

1(a)	the velocity is the speed in a particular direction OR velocity has a direction OR velocity is 56 m/s in a certain direction velocity is a vector OR speed is a scalar
1(b)	$6.9 \times 10^8 \text{ J}$ OR 690 000 000 J OR 690 MJ (KE =) $\frac{1}{2} mv^2$ OR $0.5 \times 440\,000 \times (56)^2$
1(c)(i)	$5.3 \times 10^5 \text{ N}$ OR 530 000 N (F =) ma OR $440\,000 \times 1.2$
1(c)(ii)	1300 m OR 1.3 km
1(c)(ii)	(d =) W/F OR $(\Delta)t = \Delta v/a$ OR $56 / 1.2$ OR $(\Delta)t = \text{change of momentum} / \text{force}$ (distance =) $6.9 \times 10^8 / 530\,000$ OR (distance =) average velocity $\times$ time taken OR 1.3×10^3

2(a)(i)	direction (changes) any one from: • magnitude of the velocity (changes) • speed (changes) • (there is) acceleration
2(a)(ii)	any one from: • (change) size • (change) shape
2(b)	1 place (the centre of) the metre ruler on the pivot owtte OR (labelled) diagram showing metre ruler on a pivot 2 add mass on one side (of pivot) and then add mass on other side to balance the ruler owtte 3 (moment =) force $\times$ <u>perpendicular</u> distance (from pivot) 4 sum of clockwise moments = sum of anticlockwise moments (when in equilibrium)
3(a)	<u>gravitational</u> potential to kinetic to gravitational potential to thermal (store) OR to internal (store)
3(b)(i)	1800 J (W =) Fd OR $(W =) 65 \times 9.8 \times 2.8$
3(b)(ii)	$F = \Delta p \div (\Delta)t$ AND Δp is change in momentum, $(\Delta)t$ is time (taken) OR $F = \Delta\{mv\} \div (\Delta)t$ AND $\Delta\{mv\}$ is change in momentum, $(\Delta)t$ is time (taken) OR force = rate of change in momentum OR force = change in momentum divided by time (taken) $F = \Delta p \div (\Delta)t$ OR $F = \Delta\{mv\} \div (\Delta)t$ OR $F = I \div (\Delta)t$

10(a)	Jupiter is gaseous
	Earth is rocky
10(b)(i)	(gravitational) force per unit mass OR $(g =) \frac{\text{weight}}{\text{mass}}$ in this form
	(gravitational) force on a mass OR $W = mg$
10(b)(ii)	mass
10(c)	(orbital speed of) Jupiter is slower ORA
	Jupiter is further from the Sun ORA OR orbital speeds of planets decrease as distance from the Sun increases ORA
	gravitational field (strength) of Sun decreases with distance (from Sun) ORA

Multiple Choice Answers

Q5: A

1(a)(i)	(magnitude of velocity =) 0.90 m / s
	use of Pythagoras' theorem e.g. $a^2 + b^2 = c^2$ OR (speed =) $\sqrt{(0.54^2 + 0.72^2)}$ OR correct vector triangle or rectangle drawn
	(direction of velocity =) 53° (to riverbank)
	use of trigonometry to find angle e.g. $\tan \theta = 0.72 / 0.54$ OR (only) angle with horizontal identified on the diagram
1(a)(ii)	(distance =) 81 m
	$v = s / t$ OR $(s =) vt$ OR $(s =) 0.9(0) \times 90$
	(time =) $1.5 \times 60 (= 90)$ OR (time =) 90
1(b)	friction (of water backwards) OR resistance (on swimmer backwards)
	(friction / resistance) balances forward force OR (there is) no resultant force