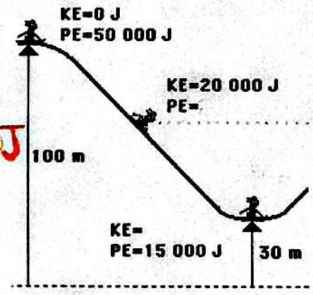
ANSWERS

Work, Power & Energy Test Review - ASSIGNMENT

Multiple Choice (Value 10)

Identify the choice that best completes the statement or answers the question. Please use CAPITAL LETTERS.

1. A stretched elastic has 400 J of elastic potential energy. If the spring constant is 2.00 N/m, how far was the elastic stretched? 20m
2. Knowing that it took an applied force of 25.0 N to move an object 5.00 m, what work was done on the object? 125 J
3. You are on "A Minute To Win It". You push a bowling ball 15.0 m using just your nose! The amount of work done is 828 J. How much force did you exert on the ball? 55.2N
4. Tim does a chin up in gym class and raises himself 0.75 m. If he has a mass of 65.0 kg, how much work does he accomplish? 478.2 J
5. If 1 horsepower is equal to 746 W, **exactly** how many watts of power is a 5.0 horsepower motor? 3730 W
6. Calculate the power output of a 80.0 kg fire fighter can climb a 10.0 m ladder in 8.00 seconds. 981 W
7. Missy Diwater, a former platform diver, has a kinetic energy of 16 000 J just prior to hitting the bucket of water. If Missy's mass is 72.0 kg, then what is her speed? 21.1 m/s
8. Ryan Howdoyoudo goes bungee jumping with a bungee cord that has a spring constant of 16.2 N/m. If he drops 92 m, how much elastic potential energy is in the bungee cord? 68 558 J
9. The kinetic energy of a 12.0 kg mass is 114 J. Find its speed. 4.36m/s
10. For the diagram (right), when KE is 20 000 J, what is potential energy? 30 000J



True/False (Value 6)

Indicate whether the statement is true (T) or false (F).

Based on general knowledge of concepts, such as definitions and terminology.

Calculation Questions

Answer the following questions on the sheet provided. Please circle your final answer and use proper units.

17. Ben Travlun carries a 100 N suitcase up three flights of stairs (a height of 20.0 m).
    a) Calculate the work done by Ben. 2000J
    b) Ben then pushes the suitcase with a horizontal force of 40.0 N at a constant speed of 2.50 m/s for a horizontal distance of 45.0 m. How much work does Ben do on his suitcase during this motion? 1800J
    c) How much work does Ben do total? 3800J
18. A 65.0 kg man pushes a 500, 000 t wall for 500 s, but it does not move. How much work does he do on the wall? Explain. No work done (does not move)
19. In class, we discussed the conservation of energy when an object at rest begins to move. More specifically, when a rock is dropped of a cliff, or when a soccer ball is kicked into the air. Explain this process, highlighting the key features of this transformation. (Sketch the graph, if you feel it will help with your explanation!) KE
20. A SMART car that is moving at 50 km/h has approximately 250 000 J of energy. Estimate the kinetic energy of the same car travelling at 100 km/h. Approx 1 million Joules
21. A model rocket engine contains explosives storing 2.50×10^3 J of chemical potential energy. The stored chemical energy is transformed into gravitational potential energy at the top of the rocket's flight path. Calculate how efficiently the rocket transforms stored chemical energy into gravitational potential energy if the 0.500 kg rocket is propelled to a height of 75.0 m. 368J g=9.81
22. You throw a ball directly upward, giving it an initial velocity of 8.50 m/s. Neglecting friction, what would be the maximum height of the ball? 3.68m h
23. An incandescent light bulb transforms 120 J of electric energy to produce 6 J of light energy. A florescent bulb requires 60 J of electrical energy to produce the same amount of light. Calculate the efficiency of each type of bulb. 5% 10%
24. A bow requires a force of 116 N to hold an arrow at "full draw" (pulled back 80 cm). Assuming that the bow obeys Hooke's Law, what is the spring constant?

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① $PE_{elastic} = 400J$

$k = 2.00\ N/m$

$x = ?\ m$

$PE = \frac{1}{2}kx^2$

$400 = \frac{1}{2}(2.00)x^2$

$x = 20\ m$

② $F_{app} = 25.0N$

$d = 5.00m$

$W = ?$

$W = Fd$

$W = (25.0)(5.00)$

$W = 125$ Joules

③ $d = 15.0m$

$W = 828\ J$

$F = ?\ N$

$W = Fd$

$\frac{W}{d} = F$

$\frac{828}{15} = F$

$F = 55.2N$

④ $d = 0.75m$

$m = 65.0kg$

$W = ?\ J$

$g = a = 9.81 m/s^2$

$W = Fd$

$W = mgd$

$W = (65.0)(9.81)(0.75)$

$W = 478.2$ Joules

⑤ $1hp = 746W$

$5.0hp = x\ W$) ×5

$x = 3730W$

⑥ $P = ?$

$m = 80kg$

$h = 10.0m$

$t = 8.00s$

$P = \frac{W}{t}$ or $\frac{mgd}{t} = \frac{(80)(9.81)(10)}{8.0}$

$= 981$ Watts

⑦ KE = 16000 J

m = 72 kg

v = ?

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

$16000 = \frac{1}{2}(72)v^2$

$\boxed{v = 21.1 \text{ m/s}}$

⑧ K = 16.2 N/m

h/d = 92 m

EPE = ? J

$PE_{elastic} = \frac{1}{2}kx^2$

$= \frac{1}{2}(16.2)(92)^2$

$\boxed{PE_{elas} = 68\,558 \text{ J}}$

⑨ KE = 114 J

m = 12 kg

V = ? m/s

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

$114 = \frac{1}{2}(12)v^2$

$19 = v^2$

$\boxed{v = 4.36 \text{ m/s}}$

C A L C U L A T I O N S !

⑰ $F_g = 100N$

h = 20 m

a) $W = Fd$

$= mgd$

$= (100)(20)$

$\boxed{W = 2000 \text{ J}}$

b) $W = Fd$

$= (40)(45)$

$\boxed{W = 1800 \text{ J}}$

$F_{horizontal} = 40N$

v = 2.50 m/s

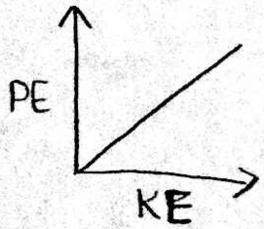
d = 45.0 m

c) 2000 J
+ 1800 J

$\boxed{3800 \text{ J}}$

⑱ Does <u>not</u> move, so no work is done!

⑲



starts with 0 KE and all PE and converts to all KE and zero PE

(20) $v_i = 50 km/h \Rightarrow 14 m/s$ or $13.9 m/s$

$KE_i = 250\ 000 J$

$KE_f = ?\ J$

$v_f = 100 km/h \Rightarrow 28 m/s$ or $27.8 m/s$

Initial

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

$250000 = \frac{1}{2} m (13.9)^2$ or $250000 = \frac{1}{2} m (14)^2$

$m = 2\ 587.857 kg$ $m = 2551 kg$

⇓ ⇓

$KE = \frac{1}{2}(2587.857)(27.8)^2$ $KE = \frac{1}{2}(2551)(28)^2$

$= 999,992 J$

$KE = 999,999.7 J$

or $1 \times 10^6 J$

(21) $PE_{chem} = 2.50 \times 10^3 J$

$\rightarrow PE_{grav} = ?\ J$

$m = 0.500 kg$

d or $h = 75 m$

$PE_{grav} = mgh$

$= (0.500)(9.81)(75)$

$= 367.9$ or $368 J$

(22) $v_i = 8.50 m/s$

$h = ?\ m$

KE = PE

$\frac{1}{2} \cancel{m} v^2 = \cancel{m} gh$

$\frac{1}{2}(8.50)^2 = (9.81)(h)$

$h = 3.68 m$

(23) $\frac{E_{out}}{E_{in}} = \frac{6}{120} \times 100 = 5\%$ efficient

$\frac{6}{60} \times 100 = 10\%$ efficient

(24) $F = 116 N$

$x/d/h = 0.8 m$

$K = ?$

$F = -Kx$

$116 = K(0.8)$

$K = 145 \frac{N}{m}$