



A car is climbing up a hill with a constant speed  $v$ .

The frictional force is  $f = \mu N$ .

The weight of car is  $mg$ .

The maximum power is  $P_{max}$ .

Find the maximum speed of the car.

- A)  $v_{max} \simeq \frac{P_{max}}{mg \sin \theta + \mu mg \cos \theta}$ .
- B)  $v_{max} \simeq \frac{P_{max}}{mg \sin \theta - \mu mg \cos \theta}$ .
- C)  $v_{max} \simeq \frac{P_{max}}{mg \sin \theta}$ .
- D)  $v_{max} \simeq \frac{P_{max}}{\mu mg \cos \theta}$ .

*Explanation:* For the car moving uphill,  $\mu m g \cos \theta$  is pointing downhill.

Since the car is moving with a constant speed, the net uphill force equals

the downhill force; i.e.,  $F = m g \sin \theta + \mu m g \cos \theta$  and  $v_{max} = \frac{P_{max}}{F}$ , so

$$v_{max} \simeq \frac{P_{max}}{m g \sin \theta + \mu m g \cos \theta}.$$

Answer **A**.

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