

# PHY 181: Spring 2023

## Midterm Sample test

### Useful facts

Prefix	Symbol	Multiple
giga-	G	$10^9$
mega-	M	$10^6$
kilo-	k	$10^3$
hecto-	h	$10^2$
deca-	da	$10^1$
—	—	$10^0 = 1$
deci-	d	$10^{-1}$
centi-	c	$10^{-2}$
milli-	m	$10^{-3}$
micro-	$\mu$	$10^{-6}$
nano-	n	$10^{-9}$

$$g = 9.8 \text{ m/s}^2$$

$$1 \text{ kg} = 2.205 \text{ lbm}$$

$$1 \text{ m} = 1.094 \text{ yd}$$

$$g_{\text{moon}} = 1.625 \text{ m/s}^2$$

$$1 \text{ lbf} = 4.45\text{N}$$

$$1 \text{ inch} = 2.54 \text{ cm}$$

$$s = \frac{\Delta d}{\Delta t} \quad \Delta d = s\Delta t \quad \Delta t = \frac{\Delta d}{s}$$

$$\vec{v} = \frac{\Delta \vec{d}}{\Delta t} \quad \Delta \vec{d} = \vec{v}\Delta t \quad \Delta t = \frac{\Delta \vec{d}}{\vec{v}}$$

$$\vec{a} = \frac{\Delta \vec{v}}{\Delta t} \quad \Delta \vec{v} = \vec{a}\Delta t \quad \Delta t = \frac{\Delta \vec{v}}{\vec{a}}$$

$$\vec{F} = m\vec{a} \quad m = \frac{\vec{F}}{\vec{a}} \quad \vec{a} = \frac{\vec{F}}{m}$$

$$\vec{W} = m\vec{g} \quad \vec{g} = \frac{\vec{W}}{m} \quad m = \frac{\vec{W}}{\vec{g}}$$

$$\vec{v}_{\text{rel}} = \vec{v}_{\text{obj}} - \vec{v}_{\text{ref}} \quad \vec{v}_{\text{obj}} = \vec{v}_{\text{rel}} + \vec{v}_{\text{ref}}$$

$$\vec{v}_{\text{ref}} = \vec{v}_{\text{obj}} - \vec{v}_{\text{rel}}$$

1: Box or circle each vector in the list below.

$$8 \quad -16 \text{ down} \quad 54 \quad 8\text{cm left}$$

$$\tau \quad \frac{9}{4}\text{in right} \quad -6\text{ft} \quad 3 \text{ left}$$

2: Box the biggest number and underline the smallest number in each row.

$$6 \times 10^{-2} \quad -3 \times 10^{-15} \quad 7 \times 10^{-2}$$

$$65\text{mg} \quad 65\text{cg} \quad 65\text{dag}$$

$$5.4\text{cm} \quad 5.4\text{Gm} \quad 5.4\mu\text{m}$$

3: Perform the following conversions.

—Convert 56Tg to g.

—Convert 20cm to km.

—Convert 101 lb(mass) to kg

4: Circle or box each SI unit below.

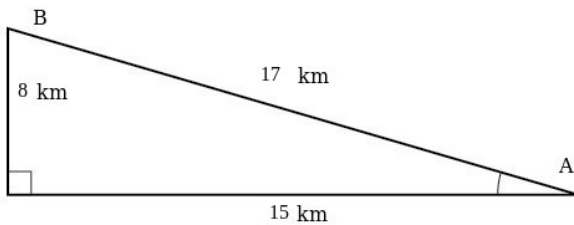
$$\text{lbf} \quad \text{mL} \quad \text{pint} \quad \text{m}$$

$$\text{L} \quad \text{s} \quad \text{Tg} \quad \text{lbm}$$

5: If an object travels a distance of 9m in 3s, what is the objects speed?

6: How far does an object travel in 9s if its speed is 3m/s?

7: A group drives from point A to point B the long way. It takes them 1 hour. What is their average velocity? (I call the direction  $\overrightarrow{AB}$  to mean from A to B.) What is their average speed?



8: If an object has a mass of 50kg and is accelerating at  $5 m/s^2$  leftward, what is the force exerted on the object?

9: If an object with a mass of 8kg has a net force exerted on it of 24N upward, what is the objects acceleration?

10: What is the weight of an object (on earth) that has a mass of 75 kg?

11: Find the net force on an object being pulled in two directions in each of the following scenarios. (It is recommended to draw a picture.)

— The forces are 12N East and 17N West.

— The forces are 22N left and 16N right.

12: If a car is traveling at 130 mph West relative to you and you are traveling at 70 mph East relative to the ground, how fast is the car traveling relative to the ground?

## Answers

1: -16 down, 8cm left,  $\frac{9}{4}$ in right, 3 left

2:  $7 \times 10^{-2}$     $-3 \times 10^{-15}$     $65 \text{dag}$     $65 \text{mg}$   
 $5.4 \text{Gm}$     $5.4 \mu\text{m}$

3:  $56 \text{Tg} = 5.6 \times 10^{13} \text{g}$     $20 \text{cm} = 2.0 \times 10^{-4} \text{km}$   
 $101 \text{lbn} = 4.58 \times 10^1 \text{kg}$

4: mL, m, L, s, Tg

5: 3m/s

6: 27m

7:  $\vec{v}_a = 17 \text{ km/hr}$   $\overrightarrow{AB}$ ,  $s_a = 23 \text{ km/hr}$

8:  $\vec{F}_{net} = 250 \text{ N leftward}$

9:  $\vec{a} = 3 \text{ m/s}^2$  upward

10:  $\vec{W} = 735 \text{N Downward}$

11:  $\vec{F}_{net} = 5 \text{N West}$     $\vec{F}_{net} = 6 \text{N left}$

12:  $\vec{v}_{obj} = 60 \text{ mph West}$