Name of the Student:_____

Max. Marks : 22 Marks **Time : 22 Minutes**

Mark Schemes

Q1.

Question Number		Mark
(a)	Use of suitable equation(s) of motion to find distance (1) Height = 7.4 (m) (1) (accept 9.8(1)/6 or 1.635 for acceleration but do not accept g/6 as a substitution if final answer is wrong and looking to award MP1 only) (a reverse argument leading to t = 2.9 s can score both marks) Example of calculation $s = ½ at^2$ $s = ½ \times (9.81 \text{ m s}^{-2} / 6) \times (3 \text{ s})^2$ $s = 7.4$ m	**2**
(b)(i)	Use of trig function appropriate to calculate vertical component of velocity **Or** 10.1 (m s^{-1}) seen (1) Use of suitable equation(s) of motion to find time (1) t = 12.4 (s) (1) (if v and u not consistent with sign of g max 2 marks. Calculation can be done for total time of 12.3 s with either total displacement =0 or u=-v) Example of calculation $u = 18 \text{ m s}^{-1} \times \sin 34° = 10.1 \text{ m s}^{-1}$ $v = u + at$ $0 = 10.1 \text{ m s}^{-1} - (9.81 \text{ m s}^{-2} / 6) \times t$ t = 6.2 s to max height time of flight = 12.4 s	**3**

(b)(ii)	Use of trig function appropriate to calculate horizontal component of velocity **Or** 14.9 ($m\ s^{-1}$) seen **Or** Use of Pythagoras (1) Use of suitable equation(s) of motion to find distance (1) Distance = 185 (m) (ecf time value from part (i)) (1) Example of calculation $v = 18\ m\ s^{-1} \times \cos 34° = 14.9\ m\ s^{-1}$ $s = vt = 14.9\ m\ s^{-1} \times 12.4\ s$ $s = 185.0\ m$		**3**

***(c)**	*lower gravitational field strength:* lower acceleration (1) the idea of an increased time of flight (1) (do not accept slower in place of lower) *lack of atmosphere:* no work done against friction **Or** no slowing/deceleration due to friction (1) (accept air resistance or drag for friction)		**3**
	Total for question		**11**

Q2.

Question Number			Mark
(a) (i)	Use of equation of motion suitable for a, e.g. $v = u + at$ (1) $a = 16.3\ m\ s^{-2}$ $(2.1 \times 10^5\ km\ h^{-2}$ or $58.7\ km\ h^{-1}\ s^{-1})$ (1) Example of calculation $a = \frac{37.5\ m\ s^{-1} - 0}{2.3\ s}$ $a = 16.3\ m\ s^{-2}$		**2**
(a) (ii)	Use of $E_k = ½ mv^2$ (1) Use of $P = E/t$ (1) Power = 3.1×10^6 W (1) **Or** Use of $F = ma$ (must be a from (i)) **and** Use of equation to find distance **and** use of work done = Fd (1) Use of $P = E/t$ (1) Power = 3.1×10^6 W (1) (distance = 43 m) Examples of calculations $E_k = ½ \times 10\,000\ kg \times (37.5\ m\ s^{-1})^2 = 7.03 \times 10^6$ J Power = 7.03×10^6 J / 2.3 s = 3.1×10^6 W		**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. (1) (do not accept 'lost' but accept air resistance as an alternative to friction)	**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 (1) need same acceleration/ (max) velocity **OR** acceleration/(max) velocity is too small (1) more energy needed (to reach top) **Or** insufficient energy (to reach top) (1)	**3**
(c)	Viscosity of oil decreases (with increasing temperature) **Or** the (warm) oil is less viscous (1) (accept a reverse argument e.g. when cold oil is more viscous) Lower frictional/resistive force **Or** less viscous drag (1)	**2**
	Total for question	**11**