9/6/17

IB Physics 1 Refresher ☺ Name: Key - Check your answers then tape/insert in Journal!

Do not begin until you are given the "go" signal!

Part 1: Units/Symbols

Complete the following table:

Symbol/Abbreviation	Unit Name	What is measured using this unit?
mol	Mole	Amount of substance
Kg	Kilogram	mass
J	Joule	Energy
W	Watt	Power
N	Newton	Force
A	Ampere	electric Current
s	Second	time
Kg m s^{-1}		Momentum
$J \cdot Kg^{-1} \cdot {}^{\circ}C^{-1}$		Specific Heat Capacity
m	Meter	length
J	Joule	Work
K	Kelvin	Temperature

What are the 3 kinematic equations?

$s = ut + \frac{1}{2}at^2$	$v = u + at$	$v^2 = u^2 + 2as$

What do the following symbols represent in our equations?
(list as many as you know, if there's more than 1 possible answer)

- u initial Velocity
- v final velocity
- t time
- s displacement
- c Specific heat capacity; Speed of light
- p momentum
- P Power; Pressure
- W Work; (sometimes) Weight
- F_N Normal force
- m mass
- μ coefficient of friction
- g accel. due to gravity; grav. field strength
- T Tension; Period; Temperature
- F_c Centripetal Force

Part 2: Conversions and Calculations

1. Convert 25.0 m s^{-1} → km h^{-1} using the factor-label method

$\left(\frac{25.0\,m}{s}\right)\left(\frac{3600\,s}{1\,h}\right)\left(\frac{1\,km}{1000\,m}\right) = 90.0\ km \cdot h^{-1}$

2. Allyson Felix won the Olympic Silver medal in the 400.m run last year. She completed her race in 49.51 s. Determine her average speed, reported to the correct sig figs and with appropriate units.

$\bar{v} = \frac{d}{t} = \frac{400.\,m}{49.51\,s} = \boxed{8.08\ m \cdot s^{-1}}$

3. The temperature on the surface of the Moon ranges between – 153 °C (dark side) to 123 °C (sunny side). Assume the Moon's surface spends equal times in darkness and in light. What is the average temperature of the Moon, in Kelvin?

$T_{°C} = \frac{123 + -153}{2} = -15°C \quad T_K = T_c + 273 = -15 + 273 = \boxed{258\ K}$

4. A BMW Z4 can accelerate from rest to 60.mi/h in 4.8 sec. What is its acceleration, in m s^{-2}?

$\left(\frac{60.\,mi}{h}\right)\left(\frac{1609\,m}{1\,mi}\right)\left(\frac{1\,h}{3600\,s}\right) = 26.817 \quad a = \frac{\Delta v}{t} = \frac{26.8 - 0}{4.8} = \boxed{5.6\ m \cdot s^{-2}}$

5. The specific heat capacity of aluminum is 920. J kg^{-1} °C^{-1}. How much energy must be added in order to raise the temperature of a 275 g sample by 65.0 °C?

$\Delta Q = mc\Delta T$

$= (0.275\,kg)(920.\,J \cdot kg^{-1} \cdot °C^{-1})(65.0\,°C) = \boxed{16{,}400\ J}$

6. A 1360 kg Subaru Impreza is traveling at 18.5 m s^{-1}.

a. What is the momentum of the car?

$p = m \cdot v = 1360 \cdot 18.5 = \boxed{25{,}200\ kg\,m \cdot s^{-1}}$

b. What is the car's kinetic energy?

$E_K = \frac{1}{2}mv^2 = \frac{1}{2}(1360)(18.5)^2 = \boxed{2.33 \times 10^5\ J}$

c. If the car came to a stop in 50.0 m, what average force was necessary to do so?

$F \cdot d = \Delta E_K$

$F \cdot (50.0) =$

$F = \frac{232730}{50.0} = \boxed{4650\ N}$ (4660 ok if you used Rounded value)

Part 3: Definitions and concepts

Define the following:

a. Displacement Change in position

b. Instantaneous velocity The rate of change in position at some instant of time

c. Heat capacity amount of energy needed to change a material's Temp by 1°C

d. Static Friction The force of friction acting between surfaces at rest relative to each other.

e. Normal force A force directed perpendicular + away from a surface, acting on an object on the surface.

f. Inertia The tendency of an object to maintain its state of motion

g. Inelastic collision a collision in which momentum is conserved, but kinetic energy is not conserved.

h. Heat engine A device used to convert thermal Energy to Mechanical (Work)

i. Centripetal force A push or pull directed toward the center of a circular path

j. Accuracy A measure of how close to an accepted value a measurement or calculation is.

k. Precision of a measurement

An indication of the smallest division a tool can measure.

Uncertainties

A block's mass was measured to be 75.0 ± 0.5 g. The dimensions of the block are as follows: 5.75 ± 0.05 cm wide, 10.5 ± 0.3 cm long, and 4.8 ± 0.1 cm thick.

What is the density of the block, including proper absolute uncertainty and sig figs?

$\rho = \frac{m}{V} = \frac{75.0\,g}{(5.75 \times 10.5 \times 4.8)\,cm^3} = \frac{75.0\,g}{289.8\,cm^3} = 0.26\ g/cm^3$ (0.2588)

$\%m = \frac{0.5}{75.0} \times 100 = 0.7\%$

$\%w = (0.05/5.75) \times 100 = 0.9\%$

$\%l = \frac{.3}{10.5} \times 100 = 2.9\%$

$\%t = \frac{.1}{4.8} \times 100 = 2.1\%$

$\%\rho = \%m + \%w + \%l + \%t$

$= 0.7\% + 0.9\% + 2.9\% + 2.1\%$

$= 12.6\% \rightarrow 12.6\%(0.26\,g/cm^3)$

$= 0.0328 \approx 0.03$

$\rho = 0.26 \pm 0.03\ g/cm^3$