Friction

IB PHYSICS | FORCES

Types of Forces | Friction

What is Friction?

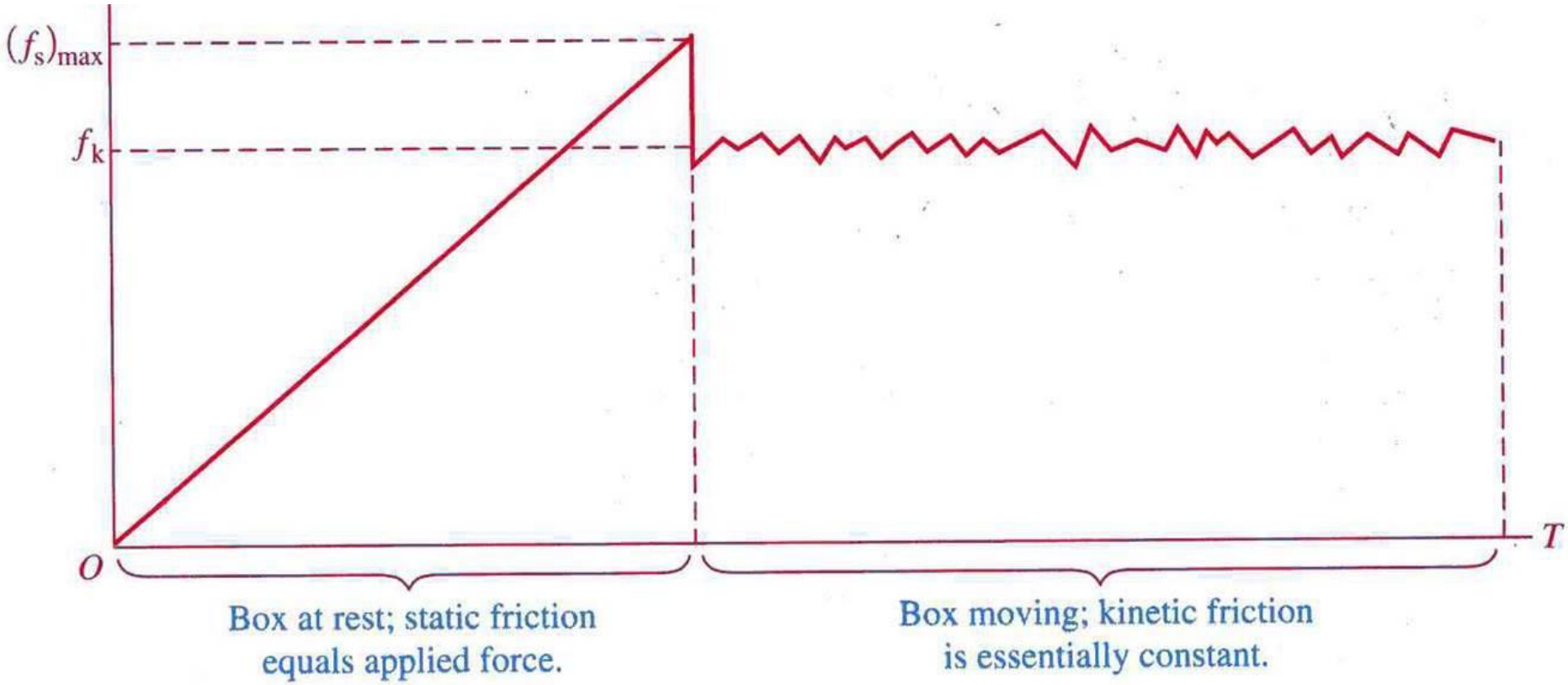
The force _____ the motion between two objects that are in _____.

Types of Friction

Static Friction-

Dynamic (Kinetic) Friction-

Static vs. Dynamic Friction

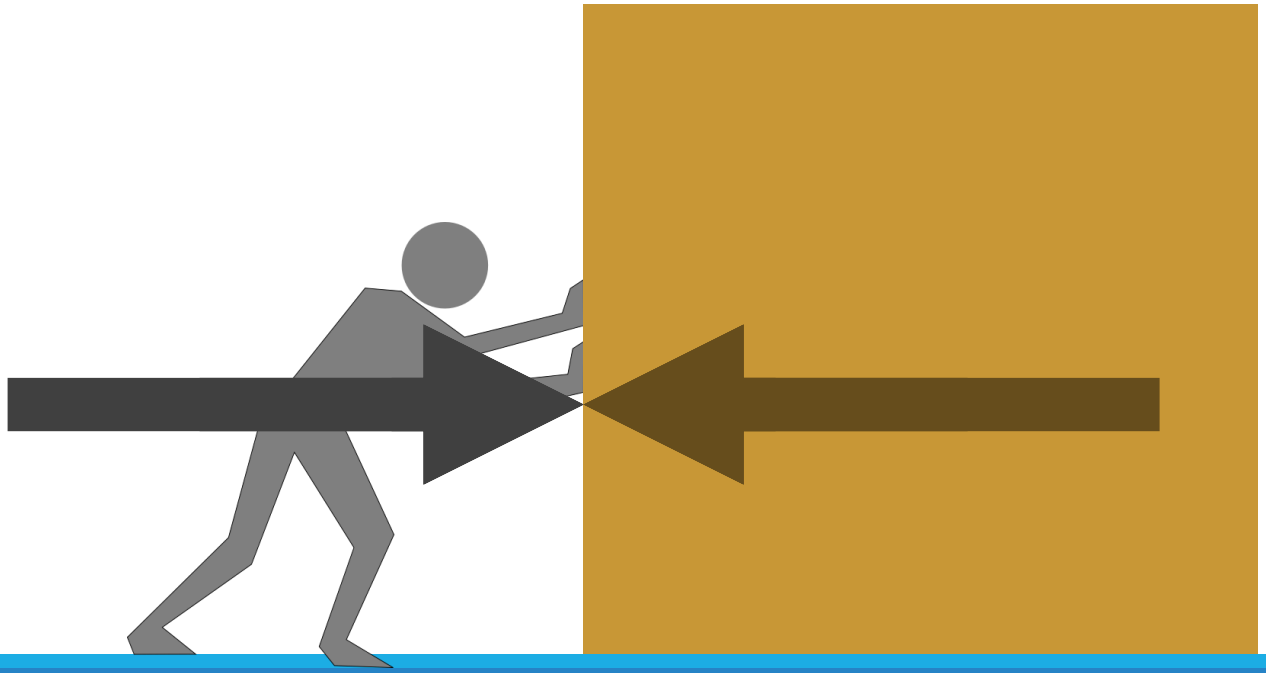


How do we Calculate Friction?

$$F_f = \mu \times R$$

Materials	μ_s	μ_d
Steel on ice	0.1	0.05
Steel on steel (dry)	0.6	0.4
Steel on steel (greased)	0.1	0.05
Rope on wood	0.5	0.3
Teflon on steel	0.04	0.04
Shoes on ice	0.1	0.05
Climbing boots on rock	1.0	0.8

Static Friction



Physics Data Booklet

Sub-topic 2.2 – Forces

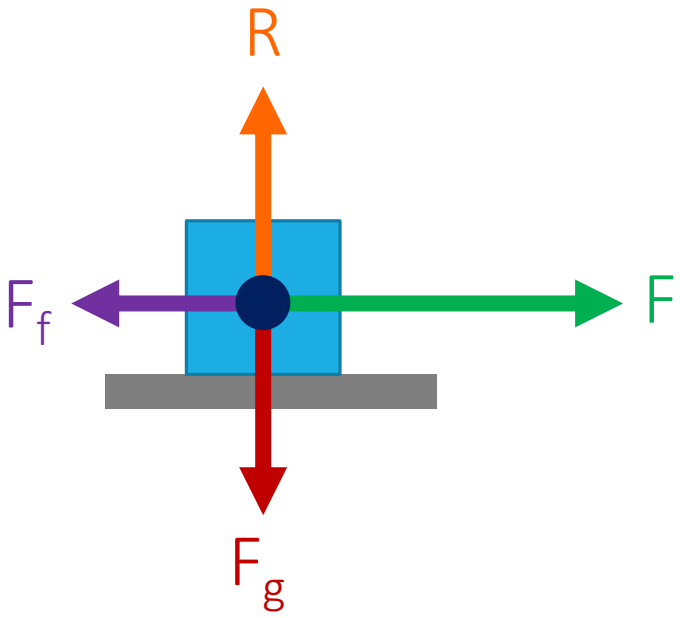
$F = ma$

$F_{\mathrm{f}} \leq \mu_{\mathrm{s}} R$

$F_{\mathrm{f}} = \mu_{\mathrm{d}} R$

How do we Calculate Friction?

F	
F_g	
R	
F_f	



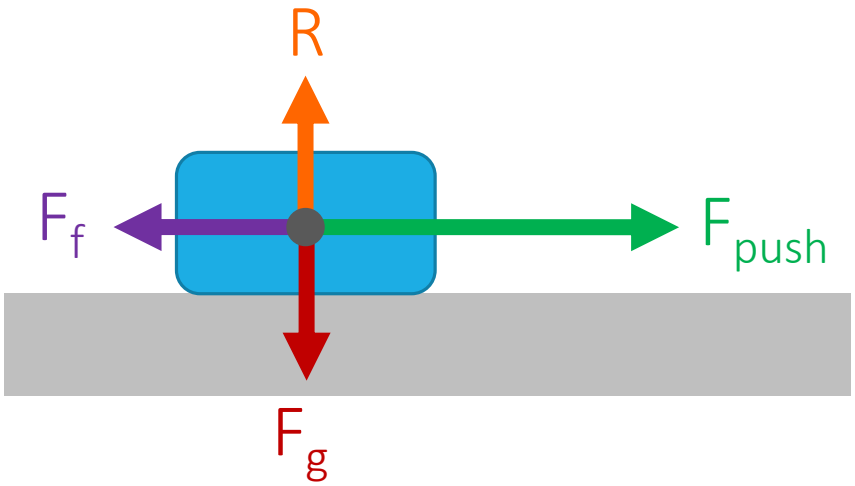
Calculate Friction | Try This…

Santa's Sleigh is loaded up with toys for all the good little girls and boys until it has a total mass of 2000 kg. What is the **static friction** force that must be overcome if μ_s is 0.1?

Calculating Acceleration w/ Friction

Step 1:
Find the Force from Friction

- $F_g = mg$
- $R = F_g$
- $F_f = \mu \times R$



Step 2:
Find F_{net}

- $F_{net} = F_{push} - F_f$

Step 3:
Find acceleration

$F_{net} = ma$ ➡ $a = F_{net} / m$

Calculate Friction | Try This…

Santa's reindeer pull his 2000 kg sleigh with a force of 4980 N. How fast does the sleigh accelerate if the coefficient of kinetic friction (μ_k) is 0.05?

Lesson Takeaways

- ❑ I can calculate the force of friction when given the reaction force and coefficient of friction
- ❑ I can quantitatively compare surfaces based on their coefficients of friction
- ❑ I can calculate the acceleration of an object with friction based on the external force and mass