First Name:_____   Last Name:_____

Q1: A 1247kg Honda Civic DX Sedan is travelling at 100 km/h. What is its momentum?

a. 1.25×10^4 kg*m/s

b. 3.46×10^4 kg*m/s

c. 1.25×10^5 kg*m/s

d. 4.49×10^5 kg*m/s

$$\frac{100 \, km}{h} \times \frac{1 \, h}{3600 \, s} \times \frac{1000 \, m}{1 \, km} = 27.\overline{7} \, m/s$$

$$p = mv$$
$$= (1247)(27.\overline{7})$$
$$= 34,638.\overline{8} \, kg \, m/s$$
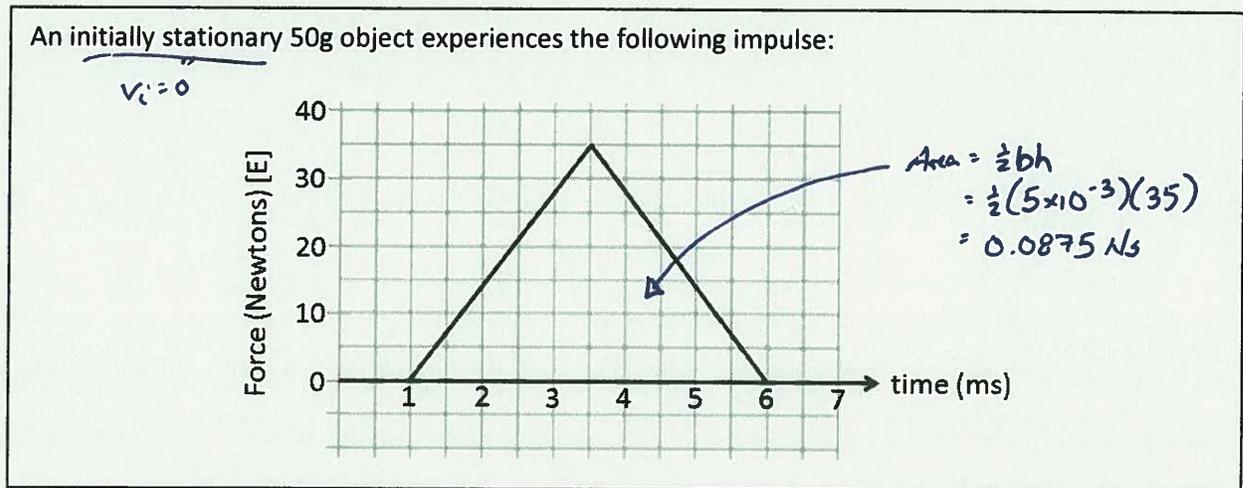$$\approx 3.46 \times 10^4 \, kg \, m/s$$

Q2: A boy and his bicycle has a combined mass of 50.0kg and are travelling at 8.50 m/s. Upon applying the brakes, it takes the boy 3.25 seconds to come to a complete stop. What is the force of friction acting on the bicycle, in Newtons?

*(Record your **three digit** answer in the Numerical Response boxes below)*

| 1 | 3 | 1 | |

$$F_{\Delta}t = m\Delta v$$
$$F(3.25) = (50)(8.50)$$
$$F = 130.7692.. \, N$$
$$\approx 131 \, N$$

Use the following information to answer Q3:

An initially stationary 50g object experiences the following impulse:

$V_i = 0$

Area $= \frac{1}{2}bh$
$= \frac{1}{2}(5\times10^{-3})(35)$
$= 0.0875$ Ns

Q3: The final velocity of the 50g object is _____ m/s.

*(Record your **three digit** answer in the Numerical Response boxes below)*

1	.	7	5

$F\Delta t = m\Delta v$
$0.0875 = (50\times10^{-3})\Delta v$
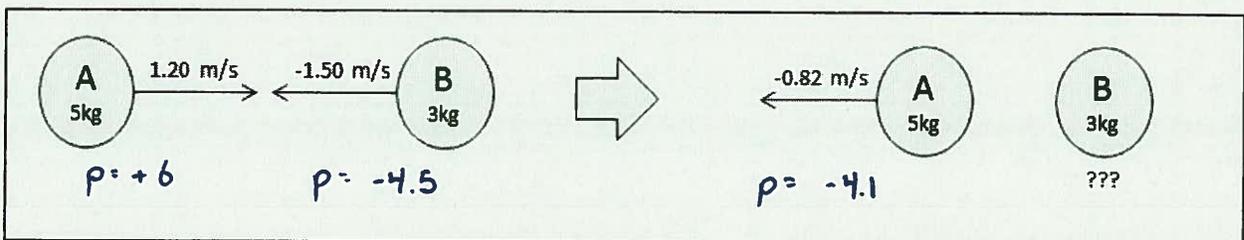$\Delta v = 1.75 \, m/s$

$\Delta v = V_f - V_i$
$1.75 = V_f - (0)$
$V_f = 1.75 \, m/s$

Use the following information to answer Q4:

A 5kg — 1.20 m/s →   ← -1.50 m/s B 3kg   ⇨   ← -0.82 m/s A 5kg   B 3kg

$P = +6$ $P = -4.5$ $P = -4.1$???

Q4: The final velocity of *Object B* is _____ m/s [R].

*(Record your **three digit** answer in the Numerical Response boxes below)*

1	.	8	7

$P_i = P_f$
$(+6) + (-4.5) = (-4.1) + P_f$
$P_f = +5.6$
$V_f = +1.866 \, m/s$
$\approx +1.87 \, m/s$

Use the following information to answer Q5:

A 2kg 1.50 m/s →   ← -1.00 m/s B 1kg   ⇨   A 2kg 0.25 m/s →   B 1kg 1.50 m/s →

$p = +3$

$E_K = 2.25$

$p = -1$

$E_K = 0.5$

$P_{TOT} = +2 \ kg\ m/s$

$E_{K_{TOT}} = 2.75 \ J$

$p = +0.5$

$E_x = 0.0625$

$p = +1.5$

$E_K = 1.125$

$P_{TOT} = +2 \ kg \ m/s$

$E_{K_{TOT}} = 1.1875 \ J$
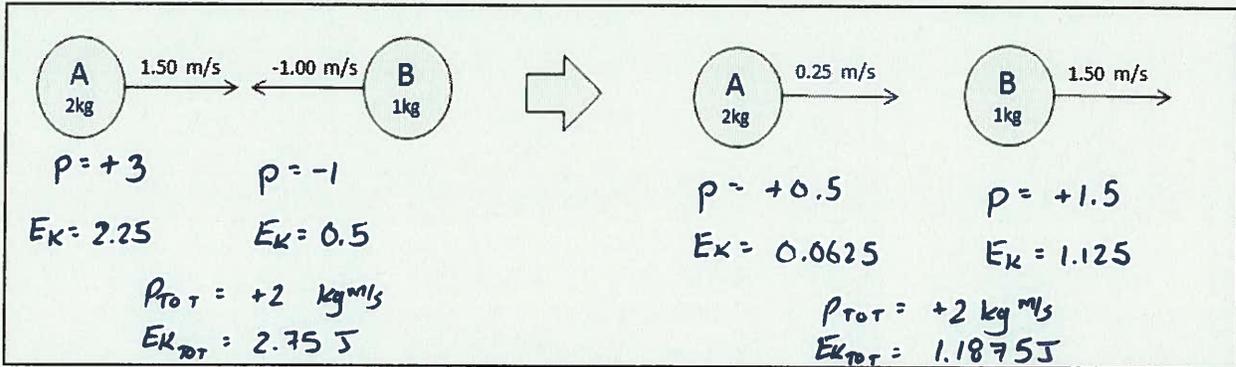
Q5: Which of the following statements is correct?

a. Momentum is conserved and the collision is elastic.

(b) Momentum is conserved and the collision is not elastic.

c. Momentum is not conserved and the collision is elastic.

d. Momentum is not conserved and the collision is not elastic.

Q6: A 50.0kg skateboarder is travelling at 5.00 m/s when he picks up a stationary 4.50kg backpack. What is his final velocity?

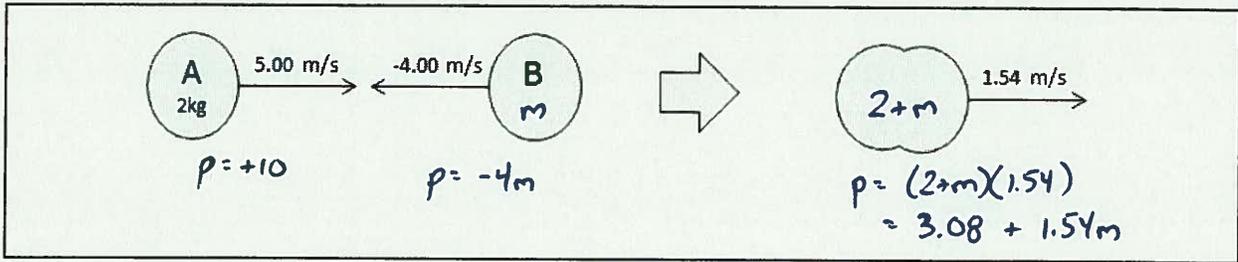*(Record your **three digit** answer in the Numerical Response boxes below)*

4	.	5	9

A 50kg 5m/s →   B 4.5kg   ⇨   54.5 kg → v_f

$p = +250$ $p = 0$
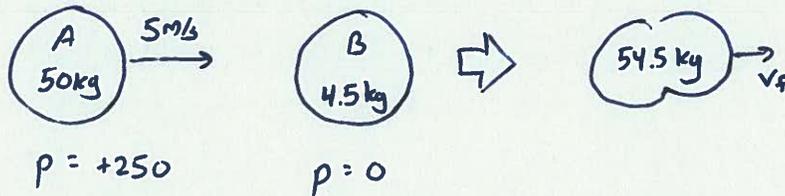
$P_i = P_f$

$(+250) + (0) = (54.5)(v_f)$

$v_f = 4.59 \ m/s.$

Use the following information to answer Q7:

A 5.00 m/s → ← -4.00 m/s B
2kg   m

⇨

2+m 1.54 m/s →

$p = +10$ $p = -4m$ $p = (2+m)(1.54)$
                                      $= 3.08 + 1.54m$

Q7: What is the mass of *Object B*, in kg?

*(Record your **three digit** answer in the Numerical Response boxes below)*

1	.	2	5

$P_i = P_f$
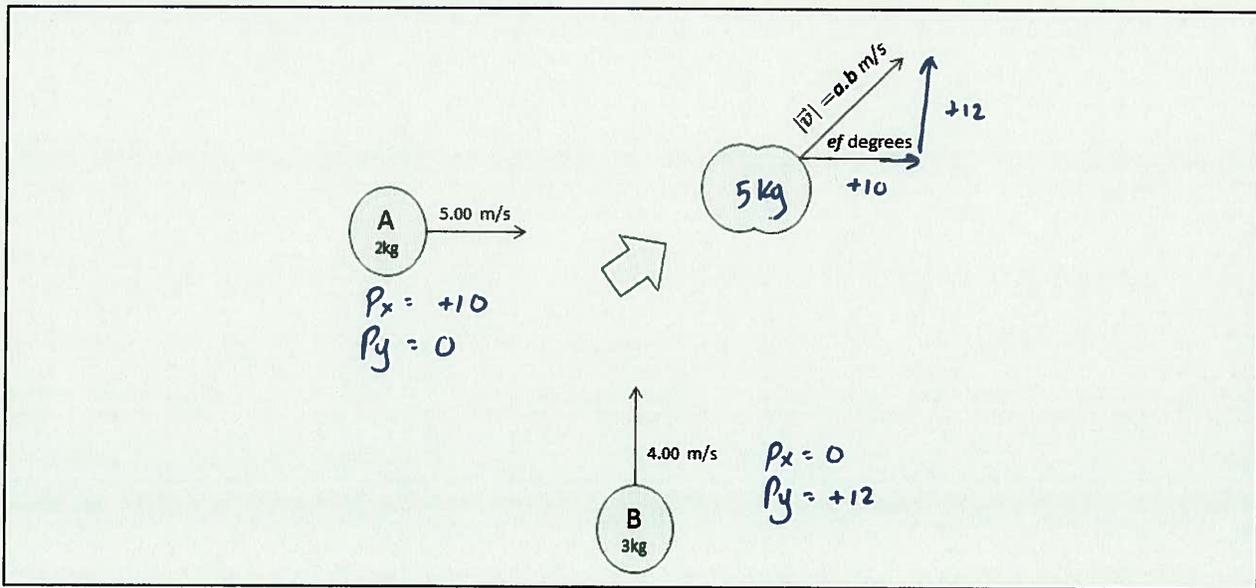
$(+10) + (-4m) = (3.08 + 1.54m)$

$10 - 4m = 3.08 + 1.54m$

$6.92 = 5.54m$

$m = 1.25 kg$

Use the following information to answer Q8:

$|\vec{v}| = a.b$ m/s

$+12$

ef degrees

5 kg $+10$

A 5.00 m/s →
2kg

$P_x = +10$
$P_y = 0$

⇨

B 4.00 m/s ↑ $P_x = 0$
3kg $P_y = +12$

Q8: The combined object moves at *a.b* m/s [*ef*° N of E], where the values of *a, b, e,* and *f* are ___, ___, ___, and ___.

*(Record your **four digit** answer in the Numerical Response boxes below)*

3	1	5	0

$v = 3.124$ m/s
$p = 15.62$ kg·m/s
$+12$
$50°$
$+10$
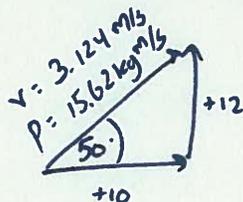
$\vec{v}_f = 3.1$ m/s [50° N of E]

Use the following information to answer Q9:
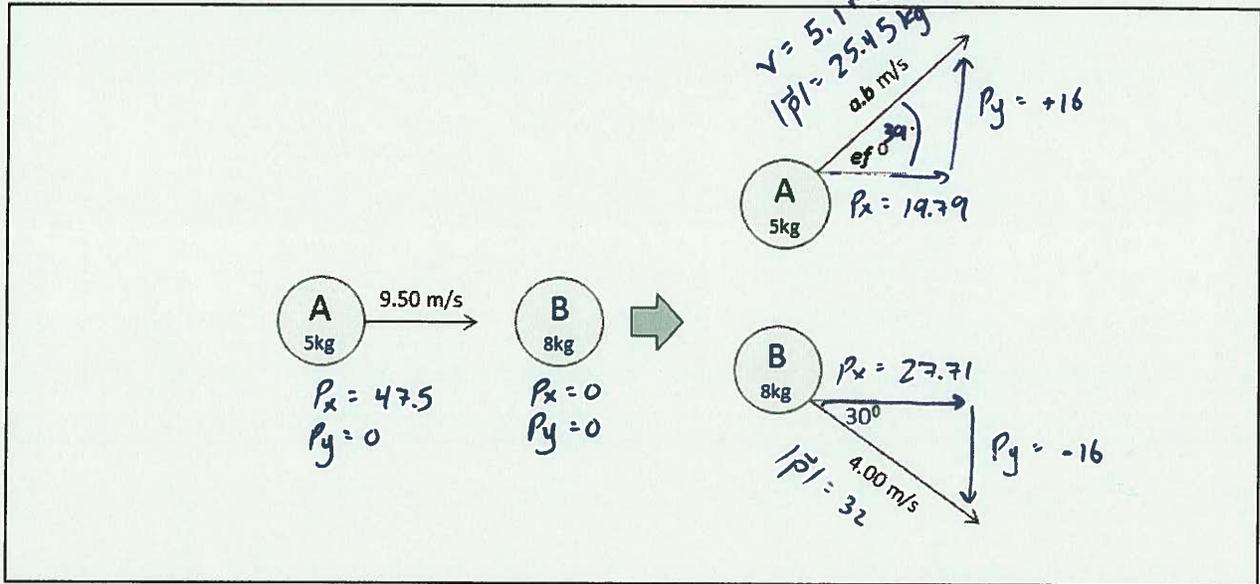
Q9: *Object A moves at **a.b** m/s [**ef**° N of E], where the values of **a, b, e,** and **f** are* ___, ___, ___, *and* ___.

*(Record your **four digit** answer in the Numerical Response boxes below)*

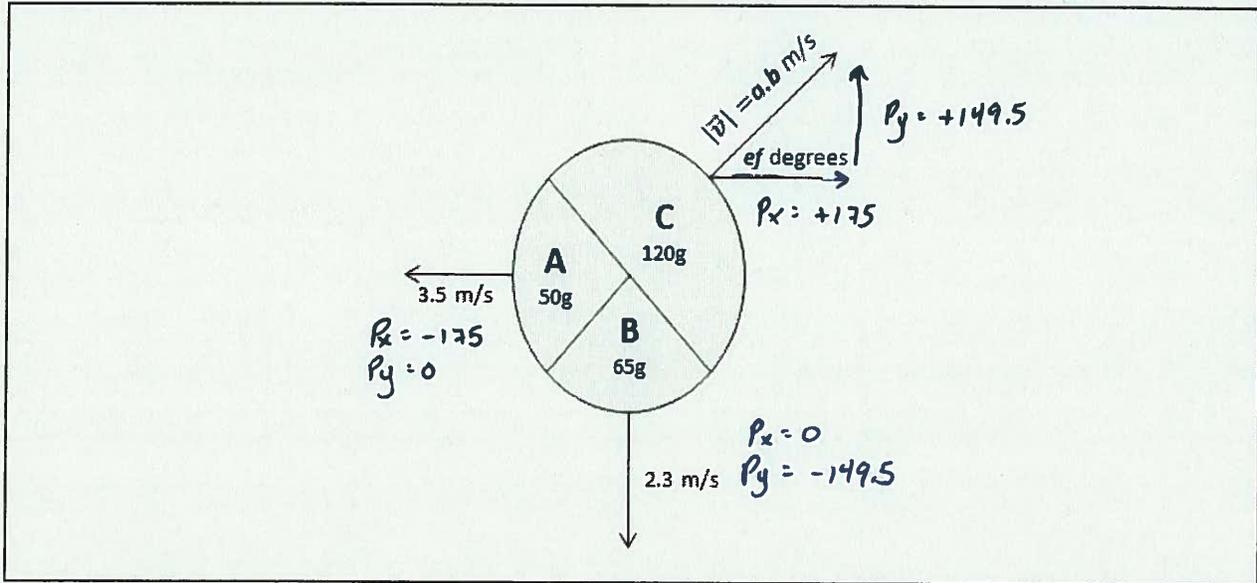| 5	1	3	9

$$\vec{V_f} = 5.1 \text{ m/s } [39° \text{ N of E}]$$

Use the following information to answer Q10:

$|\vec{v}| = a.b$ m/s

$P_y = +149.5$

ef degrees

$P_x = +175$

C
120g

A
50g

3.5 m/s

$P_x = -175$
$P_y = 0$

B
65g

2.3 m/s

$P_x = 0$
$P_y = -149.5$

Q10: An initially stationary object explodes. *Object C* moves at *a.b* m/s [*ef*°], where the values of *a, b, e,* and *f* are ___, ___, ___, and ___.

*(Record your **four digit** answer in the Numerical Response boxes below)*

1	9	4	1

$|\vec{v}| = 1.9$ m/s
$|\vec{p}| = 230.16$ g m/s

149.5

41

175
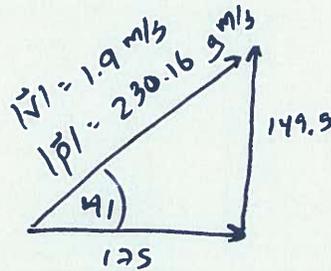
$$\vec{v}_F = 1.9 \text{ m/s } [41°]$$

Use the following information to answer Q11-Q12:

$v_{ball} = 6.50$ m/s
$m_{ball} = 8.00$g
$m_{bob} = 50.0$g
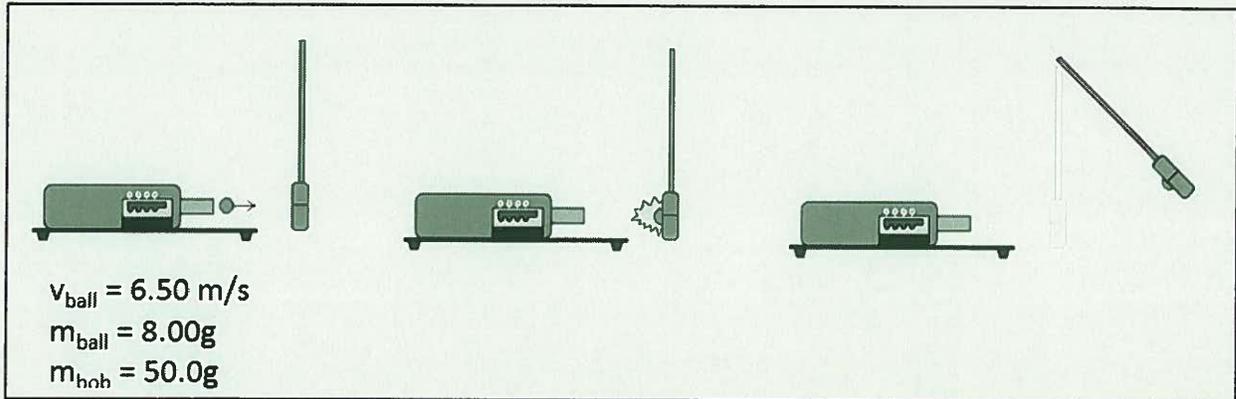
Q11: The ballistic pendulum rises to a height of **a.bc** x 10^{-d} m, where **a, b, c,** and **d** are ___, ___, ___, and ___.

*(Record your **four digit** answer in the Numerical Response boxes below)*

4	1	0	2

COLLISION

$$p_i = p_f$$
$$(8.0\times10^{-3})(6.50) + (50\times10^{-3})(0) = (58\times10^{-3})v_f$$
$$v_f = 0.896551724138 \text{ m/s}$$

CONSERVATION OF E

$$E_k \rightarrow E_p$$
$$\tfrac{1}{2}mv^2 \rightarrow mgh$$
$$\tfrac{1}{2}(0.89655...)^2 \rightarrow (9.81)h$$
$$h = 4.096865... \times 10^{-2}$$
$$h \approx 4.10\times10^{-2} \text{ m}$$

Q12: What two **Physics Principles** are used to calculate the answer to **Q11**, listed in the order you used them?

*(Record your **two digit** answer in the Numerical Response boxes below)*

4	5		