**Effects of scaling on volume**

**Solutions and marking key**

**Question 1**

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|  | Solution | Marking key/mathematical behaviours | Marks |
| (a) | Cubes  Column 4: 64,  Column 4: 512, 1000  Column 5: Each missing value is 8  Spheres  *= 33.5* for radius of 2  *= 904.8* for radius of 6  *= 523.6* for radius of 5 | * Copies volume provided * Calculates volume * Divides volumes accurately (1 if 1 wrong) * Recognises, copies pattern * Determines correct cubes * Calculates volumes correctly | 1  1  2  1  1  1 |
| (b) | 8  8 ÷ 1 or 64 ÷ 8 etc.. | * Identifies 8 as the answer * Shows correct calculation | 1  1 |
| (c) | 27 000 cm3 | * Applies scale factor from (c) | 1 |
| (d) | It is eight times as large | * Identifies 8 as the factor | 1 |
| (e) | 1767.125 cm3 | * Divides by scale factor | 1 |

**Question 2**

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|  | Solution | Marking key/mathematical behaviours | Marks |
| (a) | Column 5: 126  Column 3: 785  Column 6: Each missing value is 4 | * Copies volume provided * Calculates volume * Divides volumes accurately (1 if one wrong) * Rounds to nearest whole | 1  1  2  1 |
| (b) | 4  503 ÷ 126 or 1131 ÷ 283 etc.. | * Identifies 4 as the answer * Shows a correct calculation | 1  1 |
| (c) | It is eight times as large  2262 ÷ 283 = 7.99...  4523 ÷ 565 = 8.00 ... | * Identifies 8 as the factor * Selects values from correct cells * Uses division to calculate answer | 1  1  1 |
| (d) | (i) 56 m3  (ii) 112 m3 | * Multiplies by 4 for (i) * Multiplies by 8 for (ii) * Provides correct units | 1  1  1 |

**Question 3**

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|  | Solution | Marking key/mathematical behaviours | Marks |
| (a) | (i) 27 (ii) 64 (iii) 125  (iv) 1000 (v) 0.125 (vi) *k*3 | * Recognition of pattern of scale factors * Uses pattern to cube the factor by which the sides are multiplied | 2  4 |
| (b) | 4.096 x 0.015625 = 0.064 m3  or 4.096 ÷ 16 = 0.064 m3 | * Determines scale factor * Multiplies by scale factor | 1  1 |

**Question 4**

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|  | Solution | Marking key/mathematical behaviours | Marks |
| (a) | (i) 27 (ii) 64 (iii) 125  (iv) 1000 (v) 0.001 (vi) *k*3 | * Recognition of pattern of scale factors * Cubes the factor by which the sides are multiplied | 2  4 |
| (b) | 195.43 ÷ 27 = 7.24 m3 | * Determines scale factor * Adjusts volume using factor | 1  1 |

**Question 5**

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|  | Solution | Marking key/mathematical behaviours | Marks |
| (a)  (i)  (ii) |  | * Generates an algebraic expression for the new volume * Demonstrates that the new volume is *k*3 the size of the original volume | 1  1 |
|  | * Generates an algebraic expression for the new volume * Demonstrates that the new volume is *k3* the size of the original volume | 1  1 |
| (iii) |  | * Generates an algebraic expression for the new volume * Demonstrates that the new volume is *k2 t* the size of the original volume | 1  1 |
| (b) | Algebra can be used to provide evidence for, and the scale of, changes to volume when the dimensions are altered. | * Indicates algebra provides further evidence of the effect of scaling * Indicates the factor of change alone determines the change to the volume | 1  1 |