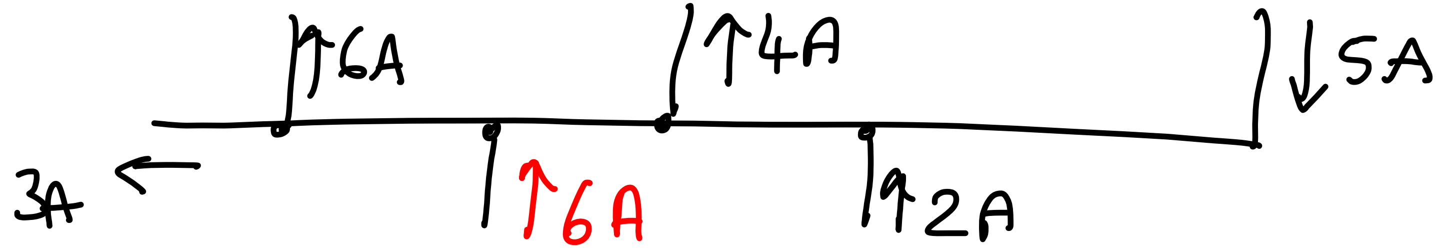
1.3

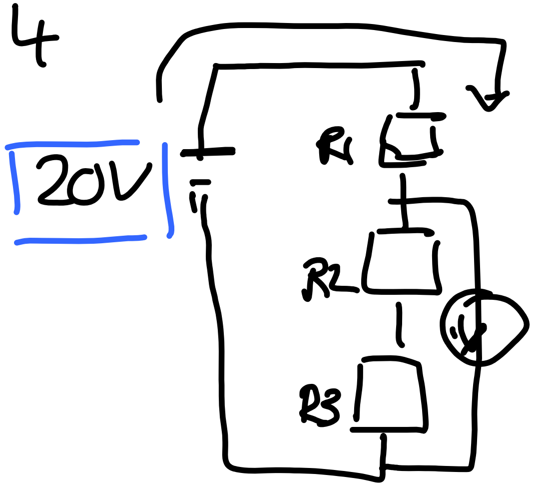


"in" $2A + 5A = 7A$

"aus" $3A + 6A + 4A = 13A$

(A)

1.4



$R_{tot} = R1 + R2 + R3$

$= 6\Omega + 4\Omega + 10\Omega$

$= 20\Omega$

14Ω

U_{23}

I = Strom

U = Spannung

R = resistenz.

$I = \frac{U}{R}$

$1A = \frac{20}{20\Omega}$

14 V (B)

1.13

induction nur wann strom ändert!

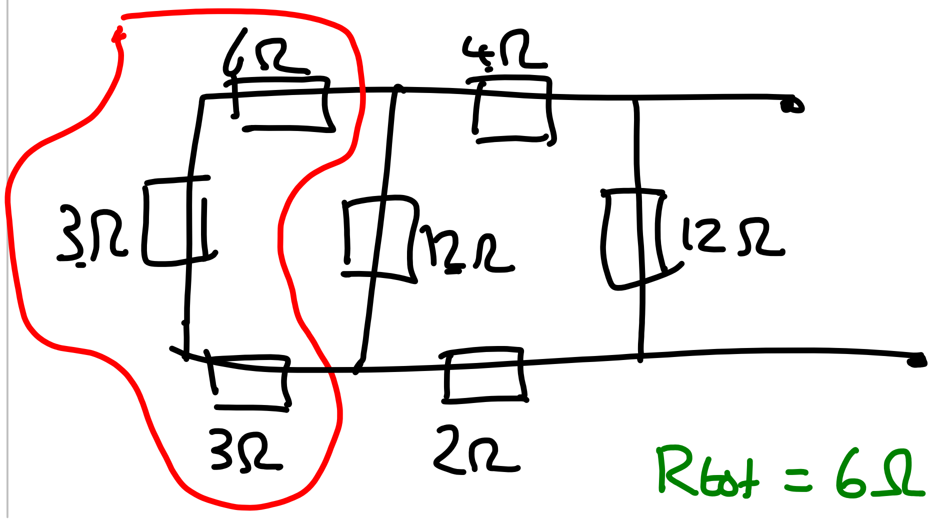
nur wann der schalter ein/aus geht.

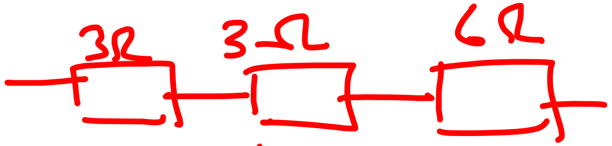
(A)

1.15

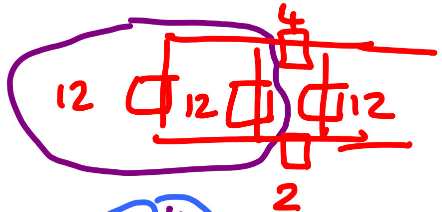
$R_{tot} = R_1 + R_2 \dots + R_n$ (series)

$\frac{1}{R_{tot}} = \frac{1}{R_1} + \frac{1}{R_2} \dots + \frac{1}{R_n}$ (parallel)



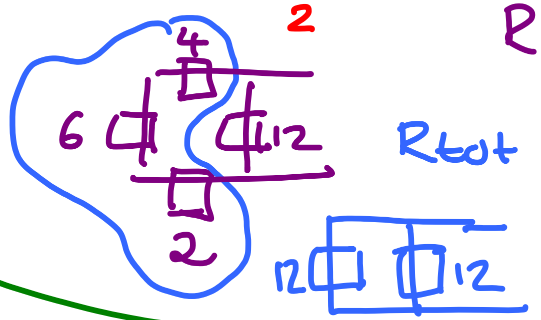


$R_{tot} = 12\Omega$



$\frac{1}{R_{tot}} = \frac{1}{12} + \frac{1}{12} = \frac{2}{12} = \frac{1}{6}$

R_{tot} 6Ω

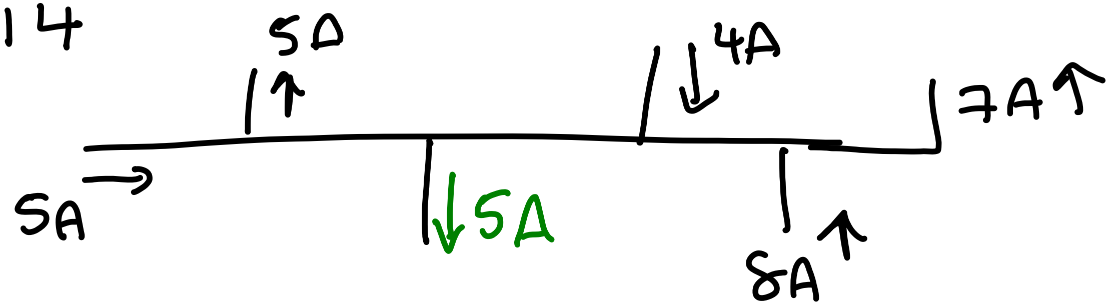


$R_{tot} = 2 + 6 + 4 = 12\Omega$

$\rightarrow \frac{1}{R_{tot}} = \frac{1}{12} + \frac{1}{12} = \frac{1}{6}$

$R_{tot} = 6\Omega$

2.14



"in" 5A + 4A + 8A = 17A   5A   (C)

"aus 5A + 7A = 12 A

2.13

$V_{tot} = 10V + 20V - 15V = 15V$

$R_{tot} = 12\Omega + 20\Omega + 8\Omega = 40\Omega$

$I = \frac{U}{R}$

$I = \frac{15V}{40\Omega} = 0.0375$ A

20 Ω $\frac{1}{2}$ total resistenz

$\frac{1}{2}$ spannungsabfall $\frac{15V}{2} = 7.5V$ (D)

$\Delta U = I \times R$

$7.5V = \Delta U = 0.0375 \times 20\Omega$

2.12

R = resistenz

C = kapazität

τ = zeitconstante

$$\tau = 100 \times 10^{3}\,\Omega \times 100 \times 10^{-6}\,F$$
$$= 100^{2} \times 10^{-3}\,s$$
$$= 10{,}000 \times 10^{-3}\,s$$
$$= 10\,s$$

$$\tau = R \cdot C$$

$$U_c(t) = U_0 \cdot e^{-\left(\frac{t}{RC}\right)} \quad RC \rightarrow \tau$$

$$\rightarrow \frac{U_c(t)}{U_0} = e^{-(t/\tau)}$$

$$\frac{U_c(t)}{U_0} = 0.368$$

$$0.368 = e^{-(t/\tau)}$$

$$\ln 0.368 = -t/\tau$$

$$\ln 0.368 = -\frac{t}{10\,s}$$

$$10 \ln 0.368 = -t$$

$$10_s \cdot -1 = -t$$

$$t = 10\,s$$ → D

1.16. $t_{1/2} = \ln 2 \cdot \tau$

$t_{1/2} = 1.6\,ms$ $\qquad \tau = \frac{t_{1/2}}{\ln 2}$

$\tau = \frac{1.6\,ms}{\ln 2}$ $\qquad \boxed{\tau = 2.3\,ms}$ B

2.15

joules → $J = C\,V$ ← volts (C ← coulombs)

$A = \frac{C}{s}$ ← coulomb, ← sekunden; ↗ ampere

Q = charge mit einheit C

$Q = I \times t$ $\qquad = 5A \times 5ns$

(Q ↓ (C); I ↗ strom (A); t ↖ zeit (s))

$Q = 25\ A\,ns$

$Q = 25\,nC$

$E = Q \times U$ ← spannung (V)

(E ↗ Energie (J); Q ↖ Charge (C))

$E = 25 \times 10^{-9}\,C \times 20 \times 10^{3}\,V$

$= 500 \times 10^{-6}\,J$ ← 1000 mal $500 \times 10^{-3}\,J$

$= 500\,mJ$ D

2.11

in erste 30 min   10 MBq → 9 MBq   10 % änderung

in nächste 30min   9 MBq → 8,1 MBq   10 % änderung

↓ 0.9

1.12

$t_{1/2}$ = 1600 jahre

$\frac{8000}{1600} = 5$ halflife "times"

t = 8000 jahre

1g $\xrightarrow[①]{t_{1/2}}$ 0.5g $\xrightarrow[②]{t_{1/2}}$ 0.25g $\xrightarrow[③]{t_{1/2}}$ 0.125g $\xrightarrow[4]{t_{1/2}}$ 0.0625g $\xrightarrow[⑤]{t_{1/2}}$ 0.03125g

↓

31.25 mg

Ⓔ

1.21

$$\frac{dV}{dt} = \frac{\pi r^4 \Delta p}{8 \eta L}$$

gleich in rohr 1 & 2

$r_1 : r_2 = 1:2$

$r_1 = \frac{1}{2} r_2$

$\frac{r_1}{r_2} = \frac{1}{2}$

$(r_1)^4 = \left(\frac{1}{2} r_2\right)^4$

$= \left(\frac{1}{2}\right)^4 r_2^4$

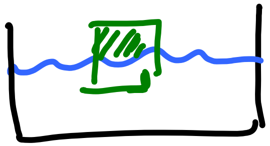
$r_1^4 = \frac{1}{16} r_2^4$

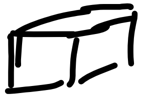
um $\frac{dV}{dt}$ gleuch zu halten wenn r_2 ist doppel so groß wie r_1 muss Δp_1 16 fach großer als Δp_2

$$\frac{\Delta p_1}{\Delta p_2} = \frac{16}{1} = 16 : 1$$

(C)

1.20



 $= 10cm \times 10cm \times 10cm$

$= 1000 cm^3$

$$\rho = \frac{m}{V} \quad \frac{500g}{1000cm^3} = \frac{1}{2} \, g/cm^3$$ ← dichte von wurfel

dichte von wasser $1 \, g/cm^3$

∴ ½ das object wird in das wasser liegen.

½ des Volum ist $500 \, cm^3$ (C)

1.23

1 Bell abnahme 10 fach 10^{-1}

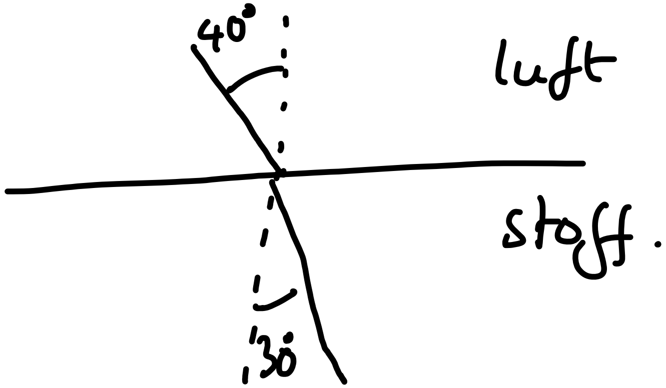
reduziere um 1 Bell → $I \times 10^{-1}$

" 1 dB → $I \times 10^{-0.1}$

" 3 dB → $I \times 10^{-0.3}$

→ $I \times 0.5$ → reduziert um faktor 2 (A)

1.14



Snell's Law

$$n_1 \sin \delta_1 = n_2 \sin \delta_2$$

$$\frac{n_1}{n_2} = \frac{\sin \delta_2}{\sin \delta_1}$$

$$n_2 = \frac{\sin \delta_1}{\sin \delta_2} \times n_1$$

Brechzahl von Luft = 1

$$n_2 = \frac{\sin 40^\circ}{\sin 30^\circ} \times 1 = \frac{0.643}{0.5} = 1.29$$

— B

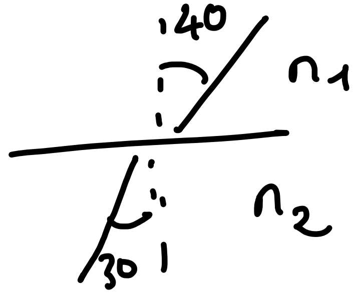
1.8 .

$n = \frac{c}{v}$

Brechzahl (n) · c: lichtgeschwindigkeit in vacuum · v: lichtgeschwindigkeit im stoff

$n_1 \sin \delta_1 = n_2 \sin \delta_2$

je größer der winkel bis 90° desto größer sin δ



$\delta_1 > \delta_2$

laut Snell

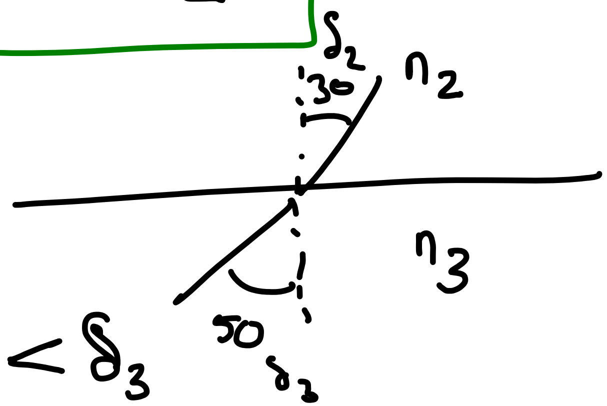
$\sin \delta_1 > \sin \delta_2$

$\therefore n_2 > n_1$

$\frac{n_1}{n_2} < 1$

$\frac{n_1}{n_2} = \frac{c/v_1}{c/v_2} = \frac{c}{v_1} \times \frac{v_2}{c}$

$\frac{n_1}{n_2} = \frac{v_2}{v_1}$ $\therefore$ $v_1 > v_2$



$\delta_2 < \delta_3$

$n_2 > n_3$ $\quad \frac{n_2}{n_3} => 1$

$v_3 > v_1$

$\therefore$ $v_3 > v_2$ $\quad \frac{v_3}{v_2} > 1$

(A) $\Rightarrow v_3 > v_1 > v_2$