Name: Answer Key Period: _____

Practice Physics Final Exam – Standards 38–47

1) A ball drops some distance and loses 30 J of gravitational potential energy. **Do not ignore air resistance.** How much kinetic energy did the ball gain? 1) C

A. exactly 30 J
B. more than 30 J
C. less than 30 J
D. cannot be determined from the information given

KE is less than 30J because a small amount of energy is lost to heat because of air resistance.

2) Describe the energy of a car driving up a hill. 2) F

F. both kinetic and potential
G. entirely potential
H. entirely kinetic
J. gravitational

The car has: Kinetic energy because its moving
Potential energy because it gaining height

3) A container of water is lifted vertically 3.0 m then returned to its original position. If the total weight is 30 N, how much work was done? 3) D

A. 90 J
B. 45 J
C. 180 J
D. No work was done.

F = 30N
+3m ↑ ↓ -3
displacement = 0
$W = F \cdot d$
$W = 30N \cdot 0m$
$W = 0\ J$

4) An object is lifted vertically 2.0 m and held there. If the object weighs 30 N, how much work was done in lifting it? 4) F

F. 60 J
G. 120 J
H. 30 J
J. 0 J

$W = F \cdot d$
$W = (30N)(2m)$
$W = 60J$
$F = 30N$
$d = 2.0m$

5) You throw a ball straight up. Compare the sign of the work done by gravity while the ball goes up with the sign of the work done by gravity while it goes down. 5) D

A. Work is + on the way up and – on the way down.
B. Work is – on the way up and – on the way down.
C. Work is + on the way up and + on the way down.
D. Work is – on the way up and + on the way down.

When Force and Displacement are in the same direction, positive work is done.
When Force and Displacement are in opposite directions, negative work is done.

6) A ball falls from the top of a building, through the air (air friction is present), to the ground below. How does the kinetic energy (K) just before striking the ground compare to the potential energy (U) at the top of the building? 6) F

F. K is less than U.
G. K is equal to U.
H. K is greater than U.
J. It is impossible to tell.

Same reason as #1

7) An acorn falls from a tree. Compare its kinetic energy K, to its potential energy U. 7) A

A. K increases and U decreases.
B. K increases and U increases.
C. K decreases and U increases.
D. K decreases and U decreases.

$U_g = mgh$
$U_g = 100\%$ ○ $KE = 0\%$
$KE = \frac{1}{2}mv^2$
"h" gets smaller
"V" gets bigger
$U_g = 0\%$ ↓ $KE = 100\%$

8) A 50-N object was lifted 2.0 m vertically and is being held there. How much work is being done in holding the box in this position? 8) G

F. less than 100 J, but more than 0 J
G. 100 J
H. more than 100 J
J. 0 J

$W = F \cdot d$ $W = (50N)(2m)$
$W = ?\ J$ $W = 100\ J$
$F = 50N$
$d = 2.0m$

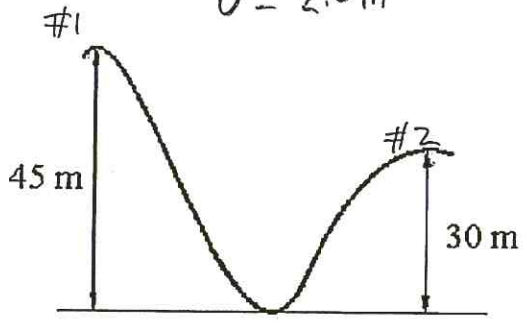

FIGURE 6-2

9) A roller coaster starts from rest at a point 45 m above the bottom of a dip (See Fig. 6-2). Neglect friction, what will be the speed of the roller coaster at the top of the next slope, which is 30 m above the bottom of the dip? 9) B

A. 30 m/s
B. 17 m/s
C. 24 m/s
D. 14 m/s

$U_{g1} + KE_1 = U_{g2} + KE_2$ * mass cancels out!
$g = 9.8\ \frac{m}{s^2}$ $mgh_1 + \frac{1}{2}mv_1^2 = mgh_2 + \frac{1}{2}mv_2^2$
$h =$ $(9.8)(45) + \frac{1}{2}(0)^2 = (9.8)(30) + \frac{1}{2}v_2^2$
Solve for "v" = $17\ \frac{m}{s}$

10) A roller coaster starts with a speed of 5.0 m/s at a point 45 m above the bottom of a dip (See Fig. 6-2). Neglect friction, what will be the speed of the roller coaster at the top of the next slope, which is 30 m above the bottom of the dip? 10) H

F. 14 m/s
G. 16 m/s
H. 18 m/s
J. 12 m/s

$U_{g1} + KE_1 = U_{g2} + KE_2$ * mass cancels out!
Same as above this time KE is NOT zero!
$mgh_1 + \frac{1}{2}mv_1^2 = mgh_2 + \frac{1}{2}mv_2^2$
$(9.8)(45) + (\frac{1}{2})(5^2) = (9.8)(30) + \frac{1}{2}(v^2)$
Solve for "v" = $17.86 = 18\ \frac{m}{s}$

11) Can work be done on a system if there is no motion? $W = F \cdot d$ 11) D

A. Yes, if an outside force is provided.
B. Yes, since motion is only relative.
C. No, since a system which is not moving has no energy.
D. No, because of the way work is defined.

If there is no motion then "d" equals "0"
$W = F \cdot 0$
$W = 0\ J$

12) A lightweight object and a very heavy object are sliding with equal speeds along a level frictionless surface. They both slide up the same frictionless hill. Which rises to a greater height? 12) G

F. The lightweight object, because it weighs less.
G. They both slide to the same height.
H. The heavy object, because it has greater kinetic energy.
J. cannot be determined from the information given

The mass doesn't affect the height of the object

$KE_{bot} = PE_{top}$ — therefore the velocity of the objects is the only variable affect the height.
$\frac{1}{2}mv^2 = mgh$
mass cancels.

13) A 500-kg elevator is pulled upward with a constant force of 5500 N for a distance of 50.0 m. What is the work done by the 5500 N force? 13) B

A. -2.45×10^5 J
B. 2.75×10^5 J
C. -5.20×10^5 J
D. 3.00×10^4 J

$F = 5500N$ $d = 50m$ $W = F \cdot d$ $W = 275,000 = 2.75 \times 10^5 J$

14) If you walk 5.0 m horizontally forward at a constant velocity carrying a 10-N object, the amount of work you do is 14) G

F. more than 50 J.
G. zero.
H. less than 50 J, but more than 0 J.
J. equal to 50 J.

$W = F \cdot d$
$F = 0$ N in the direction of motion!
$d = 5$ m
$W = 0N \cdot 5m$
$W = 0$ J

F ⊥ d = no work done.

15) You lift a 10-N physics book up in the air a distance of 1.0 m, at a constant velocity of 0.50 m/s. What is the work done by the weight of the book? 15) B

A. -10 J
B. +10 J
C. +5.0 J
D. -5.0 J

$W = F \cdot d$ $F = 10N$ $d = 1m$ $W = 10N \cdot 1m$ $W = 10$ J

16) A truck weighs twice as much as a car, and is moving at twice the speed of the car. Which statement is true about the truck's kinetic energy compared to that of the car? 16) J

F. All that can be said is that the truck has more kinetic energy.
G. The truck has twice the kinetic energy of the car.
H. The truck has 4 times the kinetic energy of the car.
J. The truck has 8 times the kinetic energy of the car.

$KE_{Car} = \frac{1}{2}mv^2 = \frac{(1)(1^2)}{2} = \frac{1}{2}$ J

$KE_{Truck} = \frac{1}{2}mv^2 = \frac{(2)(2^2)}{2} = \frac{8}{2} = 4$ J ← This is 8x more than

17) A ball drops some distance and gains 30 J of kinetic energy. Do not ignore air resistance. How much gravitational potential energy did the ball lose? 17) C

A. exactly 30 J
B. less than 30 J
C. more than 30 J
D. cannot be determined from the information given

Some U_g was lost to air resistance.

18) If you push twice as hard against a stationary brick wall, the amount of work you do 18) J

F. remains constant but non-zero.
G. is cut in half.
H. doubles.
J. remains constant at zero.

$W = F \cdot d$ $W = 0$
$F =$
$d = 0$ because the wall doesn't move!

19) A skier, of mass 40 kg, pushes off the top of a hill with an initial speed of 4.0 m/s. Neglecting friction, how fast will she be moving after dropping 10 m in elevation? 19) D

A. 196 m/s
B. 49 m/s
C. 7.3 m/s
D. 15 m/s

Total Energy at beginning $= U_g + KE$
$= mgh + \frac{1}{2}mv^2$
$= (40kg)(9.8\frac{m}{s^2})(10m) + \frac{1}{2}(40kg)(4\frac{m}{s})^2$
$T.E. = 4,240$ J

Use this energy to find the new velocity!

$KE = \frac{1}{2}mv^2$

$4,240 J = \frac{1}{2}(40kg)v^2$ ∴ solve for "v" $= 14.5\frac{m}{s} = 15\frac{m}{s}$

21. A 46 kg Olympic diver is standing on the 10 meter platform preparing to jump into the pool below.

a. What is the gravitational potential energy of the diver standing on top of the 10 meter platform?

What do you know?	$m = 46\,kg$, $h = 10\,m$, $g = 9.8\,\frac{m}{s^2}$
What formula?	$U_g = mgh$
Substitute in values	$U_g = (46\,kg)(9.8\,\frac{m}{s^2})(10\,m)$
Calculations	$U_g = 4{,}508\,N \cdot m$ $U_g = 4{,}508\,J$
Answer	$U_g = 4{,}508\,J$

b. The Olympic diver now jumps off of the platform into the pool below. What is the **velocity** of the diver just before she hits the water?

What do you know?	$U_{g\,TOP} = 4{,}508\,J = KE_{BOTTOM}$, $m = 46\,kg$
What formula?	$KE = \frac{1}{2}mv^2$
Substitute in values	$4{,}508\,J = \frac{1}{2}(46\,kg)v^2$
Calculations	$\frac{4{,}508\,J}{23} = \frac{23v^2}{23}$ $\sqrt{196} = \sqrt{v^2}$
Answer	$v = 14\,\frac{m}{s}$