PHYS 250 Test 3: Photo Upload

David Yang

TOTAL POINTS

96 / 100

QUESTION 1

20 pts

1.1 Part a 4 / 4

✓ **+ 4 pts Correct and complete explanation**

+ 0 pts Not much here I'm afraid.

+ 3 pts Cite Newton's Second to justify your argument.

+ 2 pts Incomplete argument

1.2 Part b 4 / 8

+ 8 pts Correct and complete explanation

+ 6 pts Right idea with work: but B travels farther than A.

+ 0 pts Not much here I'm afraid.

+ 3 pts Incomplete arrgument.

+ 6 pts Right idea, but you should cite the idea of work.

✓ **+ 4 pts Correct argument, but W=F*d, not W=F*t**

+ 3 pts Mentions work, but not calculated correctly

1.3 Part c 8 / 8

✓ **+ 8 pts Correct and complete explanation**

+ 6 pts Right idea with impulse, but the times are the same so impulse is the same.

+ 0 pts Not much here I'm afraid.

+ 4 pts You sort of get at impulse, but don't cite it or the impulse-momentum theorem.

+ 3 pts Impulse is the right idea, but you didn't evaluate impulse.

+ 3 pts Incomplete argument. Unless you know the effect if smaller mass is cancelled exactly by larger v, this isn't valid.

QUESTION 2

2 30 / 30

✓ **+ 30 pts Correct**

+ 0 pts Not much here I'm afraid.

- 3 pts The coefficient of friction is not the same as the force of friction.

- 3 pts W_other is the wrong sign

- 1 pts Minor calculation error

QUESTION 3

3 30 / 30

✓ **+ 30 pts Correct**

+ 0 pts Not much here I'm afraid.

- 1 pts Minor calculation error

- 3 pts Wrong sign of work done by friction

+ 22 pts Correct, but omitted the role of the stuck wheel.

+ 24 pts Correct, but didn't factor in final potential energy

QUESTION 4

4 20 / 20

✓ **+ 20 pts Correct**

+ 0 pts Not much here I'm afraid.

+ 17 pts Correct except for sign error

+ 12 pts This would be correct if the collision was elastic. But I'm afraid it isn't.

+ 8 pts Right idea to use momentum, but method is not correct.

- 1 pts Minor calculation error

1. a. B travels the longer distance after 5 seconds.

Since $a = \frac{F_{net}}{m}$, and the only horizontal force is the engine, the acceleration of B is greater than A since $m_B = \frac{m_A}{2}$. And since both spaceships start at the same point, rest, B's higher acceleration will make it travel longer distance

b. Since the forces acting on the spaceship are identical, and they both act for 5 seconds, work done on each spaceship is identical. Since work = Δ Kinetic energy for a system with no internal change of energy, and both objects are at rest at $t=0$, the Kinetic Energy of both starships are equal.

c. Impulse is $I = F \cdot \Delta t$. Since the force acts on both spaceships the same amount of time, (5s) and the force is the same, the impulses of the 2 spaceships are the same. Since $I = \Delta p$, the momentums are the same for spaceship A and B

1.1 Part a 4 / 4

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b. Since the forces acting on the spaceship are identical, and they both act for 5 seconds, work done on each spaceship is identical. Since work = Δ Kinetic energy for a system with no internal change of energy, and both objects are at rest at $t=0$, the Kinetic Energy of both starships are equal.

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1.2 Part b **4 / 8**

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+ **0 pts** Not much here I'm afraid.
+ **3 pts** Incomplete arrgument.
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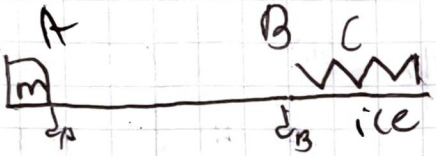
2.



FBD

At d_B, what is the velocity of the box?

$E_f = E_i + W_{other}$

Potential energy = 0 in both.

$K_f = K_i + W_{friction}$

$f_{K_{box}} = 0.3 \cdot f_{net_{box}}$

$f_{net_{box}} = ma$ $\quad f_K = .3 \cdot 3 \cdot 9.81$

$= 3 \cdot 9.81$

$W_{friction} = f_K \cdot d$

~~$K_f = K_i + 3 \cdot 9.81 \cdot .5$~~

$K_f = K_i + f_K d$

$\rightarrow \frac{1}{2} \cdot 3 \cdot v^2 = \frac{1}{2} \cdot 3 \cdot 4^2 - .9 \cdot 9.81 \cdot .5$

$\frac{3}{2} v^2 = 24 - 4.4145$

$v^2 = \frac{19.5855}{3/2}$

$v_B = 3.61344$

BL: $E_f = E_i + W_{other}$

$U_f + K_f = U_i + K_i$

$U_f + 0 = 0 + K_i$

$U_f = K_i$

$\frac{1}{2} K x^2 = \frac{1}{2} \cdot 3 \cdot (3.61344)^2$

$k = 1000$

$x^2 = 0.039171708$

$x = 0.1979 \text{ m}$

2 30 / 30

✓ **+ 30 pts** **Correct**

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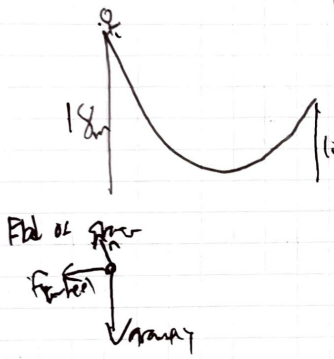

$E_f = E_i + w_{other}$

$U_f + K_f = U_i + K_i + w_{-other}$

$F_K = 0$ $\quad d = 45m$

$F_{wheel} = 50N$

$W_{-wheel} = F_{wheel} \cdot d$

$\underbrace{70 \cdot 9.81 \cdot 18 + 0 + F_{wheel} \cdot d}_{U_i + K_i + w_{other}} = \underbrace{0 + K_f}_{U_f + K_f}$

Define h=10 to be bottom

$5493.6 - 2250 = K_f$

$K_f = \frac{1}{2} m v^2$

$3243.6 = \frac{1}{2} \cdot 70 \cdot v^2$

$\frac{3243.6}{35} = v^2$

$v = \sqrt{\frac{3243.6}{35}}$

$v = 9.6267 \, m/s$

3 **30 / 30**

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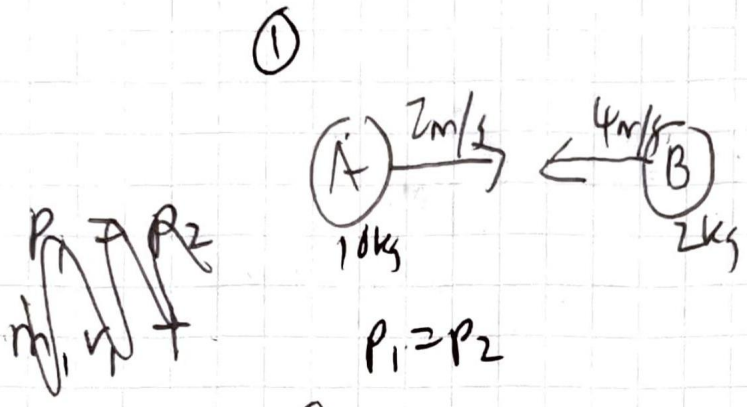

Define right as positive and left as negative

$$m_A v_{A1} + m_B v_{B1} = m_A v_{A2} + m_B v_{B2}$$

$$10 \cdot 2 + 2 \cdot -4 = 10 \cdot v_{A2} + 2 \cdot 4$$

$$12 = 10 \cdot v_{A2} + 2 \cdot 4$$

$$4 = 10 \cdot v_{A2}$$

$$v_{A2} = \frac{4}{10} \text{ m/s}$$

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