**5.11** In Fig. 5.1, the co-efficient of friction between the floor and the body B is 0.1. The co-efficient of friction between the bodies B and A is 0.2. A force **F** is applied as shown
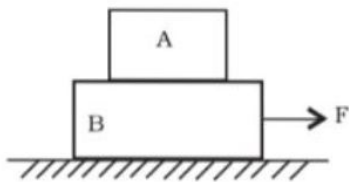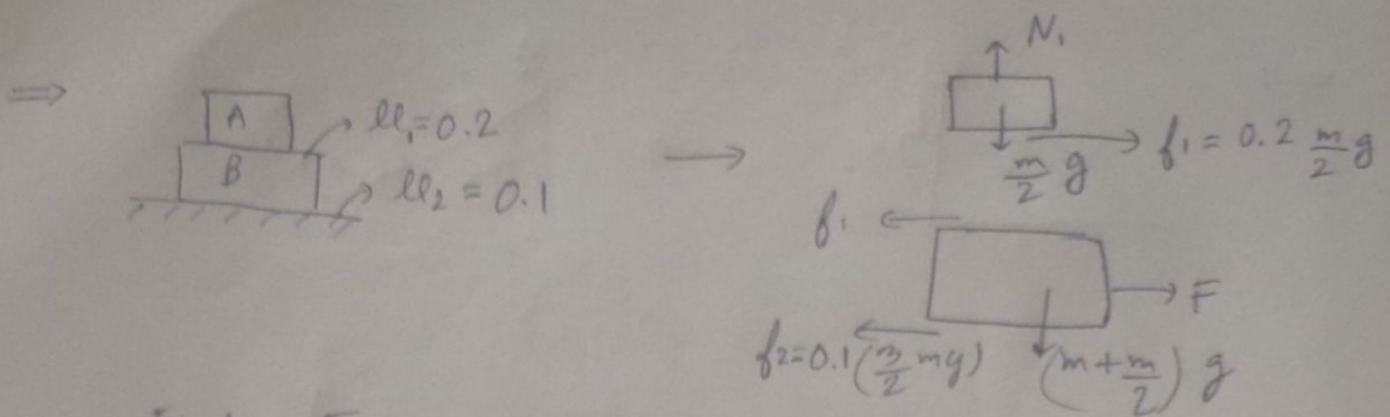
on B. The mass of A is $m/2$ and of B is $m$. Which of the following statements are true?

(a) The bodies will move together if $F = 0.25\ mg$.

(b) The body A will slip with respect to B if $F = 0.5\ mg$.

(c) The bodies will move together if $F = 0.5\ mg$.

(d) The bodies will be at rest if $F = 0.1\ mg$.

(e) The maximum value of $F$ for which the two bodies will move together is $0.45\ mg$.



Fig. 5.1

$\Rightarrow$

$\boxed{A}$ $\mu_1 = 0.2$

$\boxed{B}$ $\mu_2 = 0.1$

$\longrightarrow$

$N_1$

$\dfrac{m}{2}g$ $\rightarrow f_1 = 0.2 \dfrac{m}{2} g$

$f_1 \leftarrow$

$\rightarrow F$

$f_2 = 0.1\left(\dfrac{3}{2}mg\right)$ $\left(m + \dfrac{m}{2}\right)g$

Find $F_{max}$ (till no slipping b/w blocks)

$$f_1 = \dfrac{m}{2} a_{max}$$

$$0.1\,mg = \dfrac{m}{2} a_{max}$$

$$\boxed{a_{max} = 0.2\,g}$$

$$F_{max} - 0.25\,mg = m \times 0.2\,g$$

$$\boxed{F_{max} = 0.45\,mg}$$

For $F < F_{max}$ (No slipping)

Max. force for which both the bodies will be at rest $\Rightarrow$

$$\Rightarrow 0.1\left(m + \dfrac{3m}{2}\right) g$$

$$= 0.25\,mg$$

Ans $\Rightarrow$ (a), (b), (d), (e)