Name KEY Per___

REVIEW SHEET – Forces and the Laws of Motion

1. Read Chapter 4.

2. Terms to know: force, net force, mass, equilibrium, balanced/unbalanced forces, normal force, applied force, free-body diagram, action-reaction pairs, kinetic friction, static friction, terminal velocity, gravitational field strength.

3. Define:
   a) Inertia amount of resistance an object has to changing state of motion
   b) Weight amount of gravitational force acting on an object ($m\vec{g}$)
   c) Equilibrant a single force vector that puts a system into equilibrium
   d) Coefficient of friction ratio of Normal Force to Frictional Force

4. What was the name of Newton's most famous book? When was it published? Why was it important?
   Principia, 1687, contains Laws of Motion, Gravitation

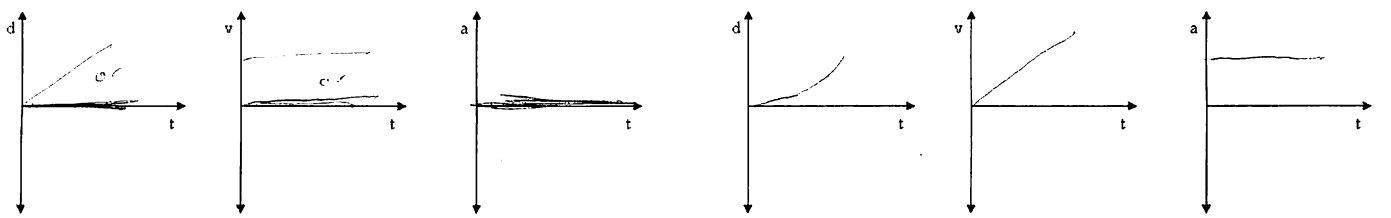
5. State Newton's:
   a) First Law of Motion
   - objects at rest remain at rest, objects in motion remain in constant motion, unless acted on by a net external force
   b) Second Law of Motion
   - acceleration of an object is proportional to net force on object, and inversely proportional to mass
   c) Third Law of Motion
   - when 2 objects interact, the force A exerts on B is equal/opposite to the force B exerts on A.

6. a) What are the four fundamental forces? strong, weak, electromagnetic, gravity
   b) Which are long range? Gravity, Electromag. c) short range? Weak, strong
   d) Which is the strongest? Strong e) Which is the weakest? Gravity

7. a) Compare mass and weight. m = property of an object, constant. $\vec{F}_g$ = property of 2 objects, changes
   b) State the units and symbols for each. m: [kg] $\vec{F}_g$: [N]
   c) What formula relates these two quantities? $\vec{F}_g = m\vec{g}$

8. Be able to:
·apply Newton's three laws of motion ·draw and label a free-body diagram ·identify the net force acting on an object · calculate with the formula $F_{net} = ma$ · calculate mass and weight · estimate weights and masses ·calculate with the formula $F_f = \mu F_N$ ·resolve the force of gravity into two components for an object on an inclined plane

9. Sketch the graphs of motion for an object acted on by:
   a) balanced forces
   b) unbalanced forces



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10. If a heavier students pushes a lighter student,
    a) who experiences a greater force? same
    b) who accelerates more? lighter

11. a) What is cause of the normal force? electromagnetic repulsion

    b) Is it always the same as the weight of an object? Give examples when it is not.
    No. → accelerating elevator, inclined plane, pushing down on an object

12. What is the difference between the acceleration of gravity and the force of gravity?
    accl. due to grav → property of Earth (constant at surface) } F_g → property of an object, varies

13. What are the two names for "g"?
    acceleration due to gravity, gravitational field strength

14. If a scale is in an elevator, when will it read
    a) normal? not accelerating
    b) greater than normal? upward acceleration
    c) less than normal? downward acceleration

15. a) What is the cause of the frictional force?
    EM Force of attraction

    b) What is the difference between the force of friction and the coefficient of friction?
    yes: Normal force, types of surface — no: surface area, speed of motion

    c) What factors influence the force of friction? Which do not?
    μ = property of surface types F_f = property depends on normal force

    d) What factors influence the coefficient of friction? Which do not?
    just properties of surface

16. Which type of friction is stronger ~~static~~ or kinetic?

17. a) What happens when a falling body reaches its terminal velocity?
    $a \to 0$ $v \to$ constant

    b) Why does it reach a terminal velocity?
    upward force/collision w/air molecules increases with vel.

18. What are some properties of systems in equilibrium?
    $\vec{a} = 0$, balanced forces, $\Sigma \vec{F} = 0$

19. What is the rule for the equilibrium of three force vectors?
    Σ Sum of any 2 forces $\geq$ third

20. If an object is in equilibrium on an inclined plane, state a formula for:
    a) the weight of the object mg
    b) the parallel component of weight $mg\sin\theta$
    c) the perpendicular component of weight $mg\cos\theta$
    d) the normal force $mg\cos\theta$
    e) the frictional (or applied) force $mg\sin\theta$