

- 1 When a drone hovers, the disturbance of air can displace the drone from its equilibrium position and set the motion to be simple harmonic as shown in Fig. 1.1.

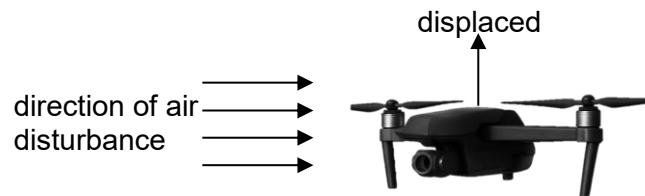


Fig. 1.1

- (a) Explain what is meant by simple harmonic motion.

.....  
..... [1]

- (b) The drone in Fig. 1.1 experiences a sudden air disturbance resulting it having a vertical displacement of 3.0 cm from its equilibrium position. Assume that the subsequent motion of the drone is simple harmonic with a period of 2.0 s.

- (i) Calculate the angular frequency of the oscillation of the drone.

$$\text{angular frequency} = \dots \text{rad s}^{-1} \quad [2]$$

- (ii) Calculate the distance the drone will move in the first 1.0 s.

$$\text{distance} = \dots \text{cm} \quad [2]$$

- (iii) State one example of a systematic error and one example of a random error which could occur in measuring the vertical displacement of the drone.

systematic error .....

.....

.....

random error .....

.....

..... [2]

- (c) Gyroscopes are crucial in drones for flight stabilisation and control.

Sound is said to be able to knock out the drone by vibrating the gyroscopes of the drone with a sound beam.

Explain how this is possible.

.....

.....

.....

.....

[3]

[Total: 10]