Name of the Student:_____
Max. Marks : 17 Marks **Time : 17 Minutes**

Mark Schemes

Q1.

Question number	Answer	Additional guidance	Mark
(i)	selection and substitution (1) (KE =) ½ x 1200 x 16(.0)^2 evaluation in kJ (1) (KE =) 150 (kJ)	(KE =) ½ x 1200 x 16(.0)^2 x 10^{-3} accept any value that rounds to 150 e.g. 153.6 award full marks for correct answer without working. award 1 mark for 153.6 or 150 to any other power of ten	**(2)** **AO2**

Question number	Answer	Additional guidance	Mark
(ii)	selection and substitution (1) $17.5 (\times 10^3) = \frac{126 (\times 10^6)}{t}$ re-arrangement and evaluation (1) (t=) 2(.0) (h)	alternative method selection and rearrangement (1) (t =) $\frac{\text{E(nergy)}}{\text{P(ower)}}$ or (t=) $\frac{126 (\times 10^6)}{17.5 (\times 10^3)}$ (substitution and) evaluation (1) (t=) 2(.0) (h) award full marks for correct answer without working. allow 1 mark for 7(.2) to any power of ten (incorrect time conversion) allow 1 mark for 2(.0) to any power of 10 (POT error)	**(2)** **AO2**

Question number	Answer	Additional guidance	Mark
(iii)	an explanation linking (energy transfers when the car is decelerating) (from) kinetic energy (store) (1) (to) chemical energy (store) (1)	 idea of energy that would be otherwise wasted uses an electrical pathway {electric current / electricity / emf} produced allow mechanical for kinetic in this context recharges battery increases available energy store of battery more useful energy available	**(2)** **AO2**

Q2.

Question number	Answer	Additional guidance	Mark
(i)	selection and substitution (1) (KE =) ½ x 1200 x 16(.0)^2 evaluation in kJ (1) (KE =) 150 (kJ)	(KE =) ½ x 1200 x 16(.0)^2 x 10^{-3} accept any value that rounds to 150 e.g. 153.6 award full marks for correct answer without working. award 1 mark for 153.6 or 150 to any other power of ten	**(2)** **AO2**

Question number	Answer	Additional guidance	Mark
(ii)	selection and substitution (1) $17.5\ (\times 10^3) = \frac{126\ (\times 10^6)}{t}$ re-arrangement and evaluation (1) (t=) 2(.0) (h)	alternative method selection and rearrangement (1) (t =) $\frac{\text{E(nergy)}}{\text{P(ower)}}$ or (t=) $\frac{126\ (\times 10^6)}{17.5\ (\times 10^3)}$ (substitution and) evaluation (1) (t=) 2(.0) (h) award full marks for correct answer without working. allow 1 mark for 7(.2) to any power of ten (incorrect time conversion) allow 1 mark for 2(.0) to any power of 10 (POT error)	**(2)** **AO2**

Question number	Answer	Additional guidance	Mark
(iii)	an explanation linking (energy transfers when the car is decelerating) (from) kinetic energy (store) (1) (to) chemical energy (store) (1)	 idea of energy that would be otherwise wasted uses an electrical pathway {electric current / electricity / emf} produced allow mechanical for kinetic in this context recharges battery increases available energy store of battery more useful energy available	**(2)** **AO2**

Q3.

Question Number	Answer	Additional guidance	Mark
(i)	(In every second), distance moved by chain around large gear = distance moved by chain around small gear (1) 2 x 48 = turns x 12 rearrangement and evaluation (1) 8 (turns each second)	accept use of gear ratio seen or implied e.g. 4:1 or 4/1 or 48:12 or 48/12 or converse e.g. 1:4 award full marks for the correct answer without working	(2)

Question Number	Answer	Additional guidance	Mark
(ii)	An explanation linking reduces friction/amount of thermal energy transferred (1) extra useful energy is available/less input energy is required (1) efficiency = useful energy transferred (by the bicycle) ÷ total energy supplied (to the bicycle) (1)	 (oil provides) lubrication less energy wasted allow for the last **two** mark points; **either** less input energy is required to produce the same output for **2** marks **or** more output energy is available for the same input energy for **2** marks	**(3)**