

USING EQUATIONS TEST 2 ANSWERS

Some of these answers require you to remember Level 2 Physics and/or common sense.
(Take $g = 9.8 \text{ ms}^{-2}$, $h = 6.63 \times 10^{34} \text{ Js}$, $c = 3 \times 10^8 \text{ m s}^{-1}$, $\epsilon_0 = 8.85 \times 10^{-12} \text{ N}^{-1}\text{m}^{-2}\text{C}^2$, $\epsilon_r = 1$ for air).

1. Calculate the power dissipated in a 10 ohm resistor carrying a current of 1.2 A. **14.4 W**
2. A 4.7 μF capacitor stores 0.2 J of energy. Find the voltage across the capacitor **292 V**
3. A capacitor has 20 Volts across it and $6 \times 10^{-6} \text{ C}$ charge on its plates. What is the value of its capacitance? **$3 \times 10^{-7} \text{ F}$**
4. When a bullet with mass 0.015 kg travelling at 650 ms^{-1} passes clean through a wooden block of mass 1.2 kg, initially at rest, the block moves off at 4 m s^{-1} immediately after the bullet has passed through it. What is the bullet's final speed? **330 m s^{-1}**
5. How far apart are two parallel plates in air, area 0.50 m^2 and capacitance $1.5 \mu\text{F}$? (Take $\epsilon_0 = 8.85 \times 10^{-12} \text{ N}^{-1}\text{m}^{-2}\text{C}^2$ and $\epsilon_r = 1$) **$2.95 \times 10^{-6} \text{ m}$**
6. If a rifle of mass 7 kg fires a bullet of mass 8 g at a speed 210 m s^{-1} , what is the rifle's initial recoil velocity? **0.24 m s^{-1}**
7. A train of mass 5000 kg moves at a speed of 30 ms^{-1} on a horizontal surface. Calculate the kinetic energy of the train. **2.25 MJ**
8. What is the resistance of a 240 V, 60 W light bulb? **960 ohms**
9. A resultant force of 4 N is applied to a body of mass 2 kg for 1 second. What is the acceleration of the body? **2 m s^{-2}**
10. A bat squeaks at 33 kHz. It receives an echo 200 ms later. How many wavelengths away is the 'target'? The speed of sound is 330 ms^{-1} . **3300 wavelengths**
11. One type of aeroplane has a maximum acceleration on the ground of 3.4 ms^{-2} . What is the minimum length of runway needed if it is to reach its take-off speed of 110 ms^{-1} ? **1779 m**
12. A 300 V battery is connected across capacitors of 3 microfarad and 6 microfarad connected in parallel. Calculate the total energy stored by the capacitors. **0.405 J**