

USING EQUATIONS TEST 3

Some of these answers require you to remember Level 2 Physics and/or common sense.

(Take $g = 9.8 \text{ ms}^{-2}$, $c = 3 \times 10^8 \text{ m s}^{-1}$, $\epsilon_0 = 8.85 \times 10^{-12} \text{ N}^{-1}\text{m}^{-2}\text{C}^2$, $\epsilon_r = 1$ for air).

1. A student whirls a stone around on the end of a string in a horizontal circle. The stone rotates round at 10 times each second. What is the time period of the stone's rotation?
2. The starter motor of a car draws 200 A from a 12 V battery for 5 seconds. How much energy is produced in the 5 seconds?
3. Calculate the total capacitance in a circuit which consists of a 10 microfarad capacitor, a 20 microfarad capacitor and a 40 microfarad capacitor in parallel with each other.
4. A 500 kg car is travelling at 12 ms^{-1} . Four seconds later it is travelling at 16 ms^{-1} . What is the impulse of the force that created the change?
5. Two resistors, 12 ohms and 24 ohms, are connected in series across a 9.0 V battery. Calculate the current flowing through the 12 ohm resistor.
6. What is the energy stored in a 200 μF capacitor charged up to 200 V?
7. Julia puts her baby brother in a bouncinette (a bouncy lie-in seat which acts like a giant spring). Julia notices that the high end of the bouncer deflects downwards by 0.15 cm when the baby is placed in it. Her Baby brother has a mass of 6.5 kg. Calculate the period of the baby's oscillatory motion.
8. Two large masses are placed 10 m apart in space. It is found that the smaller mass is attracted to the larger mass with a gravitational force of 100 mN. What is the gravitational force of attraction on the larger mass given that it has five times the mass of the smaller mass?
9. Two points A and B are at different voltage levels. Calculate the potential difference between A and B if 16 J of work is done to move a 0.50 mC charge from A to B.
10. The Milky Way is our local galaxy of stars. This galaxy is thought to rotate so it takes 200 million years to make one rotation. Our sun is situated about $5 \times 10^{21} \text{ m}$ from the galactic centre. Calculate the speed of the sun as the galaxy rotates.
11. Stuart is an ice skater who does figure skating. In one particular move he goes into a spin with an initial angular velocity of 3.4 rad s^{-1} . At this instant he is upright with his arms and one leg stretched out and has a rotational inertia about his centre of mass of 10.8 kg m^2 . He immediately pulls his arms and leg in close to his body. This reduces his rotational inertia to 4.5 kg m^2 . Calculate the angular momentum of Stuart while his arms and leg are sticking out.
12. A stone of mass 0.20 kg on the end of a piece of string is whirled in a horizontal circle of radius 3.0 m with a constant speed of 2.4 ms^{-1} . What is the tension in the string?