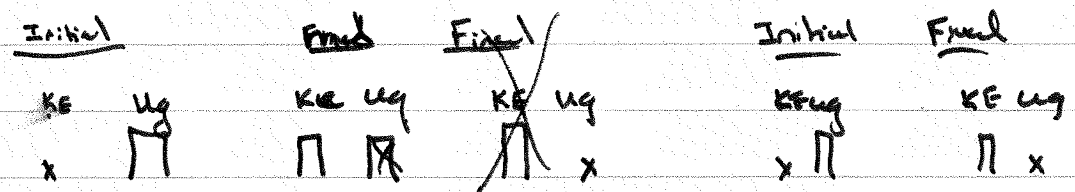
wkst - FRQ, 3 questions

AP Physics - Unit 4

(1) A
NO

(1) part 1

Block 1 — Block 2



Block 1: $mgd = \frac{1}{2}mv^2$

$\therefore V^2 = 2gd$

$V = \sqrt{2gd}$

Block 2: $mg(d-x) = \frac{1}{2}mv^2$

$V^2 = 2g(d-x)$

$V = \sqrt{2g(d-x)}$

great V leaving table

$\therefore$ Because Block 1 has greater Δ in vertical distance

part 2 Both Blocks have the same vertical distance to fall (h) from table to floor

$\therefore$ Both Blocks will have same time in Air

time to fall is indepent of Velocity in X direction, it only depends on

Y-dir

$Y = y_0 + V_{y0}t + \frac{1}{2}gt^2$

$y = h$

$h = \frac{1}{2}gt^2$

$t = \sqrt{2hg}$ $\therefore$ same time in Air

part 3

A greater horizontal velocity for the same amount of time Results in a greater horizontal displacement

$\therefore$ V of Block 1 > V of Block 2

↳ greater horizontal distance

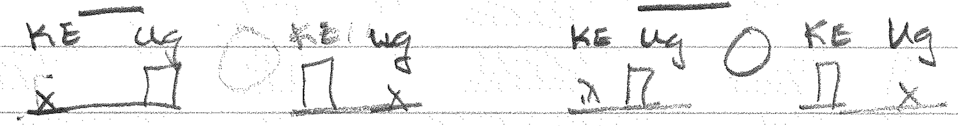
① B

- Same Δd for Both Blocks
- Both Blocks Leaving Table @ Same Δh

Does it take the same time to get down the slopes??

- can't use Energy Eqns - No time
- what does time depend upon?? acceleration

i) Block 1 Block 2



$0 + mgd = \frac{1}{2}mv^2 + 0$ $0 + mgd = \frac{1}{2}mv^2 + 0$

$V = \sqrt{2gd}$ $V = \sqrt{2gd}$

∴ Both Blocks have same V leaving Table

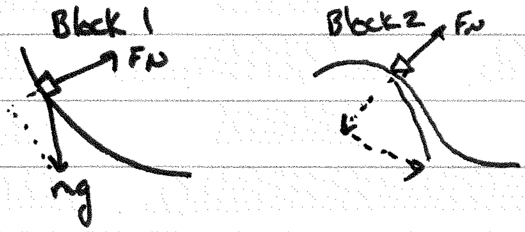
Both have same h, from Table to ground: So same time in Air

Both Blocks, same V leaving, same time in Air

∴ X The 2 Blocks land the same distance from their respective Tables

ii) Same V, same h, But not same acceleration. Not spending the same time to get same Velocity

Block 1 Block 2

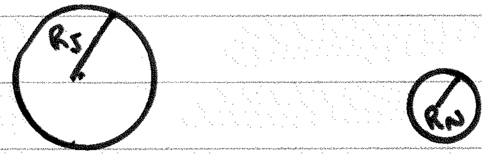


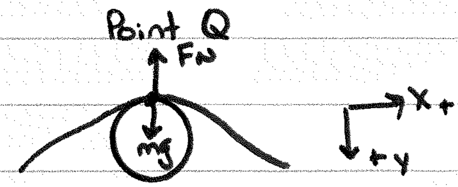
Since the Angle of Table 1 is very steep in the Beginning Block 1 will Reach its MAX Speed in less time. So it will Reach the Bottom of the Ramp 1st

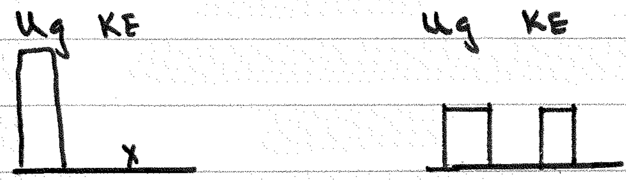
X Block 1 hits 1st

Wkst - FRQ (3 questions)

(2) Speed @ Top of Neptune







F_N is Track on Cart

$F_{Net} = F_c$

$mg - F_N = \frac{mv^2}{r}$

$F_N = mg - \frac{mv^2}{r}$

∴ At Point P F_N will decrease as V↑

If $F_N = 0$ then RollerCoaster has Lost contact w/ Track

$mgh_1 + 0 = mgh_2 + \frac{1}{2}mv^2$

$h_1 = 2R_J$ $\quad h_2 = 2R_N$

$2gR_J = 2gR_N + \frac{1}{2}v^2$

$\frac{1}{2}v^2 = 2gR_J - 2gR_N$

$v^2 = (2)(2g)(R_J - R_N)$

$v = 2\sqrt{g(R_J - R_N)}$

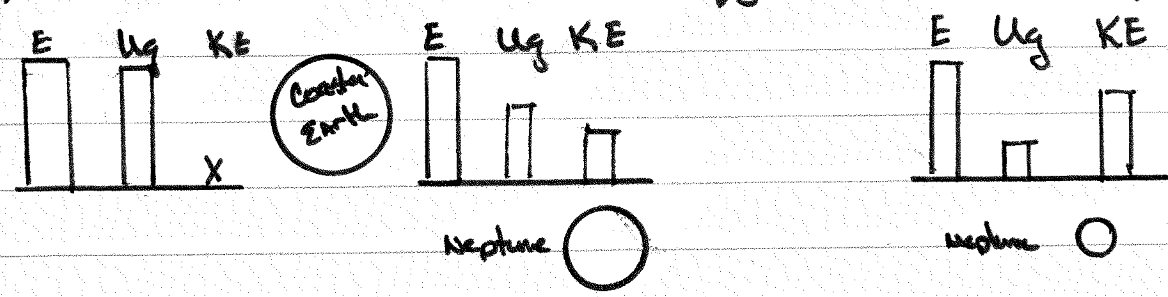
A) $v = 2\sqrt{g(R_J - R_N)}$

$v^2 = 4g\Delta R$ if the ΔR is doubled, $v \times 4$, Causing $F_N = 0$ or even (−)

Both work

or// ...

A) Jupiter Neptune w/ small ΔR vs Neptune w/ Large ΔR



Thee greater the Δ in heights the ↑ the KE will Be at point Q ∴ if Big ΔH then the cart will Be going to fast & lose contact w/ Track wkst - FRQ (2 Questions)

(B) Engineer C

$$F_N = mg - \frac{mv^2}{r}$$

when R is extremely small
then $\left(\frac{mv^2}{r}\right)$ Become a large negative term

∴ the Car will Lose Contact w/ Track

C) Already did

D) $F_N = 0$ at Almost Losing Contact

$$mg - \cancel{F_N}^{0} = \frac{mv^2}{r}$$

$$V = 2\sqrt{g(R_J - R_N)}$$

$$\cancel{m}g = \frac{\cancel{m}}{R_N}\left(2\sqrt{g(R_J - R_N)}\right)^2$$

$$\cancel{g} = \frac{1}{R_N} 4\cancel{g}(R_J - R_N)$$

$$R_N = 4R_J - 4R_N$$
$$+4R_N \qquad +4R_N$$

$$5R_N = 4R_J$$

$$\boxed{R_N = \frac{4}{5}R_J}$$