Practice Question Set For A-Level
**Subject : Physics**
**Paper-1 Topic: Mechanics And Materials**



**Name of the Student**:_____
**Max. Marks : 16 Marks** **Time : 16 Minutes**

Mark Schemes

## Q1.

(a) P at the end of linear section ✓ **1**

(b) Measure original length and diameter ✓ **1**

Determine gradient of linear section to obtain F / extension ✓ **1**

$E = \frac{F}{e} \times \frac{length}{\pi\left(\frac{d}{2}\right)^2}$ ✓ **1**

*Alternative:*
*Convert to stress–strain graph and determine gradient.*

(c) Line from A

Parallel to straight section of original

Ending at horizontal axis ✓ **1**

(d) Plastic deformation has produced permanent extension / re-alignment of bonds in material hence intercept non-zero ✓ **1**

Gradient is same because after extension identical forces between bonds ✓ **1**

(e) 0.2% is a strain of 0.002

Stress = $2.0 \times 10^{11} \times 0.002$ = **1**

$4 \times 10^8$ ✓

$Force \left( = \frac{\pi(6 \times 10^{-3})^2}{4} \times 4 \times 10^8 \right)$ ✓ **1**

= 11.3 kN ✓ **1**

(f) Maximum force = 11300 N

Weight of mass = 600 x 9.81 = 5886 N ✓

**1**

Accelerating force must be less than

11300 – 5886 = 5423 N ✓

**1**

$a$ ($= F / m$ = 5423 / 600)

= 9.0 m $s^{-2}$ ✓

**1**

(g) To lift double the load at the same acceleration, would require double the force, ✓

*The first mark is for discussing the effect on the force*

**1**

To produce the same strain either use:

- double the diameter of wire – so the stress stays the same and therefore the strain is the same for the same wire, ✓

**1**

- a wire with double the Young modulus – so that double the stress produces the same strain for the same diameter. ✓

**1**

*The other two are for discussing the two alternative methods of keeping the strain the same*

**[16]**