

IB Physics SL - Forces on Inclined Plane Problems

Directions: Complete each problem IN your notebook. - Draw a complete and well labeled FBD showing weight, wt. component directed INTO RAMP (perpendicular), wt. component directed DOWN ramp (parallel to surface), applied force (if any), friction.

1. A car is sitting at the top of a 14.5 degree hill. If the car has a mass of 575 kg and a coefficient of friction of 0.21. What is the net force? [Draw free body diagram]

- Step 1 Find F_g
- Step 2 Find F_{gx} and F_{gy}
- Step 3 Find F_N
- Step 4 Find F_f
- Step 5 Find F_{net}

Will the car roll down the hill?

2. A 750 kg car is sitting at the top of Columbia hill (27.5 degree) and accelerates from rest to the school the engine applies a force 1100 N while the coefficient of friction is 0.44.

- a) What is F_{net} ?
- b) What is the car's acceleration?
- c) How fast will the car be going at the bottom of the hill 425 m below, if the driver does not hit the brakes?

3. For Columbia hill, what force would be necessary to accelerate a car from rest up the hill from Dairy Mart to the school, 475 m down the hill, in 45 seconds?

4. Jerrica is pulling a sled with a force of 275 N at a 63 degree angle above the horizontal. The sled and the contents have a mass of 65 kg. The coefficient of friction is 0.293. If she starts pulling the sled from rest...

- a) What is the net force?
- b) What is the net acceleration?
- c) How much time will it take her to drag the sled 75 m across the softball field?

5. J Schmidt is pushing 575 N on a 18.5 kg lawnmower at an angle of 27 degrees below the horizontal to move at a constant speed. [HINT – DRAW AN ACCURATE PICTURE]

- a) What is the normal force?
- b) What is the frictional force?
- c) What is the coefficient of friction?