Hypocarbia
C. Alkalosis
D. Increased left atrial pressure
E. Head down tilt

F. Hypoxic pulmonary vasoconstriction

RE04 [Mar96] [Jul97] [Jul02] The greatest increase in (?physiological) dead space would be expected with:

A. Pulmonary embolism?
B. Atelectasis (or: collapse of one lung)
C. Pneumothorax
D. Bronchoconstriction
E. Obesity?
(see also RE08 & RE20)

RE05 [Mar96] [Jul00] [Apr01] [Jul01] [Jul02] [Feb04]

As go from the top of the erect lung to the bottom:

A. Water vapour pressure remains constant??
B. pN2 remains constant
C. pCO2 at apex is higher than at the base
D. pO2 at base is lower than at the apex - defo
E: V/Q is higher at base than apex
F. Ventilation goes up as go up lung
G. Compliance is more at base than apex - ?yes
Alt version: The difference between the apical and basal alveoli in a erect lung:

A. Apical PaO2 < basal PaO2
B. Apical PaCO2 > Basal PaCO2
C. V/Q mismatch Apical < Basal
D. Compliance Basal > Apical

RE06 [Mar96] [Mar99] [Jul01] Distribution of pulmonary ventilation & perfusion in the erect position:

A. Gradient of change in ventilation is greater than that for perfusion
B. Ventilation increases as go up the lung
C. Perfusion increases as go up the lung
D. V:Q ratio at apex is greater than at base
E. None of the above
RE06b [Feb12] version Apex compared to base of lung

A. Lower ventilation to perfusion ratio
B. Higher perfusion than at the base

C. Higher transmural pressures ??
D. Intrapleural pressure is less negative
E. ?

RE07 [Mar96] Oxygen unloading:

A. Increases with increased paCO2
B. Decreases with increase in temperature
C. Decreases with increase in 2,3 DPG
D. ?
E. ?

RE08 [Mar97] Alveolar dead space:

A. Is less than physiological dead space
B. Is decreased with mechanical ventilation
C. Is increased with hypotension

RE08b [Jul98] [Jul99] [Feb00] [Jul02]

Alveolar dead space is increased with:

A. Pleural effusion
B. CCF
C. Pneumothorax
D. Hypotension
E. None of the above
(See also RE33)

RE09 [Mar97] [Jul97] [Mar99] [Jul00] [Jul01] If dead space is one third of the tidal volume and arterial pCO2 is 45 mmHg, what is the mixed expired pCO2?

A. 20 mmHg
B. 25 mmHg
C. 30 mmHg
D. 45 mmHg
E. 60 mmHg
(Comment: Simple application of the Bohr equation)

RE10 [Mar97] [Jul98] [Mar99] [Jul00] [Jul01] [Mar03] [Jul03] With constant FIO2, CO and VO2, an increase in mixed venous O2 content would be seen with:

A. Hypothermia
B. Increased paCO2
C. Decreased 2,3 DPG
D. Alkalosis
E. None of the above

- *Alt wording*: Without a change in body oxygen consumption or cardiac output, mixed venous oxygen tension increases with:
- *Alt wording (March 03)*: With constant FIO2 and cardiac output and no change in position of ODC, mixed venous blood oxygen tension increases with:

(See also CV47 ?same Q)

Jul03: If CO constant and ODC unchanged, mixed venous oxygen tension is decreased in:

A. Cyanide toxicity
B. Anaemia
C. Hypothermia
D. Hypercarbia
E. ?

RE11 [Jul97] [Jul01] With altitude:

A. Increased 2,3 DPG
B. Increased oxygen unloading in peripheries
C. Increased oxygen uptake in the lungs
D. ?
E. ?

Alt versions:

RE11b In acclimatisation to altitude:

A. P50 is reduced, improving O2 uptake in the lungs
B. P50 is increased, improving O2 offloading in the tissues
C. 2,3 DPG levels are reduced, improving O2 offloading in the tissues
D. Alkalaemia reduces the affinity for O2, increasing p50
E. Increase in 2,3 DPG and a decrease in P50

RE11c With acute acclimitisation to altitude:

A. Hypoventilation

B. Decreased cardiac output
C. Pulmonary oedema
D. Polycythaemia
E. Increase in 2,3 DPG

RE12 [d] [Jul98] [Jul01] Central chemoreceptors:

A. Bathed in CSF
B. Respond to increase in CSF pH
C. Bathed in ECF
D. In medullary respiratory centre

RE13 [d] [Jul98] [Mar99] [Apr01] [Jul01] [Jul02] [Mar03] [Jul03] [Feb04] The peripheral chemoreceptors:

A. Have a nonlinear response to paO2 changes
B. Have an intact response at 1MAC - response eliminated by 0.1MAC
C. Respond to a fall in paCO2
D. Respond slowly to rise in paCO2 x5 more rapid than central chemoreceptors
E. Respond to alkalaemia
F. Respond only to ?incr-/decr-eased H^+
G. Respond only to arterial hypoxaemia
H. Innervated by glossopharyngeal nerve
I. Low metabolic rate
J. Stimulated by carbon monoxide
K. Stimulated by cyanide
L. Blood flow of 2 ml/gram/min (OR Blood flow of 200mls/G/min)
M. Aortic body innervated by vagus
N. Changes in arterial oxygen content
O. Low O2 extraction (OR: Low A-V O2 difference
P. Have glomus cells
(NB: RE13 represents several MCQs with different optuions)

Feb 04 Version: Peripheral chemoreceptors:

A. In the carotid sinus
B. Have glomus cells
C. Low A-V difference
D. Innervated by glossopharyngeal nerve
E. Blood flow of 200mls/g/min 20mls/g/min

RE13b [Feb04] Carotid bodies (Similar to RE13)

A. Have glomus cells
B. Innervated by vagus
C. Blood flow of 200mls/g/min
D. High A-V difference
(See also:RE36)

RE14 [d] [Jul98] [Jul99] [Jul00] Surfactant:

A. Causes hysteresis (Or: Is the ONLY cause of hysteresis) ?
B. Is produced by type 1 pneumocytes
C. Is commonly deficient in term neonates
D. Acts like detergent in water
E. Reduces the amount of negative intrapleural pressure
F. Production is slow
G. Increases pulmonary compliance

RE14b [Jul04] Surfactant

A. Surface tension is inversely proportional to surfactant concentration
B. Lung compliance decreases with surfactant
C. Is produced by alveolar type 1 cells
D. Stabilises alveoli to allow smaller alveoli to empty into larger ones
E. Increases surface tension in smaller alveoli to promote stability

RE15 [Jul97] [Apr01] In quiet breathing, exhalation is:

A. Passive due to elastic tissue alone
B. Passive due to surface tension in the alveoli and elastic tissue recoil
C. Active due to intercostal contraction
D. ?
E. ?

RE16 [d] [Mar98] [Jul98] [Apr01] [Mar03] [Jul03] The normal arterio-venous difference for CO_2 is:

A. 2 ml/100ml
B. 4 ml/100ml
C. 6 ml/100ml

D. 8 ml/100ml
E. 10 ml/100ml
(Mixed venous blood contains 52 mlsCO2/100mls blood & arterial blood contains 48 mlsCO2/100 mls blood.)

RE17 [d] [Jul98] [Mar99] [Jul00] [Apr01] [Jul01] [Mar02] [Jul02] [Jul04] [Jul09]

The lung:

A. Removes/inactivates serotonin (5HT)
B. Activates bradykinin
C. Converts angiotensin II to I
D. Inactivates aldosterone
E. Takes up noradrenaline

Alt version: Which of the following substances is removed (?inactivated) by the lungs?

A. Serotonin
B. Noradrenaline
C. Angiotensin I
D. Bradykinin
E. All of the above

July 2000: Which of the following is inactivated in the lung:

A. Angiotensin II
B. Angiotensin I
C. Bradykinin
D. Vasopressin
E. Noradrenaline

Jul 2001 version: Metabolic functions of the lung include which one of the following?

A. Inactivates ADH
B. Converts Angiotensin II to Angiotensin I
C. Activates bradykinin
D. Inactivate serotonin (5HT)
E. Activation of prostaglandins

Mar 02: Which biologically active substances are partially ?degraded by the lung?

A. Surfactant
B. Histamine
C. Angiotensin
D. Noradrenaline
E. ?all/?none of the above

RE18 [] [Mar98] [Jul98] Breathing oxygen :

A. Causes pain on re-expansion of collapsed alveoli
B. Reduces vital capacity
C. ?
D. ?

RE19 [] [Mar98] [Jul98] [Feb00] [Mar02] [Jul02]

Contribution to the increase in CO2 carriage as blood passes from artery into vein:

Carbamino HCO3 Dissolved

A. 5% 90% 5%

B. 30% 60% 10%

C. ?

D. ?

(See also RE38)

RE20 [Mar98] [Mar03] Increased physiological dead space with:

A. Decreases with age -↑ 1ml/yr from childhood
B. Anaesthesia
C. Supine position
D. Calculated from Bohr equation using end-tidal CO2
E. Calculated from endtidal CO2 and arterial CO2
F. Decreases with increase in anatomical dead space
G. Increases with PEEP
(see RE04 & RE08)

RE20b [Jul98] [Feb00] Physiological dead space increases with:

A. Pulmonary hypertension
B. Hypotension

C. Atelectasis
D. Pleural effusion
E. None of the above

RE21 [Mar98] [Mar99] [Feb00] Shunt can be calculated by knowing:

A. Cardiac output
B. Arterial oxygen content
C. Mixed venous oxygen content
D. End pulm. capillary oxygen content
E. All of the above

RE22 [Jul98] Alveolar pressure:

A. Is always negative throughout normal quiet breathing
B. Is zero (atmospheric pr) during pause between inspiration and expiration
C. Is greater than 5-6 cm H2O during quiet expiration
D. Is less than 5-6 cms H2O during quiet inspiration
Also remembered as:

Alveolar pressure during quiet breathing:

A. 5 cmsH2O negative at inhalation
B. 5 cmsH2O positive at expiration
C. Follows intrapleural pressure closely
D. Is atmospheric between inhalation & exhalation

RE23 [Mar99] [Apr01] [Jul03] [Feb04] Patient with chronic airflow limitation:

A. Gradient maximal in effort independent part of flow volume loop
B. Will have increased total lung capacity
C. Has increased static compliance
D. ?

RE24 [Jul98] [Mar99] [Jul00] One lung anaesthesia:

A. High FIO2 will completely correct paO2
B. CPAP will completely correct paO2
C. Supine position will give better VQ matching - better in lateral
D. Associated with hypercarbia during one-lung ventilation, ventilated lung can eliminate enough carbon dioxide to compensate for non-ventilated lung. Overtime however retention of CO2 from blood traversing non-ventilated

lung usually slightly exceeds increased elimination of CO2 from blood traversing ventilated lung, PaCO2 will usually slowly increase.

E. ?

July 2000 version: With regards to hypoxia with one lung anaesthesia:

A: Oxygenation is better supine
B: Should have 10cm H2O PEEP to lower lung should be 20
C: Is usually associated with hypercarbia, (?can be associated with hypercarbia)
D. ?

RE25 [Jul98] [Mar99] [Mar03] [Jul03] The partial pressure of oxygen in dry air at sea level:

A. 163 mmHg
B. 159 mmHg
C. 149 mmHg
D. 100 mmHg
E. ?

RE26 [Mar99] [Jul04] Cause of increased minute ventilation with exercise:

A. Oscillation in paO2 & paCO2
B. Hypercarbia
C. Hypoxaemia
D. Acidosis
E. None of the above

The **rapid response** in minute ventilation at the onset of exercise result from "neural inputs to the respiratory centre from the motor cortex and proprioceptive receptors in the exercising muscle".
The **gradual response** in minute ventilation that comes later may be related to fluctuations in arterial oxygen tension and hence the "oscillatory discharge of central chemoreceptors provides a potent respiratory stimulus in exercise". **Nunn** 6thEd' (p244) says that "peripheral chemoreceptors do contribute, in a small way, to exercise-induces hyperpnoea". Other factors are "the release of epinephrine and norepinephrine, and a rise in blood temperature".

RE27 [Jul99] [Feb00] [Apr01] Work of breathing (as % of total VO2) in normal healthy adult::

A. 1% Work of breathing is ~3mL O_2/min, or 1% of basal O_2 consumption
B. 5%
C. 10%
D. 20%

RE28 [Feb00] [Mar03] [Jul03] PEEP:

A. Has a variable effect on FRC - ↑s FRC

B. Reduced lung compliance - ↑s compliance in lower dep areas but ↓s compliance in non dep areas

C. Reduces lung water - redistributes lung water to extraalveolar space

D. Reduces airway resistance - ↑s lung volume (CPAP in spont vent or PEEP in vent pt) ∴ ↓s airway resistance

E. No effect on lung compliance

RE29 [Feb00] [Jul02]

At an atmospheric pressure of 247 mmHg, what is the moist inspired p02?

A. 200 mmHg

B. 2 mmHg

C. 40 mmHg

D. 50 mmHg

(see also CM08)

RE30 [Feb00] Type II pneumocytes

A. Develop from type I pneumocytes
B. Are macrophages
C. Are very flat and practically devoid of organelles
D. ?Metabolise surfactant

RE30b [Jul00] Type I pneumocytes

A: Give rise to Type II pneumocytes
B: Are flat & minimal organelles
C: Bind surfactant (? receptors) on their brush border
D. ?

RE31 [Jul00] Control (?inspiratory) of the diaphragm originates in:

A. Pneumotactic centre
B. Apneustic centre in pons
C. Dorsal medullary (?neurons of) respiratory centre
D. Ventral medullary (?neurons of) respiratory centre

RE32 [Jul00] For a normal Hb-O2 dissociation curve, the most correct relationship is:

A. PaO2 340mmHg, SaO2 99%
B. PaO2 132mmHg, SaO2 98%
C. PaO2 68mmHg SaO2 ?
D. PaO2 60mmHg, SaO2 91% ICU point
E. None of the above

RE33 [Jul00] Alveolar dead space ???

A. Measured by Fowler's method
B. ??
(may be same Q as RE08)

RE34 [Jul00] Oxygen toxicity:

A: Is caused by superoxide dismutase (OR: Increased by increased SOD)
B: Causes CNS toxicity at over 100kPa
C: Is caused by absorption atelectasis
D: Is due to formation of superoxide radicals
E: Prolonged ventilation at 50kPa causes pulmonary toxicity
F. Causes lipid peroxidation
(see also MD30)

Pulmonary toxicity occurs with prolonged exposure of 16–24 hours or more to elevated concentrations of oxygen greater than 50% at normal atmospheric pressure. Atmospheric pressure is about 100kPa.

RE35 [Jul00] [Apr01] Pulmonary stretch receptors:

A. ?
B: Are only stimulated by maintained stretch
C: Show (?slow) adaptation
D: Cause an immediate decrease in tidal volume
E. ?

RE36 [Jul00] The peripheral chemoreceptors are located:

A. Carotid sinus
B. Carotid bodies

C. The vasomotor centre

D. ?

(see also RE13)

RE37 [Apr01] [Mar03] [Jul03]

Mixed venous blood:

A. Higher haematocrit than arterial - For each CO2 molecule which diffuses into a RBC either an HCO3 or chloride atom appears inside cell (the latter due to chloride shift when some HCO3- (out)exchanges for a Cl- (in). This results in the presence of one osmotically active particle for each CO2, which attracts H2O and causes the RBC to swell slightly. This together with a very small amount of fluid returning via lymphatics means that the haematocrit of venous blood is normally about 3% greater than arterial blood.

B. Saturation of 48% - 75%

C. Higher pH than arterial Blood

D. Can be sampled from the right atrium - should be from pulmon art

E. pO2 lower than coronary sinus blood - wrong

F. Coronary sinus O2 saturation of 30%

RE38 [Apr01]

Carbon dioxide carriage:

a) 10% dissolved

b) 30% carbamino

c) 85% bicarbonate ??maybe this one. Actual figure is 90%

d) 60% bicarbonate

e) Unaffected by pO2

NB A-V difference figures ie 30,60,10 not appropriate

RE39 [Apr01]

Factors that favour formation of carbamino-haemoglobin include:

A. Carbonic anhydrase

B. A decrease in oxygen tension - Haldane effect

C. An increase in oxygen tension

D. A decrease in pH

E. None of the above

RE40 [Apr01]

CO diffusion limited because

A. Combines avidly with Hb

B. Partial pressure in blood increases as partial pressure in air increases

C. ?

RE41 [Jul01] [Jul05]

Oxygen toxicity may be seen:

A. In CNS and lungs if breath 100% at 1 ATA (?) for 24 hours

B. In CNS and lungs if breath 30% at 1 ATA (?) for 24 hours

C. In CNS if breathe 100% oxygen for 48 hours not below 2 atmospheres pure oxygen, usually higher - irrespective of length of exposure

D. ?

E. CNS toxicity seen with O2 concs far greater than 760mmHg tracheobronchial irritation, muscle twitching, tinnitis, dizziness, convulsions and coma. Speed of development of symptoms proportionate to the pressure (cf. concentration) at which oxygen is administered.

RE42 [Jul01]

Breathing 0.04% CO2 in one atmosphere for 30 minutes, you would see:

A. Periodic apnoeas (or: 'periods of apnoea')

B. Hyperpnoea

C. Signs of acidosis

D. Signs of alkalosis

E. No change

(Comment received: "I suspect 0.04% CO2 is actually what we breathe, but I haven't confirmed it in Nunn's yet")

RE43 [Jul01] [Feb04]

In the lung, airway resistance

A Mainly in small airways medium airays (up to 7th generation)

B Varies with change in lung volume

C Increased by stimulation of adrenergic receptors

D Can be measured by flow rate divided by pressure difference between mouth and alveolus Measured by pressure difference divided by flow rate.

E Increased by breathing helium-oxygen mixture

(Q42 Jul 01)

RE44 [Jul01]

The effect of decreasing airway diameter has the following effect on airway resistance:

A. 1/8

B. ¼

C. ½

D. 4 times

E. 16 times if the diameter is halved

RE45 [Mar02] [Jul02] [Mar03] [Jul03]

Gas composition of air?

```
   PO2          PCO2 PN2  P other gases
```

A. 20.98 O.4 ?

B. 20.98 0.4 ?

C. 21 0.04 ?

D. 20.98 0.04 78.58 0.42

E. 20.98 0.04 78.2 0.98

Also: “A question on fraction of gases in normal air ie Oxygen 20.98, Carbon dioxide 0.04 Nitrogen 78.08 and other gases ?- with very little difference between the percentages.”

I agree with E. This is from Ganong: "The composition of dry air is 20.98% O_2, 0.04% CO_2, 78.06% N_2, and 0.92% other inert constituents such as argon and helium"

I guess if you can't be bother to remember argon, just remember that O_2 21% + N_2 78% = 99%, knowing CO_2 is 0.04%, the rest is going to be near **0.9%!**

RE46 [Mar02] [Jul02] [Feb04].

What happens to lung function in COAD

A. Decreased static compliance Static compliance is increased in emphysema but unchanged in chronic bronchitis

B. Increased TLC

C. Decreased airway resistance

D. Increased FEV1

E. ??

RE47 [Mar03] [Jul03] [Feb04] [Jul04] [Mar05]

The amount of oxygen dissolved in plasma is

A. 0.03ml O2/100ml at PaO2 100mmHg

B. 6ml O2/100ml breathing 100% O2 at 3 atmospheres

C. 6ml O2/100ml breathing room air at 3 atmospheres

D. 0.3ml O2/l breathing room air at 1 atmosphere

E. 6 mlO2/100mls breathing 100% O2

RE48 [] [Mar03] [Jul03] [Jul04]

Closing capacity (in young adults)

A. Increases with anaesthesia - decreases in parallel with FRC

B. 10% vital capacity = closing volume

C. Decreases with age - ↑s

D. Responsible for relative hypoxaemia in healthy adult patients under anaesthesia due to shunt

E. The same as FRC in elderly supine patients - CC>FRC in elderly 44yr in supine, 66yr in erect

RE49 [Mar03] [Jul03] [Feb04] Measurement of Functional residual Capacity (FRC):

A. Helium dilution does not measure unventilated spaces on chest
B. Body plethysomography inaccurate if high FIO2 used
C. Helium used to decrease airflow viscosity - because poorly soluble
D. Body plethysomography requires oesophageal probe
E. ?

RE50 [Mar03] [Jul03] [Feb04] The absolute humidity of air saturated at 37C:

A. 760 mmHg
B. 47 mmHg
C. 100%
D. 44g/m3 - should be 44mg/l or 44g/m3
E. 17mg/m3

- Absolute humidity is the **mass** of dissolved water vapour per **unit volume** of total moist air.
- Absolute humidity of air saturated at 37°C is 44mg/L = 44g/m^3
- Absolute humidity of air saturated at 20°C is 17mg/L = 17g/m^3
- i.e. 47mg/L water vapour is added on inspiration from "room temperature" to body temperature.

RE51 [Jul03] [Feb04] [Jul04] Surface Tension

A. Is inversely proportional to the concentration of surfactant molecules per unit area
B. Cause the small alveoli to collapse into the larger ones
C. ?
D. ?
(This question renumbered from CM31)

RE52 [Jul03] Atelectasis causes hypoxaemia because of:

A. ?
B. ?
C. ?

D. ?
E. Increased shunt & V/Q Mismatch

RE53 [Feb04] Which of the following is closest value for mixed venous PO2 breathing 100% oxygen?

A. 50 mmHg
B. 75 mmHg
C. 100 mmHg

The pO_2 of mixed venous sample in a normal healthy person is about 40mmHg (and 75% oxygen saturation of Hb).

PvO2 will be only about 10mmHg higher in venous blood when breathing 100% oxygen.

The pO_2 of mixed venous sample in a normal healthy person is about 40mmHg (and 75% oxygen saturation of Hb).

For FiO2 of 21%:

PAO2 = 149 - 40/.08 + 2 = 101mmHg *[let us assume A-a gradient of 4mmHg]*

PaO2 = 97mmHg *[let us assume SpO2 = 98%; and Hb = 120g/L, or 12g/dL]*

CaO2 = 1.39 x 12 x .98 + 0.003 x 97 = 16.28 ml/100ml *[let us assume 4.8ml/100ml extraction]*

CvO2 = 16.28 - 4.8 = 11.48 ml/100ml

Now, this part is a bit dodgy mathematically, but: Because CvO2 = 1.39 x 12 x SvO2 + 0.003 x PvO2, for ease of math I'm going to assume 0.003 x PvO2 is insignificant;

Therefore SvO2 = 11.48/(1.39x120) = 68.8%

And if we refer to the O2 dissociation curve... **PvO2 =~ 35mmHg**

For FiO2 = 100%

PAO2 = 713 - 40/.08 + 2 = 663mmHg

PaO2 = 659mmHg *[let us assume SpO2 = 100% with the higher FiO2, just for the benefit of my consultant]'*

CaO2 = 1.39 x 12 x 1 + 0.003 x 663 = 18.67 ml/100ml *[let us assume 4.8ml/100ml extraction]*

CvO2 = 18.67 - 4.8 = 13.87 ml/100ml

Therefore SvO2 = 13.87/(1.39x120) = 83.2%

And if we refer to the O2 dissociation curve... **PvO2 =~ 48mmHg**

RE54 [Feb04] [Jul04] Which of the following is the best explanation for the different effects on PaO2 and PaCO2 of VQ mismatch?

A. Different solubilities of O2 and CO2
B. Different dissociation curves
C. Effect of compensatory hyperventilation

RE55 [Feb04] Functional Residual Capacity

A. Decreases with age - doesnt change with age. just CC & FRC relationship. established in neonate at 60mins post birth
B. Decreases with obesity

RE56 [Jul04] Correction of hypoxaemia in anaesthetised patient:

A. Increase airway pressures between breaths
B. V/Q matching
C. Decrease dead space

RE57 [Jul04] [Feb12] Lung compliance

A. Measurement requires a respiratory laboratory - need oesophageal manometry
B. dynamic greater than static (or other way round)
C. Static and dynamic same in emphysema
D. Difference between static and dynamic due to airflow resistance & tissue elastance
E. Due to surface tension - surface tension ↓s compliance

RE58 [Mar05] Barometric pressure is half that of sea level at:

A. 550m
B. 1500m
C. 5500m
D. 7000m
E. 19500m

- Options also remembered as: A. 1000m, B. 2500m, C. 5000m, D. 7500m, and E. 10,000m
- and as: A. 500m, B. 3500m, C. 5500m, D. 7500m, E. 10500m

RE59 [Mar05] [Jul05] Regarding O2 carriage in blood (or regarding red blood cells):

A.
B.

C. HbS less soluble than HbA HbS where valine replaces glutamic acid on beta-chain causes critical loss of solubility if reduced Hb leading to polymerisation and "sickle" shape of Hb at PaO2 less than 40mmHg
D.
E. MetHb has 85% the O2 carrying capacity of normal Hb - unable to carry O2
(Comment: A,B,D were all wrong I'm pretty sure so I put C as E is also wrong. Another similar comment: A,B,D all involved changes in 2,3 DPG and all wrong)

RE60 [Jul05]

The greatest increase in venous admixture is due to: ie shunted blood

A. Hypoventilation

RE61 [Jul05] [Mar09] [Jul09] Static lung compliance typically 200ml/cmH2O (1mmHg=1.36cmH2O)

A. Is change in pressure per unit volume = volume/pressure
B. Affected by airway resistance
C. Is equal to pulmonary elastance - inverse of it
D. Depends upon surface tension forces
E. Combination of lung and chest wall compliance
F. ?...surfactant ...

factors affecting static compliance:

3. lung vol (normally measured at FRC. If only 1 lung dV is half that for a given dP)
4. FRC variation due to body size (specific compliance 0.05cmH2O relates changes in dV & dP to FRC (dV/dP)/FRC)
5. pulmonary blood vol (comp v with congestion)
6. alveolar collapse
7. lung disease

RE62 [Jul05] Gas solubilities with decreased temperature (Also remembered as "Under a general anaesthetic, if a patient becomes hypothermic, you can expect to see:)

A. Increased PaCO2, Decreased PaO2
B. Increased PaCO2, Increased PaO2

C. No change in PaCO2 or PaO2 (OR: PaO2 no change, decreased PaCO2)
D. Decreased PaCO2, Increased PaO2
E. Decreased PaCO2, Decreased PaO2
Both O2 and CO2 - increased solubility with hypothermia

Solubility is inv proportional to pp so O2 & Co2 will ↓

RE63 [Feb06] Anatomical dead space

A. measured by carbon monoxide inhalation
B. 2ml/kg in average adult.
C. ?

RE64 [Feb06] With regard to dead space:

A. Bohr equation can be used for anatomical dead space
B. Nitrogen washout can be used for alveolar dead space anatomical dead space
C. Physiological dead space calculated from end-tidal CO_2
D. Physiological dead space can be calculated from end-tidal CO_2 and alveolar CO_2
↳ should be mixed expired

RE65 [Feb06] Regarding the work of lungs in breathing:

A. ?
B. Most work is to overcome airway resistance
C. Increased by increasing respiratory rate (i think)
D. ?
E. Work done is determined by integral of pressure volume loop

RE66 {Feb06] A-a gradient is increased with:

A. atelectasis
B. venous admixture - because 50mmHg A-a gradient is so high. Others will prob also cause ↑Aa gradient as well
C. Hypoventilation
D. reduced cardiac output
E. increased diffusion distance for oxygen
Alt stem wording: RE66b A-a gradient of 50mmHg in a patient breathing room air is most likely due to (*stem definitely correct*):

RE67 [Jul10] What percentage of total blood volume is found in the pulmonary **capillaries**?

A. 1%
B. 3%
C. 9%
D. 11%
E. 15%

pulmonary circulation has the capacity to hold 400-500mL blood as a reservoir. Which would make it 8-10%
*3% is in the **pulmonary** capillaries*

RE68 [Feb11] Blood draining from an unventilated part of lung will have an O2 composition identical to

A. Coronary sinus - high O_2 extraction and pO_2 of ~20mmHg
B. Pulmonary artery
C. Bronchial artery - from origins in the aorta and therefore have a normal systemic P_aO_2
D. Alveolar gas

RE69 [Feb12] Most likely cause of hypoxaemia post abdominal surgery?

A. Increased shunt
B. Increased dead space
C. Hypoventilation
D. ?
E. ?

RE70 The anatomical dead space is increased by:

A. Intubation
B. Chin tuck position
C. Moving from supine to erect
D. Moving from sitting to semi-recumbent
E. Bronchospasm

Nunn, factors affecting anatomical dead space:

- size of subject

- age (decrease birth to 6yr; increases early adulthood onwards)
- posture (supine = 2/3 sitting)
- position neck and jaw (increases from neck flexion to extension)
- lung volume end inspiration (increases with increasing volume)
- intubation/LMA (apparatus dead space bypassing 1/2 anatomical dead space)
- drugs (bronchodilators increase)
- Vtidal + RR (reducing Vt reduces dead space as measured by Fowler's method; due to air flow changes)

RE71 [Jul10] [Feb12] The VO2 max for a sedentary 40 year old male is about?

A. 3ml/kg/min
B. 11ml/kg/min
C. 40ml/kg/min
D. 90ml/kg/min
E. 250ml/kg/min

- fit young adult (~42 mL/kg/min)
- sedentary 70 year-old (~17 mL/kg/min)
- athelete = 5L/min
- fit young person = 3L/min

RE72 [Mar03] [Jul03] [Mar10] Respiratory exchange ratio: CO_2 produced / O_2 consumed in one breath

A. Always equals respiratory quotient = very different. **RQ** = CO_2 eliminated / O_2 consumed
B. Increases in strenuous exercise. this = metabolic rate.
C. Decreases after payment of oxygen debt - Decreases whilst repaying oxygen debt - can fall to 0.5
↑s during severe exercise as CO2 ↑s - can go up to 2
D. Is measured at steady state R can be measured at any time

RE73 [Feb08] [Feb12] During normal tidal ventilation

A. Intrapleural pressures between -5 & -8mmHg
B. Alveolar pressures between -2 & +2 cmH2O -1 to +1
C. Tracheal flow is sinusoidal
D. Peak flow is 5L/s

E. ?intrapleural pressure curve is sinusoidal
Alt version: In a normal healthy 75kg person:

A. Intrapleural pressure during tidal breathing is between -5cmH2O to -8cmH2O
B. Alveolar pressure during tidal breathing is between +5cmH2O to -5cmH2O
C. Tidal volume is 400ml - Vt = 7ml/k = 525ml in 75kg
D. inspiration last 1 second, expiration last 4 secs

RE74 [Jul06] [Feb12] FEF 25-75% (forced expiratory flow some proportion of FEV curve)

A. Includes the effort dependent part "It has the theoretical advantage of avoiding measurement during the more effort-dependent first quarter of the FVC."
B. Measured during first half of expiration - is the middle half of expiration of the FVC
C. always related to FEV1
D. fastest / steepest in 1 sec? time is not a consideration
E. Increased in COPD

RE75 [Feb12] With regards to blood sampled from the distal lumen of a pulmonary artery catheter (when it is wedged)

A. PO2 will be the equal to mixed venous PO2
B. PO2 will be less than mixed venous PO2
C. PCO2 will be equal to mixed venous PCO2
D. PCO2 will be less than mixed venous PCO2
E. PCO2 will be more than mixed venous PCO2