

Name: \_\_\_\_\_

## Honours Physics – “Summer Homework” – actually late-August preseason training 😊

Hi! Welcome to Honours Physics. Before you get to school (in mid-August), I would like you to do a little bit of review work. This will come in four parts: unit conversion, algebra, linear kinematics and significant figures... with trivial for fun!

### Unit conversion:

You always need to know how to convert units to their base SI forms (meters, seconds, kilograms etc...). You have done this for many years (most recently in chemistry). In physics class, you will need to know 7 metric prefixes:

prefix	Abbreviation	multiplier	prefix	Abbreviation	multiplier
Giga	G	$10^9$	centi	c	$10^{-2}$
Mega	M	$10^6$	milli	m	$10^{-3}$
kilo	k	$10^3$	micro	$\mu$	$10^{-6}$
			nano	n	$10^{-9}$

Now – please do these unit conversions so that you can turn this in on the first day of school. Your answers should be in scientific notation if the numbers are greater than 10000 or smaller than 0.0001.

Step 1: converting to base SI units	
2.3 mm = _____ m	3700 km = _____ m
24 Gm = _____ m	710 nm = _____ m
Step 2: odd cases – mass and time	
5.1 g = _____ kg	0.0043 g = _____ kg
86 min = _____ s	730 hr = _____ s
11.86 yr = _____ s (hint – how many days are there per year?)	
Step 3: converting to non-base SI units	
12.3 km = _____ cm	0.073 cm = _____ $\mu$ m
86 Mm = _____ km	70 nm = _____ mm
Step 4: converting from non-SI units (1 mile = 1609 m 1 inch = 2.54 cm)	
4.4 miles = _____ m	0.044 in = _____ cm
26.2 miles = _____ cm	206 in = _____ m
Step 5: converting compound units (show your work under the problems)	
22.3 km/hr = _____ m/s	0.163 g/cm <sup>3</sup> = _____ kg/m <sup>3</sup>

**Algebra:** Here are a few easy algebra problems to get you back in math mode. There will be a little more practice in the first week of school.

1. Solve for the letter closest to the beginning of the alphabet.

$2a-3b=7a+d$	$3h + c = \frac{2b}{e} + d$
$\frac{6a + 7b}{4} = 7c - 3$	$3w + 4f = 4k - 2f$

2. Solve for "d". (a=4, b=3, c=-2)

$\frac{5}{3}d - ba = 12c$	$(a - 1)d + 4 = 3c$
$3a^2 - 2b^3 = cd + 5$	$5d^2 - ad + 7 = bc$

**Linear Kinematics:** This will be our first major topic of the year, but some of it you have been doing since middle school. If an object is going at a constant speed, or if you want to find the average speed of an object, then the speed is the distance travelled divided by time (in middle school math you said "distance is rate times time" and rate meant speed). Find the average speed for the following athletes:

Name	Distance	Time	Average Speed (in m/s)
Usain Bolt	100 m	9.58 s	
Usain Bolt	200 m	19.19 s	
Wayde van Niekerk	400 m	43.03 s	
Karsten Warholm	400 m hurdles	45.94 s	
Caleb Dressel	100 m (Butterfly)	49.50s	
Hicham El Guerrouj	1 mile	3 min 43.13s	
Kelvin Kiptum	26.22 miles (marathon)	2 hr 35 seconds	

What was the average length of time for each mile run in Kiptum's marathon (in minutes and seconds)? \_\_\_\_\_

What was the average length of time for each 400 meters run in Kiptum's marathon (in seconds)? \_\_\_\_\_

**Significant figures:**

Step 1: write the following numbers to 1 significant figure (and in correct scientific notation for the last three – the number should be between 1 and 9)

$$0.000412 = \underline{\hspace{2cm}} \qquad 0.005634 = \underline{\hspace{2cm}} \qquad 0.3495 = \underline{\hspace{2cm}}$$

$$7.5543 = \underline{\hspace{2cm}} \qquad 153.22 = \underline{\hspace{2cm}} \qquad 771136 = \underline{\hspace{2cm}}$$

$$1.775 \times 10^{12} = \underline{\hspace{2cm}} \qquad 56.33 \times 10^{-15} = \underline{\hspace{2cm}} \qquad 0.004665 \times 10^{17} = \underline{\hspace{2cm}}$$

Step 2: round these numbers as stated:

To the hundredths:  $13.55632 = \underline{\hspace{2cm}}$

To the tens:  $22.34 = \underline{\hspace{2cm}}$

To the thousandths  $1.23005 = \underline{\hspace{2cm}}$

To the tenths  $65.4492 = \underline{\hspace{2cm}}$

**Trivia:** We talk about lots of stuff during the year. Try to answer these questions as quickly as you can, then look up the correct answers. You don't have to turn this part in for a grade, but we will check on your scores on the first day.

The earth:

What is our latitude (in Detroit)?

What is our longitude?

What is the tilt in the Earth's rotation axis?

What is the latitude of the tropic of Cancer?

What is the latitude of the arctic circle?

What is  $90 - (\text{latitude of the arctic circle})$ ?

The atom:

What are atoms made of?

How many protons are in  $^{14}\text{C}$ ? How many neutrons?

How many protons are in  $^{296}\text{U}$ ? How many neutrons?

What is the charge of a Helium atom?

What is the charge of a Helium nucleus?

And for fun.....what have you read? ☺

Have you read all of the Harry Potter books?

Have you read the Lord of the Rings?

Have you read Ender's Game by Orson Scott Card?

Have you the Hitchhiker's Guide to the Galaxy by Douglas Adams?

What is your favourite book of all time?