Science 1206
Unit 3 - Motion - Review Sheet

Text References: Chapter 9 - 340, 344-349, 354-359, 362-365, 376-377.
Chapter 10 - 378-379, 382-395, 398-401, 410-411
Chapter 11 - 412-417, 420-423, 426, 432-436, 442-443
Chapter 12 - 444-457, 460-473, 486-487
Pages 699-701 - Graphing Skills
Pages 702-704 - Calculation Rules

1. **Metric units** and metric conversion (see handout sheet)

2. **Significant digits** in measurements and calculations (see handout sheets)

3. **Scientific notation** (see handout sheets)

4. **Scalar vs vector quantities**: **Scalar** has magnitude only (speed = 5.5 m/s)
Vector has magnitude and direction (velocity = 5.5 m/s [E])

5. **Studying Motion:**

Speed = *distance travelled per unit of time* or *rate of travel*

Average speed = Total distance travelled ÷ Total time

OR **Average speed** = Change in distance ÷ Change in time

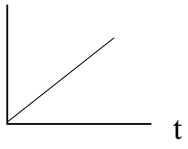
Note: Δ means *change in*

Problems: Given any two of speed, distance and time, calculate the third quantity.

6. **Uniform Motion** - motion at constant speed in a straight line (for example, a puck moving across a frictionless air table.)
Since the speed is constant, the speed at any one time (instantaneous speed) equals the average speed.

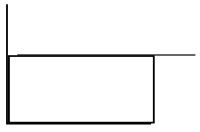
Graphs of uniform motion:

Distance vs time: Graph is a straight line with a slope.
Slope of graph = speed



Speed vs time: Graph is a horizontal line
Area between graph and the x-axis = distance travelled

Area = length x width
= t x v ------>
= d



7. **Motion in different directions:**

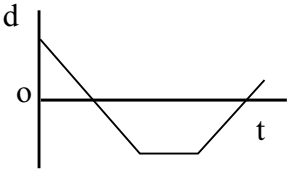
Displacement = change in position = straight line distance from starting point to final point.
Velocity = change in position (displacement) ÷ time

Example: A mouse runs 5.0 m [right] across a plank and the turns around and runs 2.0 m back the other way. If this motion takes 5.0 s, calculate the average velocity of the mouse.

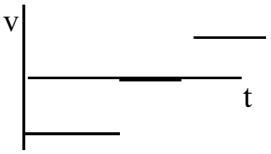
Displacement = $^{+}5.0$ m + (-2.0 m) = $^{+}3.0$ m or 3.0 m [right]

V_{av} = displacement ÷ time = 3.0 m [right] ÷ 5.0 s = 0.60 m/s [right]

Displacement vs time graphs: Slope can be negative or positive.
Slope = velocity
Sign of slope indicates direction of travel.



Velocity vs time graphs: Horizontal lines above/below x-axis
Sign of velocity indicates direction.
Area between graph and the x-axis = displacement



8. **Uniformly accelerated motion** - motion in which speed changes at a constant rate.

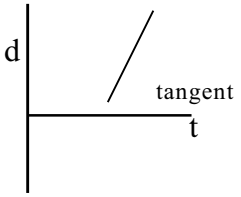
Acceleration = change in velocity ÷ change in time

where $v = v_{final} - v_{initial}$ or $v_f - v_i$

From these equations we get: $V_f = V_i + at$ and $V_i = V_f - at$

Graphs of accelerated motion:

Displacement vs time: Graph is a curved line.
Slope is calculated using tangent line.
Slope of tangent = instantaneous velocity.
Values for V_{inst} can be used to plot v vs t graph.



Positive slope = speeding up in positive direction or slowing down in negative direction.
Negative slope =speeding up in negative direction or slowing down in positive direction.

Velocity vs time: Graph is a straight line with a slope.
Above x-axis - all velocities are in positive direction.
Below x-axis - all velocities are in negative direction
Area between graph and x-axis = displacement
(Area of Triangle A - Area of Triangle B)
Slope of the velocity vs time graph = acceleration