



FORMULAE COMPILED

INTEGRATED MODULE



PSM

Cerebellum
Get the balance right

Q. 500 people were monitored in a cohort study out of which 400 were smokers. 50 of these developed lung cancer while 5 non-smokers developed lung cancer. What is the RR?

A. 1.2

B. 12.5

~~C. 2.5~~

D. 5

$$RR = \frac{I_e}{I_{ne}} = \frac{50 \times 10}{400 \times 5} = 2.5$$



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Q. 500 people were monitored in a cohort study out of which 400 were smokers. 50 of these developed lung cancer while 5 non-smokers developed lung cancer. If smoking was eliminated from the community, what proportion of lung cancer cases would decrease?

A. 60%

~~B. 55%~~

C. 50%

D. 40%

PAR

$$= \frac{I_T - I_{ne}}{I_T} \times 100$$

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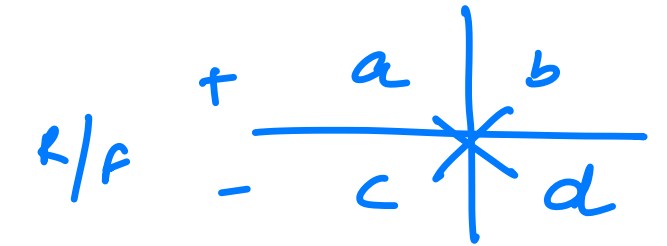
$$= \frac{\frac{50}{400} - \frac{5}{100}}{\frac{50}{400}} \times 100 = \frac{6}{11} \times 100$$

≈ 55%

Epidemiology

+ (D) -

Odds ratio/ Cross product: Case control = $\frac{ad}{bc}$



Relative risk/ Risk ratio : I_e / I_{ne}

Attributable risk/ Absolute risk: $\frac{I_e - I_{ne}}{I_e} \times 100$

Population attributable risk: $\frac{I_T - I_{ne}}{I_T} \times 100$

cohort

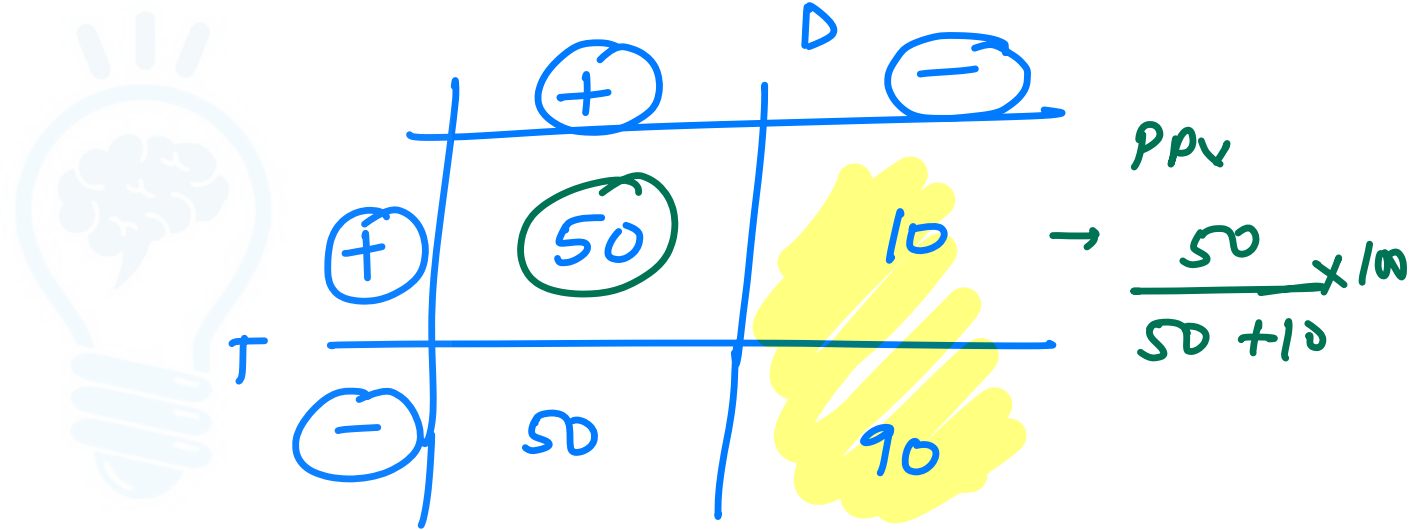
Q. A screening test is positive in 50% diseased population and 10% healthy population. Calculate the PPV

~~A. 83~~

B. 90

C. 50

D. 89



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$$\frac{50}{60} \times 100 = 83$$

Screening

		Disease		
		+	-	
Test	+	a (TP)	b	PPV = $\frac{a}{a+b}$
	-	c	d (TN)	NPV = $\frac{d}{d+c}$
		Sn = $\frac{a}{a+c}$	Sp = $\frac{d}{d+b}$	Prevalance = $\frac{a+c}{a+b+c+d}$

Youden index: $Sn + Sp - 1$

Bayes theorem:

$PPV = \frac{Sn \times prev}{Sn \times prev + (1-sp)(1-pr)} \times 100$

$NPV = \frac{Sp \times (1-pr)}{Sp \times (1-pr) + (1-sn)pr} \times 100$

ROC

80% Sn
85% Sp

BIOSTATISTICS

ALPHA ERROR / p value:

$p < 0.05$ - statistically significant
 $> 95\%$

Confidence level : $1-p$

Power of study:

$1-\beta$

Power of study \uparrow : $\downarrow \beta$, $\uparrow n$, $\uparrow SN$
 (sample size)

$$\sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

= **SD**

1, 2, 3, 6, 10

Coefficient of variation

$\rightarrow \frac{SD}{\text{mean}} \times 100$

two data sets



Confidence interval

Variance = $(SD)^2$

Standard error of mean:

$\frac{SD}{\sqrt{n}}$

$= \text{mean} \pm 2SE$

Standard error of proportion:

$\sqrt{\frac{pq}{n}}$

$p = \text{prev}$
 $q = 1-p$

Sample size

$= \frac{4pq}{d^2}$

$d = \text{abs error}$

Q. A study was conducted to find average IOP. IOP in 400 people was measured and mean was found to be 25mm Hg with a standard deviation of 10mm Hg. What is the range in which IOP of 95% population would fall?

A. 24-26mm

B. 22-28mm

C. 20-30mm

D. 23-27mm

$$\text{SE}_{\text{mean}} = \frac{SD}{\sqrt{n}} = \frac{10}{\sqrt{400}}$$

$$\text{CI} = \text{mean} \pm 2\text{SE} = 25 \pm 1$$

Q. What will be the 95% confidence interval (CI) for an estimated prevalence of 10% and a sample size of 100?

a. 2-18

~~b. 4-16~~

c. 7-13

d. Given data inadequate for calculation of class intervals

$$\frac{10\% \pm \frac{2 \times 3}{2 \times SE}}{10 \pm 6}$$

$$= \sqrt{\frac{Pq}{n}}$$

$$= \sqrt{\frac{10 \times 90}{100}}$$

$$= 3$$

Q. A study was conducted in a population with prevalence of 10%. The relative precision is 20%, alpha error is 5% and power is 20%. Calculate sample size:

$$\text{abs error} = 20\%$$

$$\begin{aligned} \text{abs error} &= \frac{20}{100} \times 10 \\ &= 2 \end{aligned}$$

$$\frac{4pq}{d^2} = \frac{4 \times 10 \times 90}{2 \times 2}$$

$$\frac{4pq}{20 \times 20}$$

A. 900

B. 3600

C. 400

D. 600

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Q. A study was conducted in a population with prevalence of 10%. The relative precision is 20%, alpha error is 5% and power is 20%. Calculate sample size:

- A. 900**
- B. 3600**
- C. 400**
- D. 600**



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Q In a study to evaluate anti-hypertensives, it was found that diuretics decrease the diastolic blood pressure by 20% with a p-value of < 0.1. What does this p-value imply?

~~< 0.1~~
10%

$p < 0.05$

- A. The test is 90% reproducible ✗
- B. 90% of the patients will have greater than 20% reduction in blood pressure ✗
- C. ~~It can be said with 90% confidence that the result, i.e. 20% reduction in blood pressure is true and not by chance~~
- D. It can be said with 10% confidence that the result, i.e. 20% reduction in blood pressure is true and not by chance ✗

BIOSTATISTICS

Mode = 3median - 2mean - Bimodal

Probability:
Mutually exclusive: Addition

Independent factors: multiplication

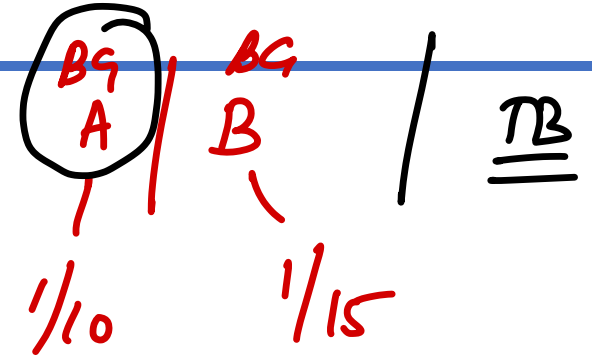
Odds: $= \frac{p}{1-p}$

Degree of freedom: Chi square - $(r-1)(c-1)$

ARR: $\frac{\underline{CER} - \underline{EER}}$

RRR: $\frac{CER - EER}{EER}$

NNT: $\frac{1}{ARR}$



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• exp drug = EER

• Control grp = CER

Q. A study was conducted to assess the effectiveness of a new treatment for a particular disease. In the control population, there were 36 deaths/treatment failures out of sample of 120. With the new treatment, 26 treatment failure were reported from a sample size of 130. How many patients should be treated to avert a single death?

NNT

A. 100

B. 10

C. 250

D. 160

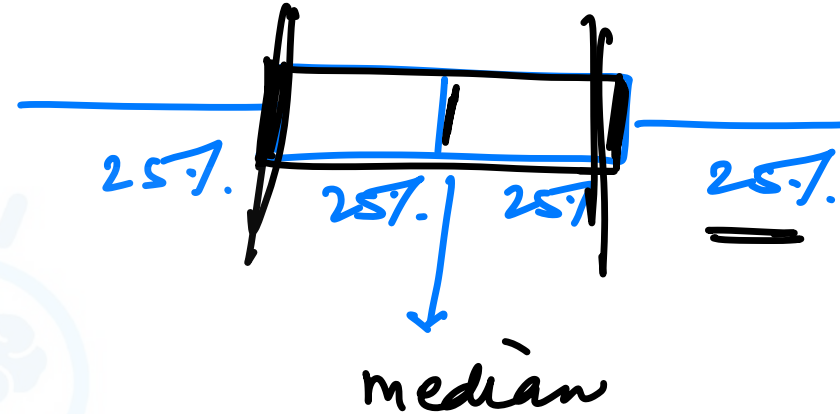
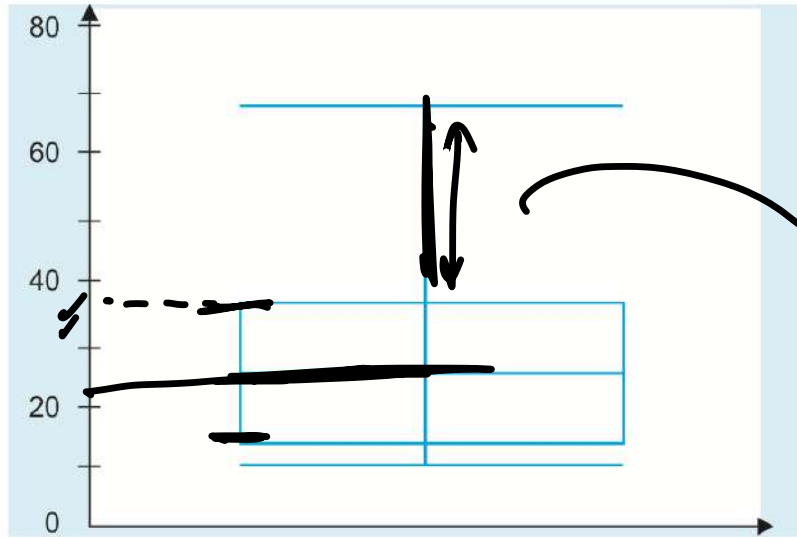
$$CER = \frac{36}{120} = \frac{3}{10}$$

$$EER = \frac{26}{130} = \frac{2}{10}$$

$$ARR = \frac{1}{10}$$

$$NNT = 10$$

Q. Graph of vitamin D value post ANC supplementation. Which option is wrong?



- A. 75% of values are >36 mg ×
- B. Positively skewed T
- C. Interquartile value 12-36 mg T
- D. Median at 24 mg T

Health and disease

Prevalence: cross-sectional $\frac{\text{total cases}}{\text{total pop}^n} \times 100$ — Proportion

Incidence: Cohort $\frac{\text{new cases}}{\text{pop}^n \text{ at risk}} \times 10000$ — Rate

Attack rate: $\frac{\text{new cases}}{\text{pop}^n \text{ at risk}} \times 10000$ — Extent of epidemic

~~Q.Q~~ Secondary attack rate (SAR): $= \frac{\text{sec cases in LHP}}{\text{susceptibles in clac}} \times 100$

Proportional mortality rate:

$\frac{\text{deaths due to a cause}}{\text{total deaths}} \times 100$



Case fatality rate:

$\frac{\text{deaths}}{\text{total cases}} \times 100$ → virulence

→ burdest of disease

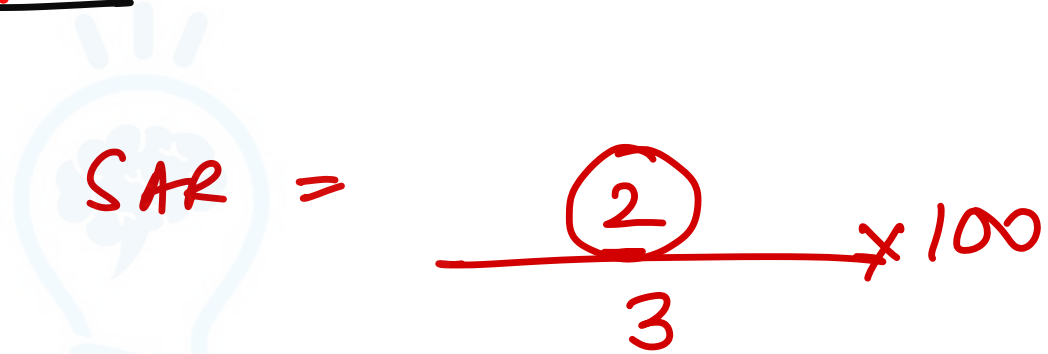
Q. In a family of 4 children who were all unvaccinated, a child developed measles on 4th Aug 2023. 2 other children developed measles by 15th Aug 2023. 5 other children in the neighbourhood developed measles on 1st September. Calculate the SAR

A. 50%

B. 33%

~~C. 66%~~

D. 75%



A handwritten calculation for the Secondary Attack Rate (SAR). It shows the formula $SAR = \frac{2}{3} \times 100$. The number 2 in the numerator is circled in red. The number 3 in the denominator is also circled in red. The entire calculation is written in red ink.

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Demography

MYP = 1st July

Crude birth rate $\frac{\text{total births / MYP} \times 1000}{-} = 16.9$

Crude death rate $\frac{\text{total deaths / MYP} \times 1000}{-} = 9.1$

Annual growth rate: $\frac{CBR - CDR}{10} - \text{census '11} = 1.64\%$

Rule of 70

GFR = $\frac{\text{Number of births to women aged 15-44/49}}{\text{Mid-year population of women aged 15-49}} \times 1000$

Total fertility rate (TFR): Completed family size — 2.1

The sum of the **ASFR** for all reproductive age groups for a particular period

CPR = >60%

Gross Reproduction Rate (GRR):

Sum of the **ASFR (births of daughters)** for all reproductive age groups for a particular period

Net reproduction rate (NRR): Best — 1

Average number of **daughters** that would be borne, according to specified rates of **mortality** and **ASFR**, by a new-born female

Literacy rate = $\frac{\text{literates}}{\text{pop}^n} \times 100$ 74% - Census 11

Sex ratio $\frac{\text{♀}}{\text{♂}} \times 1000$ 943

Child sex ratio 0-6y $\frac{\text{♀}}{\text{♂}} \times 1000$ 919

Dependency ratio $\frac{<15 + >65}{15-65yr}$ 97

Maternal mortality ratio $\frac{\text{mat deaths}}{\text{LB}} \times 1 \text{ lakh}$ 42d^r

U5MR = $\frac{\text{US deaths}}{\text{LB}} \times 1000$ 32

IMR = $\frac{\text{Infant}}{\text{LB}} \times 1000$ 28

NMR = $\frac{\text{Infant}}{\text{LB}} \times 1000$ 20

PNMR = $\frac{28d}{\text{LB}} \times 1000$ 18

SBR = $\frac{28d}{\text{LB}} \times 1000$ 21

*Maternal mortality rate

$\frac{\text{mat deaths}}{\text{♀ in 15-49y}} \times 1 \text{ lakh}$

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$\frac{>28wk + 0-7d}{\text{LB}} \times 1000$ Combined

Child survival index $\frac{1000 - \text{U5MR}}{10}$ still borns → total borns >28wk PO4 / >1000g

Q. In a community, there are 2500 live births in the last one year. During the same period, there are 5 deaths due to PPH, 3 due to peripartum sepsis, 2 due to CPD and 5 due to electrocution. What is MMR?

42d

~~A. 400~~

B. 4000

C. 4

D. 40

$$\text{MMR} = \frac{5 + 3 + 2}{2500} \times \frac{40}{10000}$$

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Q. In a community of 10000 population, 105 children were born in a year. There were 5 stillbirths, 2 died in the neonatal period due to prematurity while 2 died in the next 6 months due to diarrhea. Calculate the IMR

A. 4

B. 40

C. 9

D. 90

$$= \frac{4}{105 - 5} = \frac{4}{100} \times 1000$$

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Communicable and Non-communicable diseases

House index } Dengue / YF - Aedes
 Breteau index } = $\frac{H+}{H} \times 100 = \frac{C+}{H \text{ total}} \times 100$

API — $\frac{\text{new cases of malaria}}{\text{Cases at risk}} \times 1000$ > 5% ☹️
 ABER — $\frac{\text{slides}}{\text{popn}} \times 100$ — operⁿ eff. API ≥ 2 ☹️ ⇒ 20 ☹️

SPR — $\frac{\text{slides} + \text{slides}}{\text{slides}} \times 100$

Quetelet index = BMI $\frac{\text{kg}}{\text{m}^2}$

Ponderal index = $\frac{\text{wt (g)}}{(\text{cm}^3)} \times 100$

Broca index ideal wt = Ht (cm) - 100

Corpulence index actual wt / desirable wt < 1.2

Q. In a community of 100000 people, 5000 slides were examined for malaria. 100 came out to be positive. Calculate the API

A. 1

B. 10

C. 0.5

D. 2

Handwritten calculations for API:

$$\text{API} = \frac{100}{5000} \times 100000$$
$$\text{API} = \frac{100}{5000} \times 10^5$$

Watermark: Cerebellum Get the balance right

Miscellaneous

Chlorine demand: $n \times 2g$ \longrightarrow 455 L of water

Pearl index: $\frac{\text{no. of accid}}{\text{H W U Y}} = \frac{\text{no of accid preg}}{\text{months} \times \text{♀}} \times 1200$

Pregnancy wastage factor: 10%

Vaccine wastage factor:

Vaccine	Maximum acceptable wastage
BCG	50% and the wastage multiplication factor for calculation is 2.0.
Measles, Rota and JE	25% and the wastage multiplication factor for calculation is 1.33.
PCV, IPV, OPV, Pentavalent, Hepatitis B, DPT, TT	10% for all vaccines eligible for reuse under the open vial policy. The wastage multiplication factor for calculation is 1.11.

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Q. In a community of 5000 people, CBR is 30 per 1000 people. The number of pregnant females?

150 + 10%

A. 150

~~**B. 165**~~

C. 185

D. 200



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Q. In a community of 5000 people, CBR is 30 per 1000 people. The number of pregnant females registered by ANM?

A. 165

B. 150

C. 80

D. 30

165

ANC registra

50%



5000
Q. In a subcentre population, CBR is 30 per 1000 people. The number of BCG vaccine doses to be held in the PHC?

- ~~A. 300~~
- B. 150
- C. 165
- D. 320

Infants (births) \Rightarrow 150 $\times 2$



Q. You went to a subcenter as part of an audit. How many infants should be registered with a health worker working there?

$$\frac{1}{5000}$$

$$\text{CBR} = \frac{16.9}{1000}$$

$$17 \times 5000$$

A. 80

B. 100

C. 90

D. 75

$$= 85 \text{ babies}$$

$$\text{IMR} = \frac{28}{1000} \times 85$$

$$85 - \frac{28 \times 85}{1000}$$

Q. 20 accidental pregnancies happen after 100 women used a new contraceptive device for 2yrs. What is the pearl index?

A. 0.1

B. 1

C. 5

~~D. 10~~

$$\frac{20}{100 \times 24} \times 1200 = 10$$

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Pharmacology

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Volume of distribution = $\frac{\text{amt of drug (g)}}{\text{Conc (g/L)}}$

Half life = $\frac{0.7 \times \text{Vd (L)}}{\text{CL (ml/min)}}$

Clearance

$= \frac{UV_x}{P_x}$

Loading dose

$= \frac{\text{Conc} \times \text{Vd}}{f}$

Maintenance dose

rate of infusion

$= \frac{\text{Conc} \times \text{CL} \times \text{dosing interval}}{f}$

Therapeutic index

$= \frac{\text{LD}_{50}}{\text{ED}_{50}}$

Q. 4g of drug A is administered to a patient and the plasma concentration is found to be 50mg/l. What is the volume of distribution?

A. 10l

~~B. 80 L~~

C. 6l

D. 4l

$$= \frac{4 \times 1000}{50} =$$

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Q. A 40 year old male patient weighing 60kg is treated with an experimental drug which is available as oral tablet with BA of 90%. The V_d is 2L/kg and the desired steady state concentration is 3mg/l. The clearance is 50ml/min. What is the most appropriate loading dose?

- A. 100mg
- B. 150mg
- C. 360mg
- D. ~~400mg~~

$$= \text{Conc} \times V_d$$

$$= \frac{3 \times 2 \times 600}{0.9}$$

$$= \frac{3600}{0.9}$$

$$= 4000$$

Q. A 40 year old male patient weighing 60kg is treated with an experimental drug which is available as oral tablet with BA of 100% given QID. The V_d is 2L/kg and the desired steady state concentration is 2mg/l. The clearance is 20l/hr. What is the maintenance dose?

A. 240mg

B. 160mg

C. 300mg

D. 250mg

$$\frac{2 \times 20 \times 6 \text{ hly}}{1}$$

Cerebellum
Get the balance right

Q. The LD50 of Drug X is determined to be 500 mg, while the ED50 is found to be 50 mg. Calculate the therapeutic index (TI) of Drug X.

A) 5

~~B) 10~~

C) 15

D) 0.01

5/5



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BA ↑

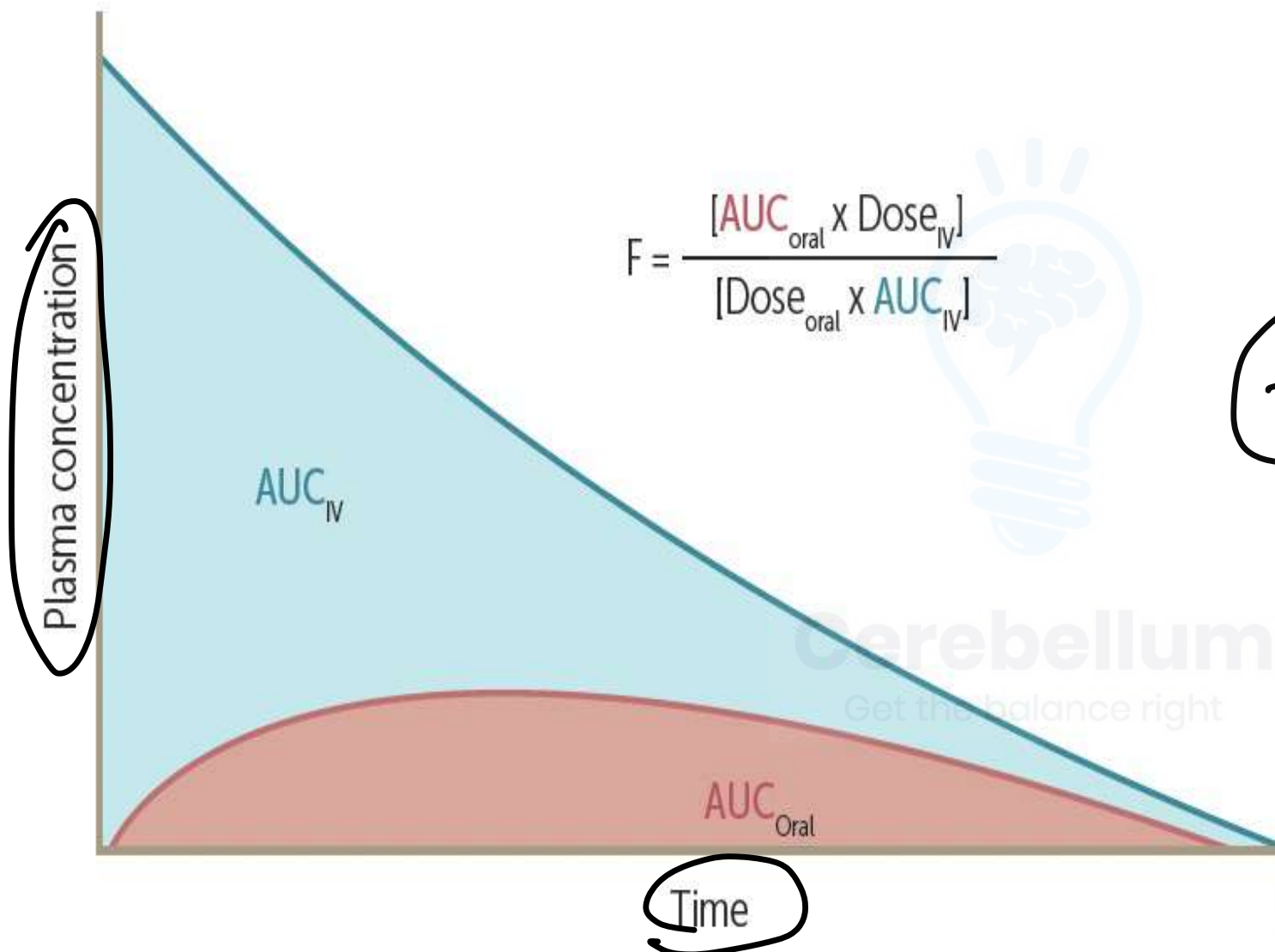
Q. AUC of drug B is 200s while that of drugs A+B is 500s with a p-value of 0.03. Which is the true statement?

A. Drug A increases renal elimination of drug B ×

B. Drug A decreases GI absorption of drug B ↓

~~C.~~ Drug A decreases first pass metabolism of drug B

D. Drug A increases first pass metabolism of drug B ↓



$$F = \frac{[AUC_{\text{oral}} \times \text{Dose}_{\text{IV}}]}{[\text{Dose}_{\text{oral}} \times AUC_{\text{IV}}]}$$

$F = BA$

Q. A drug has a half-life of 12 hours. If the initial concentration of the drug is 200 mg/mL, what would be the approximate time for the drug to reach steady state concentration?

A. 24hrs

B. 60hrs

C. 72hrs

D. 120hrs


$4-5$ half lives
 $=$
48 - 60



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Q. A drug X was given continuous intravenous infusion at 1.6 mg/min. The clearance of the drug is 640 mL/min. With a half-life of 1.8 hours, what would be the steady state plasma concentration of drug?

- A. 2.88 mg/mL**
- B. 0.004 mg/mL**
- ~~C. 0.002 mg/mL~~**
- D. 3.55 mg/mL**


$$\begin{array}{rcl} \text{maint dose} & = & CL \times \text{conc} \\ \frac{1.6}{640} & & | \\ & & 640 \times x \end{array}$$

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Q. 200mg of a drug was administered to a patient. 40mg was cleared in 1.5hrs. How much drug would remain in the body after 3hrs if the drug follows zero order kinetics?

A. 25mg

B. 50mg

C. 128mg

~~D. 120mg~~

Zero
↓
amt

first
↓
fractions

$$200 - 80$$

Q. 200mg of a drug was administered to a patient. 40mg was cleared in 1.5hrs. How much drug would remain in the body after 3hrs if the drug follows first order kinetics?

A. 25mg

B. 50mg

~~C. 128mg~~

D. 120mg

200mg
1
40mg

$\frac{1}{5} \text{ hr}$

160mg

$\frac{1}{5} \times 160 = 32 \text{ mg}$

160 - 32

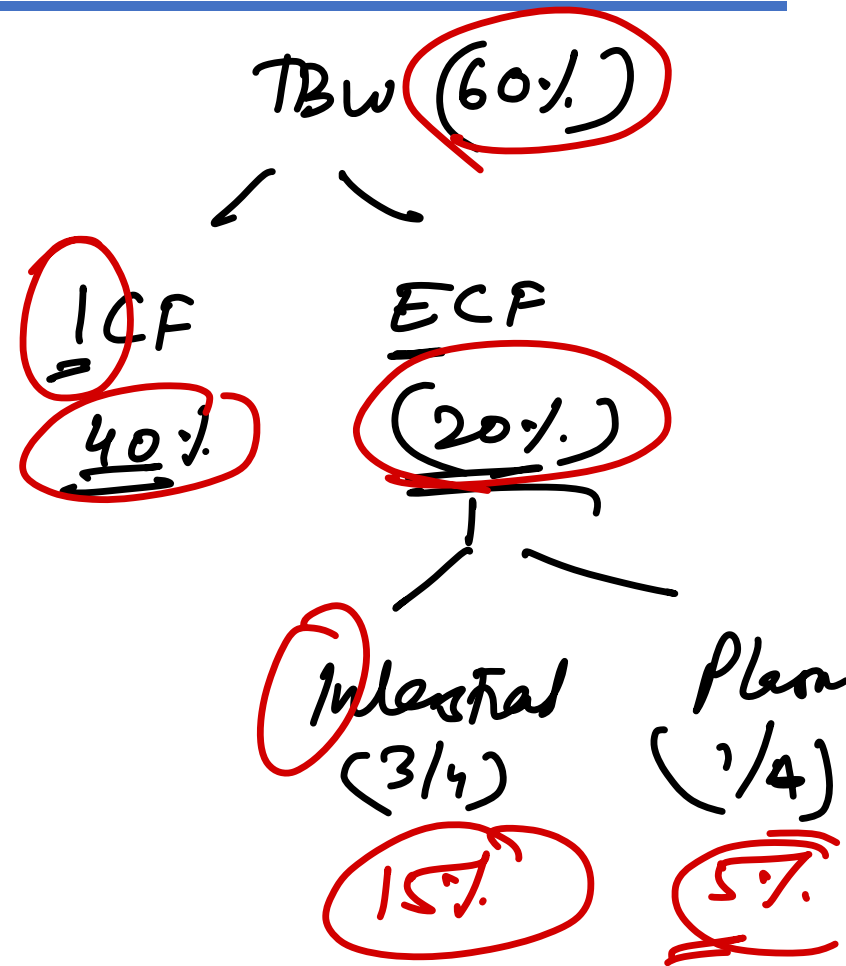
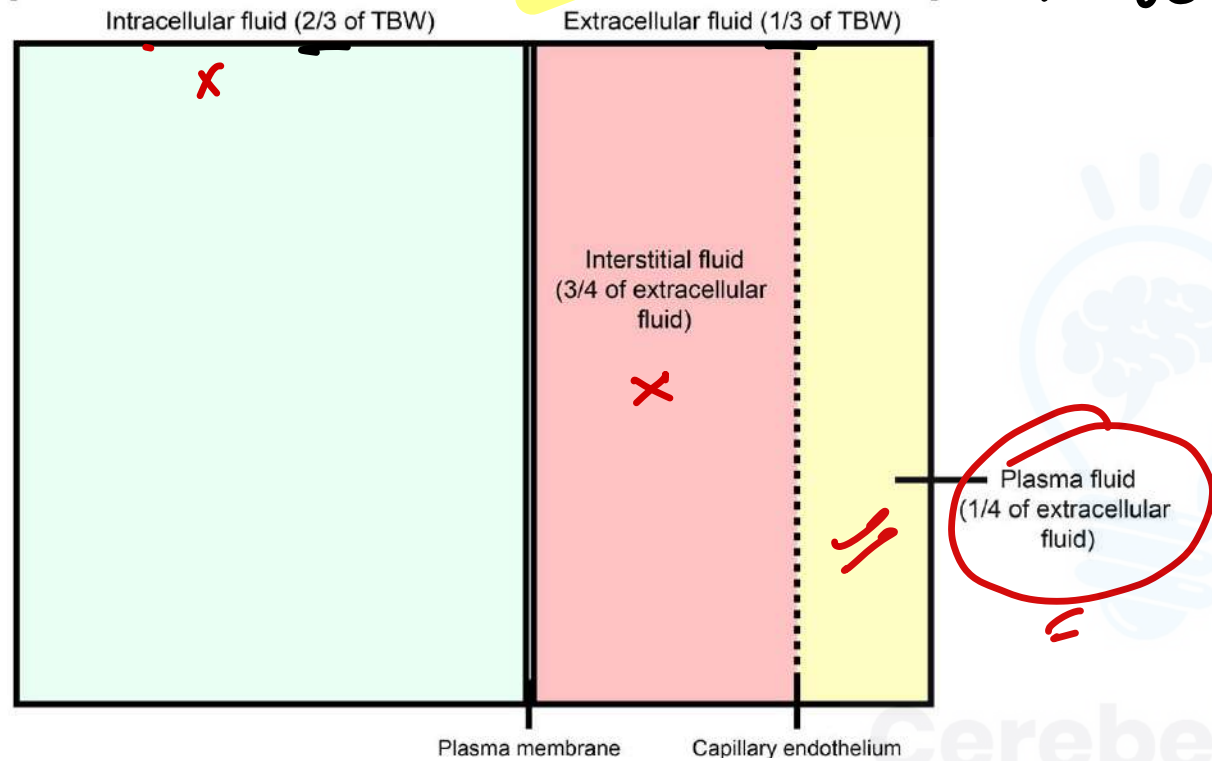


Physiology

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General physiology D20/T20

Total Body Water (TBW) → 60%



RISA
Evans Blue
(T-1824)

Mannitol
Sucrose
Inulin
Na thiosulfate

Q. Q. A patient injected with 500mg of mannitol. The concentration of mannitol in plasma is 3mg/dl. During the equilibrium period, 10% mannitol is excreted in the urine. What is the volume being estimated and which compartment does it belong to?

A. 15l

B. 25l

C. 35l

D. 50l

$$\frac{500 \text{ mg}}{3 \text{ mg/dl}} \times \frac{100}{10} = 15000 \text{ dl}$$

ECF

Cerebellum
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Q. A patient injected with D20 and the volume of the fluid was found to be 48l. If that volume is 60% of the total body weight, what is the plasma volume?

→ TBW

5%

- A. 6l
- B. 12l
- ~~C. 4l~~
- D. 18l

$$48 \times \frac{1}{3} \times \frac{1}{4}$$

$$\begin{array}{r} 60 \quad - \quad 48 \\ 5 \quad - \quad ? \end{array}$$

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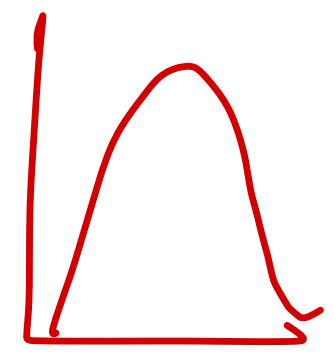
$$\begin{array}{r} 5 \times 48 \quad 4 \\ \hline 60 \quad 12 \end{array}$$

Q. Q.

Q. Calculate the tetanising frequency of the skeletal muscle from the given values: Latent period: 10 msec, Contraction period: 40 msec, Relaxation period: 50 msec

- ~~A. 25Hz~~
- B. 50Hz
- C. 2.5Hz
- D. 250Hz

$$TF = \frac{1}{CP}$$



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$$\frac{1000}{40} = 25 \text{ Hz}$$

Q. A patient got his SBP reduced by 10 mm of Hg when he stood up and he regained only 8 mm of Hg. What was the gain?

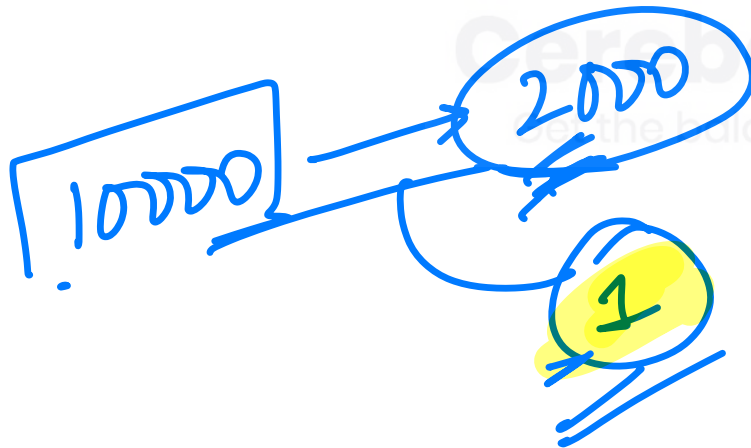
A. 2

~~B. -4~~

C. 4

D. -2

$$\text{Gain} = \frac{\text{Correction}}{\text{error}} = \frac{8}{2} = 4$$



$$\frac{8000}{2000} = 4$$

1999

Q. Sodium concentration is 140 mmol/L, glucose concentration is 90 mg/dL, and BUN concentration is 14 mg/dL. Calculate the serum osmolarity

~~A. 290~~

B. 280

C. 285

D. 295

$$2 \times 140 + 2 \times 90 + 2.8 \times 14 = 290$$

Cerebellum
Get the answer right

General physiology

$$\text{Tetanic frequency} = 1/CP$$

$$\text{Gain} = \text{Correc}^n / \text{error}$$

$$\text{Serum osmolarity} = 2 \times \text{Na} + \frac{\text{glc}}{18} + \frac{\text{BUN}}{2.8}$$

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Get the balance right

Q. A patient's tidal volume (V_t) is 600 mL, and their respiratory rate (RR) is 15 breaths per minute. During PFT, patient has dead space of 150ml, FRC of 2l, ERV of 1.5l and TLC of 6l. Calculate the alveolar ventilation rate.

$$= (V_T - V_D) \times RR$$

$$= (600 - 150) \times 15$$

$$= 450 \times 15$$

$$= 6750$$

~~A. 6.7l/min~~

B. 5l/min

C. 9l/min

D. 10l/min

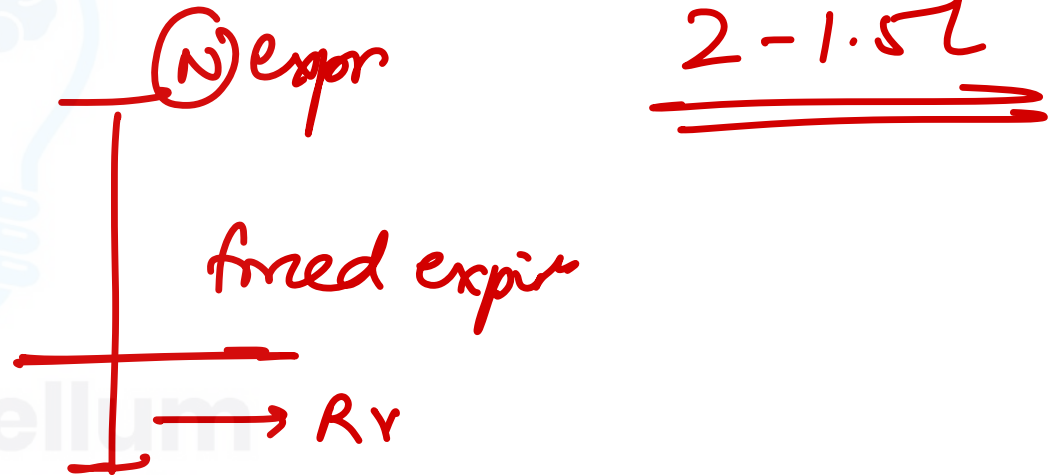
Q. A patient's tidal volume (V_t) is 500 mL, and their respiratory rate (RR) is 15 breaths per minute. During PFT, patient has dead space of 200ml, FRC of 2l, ERV of 1.5l and TLC of 6l. Calculate the residual volume

~~A. 500ml~~

B. 250ml

C. 200ml

D. 100ml



Q. At an altitude of 1300ft, the barometric pressure is 447mm Hg. What is the PiO₂?

A. 60mm Hg

~~B. 84mm Hg~~

C. 72mm Hg

D. 50mm Hg



Cerebellum
Get the balance right

$$\begin{aligned} P_{iO_2} &= (P_B - P_{H_2O}) \times \frac{F_{O_2}}{100} \\ &= \left(\underline{447} - \underline{47} \right) \times \frac{21}{100} \\ &= \frac{400 \times 21}{100} \end{aligned}$$

Q. Calculate respiratory quotient (RQ) in a patient with 50kg body weight, CO₂ exhaled 200ml/min, and O₂ consumed 250ml/min

~~A. 0.8~~

B. 1.2

C. 1

D. 0.6



$$RQ = \frac{CO_2}{O_2} = \frac{200}{250}$$

Cerebellum
Get the balance right

Q. Tidal volume of a person is 500 ml. Intrapleural pressure before inspiration = -4 cmH₂O and after inspiration = -9 cmH₂O. Compliance of the lungs is:

~~A. 100~~

B. 0.01

C. 1

D. 0.1

ΔV



ΔP

~~100~~

100

5

$$\frac{-9 - (-4)}{5}$$

$$= -5$$

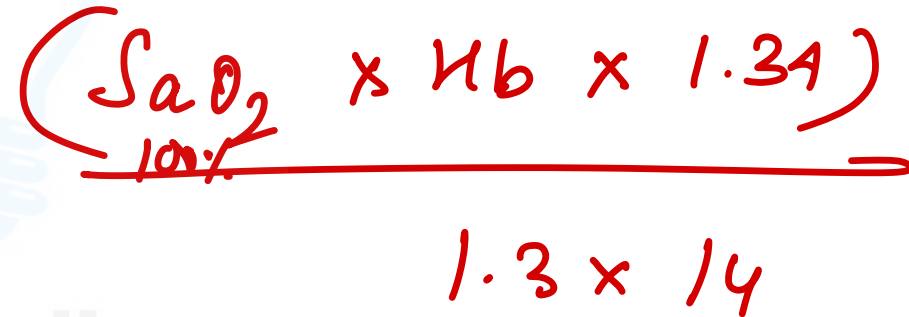
Q. What will be the oxygen carrying capacity of an 18-year-old patient with hemoglobin of 14 g/dL?

A. 14

B. 28

C. 7

~~**D. 18**~~



A handwritten calculation in red ink showing the formula for oxygen carrying capacity: $(\text{SaO}_2 \times \text{Hb} \times 1.34)$. Below the formula, a horizontal line is drawn under the entire expression. Underneath the line, the calculation is simplified to 1.3×14 . A red arrow points from the question text down to the formula.

Cerebellum
Get the balance right

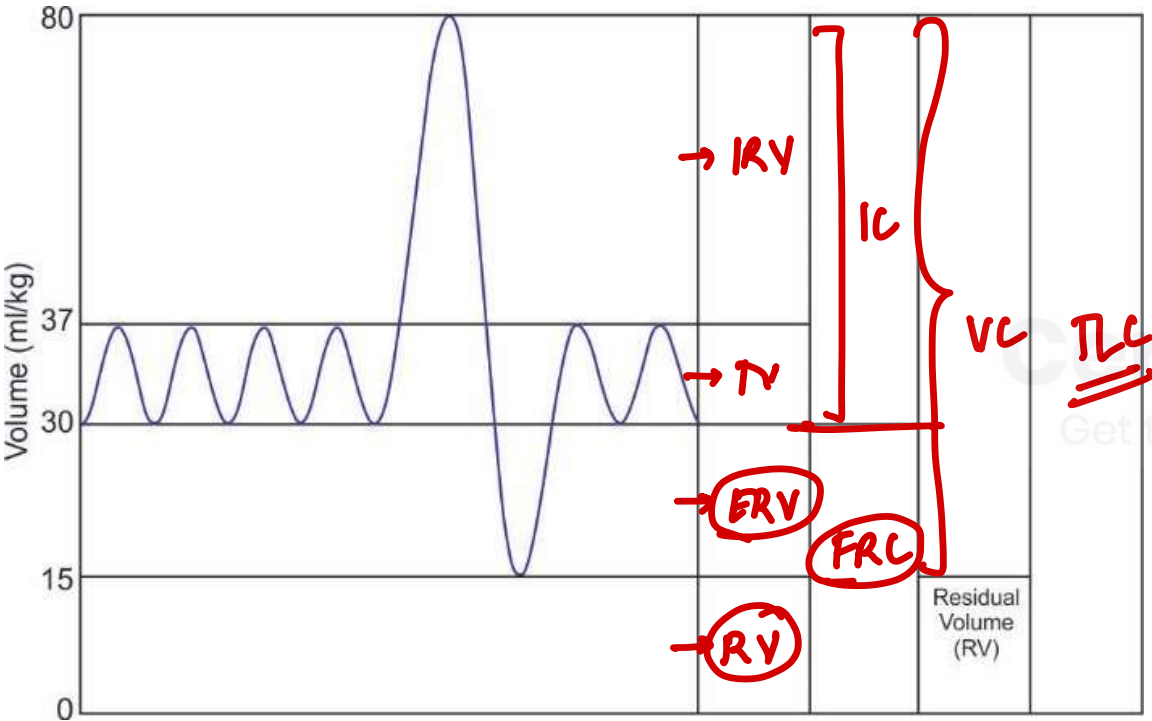
Respiratory physiology

$$\text{MINUTE VENTILATION} = TV \times RR$$

$$\text{ALVEOLAR VENTILATION} = (TV - TD) \times RR$$

Compliance $\Delta V / \Delta P$

$$V_D = V_T \times \frac{P_{aCO_2} - P_{eCO_2}}{P_{aCO_2}}$$



RENAL PHYSIOLOGY

$$\text{Clearance} = \frac{U_x V}{P_x}$$

$$\text{GFR} = C_{\text{inulin}} / \underline{\underline{C_{\text{creat}}}}$$

$$\text{RPF} = C_{\text{PAH}}$$

$$\text{Filtration fraction} = \frac{\text{GFR}}{\text{RPF}} \quad (20\%)$$

Reabsorption rate-

$$\text{FeNa} = \frac{C_{\text{Na}}}{\text{GFR}}$$

$$\text{filtered load} \quad (P_x \times \text{GFR}) \quad - \text{exc load} \quad (U_x - V_{\text{flow rate}})$$

$$\begin{aligned} E_{\text{Na}} &= \frac{U_{\text{Na}} \times V}{P_{\text{Na}} \times V_{\text{creat}}} \times P_{\text{creat}} \\ &= \frac{U_{\text{Na}} \times P_{\text{creat}}}{P_{\text{Na}} \times V_{\text{creat}}} \end{aligned}$$

Clearance: PAH > Creatinine > Inulin > Urea > Na > Glucose

Q. A patient's urine flow rate is 1.2 mL/min. The concentration of a substance X in their urine is 60 mg/mL, and the concentration of the same substance in their plasma is 0.5 mg/mL. What is the likely behavior of the kidney with the substance X

$$GFR = 100 - 120$$

$$= \frac{UV}{P} = \frac{1.2 \times 60}{0.5}$$

$$= \frac{12 \times 60^2}{5}$$

$$C = \underline{\underline{144 \text{ ml/min}}}$$

- ~~A. Tubular secretion~~
- B. Freely filtered
- C. Tubular reabsorption
- D. Neither secretion nor reabsorption



$CL > GFR$ — secret

$CL < GFR$ — reabsorption

$CL = GFR$ = freely filtered

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Q. Calculate the net filtration pressure:

Glomerular hydrostatic pressure (PGC): 60 mmHg

Bowman's capsule hydrostatic pressure (PBC): 15 mmHg

Plasma colloid osmotic pressure (π GC): 25 mmHg

~~A. 20~~

B. 10

C. 60

D. 70

$$60 - 15 - 25$$

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CVS PHYSIOLOGY

Fick's law:
$$\frac{O_2 \text{ consumption}}{A_{O_2} - V_{O_2}}$$

MET:
$$1 \text{ MET} = O_2 \text{ consumed at rest} = \underline{3.5 \text{ ml}} / \text{kg} / \underline{\text{min}}$$

Poiseuille's

$$Q = \frac{\pi P r^4}{8 \eta L}$$

Pressure r^4 radius L length $\eta = \text{viscosity}$

Reynolds number

$$Re = \frac{\rho v L}{\mu}$$

density speed diam viscosity

$Re < 2000$ laminar

Q. What is the cardiac output of a patient when arterial O₂ is 20 ml/dl and venous O₂ is 16 ml/dl and whole body oxygen consumption 300 ml/min:

$$CO = \frac{300}{15}$$

A. 7.5ml

B. 7.5l

C. 7.5dl

~~D. 75ml~~

Q. Calculate the MET equivalent of 1500ml of oxygen consumption per minute for healthy 70kg adult male

A. 2

B. 9

~~C. 6~~

D. 10

$$1 \text{ MET} = \frac{33.5 \times 70}{7} \text{ /min}$$

$$= \frac{245}{1} \text{ /min}$$

$$1 \text{ MET} \text{ --- } 245$$

$$? \text{ --- } 1500$$

$$\frac{1500}{245} = 6.1 \text{ MET}$$

~~1000~~ ~~250~~ ~~80~~ ~~306~~

Q. P-V curve of a patient with a HR of 80bpm is shown. Calculate the Cardiac output and EF of the patient.

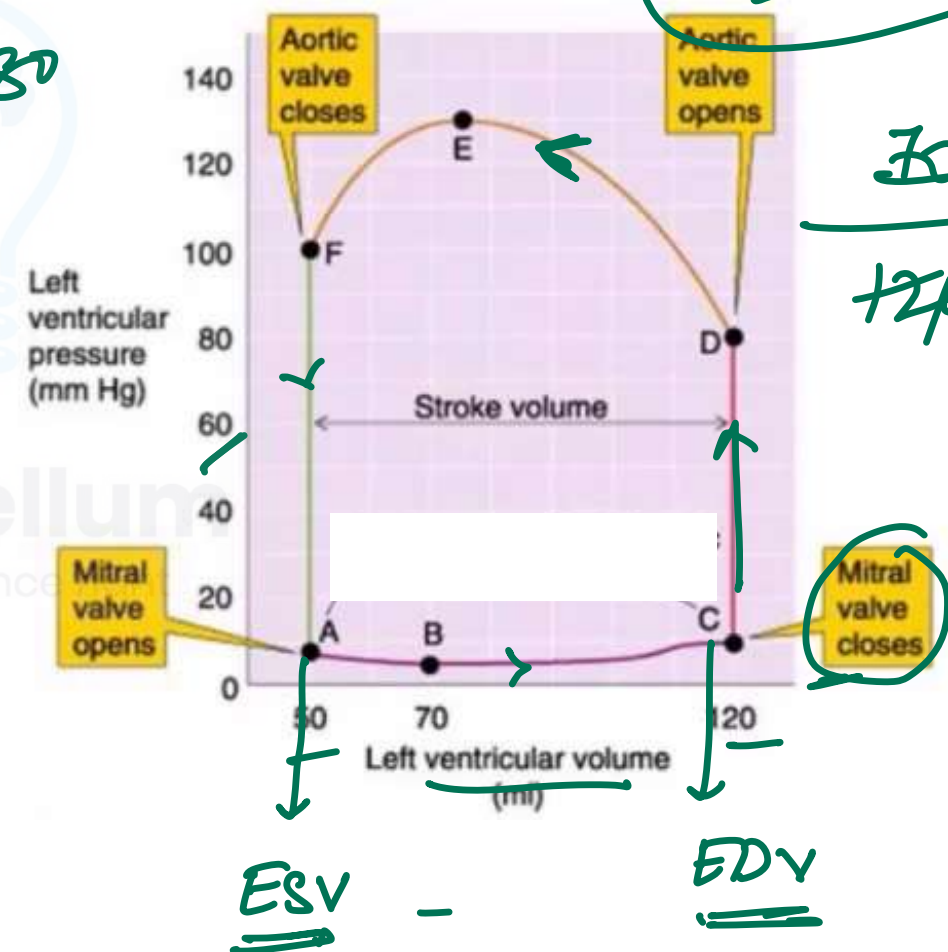
$$CO = SV \times HR$$

$$= (120 - 50) \times 80$$

$$= \frac{SV}{EDV} \times 100$$

$$= \frac{70}{120} \times 100$$

- ~~A. 5.6l, 58%~~
- B. 5.6l, 53%
- C. 6.4l, 55%
- D. 6.4l, 56%



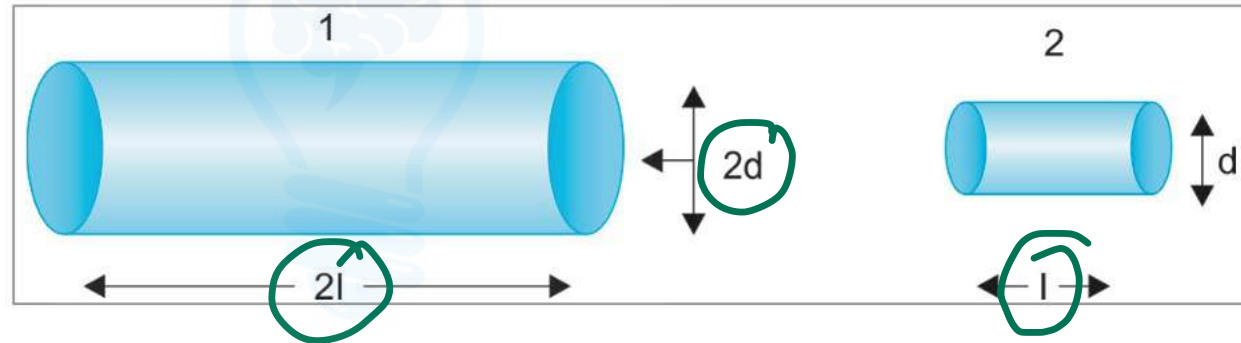
Q. Two vessels are compared as shown below. Assuming constant pressure along both the vessels and linear flow pattern, what will be the flow across the vessel 1 compared to vessel 2?

A. 2 times

B. 4 times

C. 8 times

D. 16 times



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$$\frac{1^4}{L} \frac{\cancel{2} \times 2 \times 2 \times 2}{\cancel{2}}$$

ACID-BASE IMBALANCE

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Acid-base imbalance

pH - 7.4
 Co2 - 40
 HCo3 - 24

	<u>pH</u>	<u>PRIMARY CHANGE</u>	<u>COMPENSATION</u>
<u>METABOLIC ACIDOSIS</u>	↓	HCO ₃ ↓	<u>CO₂</u> ↓ Winter's $(1.5 \times HCO_3 + 8) \pm$ $CO_2 =$
METABOLIC ALKALOSIS	↑	HCO ₃ ↑ ①	<u>CO₂</u> ↑ - 0.7 ↑
<u>RESPIRATORY ACIDOSIS</u>	↓	CO ₂ ↑ < A 10mm C	HCO ₃ ↑ ①
RESPIRATORY ALKALOSIS	↑	CO ₂ ↓ < A C	HCO ₃ ↓ ②

On laboratory investigations in a patient, **pH=7.3**,
pCO₂=35 mm Hg, What is the likely acid base
imbalance?

A. Respiratory acidosis

~~B. Metabolic acidosis~~

~~C. Metabolic alkalosis~~

~~D. Respiratory alkalosis~~



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A patient is having pH-7.12, HCO₃-28 and PCO₂-50 mm Hg. What is the acid base disorder in this patient?

A. Metabolic acidosis with respiratory compensation ✗

~~B. Metabolic alkalosis with respiratory compensation~~

~~C. Respiratory acidosis with renal compensation~~

~~D. Respiratory alkalosis with renal compensation~~

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A patient has the following arterial blood values:

pH=7.52

Pco2=20 mm Hg

HCO3= 16 mEq/L

Which of the following statements is correct?

alkalosis
CO₂ ↓ H₂O ↓
resp

resp alkalosis
renal compensⁿ

A) He is hypoventilating

CO₂ ↑ X

B) Appropriate renal compensation would cause his arterial bicarbonate to increase (↓) X

C) He has almost complete respiratory compensation X

D) He has decreased ionized Ca in blood

alk → Ca-alb

The ABG analysis findings of a patient are given below. Which of the following is the likely diagnosis?

pH: 7.2

HCO₃: 10 mEq/L ↓

PaCO₂: 25 mmHg ↓

Anion gap: 15

12 ± 4

metab acidosis

→ Delta gap

- A. Metabolic acidosis plus respiratory acidosis
- B. High anion gap metabolic acidosis plus metabolic alkalosis
- C. ~~High anion gap metabolic acidosis only~~
- D. High anion gap plus normal anion gap metabolic acidosis

$$\Delta \text{gap} = \Delta \text{AG} - \Delta \text{HCO}_3$$

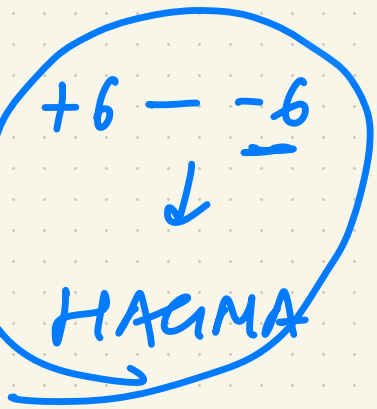
> +6 :
+metab alle

$$= (\text{AG} - 12) - (24 - \text{HCO}_3)$$

< -6 :
+ NAGMA

$$= (15 - 12) - (24 - 10)$$

$$= 3 - 14$$



$$= -11$$