Question number	Scheme	Marks
7 (a)	$(V =)x^3 \quad (\frac{dV}{dx} =)3x^2 \quad$ (at $x = 2 \quad \frac{dV}{dx} = 12$)	M1
	$\frac{dx}{dt} = 0.1$	B1 (A1 on ePen)
	$\frac{dV}{dt} = \frac{dV}{dx} \times \frac{dx}{dt} = "12" \times 0.1$ oe	M1
	1.2 m^3/s cao oe	A1cao (4)
(b)	(Surface Area =) $6x^2 \quad (\frac{dA}{dx}) = 12x \quad$ at $x = 6$	M1
	$\frac{dA}{dx} = 72$	A1
	$\frac{dV}{dx} = 108 \quad \frac{dA}{dt} = 0.05$	B1
	$\frac{dV}{dt} = \frac{dV}{dx} \times \frac{dx}{dA} \times \frac{dA}{dt} = "108" \times "\frac{1}{72}" \times 0.05$	M1
	0.075 m^3/s	A1 (5)
	<u>ALT</u>	
	A = $6x^2$ leading to an expression in A for $V \quad V = \left(\frac{A}{6}\right)^{\frac{3}{2}}$	M1
	$\frac{dV}{dA} = \frac{1}{4}\left(\frac{A}{6}\right)^{\frac{1}{2}}$ oe	A1
	$\frac{dV}{dA} = \frac{3}{2}$ and $\frac{dA}{dt} = 0.05$ oe	B1
	$\frac{dV}{dt} = \frac{dV}{dA} \times \frac{dA}{dt} = "\frac{3}{2}" \times 0.05$	M1
	1.2 m^3/s cao oe	A1cao [5] **[9]**

Part	Mark	Additional Guidance
(a)	M1	Correct expression for Volume, attempt at differentiation to ax^2, a is an integer, $a > 1$.
	B1	$\frac{dx}{dt} = 0.1$, can be explicit or implicitly used in a chain rule.
	M1	For **any correct chain rule**, that would lead to a value for $\frac{dV}{dt}$ and substitution of 0.1 and their value for $\frac{dV}{dx}$. They must show an attempt to find $\frac{dV}{dx}$, need not be a correct attempt, this isn't a dependent mark.
	A1	cao oe
(b)	M1	Correct expression for Surface Area, attempt at differentiation to bx, b is an integer, $b > 1$.
	A1	$\frac{dA}{dx} = 72$
	B1	$\frac{dV}{dx} = 108$ & $\frac{dA}{dt} = 0.05$ clearly stated, implicitly in chain rule or explicitly
	M1	For **any correct chain rule**, that would lead to a value for $\frac{dV}{dt}$ and substitution of 0.05 and their values for $\frac{dA}{dx}$ and $\frac{dV}{dx}$ They must show an attempt to find $\frac{dV}{dx}$, need not be a correct attempt, this isn't a dependent mark.
	A1	cao oe
(b) ALT	M1	Correct expression for area, attempt to rearrange, expression for V in terms of A
	A1	oe
	B1	Both derivatives clearly stated, implicitly in a chain rule or explicitly
	M1	For **any correct chain rule**, that would lead to a value for $\frac{dV}{dt}$ and substitution of 0.05 and their value for $\frac{dV}{dA}$. $\frac{dV}{dA}$ doesn't need to come from correct working, but there must have been some attempt to find an expression for V in terms of A and $\frac{dV}{dA}$ presented somewhere in the working.
	A1	cao oe