Work, Power, Energy
Pre-Test Solution Guide

1. (C) Work = F • D = ma • d = kg • m/s² • m

2. (D) Work up is + 90J and Work down is -90J. Therefore Total work is 0J.

3. (C) As the ball moves up, gravity pulls down, thus the angle is 180 degrees and work is therefore negative. When the ball is coming down, gravitational force is down and so is distance, thus positive work.

4. (A) Area is length x width, thus Force x Distance = Work

5. (A) If kinetic energy decreases, this is due to velocity decreasing, which means deceleration (negative acceleration), thus yielding a negative force and therefore negative work.

6. (D) KE = ½ mv^2 : If the truck has 2x the mass and 2x the velocity. Velocity squared = 4x times double the mass equals 8.

7. (A)

Brick		Pebble
½ mv^2	=	½ mv^2
mv^2	=	mv^2
$m(3)^2$	=	$m(5)^2$
m 9	=	m 25

Therefore the bricks mass to pebble must be 25 to 9 to offset the velocity.

8. (A) Velocity was twice as much, thus squared means that KE would be 4 times as much.

9. (B) This is the formula for potential energy of a spring, known as "elastic" Potential Energy.

10. (D) Because PE = ½ kx^2 and twice as much mass stretches the spring twice as far ("x") and thus being squared Yields times as much.

11. (A) It lost some of its PE due to frictional work, therefore if it still had 30 J of KE it would have lost more than 30 J of energy as some was lost due frictional work on air resistance.

12. (D) Power is defined by work divided by time.

13. (D) Work / time : 3 x divided by 1/3 = 9x

14. (B) Work up is 5500 N x 50 m = 275000 J up , Work down is 4900 N x 50 m = 245000 J Since weight is down and the elevator is moving up, this is negative work.

15. (C) Find work as in the previous problem: 275000 J (up) - 245000 J (down) = 30,000 J (3.0×10^4)

16. (B) Solve the force (F_x) which is downhill, and the distance is up hill, therefore F_x • D = -108.2 J

17. (C) F • D $\cos 37^0$

18. (A) Find the area from 0m to 2.0 m

19. (B) Find the area from 2.0 to 4.0 m.

20. (A) Find the area from 4.0 to 6.0 m.

21. (D) Find the total area under the curve.

22. (B) Work = Energy = $\frac{1}{2} mv^2$ therefore find F • D to determine the KE.

23. (D) KE = Work therefore find KE and you will know the work.

24. (B) Set Work = $\frac{1}{2} mv^2$ therefore $\overline{F} \cdot D = \frac{1}{2} mv^2$ Watch out for units.

25. (A) F = -Kx The spring constant ends up positive because the upward force is negative (opposite)of the distance the spring stretches. Some try to solve by setting up F x D = $\frac{1}{2} kx^2$. Solving this way gives an answer that is twice the correct one for the spring constant "K". The reason is that the force the spring applies is "-kx" and the PE stored in Elastic potential energy = (½ kx) x where "x" is the elongation of the spring. This is because the spring varies in force applied as it is stretched and/or compressed and thus the average is used to express the force ½ kx when storing force into elastic potential energy.

26.(D) Find the work to stretch it 7 cm. Find the work to stretch 3 cm. Difference is the work for 4 cm.

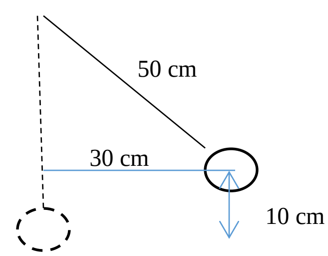
27. (B) Loss in PE = Gain in KE $mgh = \frac{1}{2} mv^2$

28. (D) PE + KE = PE+ KE

29. (C) PE + KE = PE + KE

30. (C) $mgh = \frac{1}{2} mv^2$

31. (D) Draw picture →
Use $mgh = \frac{1}{2} mv^2$



32. (D) $\frac{1}{2} mv^2 = \frac{1}{2} k x^2$ solve for "k".

33. (C) Power = F • D/time = F • velocity

34. (B) $1 \text{ hp} \times \frac{746 \text{ W}}{1 \text{ hp}} = 746 \frac{\text{J}}{\text{s}} \times 3600 \text{ sec} =$

35. (D) $P = \frac{F \cdot D}{t}$ $P = \frac{ma \cdot D}{t}$ Solve for "a" , substitute back into equation with the other givens. Divide by 745.7 to yield horsepower.