Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Mark Schemes

Q1.

(a) $t = \sqrt{\frac{2s}{g}}$ or $4.5 = \frac{1}{2} \times 9.81 \times t^2$ ✓

$t = 0.96$ s✓

2

(b) Field strength = 186000V m^{-1}✓

Acceleration = Eq / m

or $186\,000 \times 1.2 \times 10^{-6}$ ✓

0.22 m s^{-2} ✓

3

(c) 0.10(3)m (allow ecf from (i))✓

1

(d) Force on a particle = mg and

acceleration = F / m so always = g✓

Time to fall (given distance) depends (only) on the distance and acceleration✓

OR:

$g = GM / r^2$ ✓

Time to fall = $\sqrt{2s / g}$

so no m in equations to determine time to fall✓

2

(e) Mass is not constant since particle mass will vary✓

Charge on a particle is not constant✓

Acceleration = Eq / m or $(V / d)\ (q / m)$ or Vq / dm✓

E or V / d constant but charge and mass are 'random' variables so q / m will vary (or unlikely to be the same)✓

4

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Q2.

(a) (momentum of air) increases ✔

words implying increase

1

(b) (rate of change of momentum so) force acting on the air (Newton 2) ✔

1

it/air exerts force (on engine) of the same/equal magnitude/size ✔

1

but opposite in direction (Newton 3) ✔

allow backwards and forwards to indicate opposite

1

(c) *(use of F = ∆mv/t)*

F = 210 × 570 = 120 000 (N) (119 700) ✔

1

(d) momentum/velocity is a vector OR momentum/velocity has direction ✔

1

there is a change (in the air's) direction ✔

1

(e) *(use of F = ma)*

a = (−) 190 000/7.0 × 10^4 = 2.7 (2.71) (m s^{-2}) ✔

1

(f) *(use of $v^2 = u^2 + 2as$)*

CE from 01.5

accept range 850 − 860

if forget to square u or double a score 1 mark

1

$0 = 68^2 - 2 \times 2.7 \times s$ ✔

$s = 68^2/(2 \times 2.7) = 860$ (m) (856)

accept alternatives using $s = ut + 1/2at^2$ OR average speed – first mark for time calculation AND correct substitution

1

(g) rate of intake of air decreases (as plane slows) OR volume/mass/amount of air (passing through engine) per second decreases ✔

allow argument in terms of (air) resistance

(air) resistance decreases as speed of aircraft decreases for 1 mark

1

(as) smaller rate of change of momentum OR momentum change ✔

NOT FRICTION

1

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