Unit 1 Test 2 Outline

Inclined Planes - state the role of parallel and perpendicular components of weight for an object on an inclined surface
- calculate the parallel and perpendicular components of weight
- predict the influence of angle on the components of weight
- predict the influence of angle on friction force and normal force

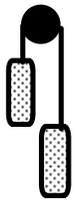
Newton's Three Laws of Motion - know and state the three laws
- apply the three laws to scenarios involving objects (including the various mathematical relationships between mass, net force, and acceleration in Newton's second law)
- apply the three laws to "simple" connected systems (including the various mathematical relationships between mass, net force, and acceleration in Newton's second law)
- predict how internal and external forces influence the motion (or lack of) in a connected system
- identify and describe action-reaction force pairs as described in Newton's third law
- apply Newton's laws when forces are acting at angles to an object, i.e. able to apply components of forces to an object

Apparent Weight - predict when it is different from the real weight
- predict the effect of acceleration on apparent weight
- calculate the apparent weight using normal force, applied force, tension, etc.
- draw free body diagrams
- make conclusions if there is enough supporting force to allow a predetermined acceleration or the acceleration possible with a predetermined amount of force

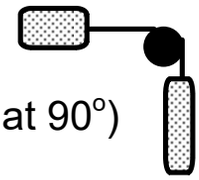
Connected Systems - draw free body diagrams for push and pull in a horizontal plane
- calculate measurements such as acceleration, applied forces, tension forces, displacement, and velocities.
- distinguish between external and internal forces
- identify action - reaction force pairs
- solve Atwood machine problems for acceleration, tension, net forces, mass values, velocity, time intervals, and displacement

Test 2(b)

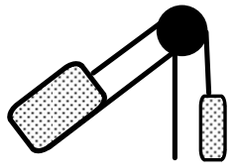
Connected Systems : all linear (in a line) 



or Atwood machine (opposing motions)



or Fletcher apparatus (motions at 90^{o})



or modified Fletcher (motions less than 90^{o})

- draw free body diagrams for the systems
- calculate measurements such as acceleration,
  tension,
  static friction (or coefficient of),
  kinetic friction (or coefficient of),
  displacement,
  final velocity,
  applied force,
  or mass.
- predict behaviour of a system (speed up, slow down,
  stay at rest)

PHY 621 Review for Test 2 on Applications of Vectors

1. An object is placed on an inclined plane. Frictional forces are present.

a) As the angle of the incline is increased, what happens to the magnitude of the following forces?

F_N	increases	decreases	remains constant
F_g	increases	decreases	remains constant
$F_{g\perp}$	increases	decreases	remains constant
$F_{g//}$	increases	decreases	remains constant
$F_{f\,stat}$	increases	decreases	remains constant

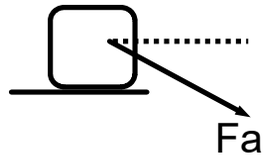
b) Which of the above force(s) is/are independent of the angle of the incline? _____

c) Which of the above force(s) is/are independent of the object's mass? _____

2. An object is being pushed along a horizontal surface by a force exerted at angle below the horizontal. Frictional forces are present.

a) As the angle below the horizontal is increased, what happens to the magnitude of the following forces?

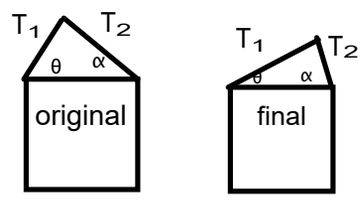
F_N	increases	decreases	remains constant
F_g	increases	decreases	remains constant
F_{ay}	increases	decreases	remains constant
F_{ax}	increases	decreases	remains constant
F_f	increases	decreases	remains constant



3. An object is suspended by a wire such that the angle each "arm" of the wire makes the horizontal is diffe The position of the object can be changed by sliding it to the left or right.

As the object's position is adjusted , angle θ decreases while angle α increases. What affect does this the following forces?

F_g	increases	decreases	remains constant
T_{1y}	increases	decreases	remains constant
T_{2y}	increases	decreases	remains constant
Σ Ty	increases	decreases	remains constant
Σ Tx	increases	decreases	remains constant
Fnet x	increases	decreases	remains constant
Fnet y	increases	decreases	remains constant



4. In class, Newton's second law was stated simply but yet illustrates three important relationships. Identify the three relationships and the condition that must be met for each relationship to be demonstrated .

relationship	condition
_____	_____
_____	_____
_____	_____

5. Use Newton's first law of motion to explain why a bob, on a string, can be swung in a circle in a horizontal plane such that there is always tension in the string? Why doesn't the bob just spiral into the centre of the circle?

_____

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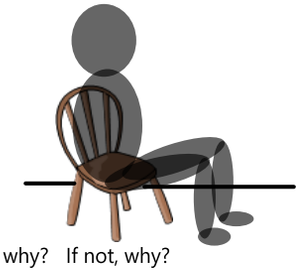
a) Mr. Whitrow (of mass 1.0 x 10^{2} kg) is sitting on a chair (of mass 10 kg). Rounding to the nearest integer, determine the following forces, including directions.

F Whitrow on chair = _____

F chair on Whitrow = _____

F floor on chair = _____

F chair on floor = _____



b) Does Newton's third law apply to the above scenario? If so, why? If not, why?

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_____

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7. Refer back to question #4. When doing pushing/pulling problems in connected systems, which of the three relationships best describes why the force required to accelerate the whole system would be more than the force required to accelerate a single object in the system (ex. the last person in line)?

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_____