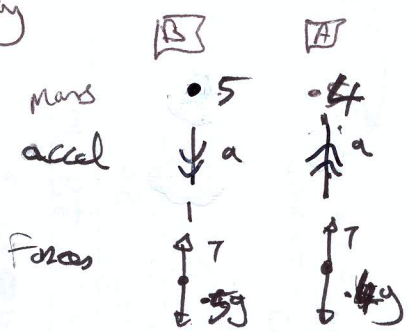
1995: Q4: Vertically

(i)



N II: $-\cdot 4g + T = \cdot 4a$ [5]

$\cdot 5g - T = \cdot 5a$ [5]

$\cdot 1g = \cdot 9a$ [5]

$\boxed{\frac{g}{9} = a}$ [5]

(ii) Velocity of A before it picks up mass C

$v = u + at \Rightarrow v = 0 + \frac{g}{9}(1) = \frac{g}{9}$. [5]

(iii) Velocity of A after 'picks up' ('collides') with C (call this w)

[Total momentum of system] before = Total momentum of system after

$\cdot 4\left(\frac{g}{9}\right) + \cdot 5\left(\frac{g}{9}\right) = \cdot 6w + \cdot 5w$ [5]

$\cdot 9\left(\frac{g}{9}\right) = 1 \cdot 1w$

$\boxed{\frac{g}{11} = w}$ [5]

[Note must consider momentum of B as well as A before and after the pickup as A, B moving with common accel as one system and will move at new velocity, w, immediately after •2 kg pickup.]

(iv) To find the distance the •6 kg travels from C before coming to rest: First calculate new f.

mass: •6 •5

accel: ↑f ↓f Assume

forces: ↑T' ↓T'

•6g •5g

N II: $\cdot T' - \cdot 6g = \cdot 6f$ and $\cdot 5g - T' = \cdot 5f$ [5]

Add $-\cdot 1g = 1 \cdot 1f$

$\boxed{-\frac{g}{11} = f}$ direction down. [5]

Find s

$u = w = \frac{g}{11}$ up

$v = 0$

$a = -\frac{g}{11}$ down

$s = ?$

$v^2 = u^2 + 2fs$

$0 = \left(\frac{g}{11}\right)^2 + 2\left(-\frac{g}{11}\right)s$

$\frac{g^2}{121} = \left(\frac{2g}{11}\right)s$

$\frac{g}{22} = s$

$0.45\text{m} = s$ [5]

from C.