Quiz #2 Ch.#5 T121 Phys101.37-39-v1

Student ID:..... Student Name:..... Section # .....

Q#1: In figure 5, if P = 6.0 N, what is the magnitude of the force exerted by block (2) on block (1)? Assume the surface is frictionless. ~~(A1) 4.8 N~~

$a = \frac{6}{10} = 0.6\ m/s^2$ → a

P → [2] ← F_{12}

$P - F_{12} = 2 \times 0.6 = 1.2$

$F_{12} = P - 1.2 = 6.0 - 1.2 = 4.8\ N$

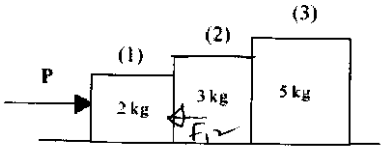


Figure 5

Q#2: A 3.0-kg block slides on a frictionless 37° incline plane. A vertical force of 15 N is applied to the block (see Fig 4). The acceleration of the block is: (Ans: 2.9 m/s 2 down the incline)

$W' = F - mg = 15 - 3 \times 9.8 = 15 - 29.4$

$W' = -14.4$

$a = \frac{W'}{m} \sin\theta$

$= \frac{14.4}{3} \times 0.37$

$= 2.89\ m/s^2$ downward

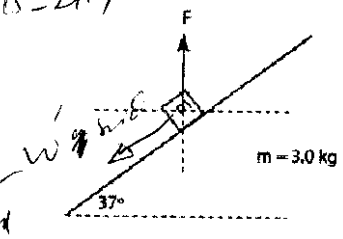


Figure 4

Q#3: A 7.0 kg block and a 3.0 kg block are connected by a string as shown in Fig 3. If the pulley is massless and the surface is frictionless, the magnitude of the acceleration of the 3.0 kg block is: (Ans: 2.9 m/s^2)

$T = 7a$

$T - 3 \times 9.8 = 3a$

$T = 3 \times 9.8 - 3a = 29.4 - 3a$

$T = 7a = 29.4 - 3a$

$10a = 29.4$

$a = \frac{29.4}{10} = 2.94\ m/s^2$

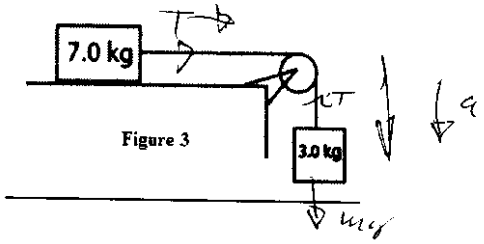


Figure 3

Quiz #2 Ch.#5 T121 Phys101.37-39-v2

Student ID:..... Student Name:..... Section # .....

Q#1: Two blocks of masses M_1 = 2.0 kg and M_2 = 4.0 kg are in contact with each other and move on a frictionless horizontal surface under the action of a horizontal force F = 60 N (see Figure 6). Find the magnitude of the force that M_1 exerts on M_2 . (A1) 40 N.

$a = \frac{60}{2+4} = 10\ m/s^2$

$F_{21} = M_1 a = 4 \times 10 = 40\ N$

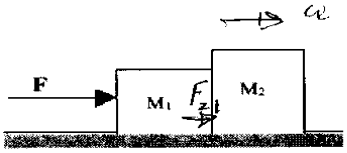


Figure 6

Q#2: A 4.0 kg block is pushed upward a 30° inclined frictionless plane with a constant horizontal force *F* (Fig 4). If the block moves with a .constant speed find the magnitude of the force *F*. (A: 23 N)

$mg \sin\theta = F\cos\theta$

$F = mg\tan\theta$

$= 4 \times 9.8 \times \tan 30$

$= 22.63 = 23\ N$

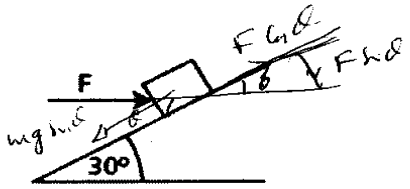


Figure 4

Q#3: Two blocks of masses m_1 = 4.00 *kg* and m_2 = 2.00 *kg* are connected by a string passing over a mass less and frictionless pulley and placed on a frictionless horizontal table as shown in Fig. 3. A force of *F* = 10.0 *N* at an angle of 60.0° with the horizontal is applied to m_1. The magnitude of acceleration of the system is: (Ans: 2.43 m/s^2)

$T - F\cos\theta = m_1 a$

$T = F\cos\theta + m_1 a$

$T - m_2 g = -m_2 a$

$T = m_2(g - a) = m_2 g - m_2 a$ ②

$T = F\cos\theta + m_1 a$ ①

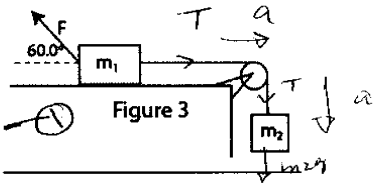


Figure 3

Solving ① & ② for T

$a(m_1 + m_2) = m_2 g - F\cos\theta$

$a = \frac{m_2 g - F\cos\theta}{m_1 + m_2} = \frac{2 \times 9.8 - 10\cos 60}{4+2} = \frac{14}{6}$

$= \frac{19.6 - 10\cos 60}{6} = 2.43\ m/s$

Quiz #2 Ch.#5 T121 Phys101.37-39-v3

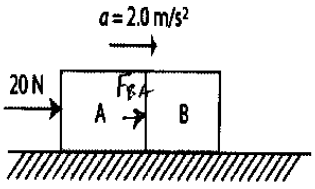
Student ID:..... Student Name:..... Section # .....

Q#1: A constant force *F* of magnitude 20 N is applied to block *A* of 4.0 kg mass, which pushes block *B* as shown in Fig. below. The block slides over a frictionless flat surface with an acceleration of 2.0 m/s². What is ~~the net~~ force on block *B*? (Ans:12 N

we need to calculate m_B!!

$a = \frac{20}{m_A + m_B} = \frac{20}{4+m_B} \Rightarrow m_B = \frac{20}{a} - 4$ due to A $= \frac{20}{2} - 4 = 10 - 4 = 6$

$F_{BA} = m_B a = 6 \times 2 = 12N$



Q#2: A block of mass 2.0 kg is being pushed by a force parallel to the ground as shown in Figure 4. The block is observed to have an acceleration of 1.0 m/s² down the incline. Assume the incline is frictionless. Calculate the magnitude of the force F. A) 9.0 N

$F\cos\theta - mg\sin\theta = -ma$

$F = \frac{mg\sin\theta - ma}{\cos\theta}$

$= \frac{2\times 9.8 \times \sin 30 - 2\times 1}{\cos 30} = 9.00N$

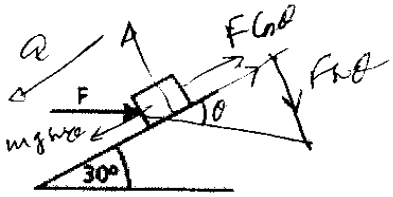


Figure 4

Q#3 A 5.0-kg block and a 10-kg block are connected by a light string as shown in Figure 3. If the pulley is mass less and the surface is frictionless, the magnitude of the acceleration of the 5.0 kg block is (Ans: 6.5 m/s²

$T = 5a$

$T - 10\times 9.8 = -10a$

$T = 98 - 10a$

$5a = 98 - 10a$

$a = \frac{98}{15} = 6.5\ m/s^2$

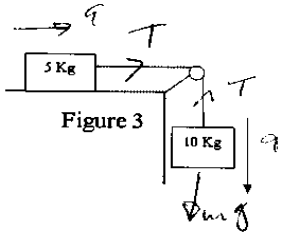


Figure 3

Quiz #2 Ch.#5 T121 Phys101.37-39-v4

Student ID:..... Student Name:..... Section # .....

Q1 Two blocks A (M_A = 4 kg)and B (M_B = 20 kg) are in contact with each other and are placed on a horizontal frictionless surface. A 36-N constant force is applied to A as shown in Fig. 4. The magnitude of the force exerted on A by B is (A1) 30 N .

$a = \frac{36}{24} = 1.5\ m/s^2$ → a

36 N → [4 kg] F_{AB}

$36 - F_{AB} = ma = 4 \times 1.5 = 6$

$F_{AB} = 36 - ma = 36 - 6 = 30\ N$

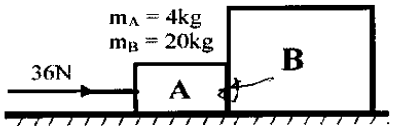


FIGURE-4

Q#2: A 3.0-kg block slides on a frictionless 37° incline plane. A vertical force of 20 N is applied to the block (see Fig 3). The acceleration of the block is: (Ans: 1.9 m/s down the incline)

$w' = 20 - 3 \times 9.8 = 9.4\ N$

$\uparrow w' \sin\theta = ma$

$a = \frac{w'}{m} \sin\theta = \frac{9.4}{3} \times \sin 37$

$a = 3.13 \times \sin 37 = 1.88\ m/s^2$

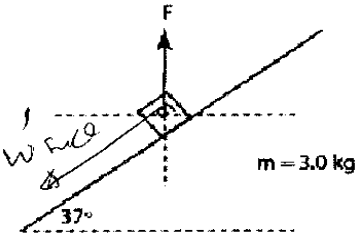


Figure 3

Q#3: Two blocks weighing 25 kg and 35 kg respectively, are connected by a string that passes over a mass less pulley as shown in Fig. 5. The acceleration of 35 kg block is: (A1) 1.63 m/s2 down ward

$T - 25 \times 9.8 = 25 \times a$

$T = 25 \times 9.8 + 25 \times a = 245 + 25a$

$T - 35 \times 9.8 = -35a$

$T - 343 = -35a$

$T = 343 - 35a = 245 + 25a$

$60a = 343 - 245 = 98$

$a = \frac{98}{60} = 1.63\ m/s^2$

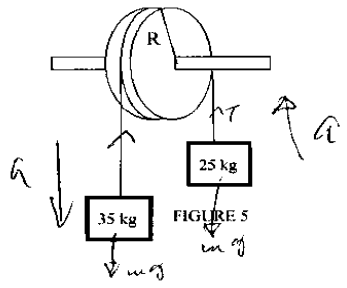


FIGURE 5

Quiz #2 Ch.#5 T121 Phys101.37-39-v5

Student ID:..... Student Name:..... ..... Section # .....

Q#1: In figure 5, if P = 6.0 N, what is the magnitude of the force exerted by block (2) on block (3)? Assume the surface is frictionless.

$a = \frac{6}{10} = 0.6\ m$ → a

F_{32} → 5 kg

$F_{32} = 5 \times a = 5 \times 0.6 = 3.0\ N$

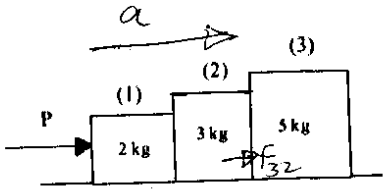


Figure 5

Q#2: A 3.0 kg block is pushed upward a 30° inclined frictionless plane with a constant horizontal force *F* (Fig 4). If the block moves with a constant speed find the magnitude of the force *F*.

Constant speed $a = 0$

$F\cos\theta - mg\sin\theta = 0$

$F\cos\theta = mg\sin\theta$

$F = \frac{mg\sin\theta}{\cos\theta} = mg\tan\theta$

$= 3 \times 9.8 \times \tan 30 = 16.97\ N$

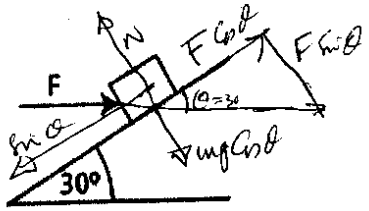


Figure 4

#3: Two blocks of masses m_1 =3.00 *kg* and m_2 = 3.00 *kg* are connected by a string passing over a mass less and frictionless pulley and placed on a frictionless horizontal table as shown in Fig. 3. A force of *F* = 20.0 *N* at an angle of 60.0° with the horizontal is applied to m_1. The magnitude of acceleration of the system is:

$T - F\cos 60 = m_1 a$

$T = m_1 a + F\cos 60$ —(1)

$T - m_2 g = -m_2 a$

$T = m_2 g - m_2 a$ —(2)

Solving (1) & (2) for T

$m_1 a + F\cos 60 = m_2 g - m_2 a$

$(m_1 + m_2)a = m_2 g - F\cos 60$

$a = \frac{m_2 g - F\cos 60}{m_1 + m_2} = \frac{3 \times 9.8 - 20\cos 60}{3+3} = \frac{29.4 - 10}{6}$

$a = 3.23\ m/s^2$

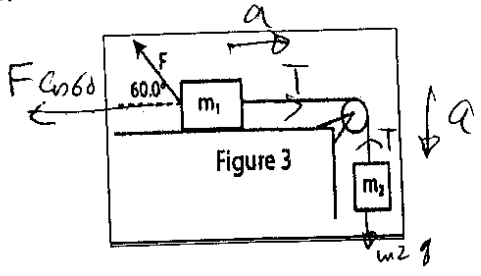


Figure 3

Quiz #2 Ch.#5 T121 Phys101.37-39-v6

Student ID:..... ..... Student Name:..... ..... Section # .....

Q#1: A constant force *F* of magnitude 20 N is applied to block *A*, which pushes block *B* of mass *m* = 6.0 kg as shown in Fig. below. The block slides over a frictionless flat surface with an acceleration of 2.0 m/s². What is the force exerted on block *A by block B*?

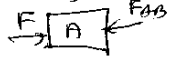
We need to Calculate m_A !!

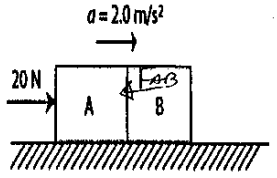
$20 = (m_A + m_B)a = (m_A + 6)2$

$m_A = \frac{20}{2} - 6 = 10 - 6 = 4\,kg$

$20 - F_{AB} = 2 \times 4$

$F_{AB} = 20 - 8 = 12\,N$





Q#2: A block of mass 4.0 kg is being pushed by a force parallel to the ground as shown in Figure 4. The block is observed to have an acceleration of 2.0 m/s² down the incline. Assume the incline is frictionless. Calculate the magnitude of the force F.

$F\cos\theta - mg\sin\theta = -ma$

$F = \frac{mg\sin\theta - ma}{\cos\theta}$

$= \frac{4 \times 9.8 \times \sin 30 - 4 \times 2}{\cos 30}$

$F = 13.4\,N$

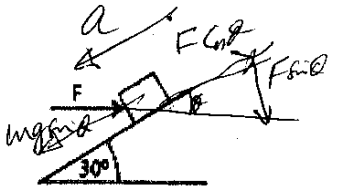


Figure 4

Q#3: Two blocks weighing 15 kg and 25 kg respectively, are connected by a string that passes over a mass less pulley as shown in Fig. 5. The acceleration of 25 kg block is :?

For 25 kg block

$T - 25 \times 9.8 = -25a$

$T = 25 \times 9.8 - 25a$ ——(1)

For 15 kg block

$T - 15 \times 9.8 = 15a$ ——(2)

$T = 15a + 15 \times 9.8$ ——(3)

Solving (1) & (3) for T

$25 \times 9.8 - 25a = 15a + 15 \times 9.8$

$25a + 15a = (25 - 15)9.8 = 10 \times 9.8 = 98$

$40a = 98 \Rightarrow a = \frac{98}{40} = 2.45\,m/s^2$

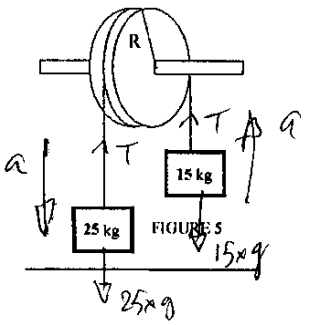


FIGURE 5