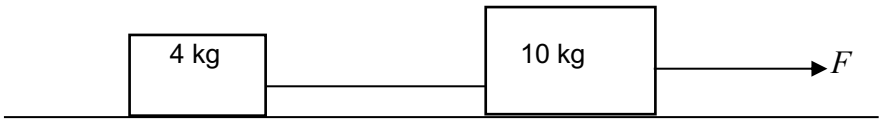
Question 16

Two boxes of masses 10 kg and 4 kg are connected by a light horizontal string and are on a horizontal table, as shown in the diagram below. The coefficient of friction between the 10 kg box and the table is 0.5.The contact between the 4 kg block and table is smooth. The 10 kg box is pulled by a force of F, parallel to the table. Which of the following is **false?**



A. If $F = 50$ newtons, the boxes move with a constant acceleration equal to $\frac{1}{14}$ m/s^2

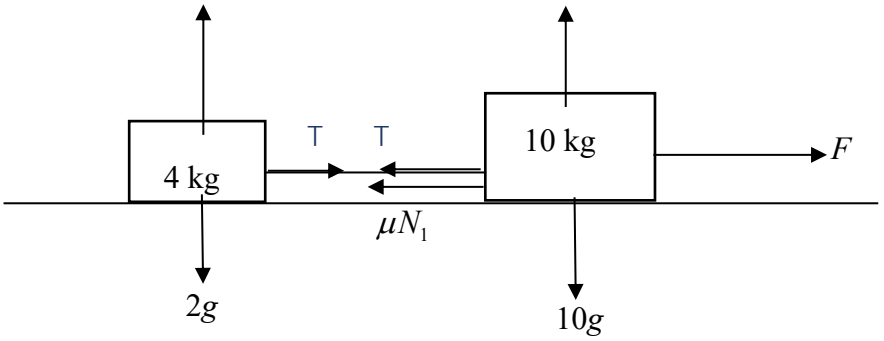
B. If $F = 49$ newtons, the boxes are on the point of moving.

C. If $F = 48$ newtons, the boxes move with constant velocity.

D. If $F = 47$ newtons the boxes remain at rest.

E. If $F = 46$ newtons

ANSWER C



Resolving horizontally around the 10 kg mass, (1) $F - T - \mu N_1 = 10a$

Resolving vertically around the 10 kg mass, (2) $N_1 - 10g = 0 \Rightarrow N_1 = 10g$

Resolving horizontally around the 4 kg mass, (3) $T = 4a$

substituting $\mu = 0.5$, $N_1 = 10g$ $T = 4a$

(1) becomes $F - 4a - 5g = 10a$ or (1) becomes $F = 14a + 5g = 14a + 49$

If $F = 50 = 14a + 49 \Rightarrow a = \frac{1}{14}$

If $F = 49 \Rightarrow a = 0$ in limiting equilibrium, or the boxes are on the point of moving.

If $F < 49$ the boxes are not on the point of moving. **C** is false.

