Ruiz-Houston's ~ Key
MYP Physics ~ Mid-Term Review

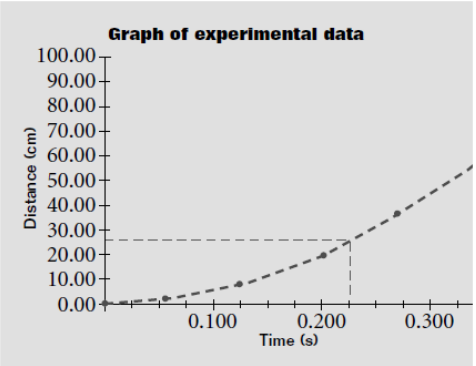
Chapter 1 ~ The Science of Physics

1. What area of physics deals with the subjects of heat and temperature?
   Thermodynamics
2. What area of physics deals with the behavior of subatomic particles?
   Quantum Mechanics
3. What term describes a set of particles or interacting components considered to be a distinct physical entity for the purpose of study?
   System = Distinct Physical Entity
   Model = Patten or representation
4. What is the SI base unit for length? Mass? Time?
   Length = m ; **Mass = kg** ; **Time = s**
5. A light-year (ly) is a unit of distance defined as the distance light travels in one year. Numerically, 1 ly = 9,500,000,000,000 km. How many meters are in a light-year?
   $9.5 \bullet 10^{15}$ m
6. How many significant figures are in the following:

9,500,000,000,000 **2**	17800 **3**	5.70 g **3**	6.070×10^3 m **4**
0.0087 **2**	0.0057 kg **2**	6070 m **3**	6.756 **4**

7. Use significant figures to do the following calculation:

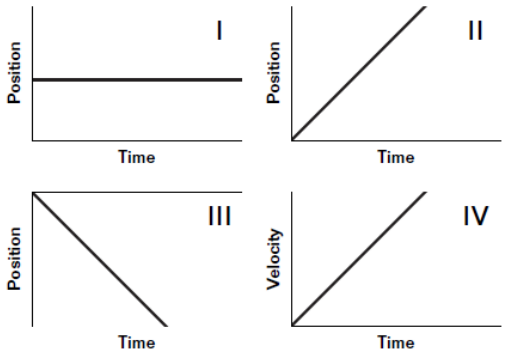
12.45 + 2.3 + 6.756 = **21.5**	12.3 / 4.654 = **2.64**	3.6 m ● 5.8 m = **21 m^2**



8. What does Δt mean =
   change in time or final time – initial time
9. What does ∑ F mean =
   Sum of Forces
10. What are the steps to the scientific method and why do scientists use models?
    - **Make observation a& collect data that lead to a question**
    - **Formulate & objectively test hypothesis by experiments.**
    - **Interpret results & revise the hypothesis if necessary**
    - **State conclusions in a form that can be evaluated by others**
11. About how far has the ball fallen after 0.200 s? **20.0 cm**
12. Create a statement that best describes the relationship between the variables.
    For equal time intervals, the change in position is increasing
13. What is the difference between accurate and precise? Are the following numbers accurate, precise, both or both if the known value is 10.2 g? 5.2, 5.1, 5.0
    - **Precise = grouping of data**
    - **Accurate = hitting the target value**
    - **This data is precise but NOT accuarate**
14. Convert 45 km/h to m/s:
    12.5 m/s
15. The slope of a position vs time graph gives you _____**velocity**_____. (review how to read these graphs)

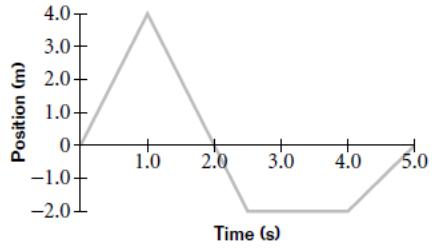
Chapter 2 ~ Motion in One Dimension

Use the graphs below to answer questions 1–3.

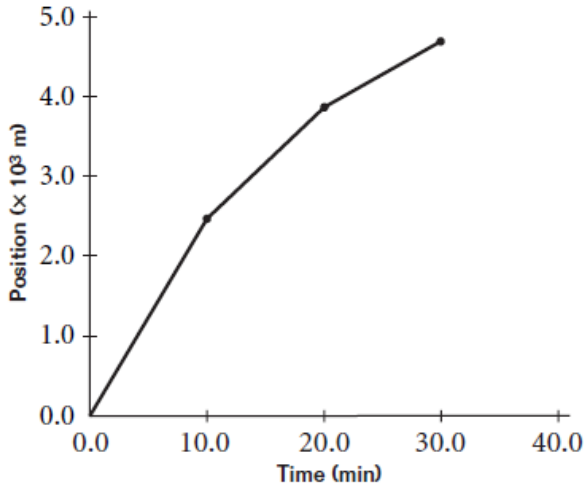


1. Which graph represents an object moving with a constant positive velocity? **II**
2. Which graph represents an object at rest? **I**
3. Which graph represents an object moving with constant positive acceleration? **IV**
4. A bus travels from El Paso, Texas, to Chihuahua, Mexico, in 5.2 h with an average velocity of 73 km/h to the south. What is the bus's displacement? (in km) **3.79.6 km ➔ 380 km South**

Use the following position-time graph of a squirrel running along a clothesline to answer questions 5–6.



5. What is the squirrel's displacement at time t = 3.0 s?
   @ 3.0 s the squirrel is – 2.0 m
6. What is the squirrel's average velocity during the time interval between 0.0 s and 3.0 s?
   - 0.67 m/s
7. A ball initially at rest rolls down a hill and has an acceleration of 3.3 m/s2. If it accelerates for 7.5 s, how far will it move during this time?
   92.8 m ➔ 93 m
8. What the velocity of car that has started 10 m from the start line and traveled a total of 50m in 25s?
   1.6 m/s ➔ 2 m/s
9. A car starting from rest, achieves a final velocity of 50m/s in 30s. What is its acceleration?
   1.67 m/s^2 ➔ 1.7 m/s^2
10. A motorcycle has an initial velocity of 20m/s and maintains a constant acceleration of 5m/s^2. What is the magnitude of the motorcycle's displacement after 30s?
    2,850 m
11. In one or two sentences, explain the difference between *displacement* and *distance traveled.*
    - **Displacement = $\Delta x = x_f - x_o$ (includes direction)**
    - **Distance Traveled = how far the object has moved (no direction)**
12. The graph below shows the position of a runner at different times during a run. Use the graph to determine the runner's displacement and average velocity:
    a. for the time interval from t = 0.0 min to t = 10.0 min
       Δx_1 = +2,400 m ; v_1 = +400 m/s
    b. for the time interval from t = 10.0 min to t = 20.0 min
       Δx_2 = +1,500 m ; v_2 = +2.5 m/s
    c. for the time interval from t = 20.0 min to t = 30.0 min
       Δx_3 = +900 m ; v_3 = +2 m/s
    d. for the entire run
       Δx_{total} = +4,800 m ; v_{avg} = +2.7 m/s



13. A rocket, starting from the launch pad, travels a distance of 500m accelerating at a rate of 40 m/s^2. Find its v_f. **v_f = 200 m/s**
14. An object is free fall experience _____**constant**_____ acceleration.
15. A flower pot falls out of a window that is 25m high. How long does it take to hit the ground? **t = 2.26 s**
16. Describe the type of motion in the table to the right.

Table 3 Velocity and Acceleration

v_f	a	Motion
+	+	speeding up
–	–	speeding up
+	–	slowing down
–	+	slowing down
– or +	0	constant velocity
0	– or +	speeding up from rest
0	0	remaining at rest

Chapter 3 ~ Two Dimensional Motion & Vectors

1. What is the difference between a scalar and vector? Give examples
   - **Vector = magnitude & direction**
   - **Scalar = magnitude only (no direction)**

2. You are walking to your friend's house. You walk 200m North and then 50m west. What is your displacement? **206 m @ 76° N of W**

3. Vector **A** has a magnitude of 30 units. Vector **B** is perpendicular to vector **A** and has a magnitude of 40 units. What would the magnitude of the resultant vector **A** + **B** be?
   50 units
4. You are walking to your friend's house. You walk 200m north and then 50m 30 degrees north of west. What is magnitude of your displacement? **229 m @ 79° N of W**

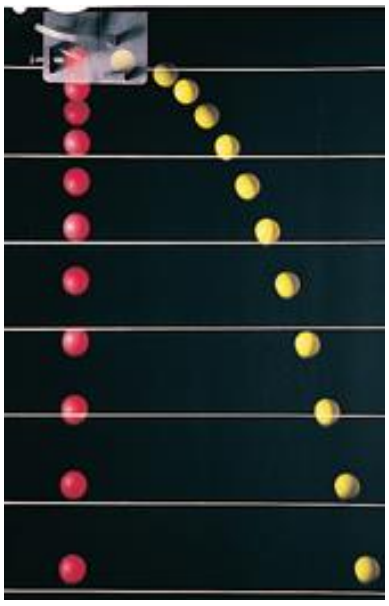
5. A motorboat heads due east at 5.0 m/s across a river that flows toward the south at a speed of 5.0 m/s.
   a. What is the resultant velocity relative to an observer on the shore? **7.1 m/s @ 45° south of east**
   b. If the river is 125 m wide, how long does the boat take to cross the river? **t= 25s (use velocity component)**

6. Vector A = 5m North and Vector B = 7m East. C = A+B. What is the value of C? (solve using component method) **8.6 m at 54.5° E of N**

7. A golfer takes two putts to sink his ball in the hole once he is on the green. The first putt displaces the ball 6.00 m east, and the second putt displaces the ball 5.40 m south. What displacement would put the ball in the hole in one putt?
   8.07 m at 42.0° south of east
8. A roller coaster travels 41.1 m at an angle of 40.0° above the horizontal. How far does it move horizontally and vertically?
   31.5 m horizontally, 26.4 m vertically
9. If a rock is thrown off a 75m cliff, at a velocity of 15m/s, how far from the cliff will the rock land? **58.7 m**

10. The shape that a projectile takes is a _____**parabola**_____. **(Its path is called the trajectory)**

11. If multiply projectiles are launched at the same time, will they all hit the ground at the same time?
    Yes, if they all have the same initial vertical velocity.



12. The Tennessee kicker punts the ball at an angle of 35 degrees above the field. The initial velocity of the football is 25m/s.
    a. What is the vertical component of the ball's velocity?
       14.3 m/s
    b. What is the final horizontal velocity?
       20.5 m/s
    c. What is its max height?
       10.5 m (not a very good punt – but, hey, its UT!)

13. Understand the velocities and accelerations of a projectile that is:
    - Dropped from a height.
      - **v_{ox} = 0 m/s ; v_{oy} = 0 m/s ; a = -9.81 m/s^2**
    - Projected horizontally from a height
      - **v_{ox} = horizontal v ; v_{oy} = 0 m/s ; a = -9.81 m/s^2**
    - Projected at an angle
      - **v_{ox} = v (cos θ) ; v_{oy} = v (sin θ) ; a = -9.81 m/s^2**

Chapter 4 ~ Forces & Newton's Laws

1. When is an object in equilibrium? **net force = 0 N (at rest or at constant velocity)**

2. If you weigh 700N what is your mass? (what is the symbol for weight) **F_g = 700 N m = 71.4 kg**

3. Define each of Newton's 3 laws and give an example of each.
   - **Newton's 1st Law = Law of inertia ~ Object will stay @ rest or stay at rest OR stay in motin with a constant velocity unless a force is applied to the object**
   - **Newton's 2nd Law ~ F = ma**
   - **Newton's 3rd Law ~ Action / Reaction Pairs**
4. What is the difference between static and kinetic friction? (Give an example of each)
   Static friction acts between two surfaces that are not in motion, relative to each other. This is the friction that you have to overcome to get an object to start moving. Kinetic friction is the friction between two surfaces when one of the objects is in motion relative to the other. This is the friction between the tires and the road for a moving car

5. Two people are pulling on a rope in opposite directions. One pulls to the left with a force of 50N and the other pulls to the right with a force of 75N. What is the net force? **25 N to the right.**

6. A person is pulling a wagon with a mass of 10kg with a force of 20N. The kinetic friction between the road and tires is 2N. What is the object's acceleration? What is the coefficient of kinetic friction?
   a = 1.8 m/s^2 ; μ = 0.02

7. A 35kg child slides down a slide at an angle of 40 degrees. What are the components of the child's weight?
   Horizontally ~ 220.5 N
   Vertically ~ 262.8 N

8. A 2kg cup of lemonade is sitting on a table that is at an angle of 20 degrees. What is the normal force?
   F_N = 18.4 N

9. A crate is pulled to the right (positive *x*-axis) with a force of 82.0 N, to the left with a force of 115 N, upward with a force of 565 N, and downward with a force of 236 N. Find the magnitude and direction of the net force on the crate.
   3.30 ●10^2 N at 96° counterclockwise from the positive *x*-axis

10. A crate rests on the horizontal bed of a pickup truck. For each situation described below, indicate the motion of the crate relative to the ground, the motion of the crate relative to the truck, and whether the crate will hit the front wall of the truck bed, the back wall, or neither. Disregard friction.

    a. Starting at rest, the truck accelerates to the right. **at rest, moves to the left, hits back wall**
    b. The crate is at rest relative to the truck while the truck moves with a constant velocity to the right. **moves to the right (with velocity *v*), at rest, neither**
    c. The truck in the previous question slows down. **moves to the right, moves to the right, hits front wall**

11. A student pulls a rope attached to a 10.0 kg wooden sled and moves the sled across dry snow. The student pulls with a force of 15.0 N at an angle of 45.0°. If μ_k between the sled and the snow is 0.040, what is the sled's acceleration? Show your work.
    a = 0.71 m/s^2

12. A 60kg basket hangs from the roof by two ropes that each make an angle of 50 degrees with the roof. What is the magnitude of the tension force on each rope? **384 N**