Science 1206 Physics:

Review

Name: KEY

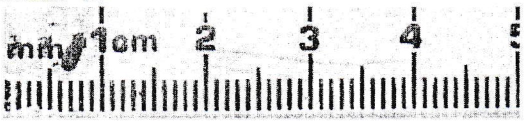
Remember: Measurements all come from some measuring device. All measurements have a unit (m, kg, L, etc.) The last digit in *any* measurement is an estimate.

Part I: Accuracy vs. Precision

1. Define Accuracy: the degree to which a measurement or calculation is similar to a standard value.

Define Precision: a measurement or calculation that can be represented with many digits consistently.

Ruler 1:



Ruler 2 :

Compare the **Accuracy** of the two rulers: Ruler 1 is more accurate because of the mm markings. You could get closer to a standard value.

Compare the **Precision** of the two rulers: Ruler 1 is more precise. You could measure to more decimal places with more certainty.

Part II: Scientific Notation. Changing to scientific notation.

Ex: 5.0×10^3 m = 5000 m **Move the decimal to the right for positive exponents.**

Ex: 5.0×10^{-3} m = 0.0050 m **Move the decimal to the left for negative exponents.**

2. Change the following measurements to scientific notation:

A.	20 000. m	2.0×10^4 m	B.	543.6 cm	5.436×10^2 cm
C.	0.000 0050 s	5.0×10^{-6} s	D.	34.1 kg	3.41×10^1 Kg
E.	0.0999 cm^3	9.99×10^{-2} cm^3	F.	0.89 g	8.9×10^{-1} g

3. Change the following scientific notation measurements to regular measurements:

A.	5.2×10^4 m	52 000 m	B.	6.7×10^{-2} m	0.067 m
C.	2.1×10^3 m	2100 m	D.	8.352×10^{-4} m	0.0008352 m
E.	4.9×10^2 m	490 m	F.	1.69×10^{-1} m	0.169 m

Part III: Uniform Motion Problems: $d = vt, v = \frac{d}{t}, t = \frac{d}{v}$

4. Mavis runs at a speed of 3.0m/s for 2.0 minutes. How far did she go? ~~(in m/s)~~

d = ?
V = 3.0 m/s
t = 2 min

$2 \text{ min} \times \frac{60 \text{ s}}{1 \text{ min}} = 120 \text{ s}$

$d = v \times t$
$= 3.0 \text{ m/s} \times 120 \text{ s}$

d = 360 m

5. Jabez ran around a track that was 408 m long. It took him 60.0 seconds. How fast was he going? If 1m/s = 3.6 km/h, what was his speed in km/h?

d = 408 m
v = ?
t = 60.0 s

$v = \frac{d}{t} = \frac{408 \text{ m}}{60.0 \text{ s}}$

$v = 6.8$ m/s

$6.8 \text{ m/s} \times 3.6 = 24.5$ Km/h

V = 24.5 Km/h

12. A car travelling at 36.0 m/s slams on its brakes. The car stops in 8.0 s, what was its deceleration? The final speed was 0.00 m/s.

$a = ?$

$v_1 = 36.0 m/s$

$v_2 = 0$

$t = 8.0 s$

$a = \frac{v_2 - v_1}{t}$

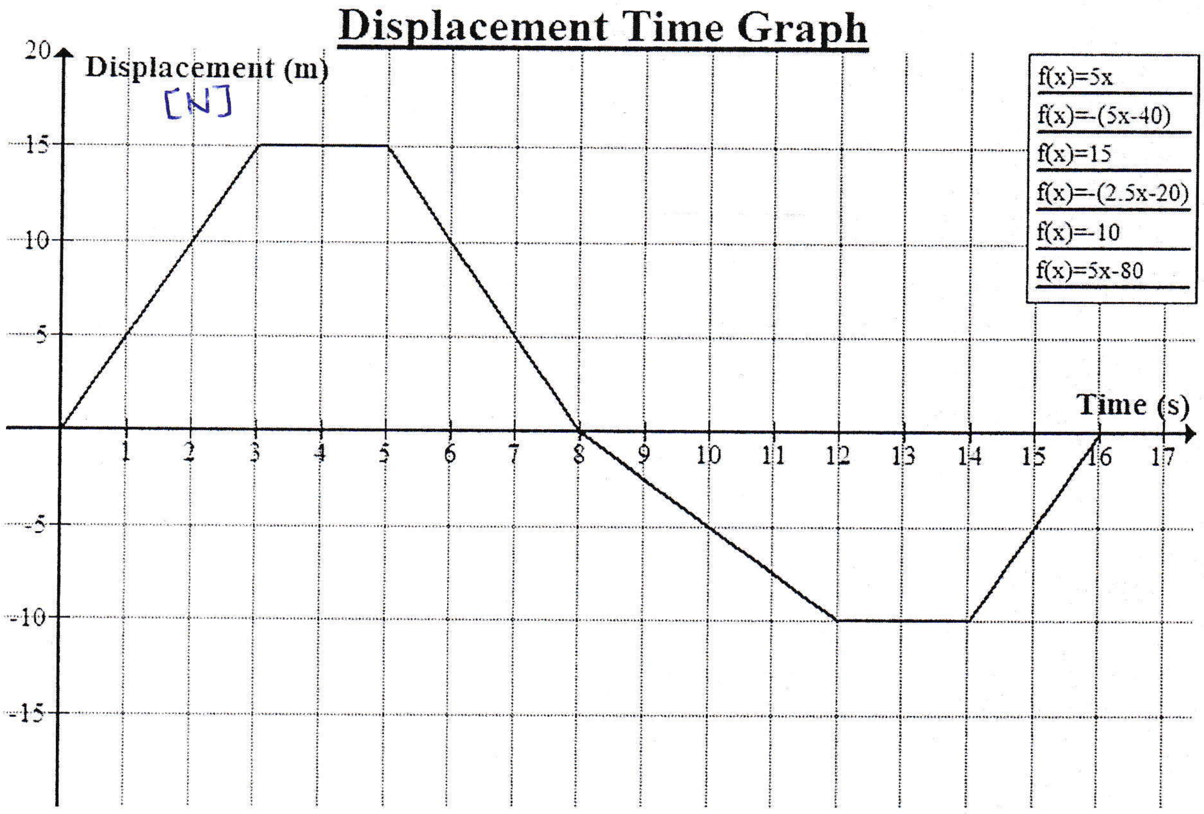
$= \frac{0 - 36.0}{8.0}$

$= \frac{-36.0}{8.0}$

$a = -4.5 m/s^2$

Part VI: Graphing Displacement

13. Consider the following displacement time graph and answer the following questions.



A. What is the object's displacement at t = 3.0 s? 15m [N]

B. What is the object's displacement at t = 6.0 s? 10 m [N]

C. What was the object's distance between 0 and 8 seconds? 30 m

$v = \frac{d}{t} = \frac{30m}{8s}$

D. What is the object's average speed between 0 and 8 seconds? 3.75 m/s

E. What is the object's average velocity between 0 and 8 seconds? 0

$\vec{v} = \frac{\vec{d}}{t} = \frac{0}{8s}$

F. What is the object's displacement between 3 and 12 seconds? 25 m [S]

G. What was the object's average velocity between 3 and 12 seconds? 2.78 m/s [S]

$\vec{v} = \frac{\vec{d}}{t} = \frac{25m}{9s}$

H. What was the object's distance between 3 and 12 seconds? 25 m

I. What was the object's instantaneous velocity at 6 seconds? 1.67 m/s [N]

$\vec{v} = \frac{\vec{d}}{t} = \frac{10m [N]}{6s}$

J. What was the object's instantaneous velocity at 11 seconds? 0.64 m/s [S]

$\vec{v} = \frac{\vec{d}}{t} = \frac{7m [S]}{11s}$

K. What was the average speed for the entire trip (between 0 and 16 seconds)? 3.13 m/s

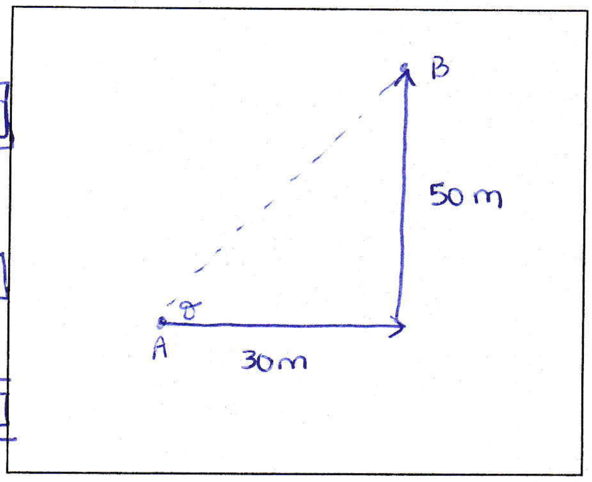
$v = \frac{d}{t} = \frac{50}{16}$

L. During which intervals was the object stopped? 3 to 5 and 12 to 14

M. At which times was the object at the starting point? 0s, 8s and 16s.

Part VIII: Displacement and Velocity Problems

16. A dog at point A walked 30. m [E] in 12.0 s, then walked 50. m [N] in 15. s, and arrived at B. Draw a labeled diagram.



A. What was the total distance the dog walked? d = 30 + 50

d = 80 m

B. What was the total displacement of the dog? $\vec{d}$ = 58 m [NE]

$a^2 + b^2 = c^2$

$30^2 + 50^2 = c^2$

$900 + 2500 = c^2$

$c^2 = 3400$

$c = \sqrt{3400}$

c = 58 m

* can use tan θ if you wish ☺

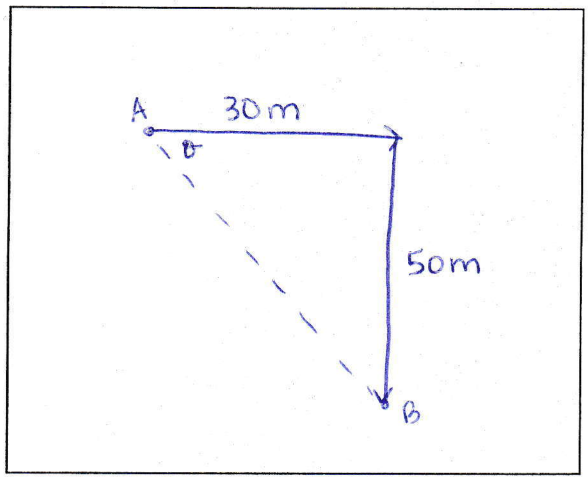
C. What was the dog's average speed? $v = \frac{d}{t}$ ⇒ v = 2.96 m/s

$v = \frac{d}{t} = \frac{80 \text{ m}}{27 \text{ s}} = 2.96$ m/s

D. What was the dog's average velocity? $\vec{v}$ = 2.14 m/s [NE]

$\vec{v} = \frac{\vec{d}}{t} = \frac{58\text{m [NE]}}{27\text{s}} = 2.14$ m/s [NE]

17. A dog at point A walked 30. m [E] in 15.0 s, then walked 50. m [S] in 25. s, and arrived at B. Draw a labeled diagram and use Pythagorean Theorem to answer the questions below.



A. What was the total distance the dog walked? d = 80m

B. What was the total displacement of the dog? $\vec{d}$ = 58m [SE]

C. What was the dog's average speed? v = 2 m/s

$v = \frac{d}{t} = \frac{80\text{m}}{40\text{s}} = 2$ m/s

D. What was the dog's average velocity? $\vec{v}$ = 1.45 m/s [SE]

$\vec{v} = \frac{58\text{m [SE]}}{40\text{s}} = 1.45$

18. What is the difference between a Scalar and Vector quantity?

Scalar quantity → number and unit (time, distance, speed, etc.)

Vector quantity → number, unit and direction (displacement, velocity, etc)

19. What is the difference between Uniform Motion and Uniform Acceleration?

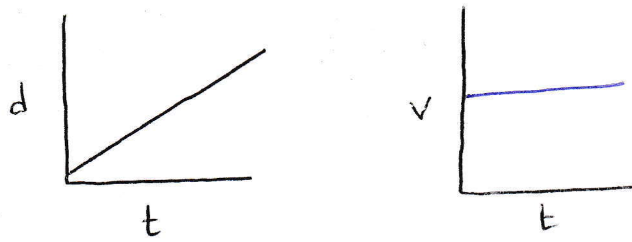
Uniform motion → object is moving at a constant speed (equal distance in every equal time period)

Uniform acceleration → object is moving at a constant acceleration (velocity changes by an equal amount in every equal time period)

Part VII: Motion Graphs

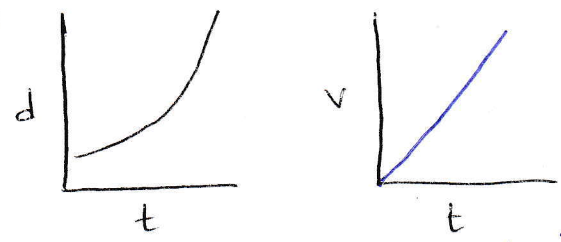
14. Given the distance time graphs below, describe the motion of the object and draw the speed-time graph that matches.

(1)



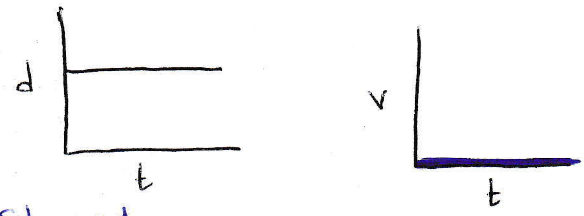
Constant speed (uniform motion)

(2)



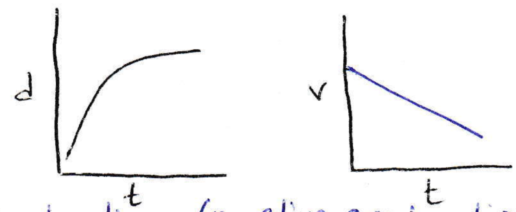
Accelerating (positive acceleration)

(3)



Stopped

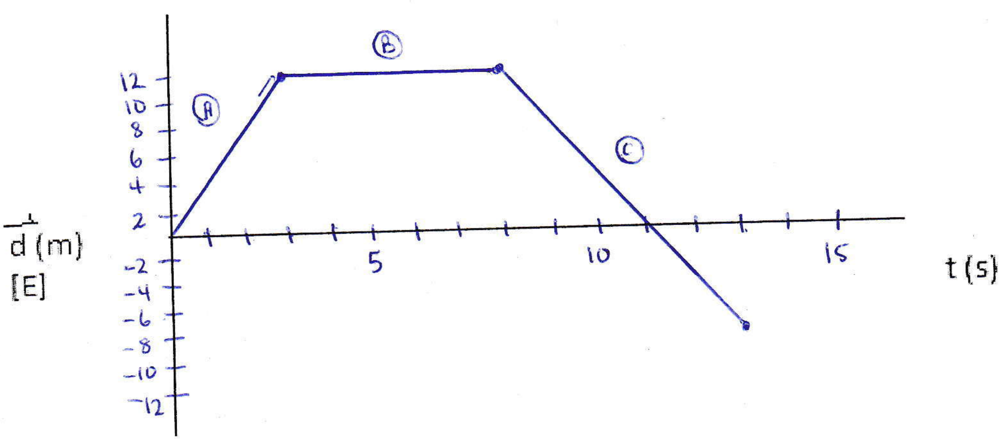
(4)

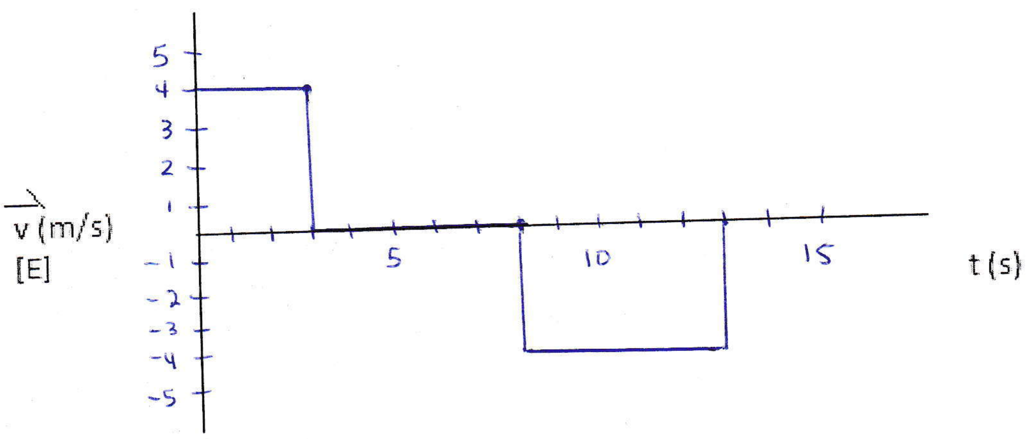


Decelerating (negative acceleration)

15. Draw a displacement-time graph from the description below. From that, calculate the velocities and construct a velocity-time graph.

An object travels 12 m/s [E] for 3 seconds, stops to rest for 5 seconds and then moves 20 m/s [W] for 5 seconds.





(A) slope = $\frac{\text{rise}}{\text{run}}$
$= \frac{12}{3}$
$= 4$ m/s [E]

(B) slope = $\frac{\text{rise}}{\text{run}}$
$= 0$ m/s

(C) slope = $\frac{\text{rise}}{\text{run}}$
$= \frac{-20}{5}$
$= -4$ m/s [W]
[W]

6. A car travelling at an average speed of 57km/h makes a 300km trip. How long did the trip take? (in hours)

d = 300 km
v = 57 km/h
t = ?

$t = \frac{d}{v} = \frac{300\ km}{57\ km/h}$

t = 5.3 h

7. A car driving at 100.0 km/h is clocked over a 100.0 m stretch. How many seconds does it take the car?

d = 100.0 m
V = 100.0 km/h
t = ?

$100.0\ m \times \frac{1\ km}{1000\ m} = 0.1\ km$

$t = \frac{d}{v} = \frac{0.1\ km}{100.0\ km/h} = 0.001\ h$

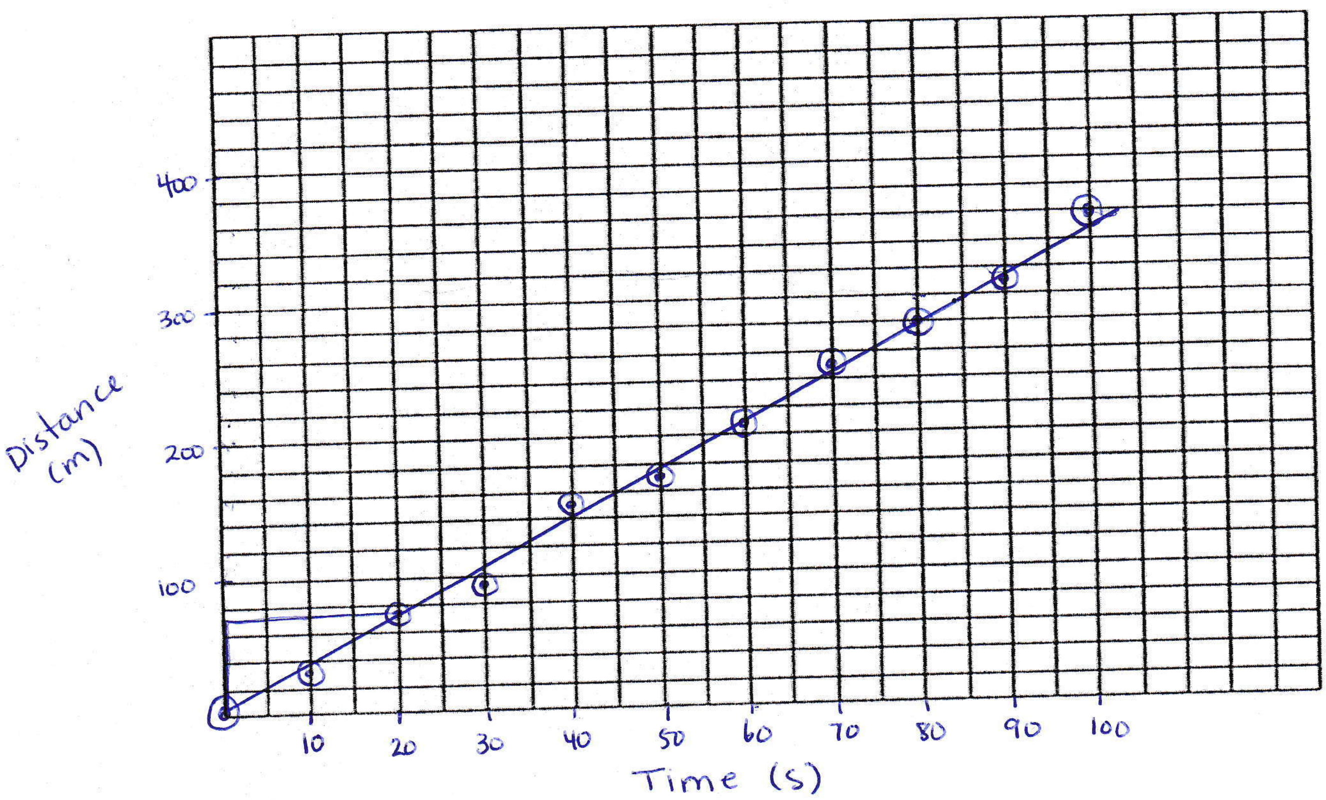
$0.001\ h \times \frac{60\ min}{1\ h} \times \frac{60\ s}{1\ min}$

t = 3.6 s

Part IV: Graphing Uniform Motion

8. The following data was collected for a student walking the halls. Her speed was not constant, but fluctuated up and down because of places in the hall where she had to slow down sometimes. Graph the data below. Draw a line of best fit through the data and determine the slope, which will give the average speed. Time is on the X .

Time	0.0 s	10 s	20 s	30 s	40 s	50 s	60 s	70 s	80 s	90 s	100 s
Distance	0.0 m	33 m	74 m	98 m	150 m	170 m	205 m	250 m	280 m	310 m	360 m



$slope = \frac{rise}{run} = \frac{74}{20} = 3.7\ m/s$

Part V: Uniform Acceleration Problems $a = \frac{v_2 - v_1}{t}, v_2 = v_1 + at,\ v_1 = v_2 - at,\ t = \frac{v_2 - v_1}{a}$

9. If a car accelerates at 3.0 m/s² for 6.0 seconds, and the car was going 15.0 m/s before, what is its final speed?

a = 3.0 m/s²
v_1 = 15.0 m/s
v_2 = ?
t = 6.0 s

$v_2 = v_1 + at$
$= 15.0 + 3.0(6.0)$
$= 15.0 + 18.0$

v_2 = 33.0 m/s

10. A helicopter that was travelling at 50.0 m/s accelerates to 75.0 m/s in 10.0 s. What was its acceleration?

a = ?
v_1 = 50.0 m/s
v_2 = 75.0 m/s
t = 10.0 s

$a = \frac{v_2 - v_1}{t} = \frac{75 - 50}{10} = \frac{25.0}{10.0}$

a = 2.5 m/s²

11. If a car was accelerating from rest at 3.0 m/s², how many seconds would it take to reach a top speed of 50.0 m/s?

a = 3.0 m/s²
v_1 = 0
v_2 = 50 m/s
t = ?

$t = \frac{v_2 - v_1}{a} = \frac{50 - 0}{3.0} = \frac{50.0}{3.0}$

t = 16.7 s