Name of the Student:_____

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

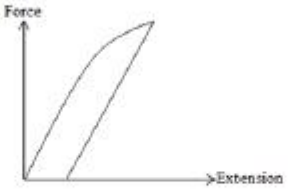
Mark Schemes

Q1.

Question Number	Answer		Mark
(a)	Static domino now has an unbalanced force acting on it so starts to move/fall **Or** falls from rest **Or** accelerates **Or** Before it is hit, the static domino has no unbalanced force on it (so) remains at rest	(1) (1) (1) (1)	**2**
(b)	**(QWC – work must be clear and organised in a logical manner using technical terminology where appropriate)** <u>The bottom coin is knocked out from under the stack</u> Only the bottom coin is given a force **Or** bottom coin has an unbalanced force on it Bottom coin starts to move **Or** accelerates <u>The flicked coin stops</u> Stacked/bottom coin gives the flicked coin a force **Or** force on flicked coin due to N3. The resultant force on the flicked coin is opposite to the direction of motion **Or** the flicked coin decelerates <u>The stack drops down</u> The remaining stacked coins do not receive any horizontal force (so stay still horizontally) The stacked coins now have an unbalanced vertical force (and drop) **Or** there is now only weight acting (vertically)	 (1) (1) (1) (1) (1) (1)	**6**
(c)	The idea that the direction of the (force of the flicked) coin on the stack is in a different direction (to initial direction of travel) The idea that the force from stack on (flicked) coin is in a different direction (to initial direction of travel) (Accept a labelled diagram indicating an off-centre collision)	(1) (1)	**2**
	Total for question		**10**

Q2.

(a)(i)	Use of density = $\frac{\text{mass}}{\text{volume}}$ **Or** see upthrust = ρVg	(1)	
	Use of upthrust = mass of water displaced x g	(1)	
	Upthrust = 0.026 N	(1)	
	Idea that the effect of the upthrust is more significant for the nylon than for the copper (e.g. a quantitative comparison made between the 2 net forces **Or** a sensible comment linking the upthrust to the 2 weights)	(1)	
	Or		
	Use of density = $\frac{\text{mass}}{\text{volume}}$	(1)	
	Use of weight = mass × g	(1)	
	Density $_{\text{copper}}$ = 8625 kg m^{-3} **Or** density $_{\text{nylon}}$ = 1098 kg m^{-3}	(1)	
	Comparison of the densities of both copper and nylon to that of sea water e.g. the density of nylon is only just greater than that of sea water so it almost floats whilst the density of copper is much greater than that of sea water so it will fall rapidly	(1)	**4**
	<u>Example of calculations</u> Mass of water displaced by either line = 1030 kg m^{-3} × 1.30 × 10^{-7} m^2 × 20.0 m = 2.68 × 10^{-3} kg Upthrust = 2.68 × 10^{-3} kg × 9.81 N kg^{-1} = 0.0263 N Net downwards force on Copper = 0.220 N – 0.0263N = 0.194 N Net downwards force on nylon = 0.0280 N – 0.0263 N = 0.00170 N		

(a)(ii)	Use of either stress $= \frac{\text{load}}{\text{cross sectional area}}$ **Or** strain $= \frac{\text{extension}}{\text{original length}}$ **Or** see $E = \frac{Fx}{A\triangle x}$	**(1)**	
	Use of Young modulus $= \frac{\text{stress}}{\text{strain}}$ **Or** use of $E = \frac{Fx}{A\triangle x}$	**(1)**	
	Extension = 0.0775 m	**(1)**	**3**
	<u>Example of calculation</u> Stress $= \frac{65.0\text{ N}}{1.30 \times 10^{-7}\text{ m}^2} = 5.00 \times 10^8$ Pa **Or** strain $= \frac{\text{extension}}{20.0\text{ m}}$ 129×10^9 Pa $= 5.00 \times 10^8$ Pa $\div \frac{\text{extension}}{20.0\text{ m}}$ Extension = 0.0775 m		
(b)(i)	Loading graph to include elastic(straight) line and some plastic(curved) section	**(1)**	
	Unloading line showing a permanent extension	**(1)**	
	Unloading line to be parallel to the loading line	**(1)**	**3**
			
(b)(ii)	Line becomes more sensitive **Or** all work done is used to reel in fish **Or** no/less work done on extending the line **Or** all force supplied pulls in fish **Or** less force required (to reel in fish) **Or** less (elastic /plastic) stretch **Or** elastic limit increases	**(1)**	**1**
	Total for question		**11**