

USING EQUATIONS TEST 4

For the following questions you will be given credit for writing down the equation(s) used, the final answer and the correct S.I. units.

1. An arrow, in being fired from a bow, is accelerated over a distance of 0.40 m and leaves the bow with a velocity of 40 ms^{-1} . What is the average acceleration of the arrow while being fired?
2. A bullet is fired horizontally from a gun held 1.4 m above the ground on the Canterbury plains. If the bullet leaves the gun with a velocity of 300 ms^{-1} at what distance from the gun will the bullet strike the ground?
3. A stone of mass 0.20 kg on the end of a piece of string is whirled in a horizontal circle of radius 1.0 m with a constant speed of 2.4 ms^{-1} . What is the tension in the string?
4. A car has a mass of 2000 kg and is moving at a velocity of 45 kmh^{-1} when it strikes, head on, a smaller car of mass 1200 kg and a velocity of 60 kmh^{-1} . What is the velocity of the cars after the impact if they become locked together?
5. A torch battery has an e.m.f of 1.5 V and an internal resistance of 2Ω . What is the potential difference across the terminals of the battery when a current of 0.2 A is being taken from it?
6. An electric cable consists of 6 strands of bare copper wire twisted together. If each wire has a cross-sectional area of 1 mm^2 , what will be the resistance of a 20 m length of the cable (resistivity of copper is $1.7 \times 10^{-8} \Omega\text{m}$)?
7. What is the size of the maximum charge on the plates of a capacitor of capacitance $8 \mu\text{F}$ when connected to a 2.0 V battery?
8. What is the capacitance of a system consisting of an $8 \mu\text{F}$ capacitor in series with a $16 \mu\text{F}$ capacitor?
9. What is the energy of a photon of yellow light with a wavelength in a vacuum of $5.9 \times 10^{-7} \text{ m}$? ($c = 3 \times 10^8 \text{ ms}^{-1}$, $h = 6.63 \times 10^{-34} \text{ Js}$)
10. The speed of sound in air is 330 ms^{-1} . A clarinet sounds a note, which has a frequency of 660 Hz. Calculate the frequency of the sound.
11. Elizabeth skis down a slope and descends a vertical height of 6 m. Her mass is 55 kg. At the bottom of the slope her speed is 8 ms^{-1} . Assume her speed at the top was negligible. Calculate how much energy has been lost to the forces of friction.
12. Kelvin stands on the equator of the earth (radius $6.4 \times 10^6 \text{ m}$). Find his linear velocity due to the spinning earth.
13. A resistor of 10 ohms has a current of 2 Amps in it. What heat is being produced per second in the resistor?
14. Calculate the gravitational force between a 5.0 tonne lead sphere and 2.0 tonne sphere which are 75 cm apart (take $G = 6.67 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}$).