KEY

First Name:_____ Last Name:_____

L02 – Formative Quiz – Momentum and Net Force

Q1: The Jamaican sprinter Usain Bolt has a mass of 94kg, and is able to run at an astounding top speed of 45 kilometers per hour. When at top speed, Usain's momentum is ***a.bc*** x 10^{d} kg m/s. The values of ***a***, ***b***, ***c***, and ***d*** are ___, ___, ___, and ___.

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

1	1	8	3

$\frac{45\,km}{h} \times \frac{1\,h}{3600\,s} \times \frac{1000\,m}{1\,km} = 12.5\,m/s$

$p = mv$
$= (94)(12.5)$
$= 1175\ kg\,m/s$
$= 1.175 \times 10^{3}\ kg\,m/s \approx 1.18 \times 10^{3}\ kg\,m/s$

Use the following information to answer Q2-Q3:

> A car of mass 1000kg is travelling North at 15 m/s when it applies its breaks, coming to a stop 10 seconds later.

Q2: What is the change in momentum that the car experiences?

a. 15,000 kg*m/s [North]
b. 15,000 kg*m/s [South]
c. 112,500 kg*m/s [North]
d. 112,500 kg*m/s [South]

Initial: $\vec{p} = m\vec{v}$
$= (1000)(15)$
$= 15{,}000\ kg\,m/s\ [N]$

Final: $\vec{p} = m\vec{v}$
$= (1000)(0)$
$= 0\ kg\,m/s\ [N]$

$\vec{\Delta p} = \vec{p}_f - \vec{p}_i$
$= 0 - 15{,}000 = -15{,}000\ kg\,m/s\ [N]$ or $+15{,}000\ kg\,m/s\ [S]$

Q3: What average force did the road apply to the car, in Newtons?

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

1	5	0	0

$\vec{F} = \frac{\Delta \vec{p}}{\Delta t} = \frac{15{,}000\ kg\,m/s\ [S]}{10\,s} = 1500\ N\ [S]$

MARKING:

Beginning	0 – 1
Progressing	1.5 – 2.0
Competent	2.5
Exemplary	3