

| Question Number | Answer | Mark | | | | | | | | | | | | | | |
|---|---|--------|-------|---------------|---------------|--|---|---------------------------------------|---------------------------------------|------------------|------------------|---|---|---------------------------------------|---------------------------------------|---|
| 3(a) | <ul style="list-style-type: none">Sample of nylon secured at one end (1)Slotted masses hung from the opposite end (1)Force/mass increased until sample breaks (1)$F = mg$ to calculate the forceOr use a force meter to measure the weight of the mass (1) <p>MP1 & 2 can be awarded from a diagram.</p> | 4 | | | | | | | | | | | | | | |
| 3(b) | <ul style="list-style-type: none">Comment identifying an appropriate safety issue (1)Associated control measure (1) <p><u>Examples</u></p> <ul style="list-style-type: none">Masses falling on feetEnsure feet are not underneathSnapped nylon hitting eyesWear safety glasses | 2 | | | | | | | | | | | | | | |
| 3(c)(i) | <ul style="list-style-type: none">Mean diameter = 0.55 (mm) (1)Use of half rangeOr value furthest from mean (1)Percentage uncertainty = 3.6 (%) (1) <p><u>Example of Calculation</u></p> <p>Mean = (0.55 mm + 0.57 mm + 0.54 mm + 0.55 mm + 0.53 mm)/5</p> <p>Mean = 0.55 mm</p> <p>Range = 0.57 mm – 0.53 mm = 0.04 mm</p> <p>Percentage uncertainty = (0.02 mm / 0.55 mm) × 100 % = 3.6 %</p> | 3 | | | | | | | | | | | | | | |
| 3(c)(ii) | <ul style="list-style-type: none">Use of $A = \pi r^2$Or use of $A = \pi d^2/4$ (1)Use of $\sigma = F / A$ for sample before absorbing water (1)Use of $\sigma = F / A$ for sample after absorbing water (1)Calculation of a percentage change (1)Comparative statement consistent with calculated values (1) <p><u>Example of Calculation</u></p> <table><tr><td>Before</td><td>After</td></tr><tr><td>$A = \pi r^2$</td><td>$A = \pi r^2$</td></tr><tr><td>$A = \pi \times (2.25 \times 10^{-4} \text{ m})^2$</td><td>$A = \pi \times (2.3 \times 10^{-4} \text{ m})^2$</td></tr><tr><td>$A = 1.59 \times 10^{-7} \text{ m}^2$</td><td>$A = 1.66 \times 10^{-7} \text{ m}^2$</td></tr><tr><td>$\sigma = F / A$</td><td>$\sigma = F / A$</td></tr><tr><td>$\sigma = 65.8 \text{ N} / 1.59 \times 10^{-7} \text{ m}^2$</td><td>$\sigma = 57.8 \text{ N} / 1.66 \times 10^{-7} \text{ m}^2$</td></tr><tr><td>$\sigma = 4.1 \times 10^8 \text{ Pa}$</td><td>$\sigma = 3.5 \times 10^8 \text{ Pa}$</td></tr></table> <p>Percentage change</p> <p>% difference = $((4.1 \times 10^8 - 3.5 \times 10^8) / 4.1 \times 10^8) \times 100\% = 15\%$</p> | Before | After | $A = \pi r^2$ | $A = \pi r^2$ | $A = \pi \times (2.25 \times 10^{-4} \text{ m})^2$ | $A = \pi \times (2.3 \times 10^{-4} \text{ m})^2$ | $A = 1.59 \times 10^{-7} \text{ m}^2$ | $A = 1.66 \times 10^{-7} \text{ m}^2$ | $\sigma = F / A$ | $\sigma = F / A$ | $\sigma = 65.8 \text{ N} / 1.59 \times 10^{-7} \text{ m}^2$ | $\sigma = 57.8 \text{ N} / 1.66 \times 10^{-7} \text{ m}^2$ | $\sigma = 4.1 \times 10^8 \text{ Pa}$ | $\sigma = 3.5 \times 10^8 \text{ Pa}$ | 5 |
| Before | After | | | | | | | | | | | | | | | |
| $A = \pi r^2$ | $A = \pi r^2$ | | | | | | | | | | | | | | | |
| $A = \pi \times (2.25 \times 10^{-4} \text{ m})^2$ | $A = \pi \times (2.3 \times 10^{-4} \text{ m})^2$ | | | | | | | | | | | | | | | |
| $A = 1.59 \times 10^{-7} \text{ m}^2$ | $A = 1.66 \times 10^{-7} \text{ m}^2$ | | | | | | | | | | | | | | | |
| $\sigma = F / A$ | $\sigma = F / A$ | | | | | | | | | | | | | | | |
| $\sigma = 65.8 \text{ N} / 1.59 \times 10^{-7} \text{ m}^2$ | $\sigma = 57.8 \text{ N} / 1.66 \times 10^{-7} \text{ m}^2$ | | | | | | | | | | | | | | | |
| $\sigma = 4.1 \times 10^8 \text{ Pa}$ | $\sigma = 3.5 \times 10^8 \text{ Pa}$ | | | | | | | | | | | | | | | |
| Total for question 3 | | 14 | | | | | | | | | | | | | | |