Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Mark Schemes

Q1.

Question number	Answer	Additional guidance	Mark
	An answer that combines the following points of application of knowledge and understanding to provide a logical description: • work is done against friction (1) • energy is stored in another specified way (1)	ignore references to friction as energy store acceptable stores are: • KE of water • thermal energy of water • thermal energy of air • (G)PE of water	**(2)**

Q2.

Question number	Indicative content	Mark
*	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.	**(6)** **AO3**

	Use of equipment • Provide a measurable load; for example hang a cube on one end of the system / on spring (balance) • Provide a measurable effort; for example hang spring balance on other end of system • Method to measure distances moved; for example use metre rule Obtaining relevant data • Measure weight of cube with spring balance • Take reading of spring balance when being pulled • Measure height by which the cube is raised • Measure distance moved by (end of) spring balance. Processing results • calculate work done on cube = obtained weight x obtained distance • calculate work done by student = obtained force x obtained distance • calculate efficiency as (calculable) work done on cube / (calculable) work done by student • inspect results to look for relationship between weight of cube and efficiency • plot graph of efficiency against weight	

Level	Mark	Descriptor
	0	• No awardable content
Level 1	1–2	• Analyses the scientific information but understanding and connections are flawed. (AO3) • An incomplete plan that provides limited synthesis of understanding. (AO3)
Level 2	3–4	• Analyses the scientific information and provides some logical connections between scientific enquiry, techniques and procedures. (AO3) • A partially completed plan that synthesises mostly relevant understanding, but not entirely coherently. (AO3)
Level 3	5–6	• Analyses the scientific information and provide logical connections between scientific enquiry, techniques and procedures. (AO3) • A well-developed plan that synthesises relevant understanding coherently. (AO3)

Level	Mark	Additional Guidance	General additional guidance – the decision within levels e.g. - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	Additional guidance At least two uses of equipment	Possible candidate responses Hang cubes on hook Spring balance on ring
Level 2	3–4	Additional guidance At least two methods of obtaining relevant data from use of equipment.	Possible candidate responses Measure weight of cube with spring balance. Hang cube on hook. Pull on other end. Measure how far cube has gone up. OR Put cube on hook. Put spring balance on ring. Pull and read force. Measure how far spring balance moves.
Level 3	5–6	Additional guidance At least two methods of obtaining relevant data from correct use of equipment and at least two descriptions of processing that data.	Possible candidate responses Use spring balance to measure weight of cube and force needed by student. Measure height that cube was raised by. Calculate work done by multiplying force and distance moved in each case.

Q3.

Question Number:	Answer	Additional Guidance	Mark
	a description to include: kinetic energy (store) (of cyclist and /or bicycle) decreases / is transferred into(1) thermal energy (store) (of brakes / surroundings) increases (1)	 KE for kinetic energy allow heat for thermal allow brakes get hotter ignore sound energy accept kinetic (energy) to heat (energy) for 2 marks in this context	**(2)** AO 1 1

Q4.

Question Number	Answer	Acceptable answers	Mark
(a)	A transverse and electromagnetic		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	 Evaluation 171.5 (1) Substitution (34.3/171.5) x 100 (1) Evaluation 20 (%) (1)	award full marks for correct answer with no working 34.3 x 5 [34.3 /(34.3 x 5)] x 100 [34.3 /(34.3 x 5)] [34.3 /171.5] Allow 0.2 or 1/5 for 3 marks	**(3)**

Question Number	Answer	Acceptable answers	Mark
(c)	rate of {energy/heat} (from the Sun){absorbed/taken in} (1) equals rate of {energy/heat} {radiated/emitted/given out}(1)	Allow 'energy in = energy out' for 1 mark 'power in = power out' for 2 marks	**(2)**

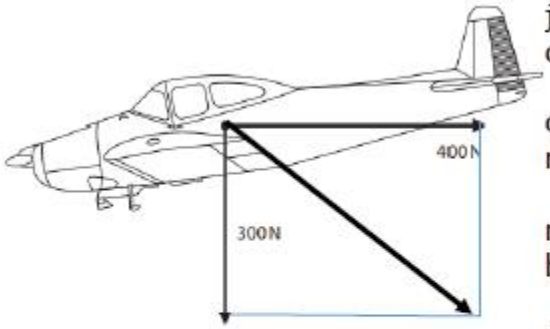
Q5.

Question number	Indicative content	Mark
	Answers will be credited according to the candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all of the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **A03 (6 marks)** · the varying height shows a varying gravitational potential energy(gpe) during the swings · when the height is a maximum the gpe is a maximum-at top of swing · when the height is a minimum the gpe is a minimum-at bottom of swing · kinetic energy varies during swing · kinetic energy maximum at bottom of swing · kinetic energy minimum at top of swing · (continuous) interchange of KE and gpe · total amount of energy is constant during one swing · over a number of swings max KE and max PE decreases · energy is dissipated/'lost' to surroundings · because of air resistance / friction · amplitude/size of swings decrease (as energy 'lost' to surroundings) ignore references to momentum	**(6)**

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Deconstructs scientific information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. • Judgements are supported by limited evidence. (AO3)
Level 2	3-4	• Deconstructs scientific information and provides some logical connections between scientific concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently. • Judgements are supported by evidence occasionally. (AO3)
Level 3	5-6	• Deconstructs scientific information and provide logical connections between scientific concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently. • Judgements are supported by evidence throughout. (AO3)

Q6.

Question Number:	Answer	Additional guidance	Mark
(i)	0.9 (k N) (1) up / upwards / ascending (1)	accept .9 or 0.90 north N ↑	**(2)** AO 3 2a AO 3 2b

Question Number:	Answer	Additional guidance	Mark
(ii)		judge length and direction by eye construction lines need not be shown magnitude need not be stated allow missing arrowhead if direction and length are correct reject answers which have any additional vectors drawn	**(1)** AO 3 2b

Question Number:	Answer	Additional Guidance	Mark
(iii)	recall and substitution (1) GPE = 750 x 10 x 1300 evaluation (1) (energy =) 9 800 000 (J)	 no POT error (could have missed out g) allow answers in standard form 9.8×10^6 allow answers that round to 9 800 000 e.g. 9 750 000 J allow 9800 kJ or 9.8MJ allow 9 555 000 J allow negative values award full marks for correct answer without working	**(2)** AO 2 1