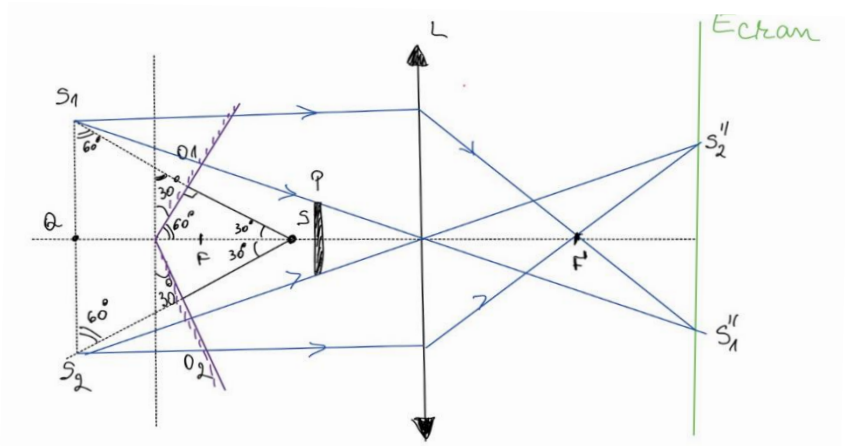
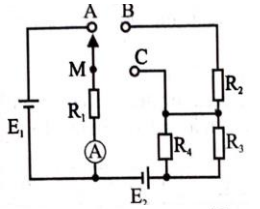
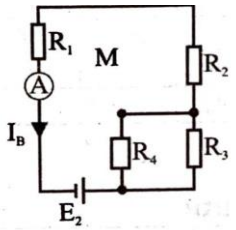
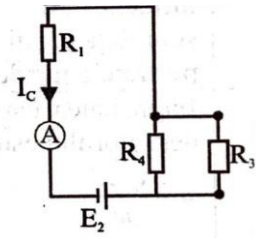
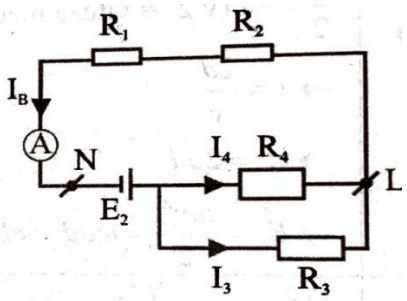
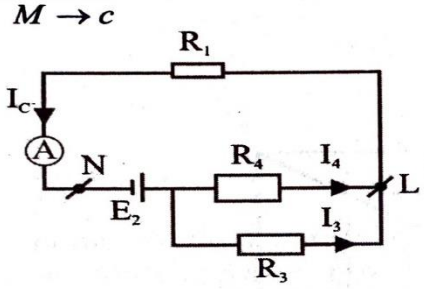
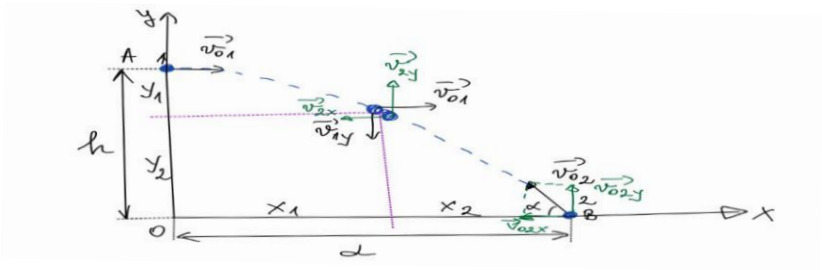
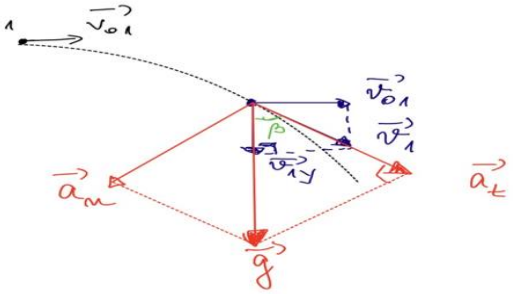
INSPECTORATUL ȘCOLAR JUDEȚEAN GORJ

MINISTERUL EDUCAȚIEI

Barem de evaluare
Olimpiada de Fizică
Etapa locală – ianuarie 2023
Clasa a IX-a

Subiectul I		**10p**
a) S_1, S_2 sunt simetricele lui S față de oglindă. În ΔS_1SS_2 toate unghiurile sunt egale cu 60° ↔ ΔS_1SS_2 echilateral $SO_1 = d_2 \sin 60° = \frac{\sqrt{3}}{2} \cdot d_2$ $S_1O_1 = SO_1 \leftrightarrow SS_1 = S_1S_2 = d_2\sqrt{3} \approx 11{,}98$ cm	2p 1p	3p
b) Deducerea distanței x_1 față de lentilă a imaginilor S_1, S_2 $x_1 = SQ + d_1 - d_2 = 1{,}5\, d_2 + d_1 - d_2 = 12$ cm $C = 1/f \leftrightarrow f = 8$ cm $\frac{1}{x2} - \frac{1}{x1} = \frac{1}{f}$ $x_2 = 24$ cm	1p 1p 1p	3p
c)  	3p	3p
Oficiu	1p	1p
Subiectul II		**10p**
a)  $M \to a \qquad I_a = \frac{E_1}{R_1} = 1\text{ A}$ $M \to b$ $I_B = \frac{E_2}{R_1 + R_2 + \frac{R_3 \cdot R_4}{R_3 + R_4}}$  $I_B = 1{,}5\ A$	1p 1p	3p

$M \to c$ $I_c = \dfrac{E_2}{R_1 + \dfrac{R_3 \cdot R_4}{R_3 + R_4}}$  $\boldsymbol{I_C = 2,72\ A}$	1p	
b) $M \to b$ $U_{NL} = ?$ $U_{NL} = E_2 + R_4 \cdot I_4$ $I_B = 1,5\text{A}$ $\begin{cases} R_4 \cdot I_4 = R_3 \cdot I_3 \\ I_3 + I_4 = I_B \end{cases}$ $U_{NL} = E_2 + R_4 \cdot I_4$ $I_3 = \dfrac{R_4}{R_3} \cdot I_4 \qquad I_4 \cdot \left(\dfrac{R_4}{R_3} + 1\right) = I_B \qquad I_4 = \dfrac{R_3 \cdot I_B}{R_3 + R_4}$ $\Rightarrow U_{NL} = E_2 + \dfrac{R_3 \cdot R_4}{R_3 + R_4} \cdot I_B$ $\boldsymbol{U_{NL} = 78\ V}$  $M \to c$  $U_{NL} = E_2 + \dfrac{R_3 \cdot R_4}{R_3 + R_4} \cdot I_c$ $\boldsymbol{U_{NL} = 92,72\ V}$	1p 0,5p 1p 0,5p	3p
c) $Q_J = Q_t$ $Q_J = I_1^2 \cdot R_1 \cdot \Delta t = \dfrac{E_1^2}{R_1} \cdot \Delta t$ $Q_t = m \cdot \lambda$ $m = \dfrac{E_1^2 \cdot \Delta t}{R_1 \cdot \lambda}$ $m = 0,107784\ kg = 107,784\ g$	1p 1p 1p	3p
Oficiu	1p	1p

Subiectul III		**10p**
a)  $\begin{cases} x_1 = v_{01}\,t \\ y_1 = \frac{1}{2}gt^2 \end{cases} \qquad \begin{cases} x_2 = v_{02}t\cos\propto \\ y_2 = v_{02}t\sin\propto - \frac{1}{2}gt^2 \end{cases}$ $x_1 + x_2 = d, \quad y_1 + y_2 = h$ După prelucrare se obține $\frac{h}{d} = \frac{v_{02}\sin\alpha}{v_{01}+v_{02}\cos\alpha}$ $d = \frac{v_{02}^2 \sin 2\alpha}{g}$ $v_{01} = \frac{d\sin\alpha - h\cos\alpha}{h}\sqrt{\frac{gd}{\sin 2\alpha}}$	1p 1p 1p	3p
b) Din $y_1 + y_2 = h \Longrightarrow t = \frac{h}{v_{02}\sin\alpha} \Longrightarrow t = h\sqrt{\frac{2ctg\alpha}{gd}}$ Condiția ca ciocnirea să se producă în aer: timpul de întâlnire să fie mai mic decât timpul de coborâre al primului corp. $h = \frac{gt_c^2}{2} \Longrightarrow t_c = \sqrt{\frac{2h}{g}}$ $t < t_c \Longrightarrow ctg\alpha \leq \frac{d}{h}$	2p 1p	3p
c)  $a_n = g\sin\beta\,, \sin\beta = \frac{v_{01}}{v_1}$ $v_1 = \sqrt{v_{01}^2 + v_{1y}^2} = \sqrt{v_{01}^2 + g^2t^2}$ $a_n = \frac{gv_{01}}{\sqrt{v_{01}^2+g^2t^2}}$ $a_t = g\cos\beta\,, \qquad \cos\beta = \frac{v_{1y}}{v_1}$ $a_t = \frac{g^2t}{\sqrt{v_{01}^2 + g^2t^2}}$	1p 1p	3p

$a_n = \frac{v_1^2}{R} \Rightarrow R = \frac{(v_{01}^2 + g^2t^2)^{\frac{3}{2}}}{gv_{01}}$	1p	
Oficiu	1p	1p