Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic : 4_Materials

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Name of the Student:____

Max. Marks : 21 Marks **Time : 21 Minutes**

Mark Schemes

Q1.

Question Number	Acceptable Answer	Additional Guidance	Mark
	• If two springs are added in parallel the stretching force is shared between the springs **(1)** • Hence the extension for a given force is half of what it would be for a single spring **(1)** • So parallel combination has twice the stiffness of a single spring **(1)** • For two identical resistors in parallel $\frac{1}{R_{eff}} = \frac{1}{R} + \frac{1}{R}$ **(1)** • So, adding two equal resistors in parallel halves the effective resistance of the combination **(1)** • This is in contrast to the springs and so the student's suggestion is invalid (dependent upon MP3 and MP5) **(1)**	MP3: Allow parallel combination has a greater stiffness than a single spring MP5: Allow adding two resistors in parallel decreases the effective resistance of the combination Equivalent points for MP4 – MP6 • For two identical resistors in series, $R_{eff} = R + R$ • So adding two equal resistors in series doubles/increases the effective resistance • This is equivalent to parallel springs, so the student's statement is invalid (dependent upon MP3 and MP5)	6

Q2.

Question Number			Mark
(a) (i)	Use of equation of motion suitable for a, e.g. $v = u + at$ $a = 16.3\ \text{m s}^{-2}$ $(2.1 \times 10^5\ \text{km h}^{-2}$ or $58.7\ \text{km h}^{-1}\ \text{s}^{-1})$ <u>Example of calculation</u> $a = \frac{37.5\ \text{m s}^{-1} - 0}{2.3\ \text{s}}$ $a = 16.3\ \text{m s}^{-2}$	(1) (1)	**2**
(a) (ii)	Use of $E_k = \frac{1}{2} mv^2$ Use of $P = E/t$ Power = 3.1×10^6 W **Or** Use of $F = ma$ (must be a from (i)) **and** Use of equation to find distance **and** use of work done = Fd Use of $P = E/t$ Power = 3.1×10^6 W (distance = 43 m) <u>Examples of calculations</u> $E_k = \frac{1}{2} \times 10\ 000\ \text{kg} \times (37.5\ \text{m s}^{-1})^2 = 7.03 \times 10^6\ \text{J}$ Power = $7.03 \times 10^6\ \text{J} / 2.3\ \text{s} = 3.1 \times 10^6$ W	(1) (1) (1) (1) (1) (1)	**3**
(a) (iii)	Energy transferred by heating **Or** energy transferred due to friction **Or** work done against friction **Or** idea that more energy required (due to energy transfer) due to friction. (do not accept 'lost' but accept air resistance as an alternative to friction)	(1)	**1**
***(b)**	(QWC – Work must be clear and organised in a logical manner using technical wording where appropriate) larger force is needed **Or** the (same) force is insufficient need same acceleration/ (max) velocity **OR** acceleration/(max) velocity is too small more energy needed (to reach top) **Or** insufficient energy (to reach top)	(1) (1) (1)	**3**
(c)	Viscosity of oil decreases (with increasing temperature) **Or** the (warm) oil is less viscous (accept a reverse argument e.g. when cold oil is more viscous) Lower frictional/resistive force **Or** less viscous drag	(1) (1)	**2**
	Total for question		**11**