Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic : 2 (Mechanics)

Name of the Student:_____
Max. Marks : 26 Marks **Time : 26 Minutes**

Mark Schemes

Q1.

Question Number	Acceptable Answers		Mark
(a)	**Laminar**: Continuous lines, not crossing, below the wing, with at least 2 continuing beyond the wing	**(1)**	
	Turbulent: swirls, crossing lines, changes of direction greater than 90˚ **only** above the wing, not necessarily attached to the lines from the left	**(1)**	**2**

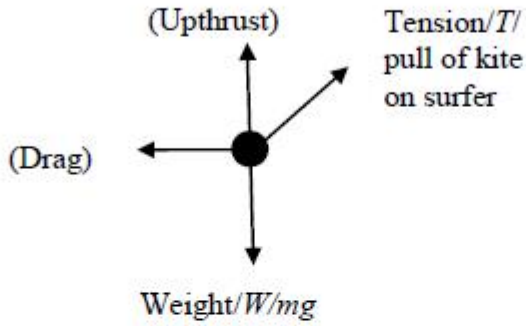
Question Number	Acceptable Answers		Mark
(b)(i)	The idea that a (component of) lift = weight	**(1)**	
	See $L \cos 20°$ or $mg / \cos 20°$	**(1)**	
	$L = 0.66$ or 0.7 (N)	**(1)**	**3**
	<u>Example of calculation</u> Vertical component of lift = weight $L\cos 20° = 0.063 \text{ kg} \times 9.81 \text{ N kg}^{-1}$ $L = 0.66$ (N)		

Question Number	Acceptable Answers		Mark
(b)(ii)	Find the horizontal component of lift (drag) using trig or Pythagoras ($L \sin 20°$, $W \tan 20°$, $\sqrt{L^2 - W^2}$)	**(1)**	**3**
	Use of $F = ma$	**(1)**	
	Acceleration = (−) 3.6 to 3.7 m s^{-2} (ecf)	**(1)**	
	Example of calculation $L_{horizontal} = -L\sin 20^{\circ} = -0.66\ \text{N} \times \sin 20^{\circ} = -0.226\ \text{(N)}$ $\text{acceleration} = \frac{-0.226\ \text{N}}{0.063\ \text{kg}}$ acceleration = −3.57 m s^{-2}		

Question Number	Acceptable Answers		Mark
(c)(i)	Bird/leg exerts force/push (down) on ground	**(1)**	**4**
	N3 ground exerts a force (up) on bird	**(1)**	
	Force ≠ / > weight **Or** there is a resultant/unbalanced force	**(1)**	
	Due to N2 / N1 bird accelerates	**(1)**	

Question Number	Acceptable Answers		Mark
(c)(ii)	Maximum force read from graph = 2.00 N to 2.10 N	**(1)**	**3**
	resultant force = $F - W$ (1.37 N to 1.43 N)	**(1)**	
	Answer = 23 m s^{-2}	**(1)**	
	Example of calculation Maximum force = 2.05 N 2.05 N – (0.063 kg x 9.81 m s^{-2}) = 0.063 kg × a a = 22.7 m s^{-2}		
	Total for question		**15**

Q2.

Question Number	Answer		Mark
(a)(i)	Tension line and arrow correctly drawn and labelled Weight line and arrow correctly drawn and labelled  (Tension can be on either side. If 2 marks have been awarded subtract 1 mark if the drag has been included and is not a horizontal force opposing the tension)	(1) (1)	2
(a)(ii)	Use of correct trig function to find horizontal component of the tension $T_{horizontal}$ = 840 (N) Example of calculation Horizontal component of tension = $T\cos\theta$ $T_{horizontal}$ = 1100 N × cos 40° $T_{horizontal}$ = 843 N	(1) (1)	2
(a)(iii)	$T_{vertical}$ = 1100 sin 40° **Or** $T_{vertical}$ = 707 (N) seen Use of $W = mg$ Use of $mg = U + T_{vertical}$ with a sensible statement discussing what would happen if $T_{vertical}$ = W **Or** $T_{vertical}$ > weight **Or** $T_{vertical}$ < weight e.g. $T_{vertical}$ = W **Or** mass = 72 kg: Upthrust is zero $T_{vertical}$ > weight **Or** mass < 72 kg: Can't have a negative upthrust $T_{vertical}$ < weight **Or** mass > 72 kg : To provide some upthrust Example of calculation $T_{vertical} = T \sin 40°$ (= 707 N) **OR** $mg = U + T_{vertical}$ $mg = U + 707$ N mass = $\frac{707 \text{ N}}{9.81 \text{ N kg}^{-1}}$ = 72.1 kg	(1) (1) (1)	3

*(b)	**(QWC – work must be clear and organised in a logical manner using technical terminology where appropriate)** C (1) **Max 3** The horizontal component of the tension in the line produces the forward force acting on the surfer **Or** horizontal component of tension = $T\cos\theta$ (accept $T_{horizontal} = 1100\cos\theta$) (1) As the angle to the horizontal (θ) decreases **Or** As the angle to the vertical (θ) decreases ➔ $T\cos\theta$ increases **Or** the forwards force on the surfer increases **Or** the smallest θ gives the maximum/greatest force (1) Work done increases (1) Power transferred to surfer= $\frac{\text{work done}}{\text{time}}$ has increased hence the power increases **Or** more work done per second on the surfer so the power increases (1)	**4**
	Total for question	**11**