

Experiment 8

Elastic and Inelastic Collision (Individual)

04/02/2025

Endi Troqe

Data Table

Trial #	Mass of Red Ball (kg)	Mass of Blue Ball (kg)	V_r^{in} [m/s]	V_b^{in} [m/s]		V_r^{f} [m/s]	V_b^{f} [m/s]	K^{in} [J]	K^{f} [J]	p^{in} [kg m/s]	p^{f} [kg m/s]
#1	0.5	0.10	3.00	-3.00		1.00	7.00	2.70	2.70	1.20	1.20
#2	0.10	3	3.00	0.00		-2.81	0.19	0.45	0.45	0.30	0.30
#3	0.5	0.10	-3.00	3.00		-1.00	-7.00	2.70	2.70	-1.20	-1.20
#4	0.10	0.5	1.5	-2.00		-4.33	-0.83	1.11	1.11	-0.85	-0.85
#5	0.5	0.10	-2.00	2.5		-0.55	-5.00	1.31	1.31	-0.75	-0.75

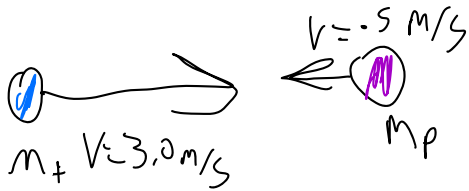
kg= kilograms

Before

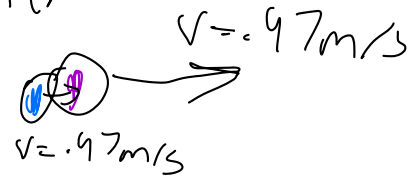
Elastic

After

Trial 1



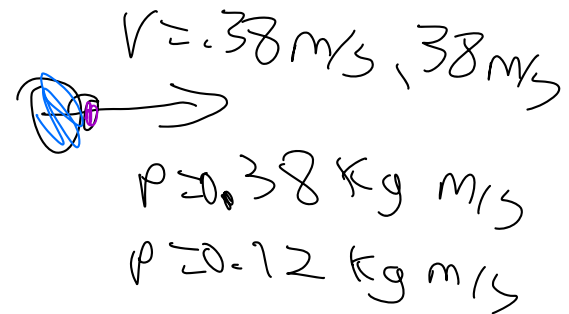
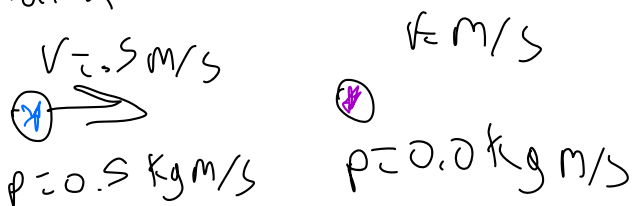
after



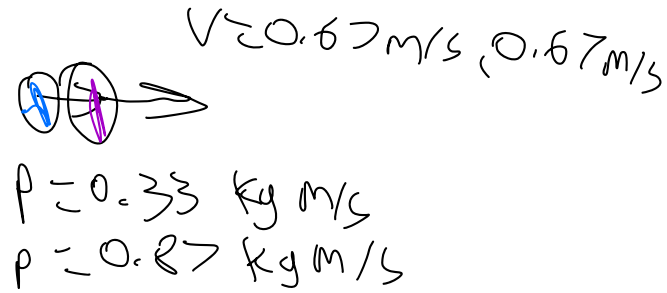
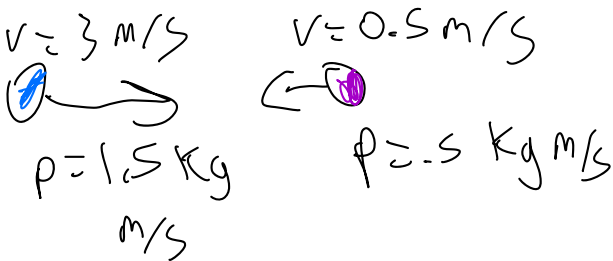
$$m_{TP} = 0.19 \text{ kg m/s}$$

$$m_{PP} = 0.99 \text{ m/s}$$

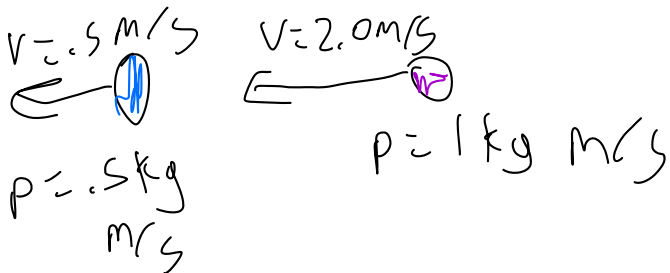
Trial 2



trial 3



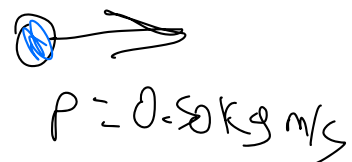
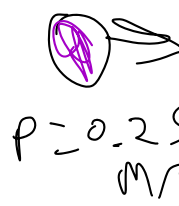
trial 4



$$v = 1.00 \text{ m/s}, 1.00 \text{ m/s}$$



trial 5



Sample Calculations for total momentum (Trial #5 only) (Elastic)

Before Momentum of red ball= $0.5 \text{ kg} \times -2.00 \text{ m/s} = -1.0 \text{ kg m/s}$
Momentum of blue ball= $0.10 \text{ kg} \times 2.5 \text{ m/s} = 0.25 \text{ kg m/s}$ Total
momentum= $-1.0 \text{ kg m/s} + 0.25 \text{ kg m/s} = -0.75 \text{ kg m/s}$

After Momentum of red ball= $0.5 \text{ kg} \times -0.5 \text{ m/s} = -0.25 \text{ kg m/s}$
Momentum of blue ball= $0.10 \text{ kg} \times -5 \text{ m/s} = -0.5 \text{ kg m/s}$ Total
momentum= $-0.25 \text{ kg m/s} + (-0.5 \text{ kg m/s}) = -0.75 \text{ kg m/s}$

Sample Calculations of total kinetic energy (Trial #5 only)

Before Kinetic Energy of red ball = $\frac{1}{2}(0.5 \text{ kg}) \times (-2.00 \text{ m/s})^2 = 1.0 \text{ J}$
Kinetic Energy of blue ball= $\frac{1}{2}(0.10 \text{ kg}) \times (-5 \text{ m/s})^2 = 0.3125 \text{ J}$ Total
Kinetic Energy= $1.0 \text{ J} + 0.3125 \text{ J} = 1.3125 \text{ J}$

After Kinetic Energy of red ball = $\frac{1}{2}(0.5 \text{ kg}) \times (-0.5 \text{ m/s})^2 = 0.0625 \text{ J}$
Kinetic Energy of blue ball = $\frac{1}{2}(0.10 \text{ kg}) \times (-5 \text{ m/s})^2 = 1.25 \text{ J}$ Total
Kinetic Energy = $0.0625 \text{ J} + 1.25 \text{ J} = 1.3125 \text{ J}$

Conservation of Linear Momentum (completely inelastic)

Trial #	Mass of Turquoise Ball (kg)	Mass of Pink Ball (kg)	V_{T}^{in} (m/s)	V_{P}^{in} (m/s)	V_{P}^{F} (m/s)	V_{T}^{F} (m/s)	K^{in} (J)	K^f (J)	p^{in} (kg m/s)	p^f (kg m/s)
#1	0.5	1.3	3.0	-0.5	0.47	0.47	2.41	0.20	0.85	0.85
#2	1.0	0.3	0.5	0.00	0.38	0.38	0.13	0.10	0.50	0.50
#3	0.5	1.0	3.0	-0.5	0.67	0.67	2.38	0.33	1	1
#4	1.0	0.5	-0.5	-2.0	-1	-1	1.13	0.75	-1.5	-1.5
#5	0.5	1.0	-0.4	-2.0	-1.47	-1.47	2.01	1.61	-2.20	-2.20

v_{Tin} --initial velocity of turquoise ball

V_{Pin} --initial velocity of pink ball

v_{pF} --final velocity of pink ball

v_{TF} --final velocity of turquoise ball

K_{in} --initial Kinetic Energy of system

K_f --final Kinetic Energy of system

p_{in} -- initial momentum of system

p_f -- final momentum of system

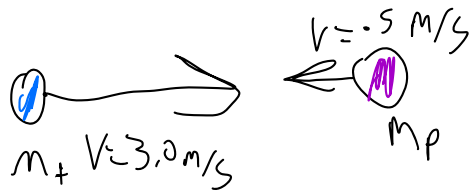
Additional Assignment:

Before

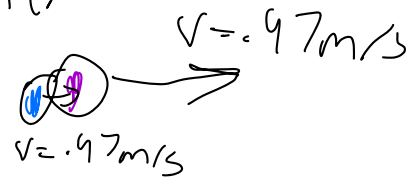
Inelastic

After

Trial 1



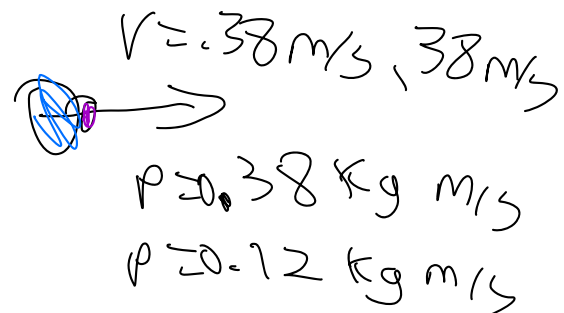
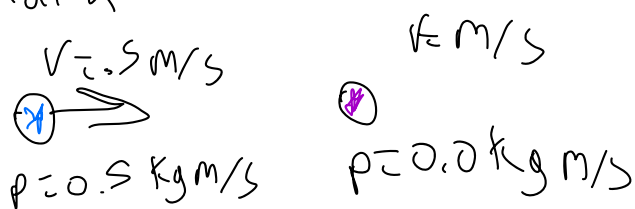
after



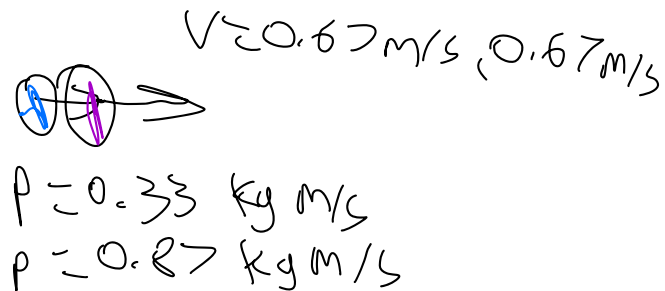
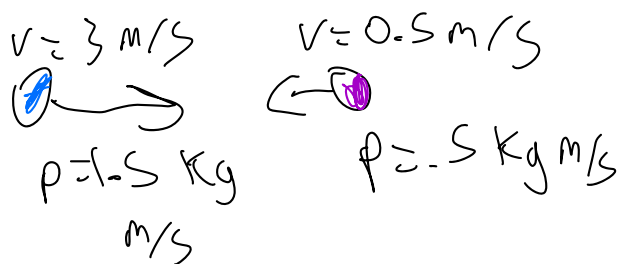
$$m_{1+2} = 0.19 \text{ kg m/s}$$

$$m_{pp} = 0.99 \text{ m/s}$$

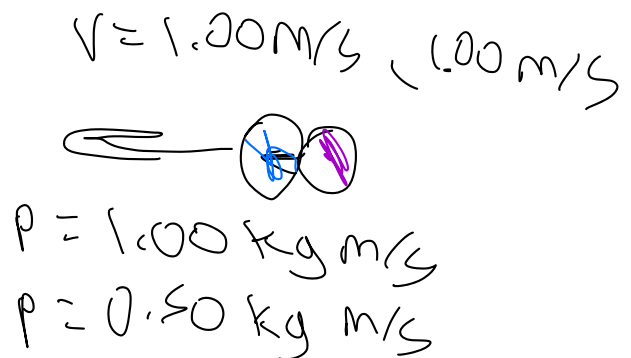
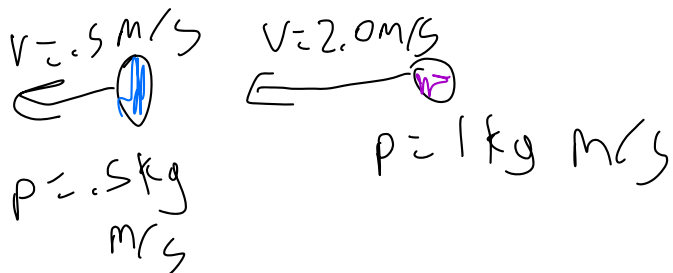
Trial 2



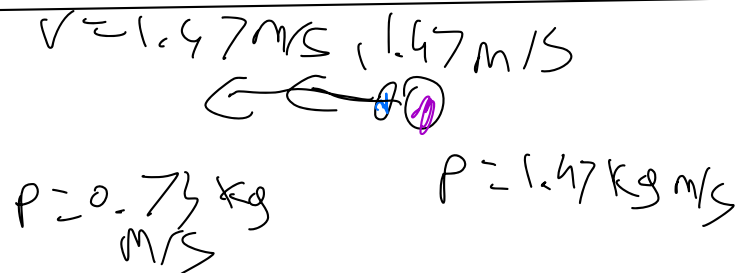
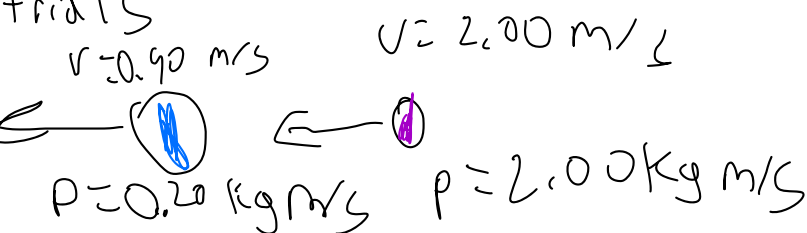
Trial 3



Trial 4



Trial 5



Sample Calculations for total momentum (Trial #5 only) (Inelastic)

Before Momentum of pink ball= $1.0 \text{ kg} \times -2.0 \text{ m/s} = -2 \text{ kg m/s}$
Momentum of turquoise ball= $0.5 \text{ kg} \times -0.4 \text{ m/s} = -0.2 \text{ kg m/s}$ Total
momentum= $-2 \text{ kg m/s} + -0.2 \text{ kg m/s} = -1.8 \text{ kg m/s}$

After Momentum of pink ball= $1.0 \text{ kg} \times -1.47 \text{ m/s} = -1.47 \text{ kg m/s}$
Momentum of turquoise ball= $0.5 \text{ kg} \times -1.47 \text{ m/s} = -0.735 \text{ kg m/s}$ Total
momentum= $-1.47 \text{ kg m/s} + -0.735 \text{ kg m/s} = -2.2 \text{ kg m/s}$

Sample Calculations of total kinetic energy (Trial #5 only)

Before Kinetic Energy of pink ball = $\frac{1}{2}(1.0 \text{ kg}) \times (-2.0 \text{ m/s})^2 = 2 \text{ J}$
Kinetic Energy of turquoise ball= $\frac{1}{2}(0.5 \text{ kg}) \times (-0.4 \text{ m/s})^2 = 0.04 \text{ J}$
Total Kinetic Energy= $2 \text{ J} + 0.04 \text{ J} = 2.04 \text{ J}$

After Kinetic Energy of pink ball = $\frac{1}{2}(1.0 \text{ kg}) \times (-1.47 \text{ m/s})^2 = 1.08 \text{ J}$
Kinetic Energy of turquoise ball = $\frac{1}{2}(0.5 \text{ kg}) \times (-1.47 \text{ m/s})^2 = -0.54 \text{ J}$
Total Kinetic Energy = $1.08 \text{ J} + -0.54 \text{ J} = 0.539 \text{ J}$