

## Contemporary Physics I – HW 2

### HW 2

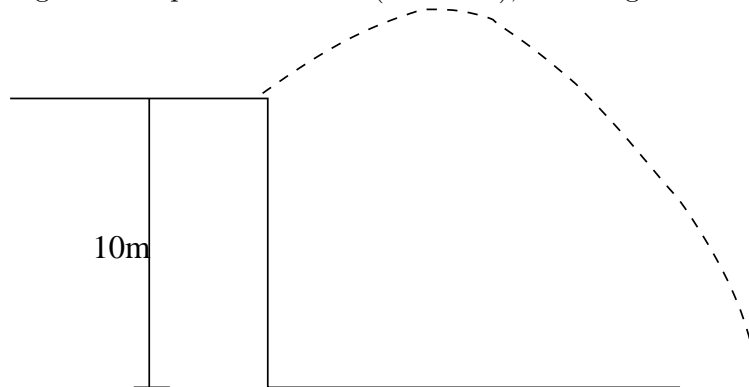
Due October 8, 2009

Please answer all questions clearly and concisely. While you need not transcribe the question completely, it should be clear from your answer alone what you are talking about.

You are strongly encouraged to discuss the homework with your classmates, but you must complete the written homework by yourself, and of course, the material you submit must be your own.

Remember, show all of your work!

1. You are standing at the top of a 10m cliff (as shown), throwing stones over the edge.



You throw a 0.2 kg stone at an angle of 30 degrees above the horizontal with a speed of  $10\text{m/s}$ .

- (a) What is the x-component of the stone's velocity immediately after it leaves your hand?
  - (b) What is the y-component of the stone's velocity immediately after it leaves your hand?
  - (c) How long after you throw it does it reach its maximum height?
  - (d) How long after you throw the stone does it take to hit the ground?
  - (e) How far from the edge of the cliff does the rock hit?
2. Consider the earth ( $m = 6 \times 10^{24}\text{kg}$ ) traveling around the sun ( $M = 2 \times 10^{30}\text{kg}$ ) with an orbital radius of  $1.5 \times 10^{11}\text{m}$ .  
For each part, please compute. Do not simply look up the answer. I'm aware that this internet that I've been hearing so much about could probably give you the answer, but that's not what we're looking for right now.
    - (a) What is the gravitational force between the two?
    - (b) What is the centripetal acceleration on the earth?
    - (c) What is the circular velocity of the earth?
    - (d) What is the magnitude of the momentum of the earth?
  3. What is the charge number (Q), Baryon number, (B – how many baryons), and lepton number (L) of the following:

- (a)  $e$  (electron)
- (b)  $p$  (proton)
- (c)  $e^+$  (positron)
- (d)  $\gamma$  (photon)
- (e)  $\bar{\nu}$  (anti-neutrino)
- (f)  $He$  (Helium nucleus)

4. 2.P.26

5. 2.P.38

6. 3.P.34

7. 3.P.37