Lab: Effect of increasing incline on kinetic friction for a wooden block

Testable Question: How does the incline affect friction of wood on cardboard.

Independent (Manipulated) Variable:
incline

Dependent (Responding) Variable:
magnitude of kinetic friction

Controlled Variables:
materials of objects (ramp, object) • cross-sectional area
mass of object
surface area
applied force (same person)

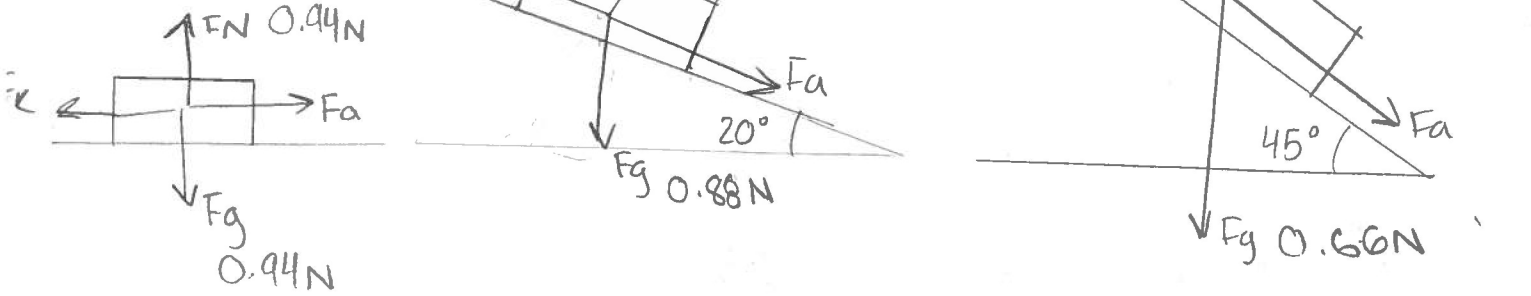
Expected Results:
The greater the incline, the less kinetic friction acting on the object.

Procedure (Include a sketch):

① FLAT (0°)

② 20°

③ 45°



Observations (a table is the clearest way to present):

MATERIALS	ACCELERATION	APPLIED FORCE	INCLINE	
WOOD ON PAPER	$0.092 m/s^2$	0.1N	0°	①
WOOD ON PAPER	$0.162 m/s^2$	0.1N	20°	②
WOOD ON PAPER	$0.283 m/s^2$	0.1N	45°	③

Calculations: (on other page)

①

$F_g = mg$

$= 0.0963(9.8 m/s^2)$

$= 0.94N$

$F_N = 0.94N$

$F_K = \mu F_N$

$= 0.26(0.94N)$

$= 0.24N$

② $F_g = mg$

$= 0.0963(9.8 m/s^2)$

$= 0.94N$

$F_N = 0.88N$

$F_K = \mu F_N$

$= 0.26(0.88N)$

$= 0.23N$

③ $F_g = mg$

$= 0.0963(9.8 m/s^2)$

$= 0.94N$

$F_N = 0.66N$

$F_K = \mu F_N$

$= 0.26(0.66N)$

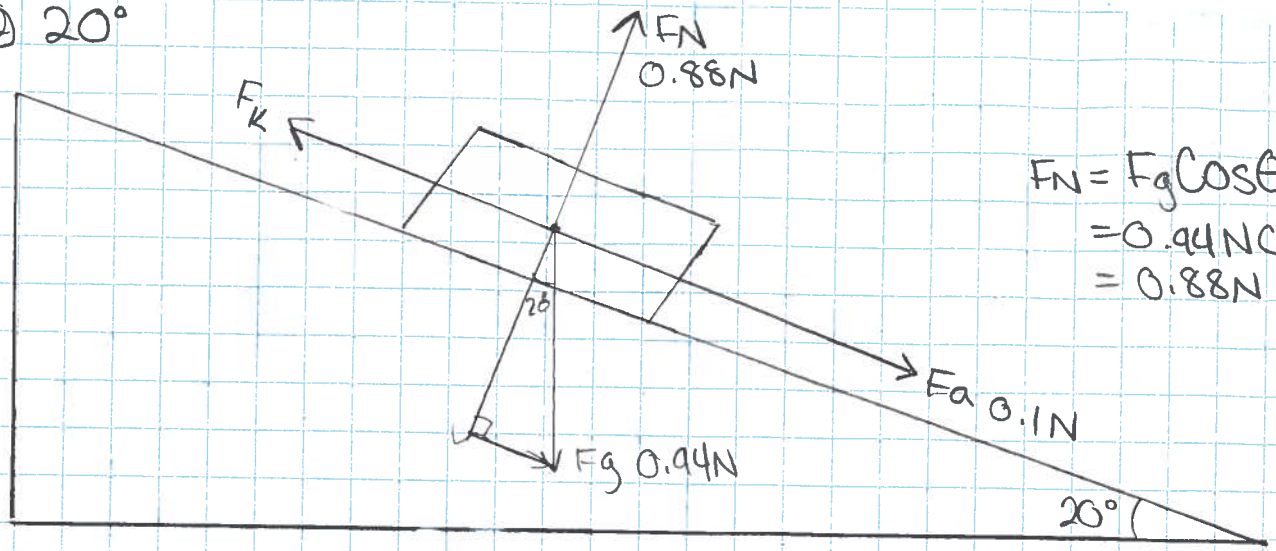
$= 0.17N$

Conclusions:

Our original hypothesis was that the kinetic friction would decrease as the incline increased. This proved to be correct as the F_K for 0° was 0.24N, F_K for 20° was 0.23N and F_K for 45° was 0.17N. Our experiment proved this correct as well because acceleration increased as the incline increased. Acceleration + Friction are inversely proportional ∴ friction decreased

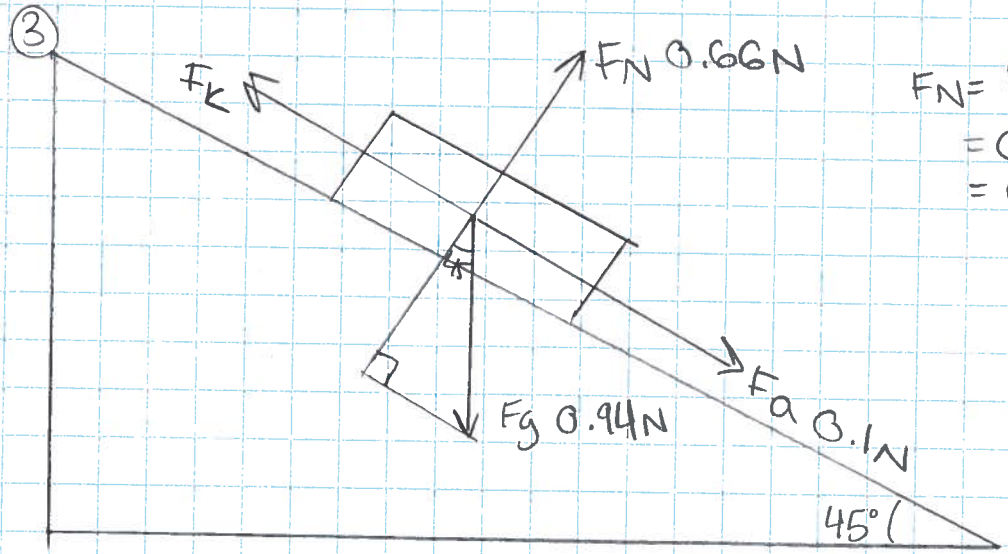
CALCULATIONS:

② 20°



$F_N = F_g \cos\theta$
$= 0.94N \cos 20$
$= 0.88N$

③



$F_N = F_g \cos\theta$
$= 0.94 \cos 45$
$= 0.66N$

ACCELERATION:

①

$0.0918\ m/s^2$ [forward]

$V = \frac{1m}{3.3s}$
$= 0.303\ m/s$ [forward]

$\vec{a} = \frac{V}{t}$
$= \frac{0.303\ m/s}{3.3s}$
$= 0.0918\ m/s^2$ [forward]

②

$0.162\ m/s^2$ [forward]

$V = \frac{1m}{2.476s}$
$= 0.40\ m/s$ [forward]

$\vec{a} = \frac{V}{t}$
$= \frac{0.40\ m/s}{2.476s}$
$= 0.162\ m/s^2$ [forward]

③

$0.283\ m/s^2$ [forward]

$V = \frac{1m}{1.873s}$
$= 0.53\ m/s^2$

$\vec{a} = \frac{V}{t}$
$= \frac{0.53\ m/s^2}{1.873s}$
$= 0.283\ m/s^2$ [forward]