<u>USING EQUATIONS TEST 1</u>

Some of these answers require you to remember Level 2 Physics and/or common sense.
(Take g = 9.8 ms^{-2}, h = 6.63 x 10^{34} Js, c = 3 x 10^8 m s^{-1}, e$_o$= 8.85 x 10^{-12} N^{-1}m^{-2}C^2, e$_r$= 1 for air).

1. A mass A of 6 kg moving with a velocity of 5 ms^{-1} collides with a mass B of 8 kg moving in the opposite direction at 3 ms^{-1}. Calculate the final velocity if the masses stick together on impact.

2. An object of mass 2.0 kg starts from rest and slides down a frictionless incline at an angle of 30º to the horizontal. If it slides 2.5 m down the plane, what will be its velocity?

3. A wheel has a radius of 0.3 m. It rotates with an angular velocity of 12 s^{-1}. What is the linear velocity of a point on the rim of the wheel?

4. Calculate the capacitance of a pair of parallel plates of area 0.025 m^2 if they are separated by a piece of perspex 0.1 mm thick. Take the relative permittivity of perspex to be 3.5.

5. What is the resistance of a 240 V, 100 W light bulb?

6. A 5 kg mass extends a spring by 0.50 m. What is the spring constant of the spring?

7. How far apart are two parallel plates in air, area 0.50 m^2 and capacitance 1.5 µF?

8. A yo-yo, initially at rest, is allowed to fall from a finger. The yo-yo drops with constant linear acceleration. After 1.40 seconds it has fallen 1.20 m and reached an angular velocity of 4090 revolutions per minute. What angle (in radians) does the yo-yo turn through during the fall of 1.20 m?

9. How much torque is needed to bring a flywheel with moment of inertia 0.2 kg m^2 rotating at 50 rad s^{-1} to rest in 20 seconds?

10. The time taken for a neutron to travel 6 m in a straight line is 0.3 ms. If a neutron has a mass of 5 x 10^{-26} kg, calculate its kinetic energy.

11. Calculate the wavelength of sound being emitted at a frequency of 10 Hz from a stationary source. The speed of sound in air is 330 ms^{-1}.

12. Calculate the gravitational force between a 5.0 tonne lead sphere and 2.0 tonne sphere which are 75 cm apart (take G = 6.67 x 10^{-11} Nm^{2}kg^{-2}).