Unit 2 & 3: Work, Energy & Power		
Name:	Date:	Score: /34

Quick questions (1 mark each):

1) What are the units of power?
2) What are the units of work?
3) What are the units of energy?
4) What is the equation which links driving force, power of an engine and velocity?
5) Given it takes 5 seconds for an engine to do 80 kJ of work at what power is it working?

Q6) A boy on a sledge slides down a straight track of length 180m which descends a vertical distance of 40m. The combined mass of the boy and the sledge is 75 kg. The initial speed is $3ms^{-1}$ and the final speed is $12ms^{-1}$. The magnitude, *R*N, of the resistance to motion is constant. By considering the change in energy, calculate *R*. **[5]**

Q7) A car of mass 1100 kg has maximum power of 44 000W. The resistive forces have constant magnitude 1400N.
(i) Calculate the maximum steady speed of the car on the level. **[2]**

The car is moving on a hill of constant inclination θ to the horizontal, where $\sin\theta = 0.05$.
(ii) Calculate the maximum steady speed of the car when ascending the hill. **[3]**

(iii) Calculate the acceleration of the car when it is descending the hill at a speed of $10ms^{-1}$ working at half the maximum power. **[3]**

Q8) A particle *P* of mass 0.6 kg is released from rest and slides down a line of greatest slope of a rough plane. The plane is inclined at 30° to the horizontal. When *P* has moved 12 m, its speed is 4 m s^{-1}. Given that friction is the only non-gravitational resistive force acting on *P*, find
(a) the work done against friction as the speed of *P* increases from 0 m s^{-1} to 4 m s^{-1}, **(4)**
(b) the coefficient of friction between the particle and the plane. **(4)**

Q9) A car of mass 750 kg is moving up a straight road inclined at an angle θ to the horizontal, where $\sin\theta = 1/15$. The resistance to motion of the car from non-gravitational forces has constant magnitude *R* newtons. The power developed by the car's engine is 15 kW and the car is moving at a constant speed of 20 m s^{-1}.
(a) Show that $R = 260$. **(4)**

The power developed by the car's engine is now increased to 18 kW. The magnitude of the resistance to motion from non-gravitational forces remains at 260 N. At the instant when the car is moving up the road at 20 m s–1 the car's acceleration is *a* m s^{-2}.
(b) Find the value of *a*. **(4)**