

USING EQUATIONS TEST 6

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. (Take $c = 3.00 \times 10^8 \text{ m s}^{-1}$ and $h = 6.63 \times 10^{-34} \text{ J s}$ and $g = 10 \text{ ms}^{-2}$).

1. 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} .
2. If a tuning fork X gives beats at 6 Hz when sounded with fork Y (550 Hz.) and beats at 4 Hz when it is sounded with fork Z (540 Hz). What is the frequency of X?
3. A 10 kg mass extends a spring by 50 mm. What is the spring constant of the spring?
4. A bullet, mass 0.015 kg, travelling at 650 m s^{-1} passes through a wooden block of mass 1.2 kg, initially at rest. The block moves off at 4 m s^{-1} after the bullet has passed through it. What is the bullet's final speed?
5. Calculate the wavelength of the light emitted when an electron falls from an energy level of $-6.06 \times 10^{-20} \text{ J}$ to an energy level of $-8.73 \times 10^{-20} \text{ J}$.
6. What power of electric fire can be connected to the 240 V mains supply if the maximum fuse value possible is 13 A?
7. A 5 kg mass extends a spring by 0.50 m. What is the spring constant of the spring?
8. A ballet dancer spins about a vertical axis at 2 revolutions per second with her arms outstretched. With her arms folded, her moment of inertia about the vertical axis decreases by 60 %. Calculate the new rate of revolution.
9. A 24 ohm resistor radiates 12 W. A 16 ohm resistor in parallel with it will radiate how much power?
10. A loudspeaker is put close to the open end of a pipe 0.8 m long which is closed at the other end. Starting from $f = 0 \text{ Hz}$, the first resonance is heard at 105 Hz. Neglecting end effects, calculate the exact speed of sound in air.
11. How far apart are two parallel plates in air, area 0.50 m^2 and capacitance $1.5 \mu\text{F}$? (Take $\epsilon_0 = 8.85 \times 10^{-12} \text{ N}^{-1}\text{m}^{-2}\text{C}^2$)
12. 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?
13. The timekeeper at an athletics meeting is 100 m from the starter. Find the time lag between seeing the flash of the starter's pistol and hearing the sound.(speed of sound = 340 ms^{-1} .)