Projectiles and Satellites Answers – NAT 5

1) a) 2.24ms^{-1}.

b) 1.4s. It will take the same time to land due to the pull of the Moon acting on it.

The ball bearing however will land further away from where it is released, due to the constant horizontal component of speed that it is released with.

2) a) i) 2.55ms^{-1}.

ii) 8.33ms^{-1}.

b) Same. The vertical acceleration of 9.8ms^{-2} will be the same so mass is irrelevant.

3) a) 0.55s.

b) 5.39ms^{-1}.

c) Vertical speed (ms^{-1}) on the y-axis and time in seconds on the x-axis.

The graph will be a **SLTO** reaching 5.39ms^{-1} on the y-axis and 0.55s on the x-axis.

d) 1.48m.

e) This is due to the force of friction called air resistance acting against the balls motion.

4) a) i) 160ms^{-1}.

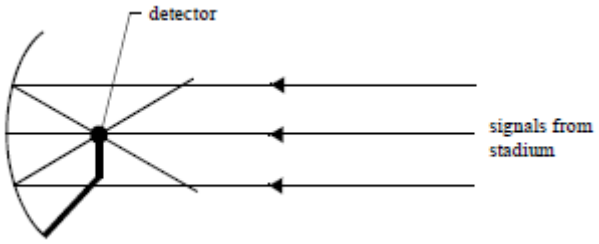
ii) 160ms^{-1}.

b) 2.45ms^{-1}.

c) 0.31m.

5) a) i) Increases the amplitude of the signals or collects more signals.

ii) Collect more waves to give a more powerful signal. (Greater amplitude)



b) The amplitude of the signal will be reduced.

6) 0.025 s

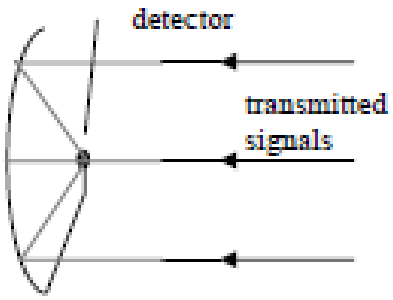
7) a) Time for the signals to travel from the satellite to the sat nav.

b) i) Energy.

ii) Radio waves – 3×10^{8} ms^{-1} Speed of Sound – $340ms^{-1}$

iii) The height above the Earth.

c)



8) a) Period of orbit of 24 hours. **OR**

Stays at the same point above the Earth's surface. **OR**

Orbits at 36,000km above the Equator.

b) A long strand of glass.

c)

Signal	Transmission speed in m/s
Satellite	3×10^8
Optical Fibre	2×10^8

d) Optical fibre = 0.00025 s

Satellite = 0.243613 s

Time delay = 0.243613 – 0.00025 = 0.243363s = **0.243s**

9) a) i) 5×10^9Hz.

ii) 2×10^{-10} s

b) Radio waves and microwaves arrive at the same time.

As radio waves and microwaves have the same speed.

c)

The waves are reflected to the focus.

The wave energy is a maximum at the focus.