ke_gpe_ball_off_ramp

1. A 50 kg. mass is held at a height of 30 m above the ground. How much gravitational potential energy does it possess?

2. A bowling ball of mass 10 kg. is thrown at a velocity of 20 m/s. How much kinetic energy does it possess?

3. A 350 gram weight is held 200 cm above the floor. How much gravitational potential energy does it possess?

4. A 200 gram baseball is thrown at 40 m/s. How much kinetic energy does it possess?

5. A mass *m* is held a height *h*. If the height is doubled by what factor does the gravitational potential energy change?

A. It does not change
B. It doubles
C. It increases by a factor of four
D. It decreases to half its original value
E. You must k now the value of *m*

6. A mass *m* moves at a velocity *v*. If the velocity is doubled, by what factor does the kinetic energy of the mass change?

A. It does not change
B. It doubles
C. It increases by a factor of four
D. It decreases to half its original value
E. You must k now the value of *m*

7. What is 60 miles/hour in proper SI units.

There are 1610 meters to a mile and 3600 s in an hour.

8. How much kinetic energy does a 1000 kg car possess if it is traveling at 60 mi/h?

9. A marble is dropped from a height of 20 m. What is its velocity (or speed) just before it strikes the ground?

10. A marble is dropped from a height of 20 m. How long does it take for the marble to hit the ground?

11. (a) The mass of the marble is 22.5 ± 0.1 g What is the % uncertainty of its mass?

(b) At a point 10.0 meters below where it was released a set of photo-gates times the marble to be traveling at 13.9 ±0.1 m/s. What is the % uncertainty of its speed at this point?

(c) What is the kinetic energy of the marble 10.0 meters below the point where it was released?

(d) What is the total % uncertainty of the marble's kinetic energy at the point 10.0 meters form where it was released?

12.

	A	B	C	D	E	F	G
1	ramp height from table (m)	speed at bottom of ramp (m/s)	height of table from floor (m)	time for ball to hit floor from table top (s)	distance ball lands from table (calculated) (m)	distance ball lands form table (measured) (m)	%error
2	0.352		1.100			1.196	

(a) What would you type into cell B2 in order to calculate the speed the speed at the bottom of the ramp?

(b) What would you type into cell D2 in order to calculate the time it takes for the ball to strike the floor?

(c) What would you type in cell E2 in order to calculate the distance the ball should land from the bottom of the table?

(d) What would you type into cell G2 in order to calculate the percent error of the trial (use calculated as accepted value)

13. What is the SI unit for acceleration?

a. meters b. Newtons c. joules d. m/s e. m/s^2 f. amps
g. volts h. coulombs i. farads j. watts k. kilograms l. ohms

14. What is the SI unit for electric charge?

a. meters b. Newtons c. joules d. m/s e. m/s^2 f. amps
g. volts h. coulombs i. farads j. watts k. kilograms l. ohms

15. What is the SI unit for power?

a. meters b. Newtons c. joules d. m/s e. m/s^2 f. amps
g. volts h. coulombs i. farads j. watts k. kilograms l. ohms

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16.A ball is placed at the top of ramp at a height of 45.0 cm. It is released such that at the bottom of the ramp it is projected horizontally off the edge of the table. The table is 1.55 meters high.

(a) What is the speed of the ball just as it leaves the edge of the table?

(b) How long does it take before it strikes the floor?

(c) How far from the edge of the table should it strike the floor?

(d) What is it's horizontal component of velocity just before it hits the floor?
(This becomes the **i** component of its final "net" velocity)

(e) What is its vertical component of velocity just before it strikes the floor? (Use the height of the table to determine this along with $\sqrt{2gh}$)
(This becomes the **j** component of the final "net" velocity just before it strikes the floor.

(f) What is the "net" velocity of the ball just before it strikes the ground? Give the magnitude and the angle from horizontal
This is the vector sum (just like you did on the force tables) of the vertical velocity and the horizontal velocity

answers:

1. 1.5 x 10^4 joules (14,700 to two significant figures)
2. 2.0 x 10^3 joules
3. 6.9 joules (convert grams to kg and cm to m)
4. 1.6 x 10^2 joules
5. B it doubles
6. C (since the KE is a function of the square of the velocity, if the velocity doubles, the energy quadruples)
7. $\frac{60mi}{h}\left(\frac{1610m}{1mi}\right)\left(\frac{1h}{3600s}\right) = 27\frac{m}{s}$

8. 3.6 x 10^5 joules

9. 20 m/s

10. 2.0 s
11. (a) 0.44% (b) 0.72 % (c) 2.17 joules (convert 22.5 grams to kg) (d) 1.88 %

12. (a) =sqrt(2*9.8*a2)

    (b) =sqrt(2*c2/9.8)

    (c) =b2*d2

    (d) =abs((e2-f2)/e2) format to read %

13. e. m/s^2

14. h coulombs

15. j. watts

16. (a) 2.97 m/s (b) 0.562 s (c) 1.67 m

(d) The horizontal component never changes, so it is the same as when it left the table, or
2.97 m/s

(e) the vertical component would be the same as if it just fell from the edge of the table (1.55 m)

so the vertical component of the velocity right before it strikes the floor is

$\sqrt{2gh} = \sqrt{2 \cdot 9.8\,m/s^2 \cdot 1.55m} = 5.51m/s$ **this velocity points down**

(f) The net velocity is

2.97 i - 5.51 j m/s

(the j component is negative because it is pointing down)

So the net velocity is

$$\sqrt{2.97^2 + 5.51^2} = 6.25 m/s$$

at

$$\theta = \tan^{-1}\left(\frac{-5.51}{2.97}\right) = -61.6°$$