USING EQUATIONS TEST 2 ANSWERS

Some of these answers require you use common sense. (Take $g = 9.8\ ms^{-2}$).

1. A motor boat is travelling at a steady speed of $1.4\ ms^{-1}$. The boat then accelerates uniformly for 5.5 seconds reaching a speed of $10\ ms^{-1}$. Calculate the acceleration. $1.6\ ms^{-2}$

2. Bill is traveling in a circle at a constant speed of $14\ ms^{-1}$. He completes one circle in 40 seconds. Bill's mass is 58 kg. Calculate the magnitude of the centripetal force on him. 130 N

3. A wire is placed in between two magnetic poles. The wire is part of an electric circuit. When the current is switched on the wire experiences a downwards force. The strength of the magnetic field through the wire is 0.13 T. The wire is at right angles to the field and the length of wire in the field is 3 cm. If the downwards force experienced by the wire is 0.02 N, calculate the current. 5.1 A

4. A small plastic ball hanging on a pendulum is given a negative charge of 3.9×10^{-5} C and allowed to swing through a magnetic field with a magnetic field strength of 0.13 T. The maximum speed of the ball as it passes through the magnetic field is $2\ ms^{-1}$. Calculate the magnitude of the magnetic force on the ball at its maximum velocity. 1.0×10^{-5} N

5. The Moon orbits about the centre of the earth at a distance of 3.84×10^{8} m. The period of its orbit is 2.36×10^{6} s. Calculate the speed of the Moon in its orbit. $1.02 \times 10^{3}\ m\ s^{-1}$

6. A hunter practises shooting by firing at a target. The mass of the rifle without the bullet is 9.2 kg. The rifle recoils as the hunter fires it. The recoil velocity of the rifle is $1.2\ ms^{-1}$. The mass of the bullet is 0.086 kg. Calculate the velocity of the bullet as it leaves the rifle. $128.4\ ms^{-1}$

7. Jane moves a lit match to a distance of 4.1 m from a concave lens of focal length 0.42 m. Calculate the distance of that the image will be found from the lens. - 0.38 m

8. Water waves have a frequency of 2.20 Hz and the wavelength of the waves is 0.21 m. Calculate the velocity of the waves. $0.46\ ms^{-1}$

9. A red laser beam is shone from a laser pointer onto the bottom of a thick-bottomed glass with some water in it. The light is incident on the glass-water interface at 43°. The refractive index of glass is 1.51 and that of water is 1.33. The speed of red laser light in water is $2.26 \times 10^{8}\ ms^{-1}$ and its frequency is 5.64×10^{14} Hz. Calculate the wavelength of the red laser light in glass. 3.53×10^{-7} m

10. A speaker is used to create sound waves. The period of the speaker cone is 5.0×10^{-4} s. The speed of sound in the air is $330\ ms^{-1}$. Calculate the wavelength of the waves produced by the speaker. 0.165 m

11. The voltage across the electrodes of a spark plug is 40000 V. The distance between the electrodes of the spark plugs is 0.80 mm. Calculate the electric field strength between the electrodes. $5.0 \times 10^{7}\ Vm^{-1}$

12. Clouds of ionized gases containing protons or electrons from the solar wind become trapped in the earth's magnetic field to form the aurorae (or northern lights and southern lights). The solar wind, travelling at $630\ km\ s^{-1}$, hits the earth's magnetic field at 90° to the magnetic field. Each particle has a charge of 1.6×10^{-19} C and experiences a force of 2.5×10^{-15} N. Calculate the size of the earth's magnetic field. 0.025 T