Ch 8 HW Assignment: Answers & HW Hints (Pt. 1)

Part 1: Potential Energy

Pg. 189-190 #1, 4, 5

Answers

1a. 166.6J

b. -166.6J

c. 196J

d. 29.4J

e. 166.6J

f. -166.6J

g. 296J

h. 129.4J

4a. 0J

b. 169,785J

c. 339,570J

d. 169,785J

e. 339,570J

f. Increase

5. 8889N/m

Ch 8 HW Assignment: Answers & HW Hints (Pt. 2)

Part 2: Conservation of M.E.

Pg. 190-192 #9, 10, 13, 15, 17, 18, 20-25, 28-31, 34

Answers

9a. 256.9m
b. Same
c. Decreases

10a. 12.9m/s
b. 12.9m/s
c. Increases

13a. 17.0m/s
b. 26.5m/s
c. 33.4m/s
13d. 56.7m
e. All the same.

15a. 0.98J
b. -0.98J
c. 306.3N/m

17a. 8.35m/s
b. 4.33m/s
c. 7.45m/s

18a. 7.22J
b. -7.22J
c. 0.86m
d. 26.1cm

20a. $-3x^2+12x+27$
b. 39J
c. -1.61m
d. 5.61m

21a. 4.85m/s
b. 2.43m/s

22. 10.0cm

23. -317.5J

24a. 4.4m
b. Same

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Answers (cont)

25a. No, since…

b. 933N

28a. 0.81m/s

b. 0.21m

c. 6.31m/s^2

d. Up the incline

29a. 39.2J

b. 39.2J

c. 4.0m

30a. 2.82m/s

b. 2.71m/s

31a. 0.35m

b. 1.7m/s

34. 1.25cm

Ch 8 #17

For part C, think about the object bob when it gets to that highest position. For the cord to remain straight, it must still be in motion so there is still almost tension in the cord. So you must start with a centripetal problem, thinking about the forces acting on the bob at the top. (But since it's the slowest speed it can have at this point, think about the moment when the tension force drops to zero.) Use these centripetal ideas to find the speed at the top point, and then work the E-conservation problem using that value.

Ch 8 #18

On part C be careful, since you're dealing with the height *above the spring's relaxed position* from which the block was dropped. If you treat the spring's relaxed position as the zero-level for gravitational potential energy (which makes your initial energy just mgh, where you're trying to solve for h), then you must treat the block's final position as a negative height.

On part D, the setup is going to be similar to what worked for you on part C, but you should end up needing to solve a quadratic before all is said and done.

Ch 8 #20

For part A, you should just need to remember the calculus-based relationship between force and work done (which is closely related to U). Then for part B, just think hard about the previous relationship… Since you're trying to find max U, you need to find the position at which the derivative of U equals zero. But the derivative of U should just be force, which you already knew.

Ch 8 #22

If you've already completed #18 part D, then this one should feel quite similar.

Ch 8 #23

This one brings in some projectile ideas, along with your energy-conservation ideas, since time doesn't directly enter into energy formulas. To calculate ΔU, you'd have to know something about the height the ball reaches during the 6s interval. So start by solving for the vertical location of the ball after the 6 seconds, and then finish by calculating its potential energy at this height (relative to its initial location as the zero-level).

Ch 8 #24

Start with calculating the launch speed, using just energy-conservation ideas. But then the launch angle really does affect the answer to this question, because it controls how much horizontal velocity the skier still possesses when at his highest point. So calculate the horizontal component of the launch speed, and realize that this will be the skier's entire speed when at the final max height. Energy-conservation ideas should finish the problem for you.

Ch 8 #28

For part C, you can find the acceleration by simply using $\Sigma F = ma$ ideas, keeping in mind that there are multiple forces contributing to the acceleration.

Ch 8 #34

This one is good because it helps you practice the combination of energy-conservation ideas with projectile ideas. However, it's a little harder than it actually needs to be. So if you're really looking for a challenge, then try the problem as is. Otherwise, you'll still get all the practice you need (and still get the right answer) if you assume that you know the table's height is 1.0m and that the mass of the ball is 1.0kg.

Ch 8 HW Assignment: Answers & HW Hints (Pt. 3)

Part 3: Reading a Potential Energy Curve

Pg. 192-193 #39-41

Answers

39a. 2.13m/s

b. 10N

c. + x-dir

d. 5.74m

e. 30N

f. - x-dir

40a. 8.37m/s

b. 12.65m/s

c. 7.67m

d. 1.73m

41a. -3.73J

b. graph

c. 1.3m

d. 9.1m

e. 2.16J

f. x=4.0m

g. $(4-x)(e^{-x/4})$

h. x=4.0m

Ch 8 #41

For part B-F, there's not really much work you can show. Just do it on your calculator and make sure that you know how to find the answers.

For part G, here are a couple of calculus reminders: To find d/dx of a product of two functions of x, you need to use the product rule. (Check your old Ch 2 notes if you forget.) Then also remember that the derivative of $e^{f(x)}$ equals $(e^{f(x)})(df/dx)$.

Ch 8 HW Assignment: Answers & HW Hints (Pt. 4)

Part 4: 'Real' Energy Conservation

Pg. 193-195 #46, 47, 51-54, 56, 59, 64, 65

Answers

46. -10,992J

47a. -2940J

b. 392J

c. 212N

51a. 1,528,800J

b. -509,599J

c. 1,019,201J

d. 62.6m/s

52. 0.15

53. 1.23m

54a. 0.292m

b. 14.16J

56. 4.30m

59a. -0.9J

b. 0.46J

c. 1.04m/s

64. 3.52m/s

65a. 7.38m/s

b. 0.902m

c. 2.77m

d. -skip-

Ch 8 #52

Just realize, when setting up your conservation of energy equation, that you can have final energy equal to zero. (This wasn't possible back when we didn't have friction in our problems, because if you started with energy then you ended with energy. But now that there's friction, you can start with energy and friction can do work to steal away all of those Joules.)

Ch 8 #53

Just don't worry that they didn't tell you mass, even when you need to include work done by friction. If you write out all terms, you'll see that even the work term has an 'm' in it. This means you can cancel the masses.

Ch 8 #54

For part A, think of the initial position as equilibrium (where you know KE=20J and U_{spring}=0J) and think of the final position when the object stops.

For part B, just realize that friction not only acts as the object moves out to its max position, but also as it moves back toward equilibrium.

Ch 8 #64

Just assume on this one that the object does in fact reach point B. If you start solving and your answer is nonsensical, you'll know that it doesn't actually reach that position.

Ch 8 #65

On part B, the k value is given in MN/m, which means meganewtons, and mega means x10^6.

On part D, you can skip it.