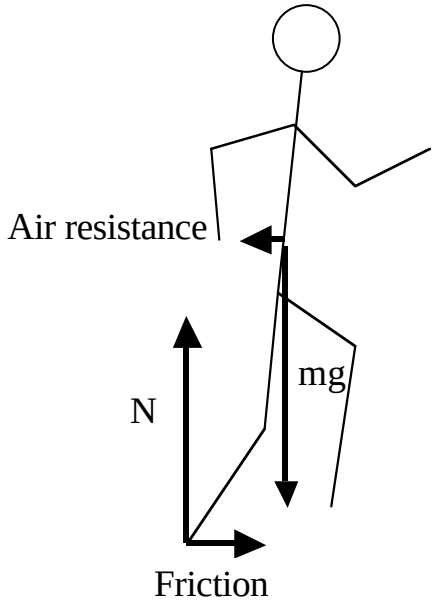
EDUH 1017 - Sports Mechanics
Progressive Test - SAMPLE

Time allowed : 40 minutes
Closed book - Formula Sheets are provided

Question 1

(a) The force of the ground on your feet
It is the reaction force (normal and frictional) to your feet pushing on the ground.
(b) Forward force is opposed by any force resisting the motion (e.g. air resistance).
A net forward force is required to accelerate the body initially.
A smaller force is required to balance resisting forces and continue walking at zero average acceleration.
(c) Only forces ON the person - see diagram



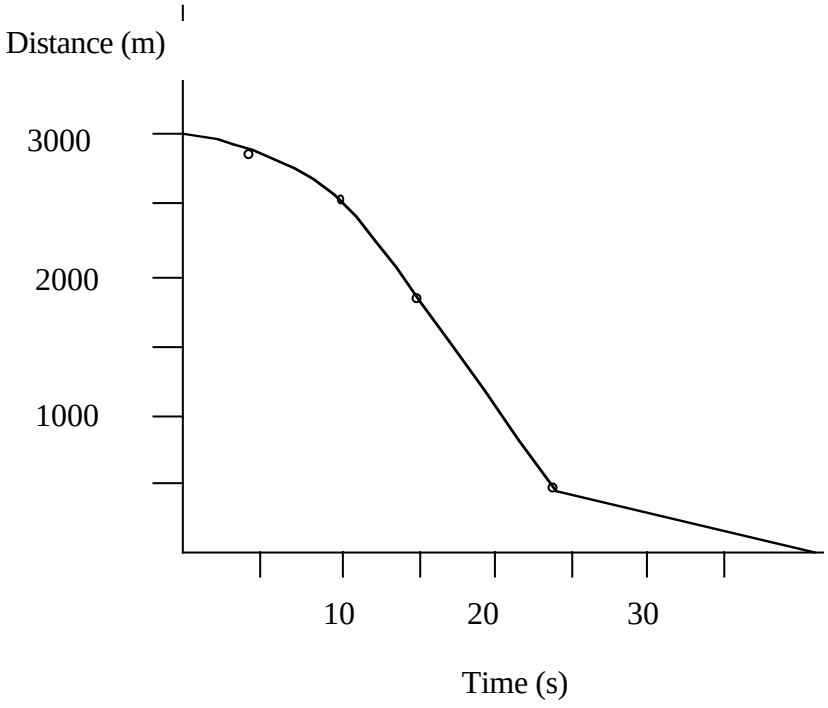
Question 2

Using

$$d = v_i t + \left(\tfrac{1}{2}\right) a t^2$$

$$2500\ m = 0 + \left(\tfrac{1}{2}\right)\left(9.8\ m/s^2\right) t^2$$

Time to fall 2500 m from rest = 23 s



Question 3

(a)

(i)

$$v_f^2 = v_i^2 + 2ad = (2.5)^2 + 2(0.01m/s^2)(315.5m)$$

$$v_f = 3.5\ m/s$$

(ii)

$$F = ma$$

$$= \left(6.6\times10^7\ kg\right)\left(0.01m/s^2\right) = 6.6\times10^5\ N$$

(iii)

$$W = Fd$$

$$= \left(6.6\times10^5\ N\right)(315.5m) = 2.1\times10^8\ J$$

(b)

(i)

$$v_f = v_i + at = 30km/h\times1000m/km\times\frac{1}{3600}s/h + a(1200s)$$

$$a = 0.0069\ m/s^2$$

(ii)

$$v_f^2 = v_i^2 + 2ad = \left(30km/h\times1000m/km\times\frac{1}{3600}s/h\right)^2 + 2(0.0069m/s^2)d$$

$$d = 5.0\ km$$