شكراً لتحميلك هذا الملف من موقع المناهج الإماراتية

ملخص ومراجعة درس Friction الاحتكاك

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التواصل الاجتماعي بحسب الصف التاسع المتقدم




روابط مواد الصف التاسع المتقدم على تلغرام

التربية الاسلامية	اللغة العربية	اللغة الانجليزية	الرياضيات

المزيد من الملفات بحسب الصف التاسع المتقدم والمادة فيزياء في الفصل الثاني

1	ملخص ومراجعة درس Vectors الأشعة
2	ملخص ومراجعة الدرس الثالث Law Third s'Newton قانون نيوتن الثالث
3	ملخص ومراجعة الدرس الثاني Force Drag and Weight الوزن وقوة السحب
4	ملخص ومراجعة ثانية الدرس الأول Motion and Force القوة والحركة

المزيد من الملفات بحسب الصف التاسع المتقدم والمادة فيزياء في الفصل الثاني	
5	ملخص ومراجعة الدرس الأول Motion and Force القوة والحركة

LESSON 2
FRICTION

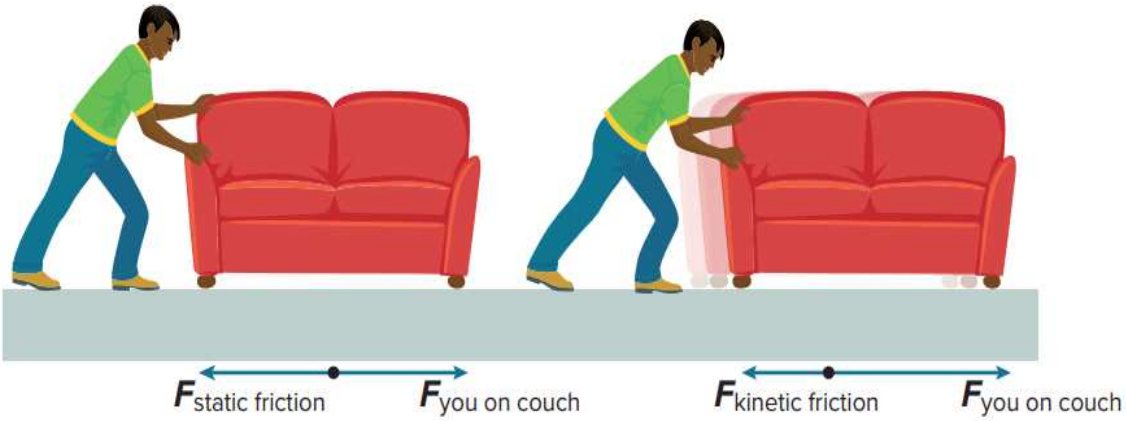


Figure 10 An applied force is balanced by static friction up to a maximum limit. When this limit is exceeded, the object begins to move.

Identify *the type of friction force acting on the couch when it begins to move.*

Kinetic Friction Force

The kinetic friction force equals the product of the coefficient of kinetic friction and the normal force.

$$F_{\text{f, kinetic}} = \mu_k F_N$$

Kinetic friction

object is moving across the surface (kinetic friction)

μ_k is the coefficient of kinetic friction.

μ_k = > 0

In almost all cases, μ_k is also less than 1.

The direction of the kinetic friction force is always opposite to the direction of motion of the object relative to the surface it moves on.

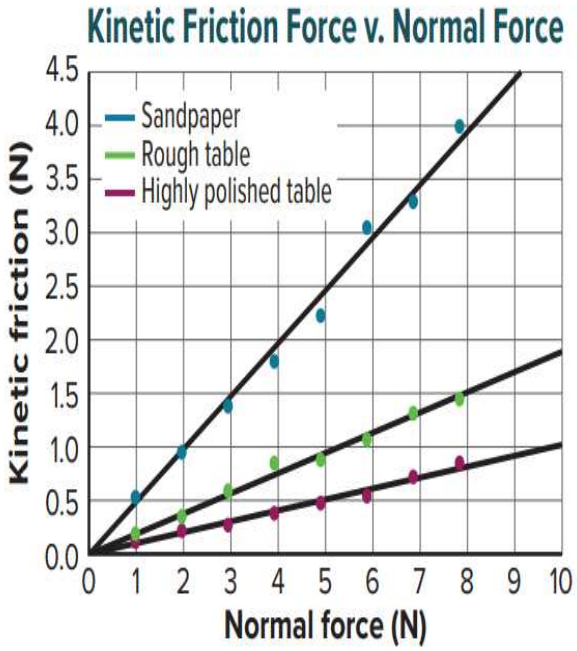


Figure 12 A plot of kinetic friction v. normal force for a block pulled along different surfaces shows a linear relationship between the two forces for each surface. The slope of the line is μ_k.

Compare *the coefficient of kinetic friction for the three surfaces shown on the graph.*

Table 1 Kinetic Friction v. Normal Force (sandpaper)

Number of blocks	Normal force (N)	Kinetic friction (N)
1	0.98	0.53
2	1.96	0.95
3	2.94	1.4
4	3.92	1.8
5	4.90	2.3
6	5.88	3.1
7	6.86	3.3
8	7.84	4.0

Static Friction Force

The static friction force is less than or equal to the product of the coefficient of static friction and the normal force.

$$F_{\text{f, static}} = \mu_s F_N$$

Static friction

If an object is at rest, it takes a certain threshold amount of external force to set it in motion. (kinetic friction)

μ_s is the coefficient of static friction.

Static friction

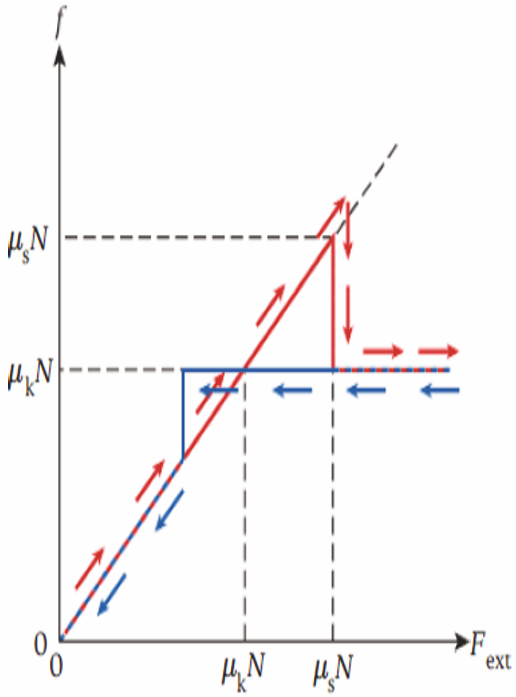
As soon as the object starts moving, a lot less force is required to keep it in constant sliding motion. $\mu_s > \mu_k$

friction force depends on an external force, F_{ext}, applied to an object μ_s is the coefficient of static friction.

initially at rest, a small external force results in a small force of friction, rising linearly with the external force until it reaches a value of $\mu_s N$.

a value of $\mu_k N$ when the object is set in motion. the external force has a value of $F_{ext} = \mu_s N$, resulting in a sudden acceleration of the object.

This dependence of the friction force on the external force is shown in Figure as a red line.



SUMMARY

- If an object is at rest, it takes an external force with a certain threshold magnitude and acting parallel to the contact surface between the object and the surface to overcome the friction force and make the object move.
- The friction force that has to be overcome to make an object at rest move is larger than the friction force that has to be overcome to keep the object moving at a constant velocity.
- The magnitude of the friction force acting on a moving object is proportional to the magnitude of the normal force.
- The friction force is independent of the size of the contact area between object and surface.
- The friction force depends on the roughness of the surfaces; that is, a smoother interface generally provides less friction force than a rougher one.

EXAMPLE Problem 3

BALANCED FRICTION FORCES You push a 25.0-kg wooden box across a wooden floor at a constant speed of 1.0 m/s. The coefficient of kinetic friction is 0.20. How large is the force that you exert on the box?

15. Gwen exerts a 36-N horizontal force as she pulls a 52-N sled across a cement sidewalk at constant speed. What is the coefficient of kinetic friction between the sidewalk and the metal sled runners? Ignore air resistance.

16. Mr. Ames is dragging a box full of books from his office to his car. The box and books together have a combined weight of 134 N. If the coefficient of static friction between the pavement and the box is 0.55, how hard must Mr. Ames push horizontally on the box in order to start it moving?

17. Thomas sits on a small rug on a polished wooden floor. The coefficient of kinetic friction between the rug and the slippery wooden floor is only 0.12. If Thomas weighs 650 N, what horizontal force is needed to pull the rug and Thomas across the floor at a constant speed?

18. CHALLENGE You need to move a 105-kg sofa to a different location in the room. It takes a 403-N force to start the sofa moving. What is the coefficient of static friction between the sofa and the carpet?

EXAMPLE Problem 4

UNBALANCED FRICTION FORCES Imagine that the force you exert on the 25.0-kg box in Example Problem 3 is doubled.

a. What is the resulting acceleration of the box?

b. How far will you push the box if you push it for 3 s?

19. You want to move a 41-kg bookcase to a different place in the living room. If you push with a force of 65 N and the bookcase accelerates at 0.12 m/s^2, what is the coefficient of kinetic friction between the bookcase and the carpet?

21. Ke Min is driving at 23 m/s. He sees a tree branch lying across the road. He slams on the brakes when the branch is 60.0 m in front of him. If the coefficient of kinetic friction between the car's locked tires and the road is 0.41, will the car stop before hitting the branch? The car has a mass of 1200 kg.

25. **Velocity** Dinah is playing cards with her friends, and it is her turn to deal. A card with a mass of 2.3 g slides 0.35 m along the table before it stops. If the coefficient of kinetic friction between the card and the table is 0.24, what was the initial speed of the card as it left Dinah's hand?