

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? **0.1 s**
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? **12000 J**
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.
70 microfarads
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? **2000 kg m s^{-1}**
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. **0.25 A**
6. What is the energy stored in a 200 μF capacitor charged up to 200 V? **4 J**
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.
0.78 s
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? **100 mN**
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. **32000 V**
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. **$4.97 \times 10^6 \text{ ms}^{-1}$**
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 his angular momentum. **$37 \text{ kg m}^2 \text{ s}^{-1}$**
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? **0.352 N**