Practice Question Set For A-Level
**Subject : Physics**
**Paper-1 Topic: Further Mechanics**

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**Name of the Student**:_____
**Max. Marks : 18 Marks** **Time : 18 Minutes**

Mark Schemes

## Q1.

(a) (i) use of $mg = k\Delta L$ or $F = k\Delta L$ **and** $F = mg$

C1

extension = 5.9 m

A1

total length = 25.9 m (allow 20 + their extension)

B1

**3**

(ii) 20 + twice (5.9) amplitude + 2.6; 34.4 m;
allow ecf from ai

B1

**1**

(b) (i) $T = 2\pi\sqrt{m/k}$ and $T = 1/f$ or $f = 1/2\pi\sqrt{k/m}$

B1

correct substitution: allow for calculation
of T (4.85 s)

B1

0.21 or 0.206 (Hz)

B1

**3**

(ii) substitutes data in $v_{max} = 2\pi fA$

C1

5.4 $ms^{-1}$ (5.28 to 5.53)

A1

**2**

(iii) two complete oscillations shown with positive
and negative velocities and acceptable shape

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(condone more than 2)

B1

**and two from**
period of 5 s used in graph (allow ecf for T from earlier part)

B1

start at 0 and positive velocity change at T = 0 with positive and negative velocities shown

B1

max velocity shown decreasing

B1

3

(c) (i) it would have to raised

B1

rest extension would be greater/rider would be nearer the ground if extension unchanged

B1

the rider has to move down a distance = to the amplitude (5.9 m) from the new rest position

**or** with same initial extension/energy stored in rope, the rider would reach a lower height
amplitude would be lower
**or** due to the larger mass more energy (= mgh) is needed to reach the same height

so initial extension would have to be increased

B1

3

(ii) the rope would become slack at the top of the ride so the rider would go into free flight/rider would overshoot the highest point

B1

the rider would fall and, with negligible air resistance, the rope would again absorb the energy arriving back at the start point **or** rider is more likely to fail to reach the ground after one oscillation due to energy losses/air resistance

B1

the PE gained (at the top of the flight) can (at most) only be converted back to the elastic energy that was stored in the rope at the start

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(allow a statement to the effect that to hit the floor would contravene conservation of energy or require an energy input)

B1

3

**[18]**

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