1. Define the following terms:
    a. Force

    push or pull that 1 body exerts on another

    b. Net Force

    Sum of all forces acting on object

    c. Balanced Forces

    net force = 0

    d. Equilibrium

    net force = 0 – motion not changing

    e. Normal Force

    perpendicular force of surface → object pressing on it

    f. Free-Body Diagram

    diagram shows all forces acting on object

    g. Mass –

    amount of matter an objects has

    h. Weight

    force of gravity pulling on mass

    i. Friction

    force that resist motion

j. Static Friction

Friction between 2 objects that are not moving

k. Rolling Friction

force that resists motion of rolling objects

l. Sliding Friction

force that resists motion of 2 objects moving over each other

m. Air Friction

friction force when object disrupts air flow

n. Viscous Friction

friction of object moving through water

o. Vector Quantity

Variable has size + direction

2. In the "Friction" lab, when the energy car and sled were launched on the level track, what was true of the values for acceleration for both?

negative!

3. **Why** were the acceleration values as described in the previous question?

decelerating - slowing down

4. If an organism gains weight does it also gain mass?

YES!

5. What is the relationship between mass and weight? Use the graph from the "What is a Newton?" lab to help you answer the question.

direct (strong)

6. The weight of an object depends upon 2 factors. What are they?

- mass +
- gravity!

7. What is the formula for calculating weight?

$W = m \times g$

8. What is the SI unit of mass? kg

9. What is the SI unit of force? Newton (N)

10. What is the SI unit of weight? Newton (N)

11. What can change the speed and/or direction of an object?

FORCE

12. If an object is at rest, what's true of the net force on the object?

net force = 0

13. What's also true about the acceleration of the object in the previous question?

accel = 0

14. If an object is moving in a straight line at constant speed, what's true of the net force on the object?

net force = 0

15. What's also true about the acceleration of the object in the previous question?

accel = 0

16. What's the relationship between balanced forces and a net force of zero?

Same thing

17. Is force a vector quantity? Why or why not?

YES – has direction

18. Does mass change with location? Why or why not?

NO – amt. of matter in you doesn't change

19. Does weight change with location? Why or why not?

YES – gravity strength changes

20. Do all forces act through direct contact? If not, name a force that does not require direct contact to affect objects.

No – gravity

For each problem below, carry out these steps:

- Write the **formula** that you will use to solve the problem
- Re-write the formula, substituting known values **with units**
- Write the answer using the proper **unit**
- Check you answer for the proper number of **significant figures**
- Check you work for accuracy

1. If a cow has a mass of 300 kg, what is its weight on Earth?

$$W = mg = (300\,kg)(9.8\,N/kg) = \underline{3{,}000\ N}$$

2. If a human travels to Mars, and has a mass of 75 kg and a weight of 278 Newtons, what is the strength of gravity on Mars?

$$g = \frac{W}{m} = \frac{278\,N}{75\,kg} = 3.7\ N/kg$$

3. If the strength of gravity on Saturn is 11.2 N/kg, and a pretzel has a mass of 0.01 kg, what is the weight of the pretzel on Saturn?

$$W = mg = 0.01\,kg \times 11.2\,N/kg = \underline{0.1\ N}.$$

4. If the 1.00 cm flag of an energy car passes through a photo gate in 0.0725 seconds, what is the speed of the energy car?

$$s = d/t = \frac{1.00\,cm}{0.0725\,s} = \underline{13.8\ cm/s}$$

5. If the speed of an energy car is measured at 140 cm/s at one photo gate, and 0.60 seconds later has a speed of 110 cm/s, what is the acceleration of the energy car?

$$a = \frac{V_f - V_i}{t} = \frac{110\,cm/s - 140\,cm/s}{0.60\,s}$$

$$= \frac{-30\,cm/s}{0.60\,sec} = -50.\ \underline{cm/s/s}.$$