# IGCSE (EDEXCEL) Physics : Velocity and acceleration answers

Q1. (a) (i) (average) speed = distance (travelled) ÷ time (taken);

(ii) substitution OR rearrangement; evaluation;
e.g. 21 = distance / 0.14 OR s=v×t (distance =) 2.9 (m)

(b) (i) force = mass × acceleration;

(ii) substitution OR rearrangement; evaluation;
e.g. 7600 = 1200 × a OR a = F / m (a =) (–)6.3 ($m/s^2$)

(iii) substitution into $v^2 = u^2 + 2as$; rearrangement; evaluation;
e.g. $0^2 = 21^2 + [2 \times (–)6.3 \times \text{distance}]$ distance = 441 / 12.6
distance = 35 (m)

Q2. (a) (i) substitution into a = Δv / t; evaluation to 3 or more s.f.;
e.g. acceleration = (4.20 – 1.45) / 0.286 (acceleration =) 9.62 (m/s2)

(ii) idea that air resistance / friction also acts on ball; which opposes the ball's weight;

(iii) substitution into $v^2 = u^2 + 2 \times a \times s$;
rearrangement; evaluation;
e.g. $4.202 = 1.452 + (2 \times 9.6 \times s)$
$s = (v^2 - u^2) / 2a$
(s =) 0.809 (m)

Q3. (a) (i) momentum = mass × velocity;

(ii) 72 × 13 = 936;

(iii) substitution into given equation; correct evaluation;
correct answer: 3200 (N)
e.g. force = change in momentum ÷ time taken = 936 ÷ 0.29 = 3200 (N)

(iv) B
A cannot be correct as increasing the force does not protect the driver
C cannot be correct as they would both increase the force on the person
D cannot be correct as the airbag decreases the momentum

Q4. substitution into $v^2 = u^2 + 2as$;
rearrangement; evaluation;
e.g. $v^2 = 0 + (2 \times 10 \times 18)$
$v = \sqrt{360}$
(v =) 19 (m/s)

Q5. (a) use of u=0 (m/s);
correct substitution into '$v^2 = u^2 + 2as$';
correct evaluation of v;
e.g. $v^2 = u^2 + 2aS$
$v^2 = 26000$

correct evaluation of $v^2$;
correct answer = 160 (m/s)
$v^2 = 0^2 + (2 \times 10 \times 1300)$
v = 161.245... (m/s)

(b) any THREE from:
MP1. reference to weight and air resistance;
MP2. air resistance larger than weight (when parachute opens);
MP3. reference to 'F = ma';
MP4. acceleration is upwards;
MP5. air resistance decreases as parachutist slows down;

Q6. (i) e.g. (a =) (-)14000 / 1900
(a =) (-)7.4
$m/s^2$

(ii) substitution into $v^2 = u^2 + 2as$;
rearrangement; evaluation;
e.g. 0 = 182 + (2 x -7.4 x s)
(s =) 324 / (2 x 7.4)
(s =) 22 (m)

Q7.(a) any four from:

MP1. air resistance increases (greatly) when parachute is opened;

MP2. idea that air resistance is greater than weight;

MP3. (therefore) resultant force is upwards;

MP4. idea that as speed decreases, air resistance decreases;

MP5. resultant force (eventually) becomes zero;

MP6. constant speed achieved;

(b) attempted use of $v^2 = u^2 + ( 2 \times a \times s)$;
correct substitution;
rearrangement of formula / evaluation of $v^2$; evaluation of v;
e.g. $v^2 = u^2 + ( 2 \times a \times s)$; $v^2 = 0.452 + (2 \times 3.4 \times 2.0)$;
$v = \sqrt{(0.452 + ( 2 \times 3.4 \times 2.0))}$ OR $v^2 = 13.8$ (v =) 3.7 (m/s)

(c) any one from:

MP1. Mars has a smaller mass;

MP2. Mars has a lower density;

MP3. Mars has a smaller (iron rich) core;

Q8.(a) substitution into given equation $v^2 = u^2 + (2 \times a \times s)$;
evaluation of $v^2$;
evaluation of v to 3sf or more i.e. 16.1 (m/s);
e.g. $v^2 = u^2 + (2 \times a \times s)$ $v^2 = 0^2 + (2 \times 10 \times 13 )$
$v^2 = 260$ $v^2 = \sqrt{260} = 16.1$ (m/s)

(b) any FIVE from:
MP1 ball has weight;
MP2 ball accelerates;
MP3 drag increases (while accelerating);
MP4 resultant force decreases;
MP5 (so) acceleration decreases;
MP6 drag = weight / resultant = 0 / forces balanced;
MP7 terminal velocity/constant speed /acceleration=0;

Q9. (i) acceleration = change in velocity / time;

(ii) substitution; rearrangement; evaluation;
e.g. 1.2 = (35 – 26) / t
t = 9 / 1.2
(t =) 7.5 (s)