

## Unit 6 Forces – Review

### Concepts:

- 1) What is the difference between weight and mass?
- 2) Define the net force on an object.
- 3) Describe Newton's 3 Laws of Motion.
- 4) What two things does the force of friction depend on?
- 5) What is the general equation for the net force acting on an object?
- 6) If an object is moving at constant velocity, what is known about the net force?

### Problems:

#### A. Force of Gravity and Universal Gravitation

- 1) Calculate the force of gravity on a 25 kg mass on the surface of the earth.
- 2) A 35 kg mass is on the surface of Mars has a force of gravity of 259 N. What is its mass on Earth?
- 3) What is the force of gravity of a 80 kg astronaut on the moon if the moon has a mass of  $7.4 \times 10^{22}$  kg and a radius of  $1.74 \times 10^6$  m?
- 4) What would be the force of gravity on an object at twice the Earth's radius if its force of gravity on Earth is 345 N?

#### B. Net Force

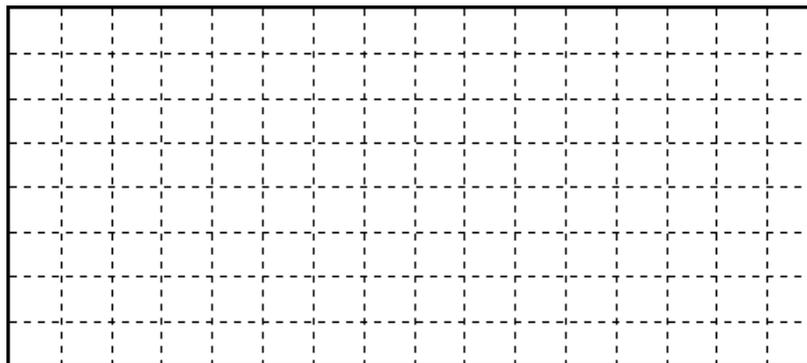
- 5) A net force of 30.0 N [South] acts on a 10.0 kg object. What is its acceleration?
- 6) A 16.0 kg object is accelerated at a rate of  $2.0 \text{ m/s}^2$  by a net force. What is the magnitude of the net force?
- 7) A 1500 kg car accelerates uniformly from 5.0 m/s to 12 m/s. During this acceleration, the car travels 94 m. What is the net force acting on the car during this acceleration?
- 8) A 60 kg runner achieves a speed of 15 m/s in 10.0s when starting from rest. What is the force applied to accelerate the runner if the force of friction was 20 N?
- 9) Find the force applied to accelerate a 10.0 kg object at  $2.5 \text{ m/s}^2$  if the force of friction is 15 N.
- 10) A 1200 kg car is pushed by three students from rest to 5.0 m/s for 30 m along a level surface. What was the net force on the car? What was the applied force? (Assume the force of friction on the car is 100 N.)
- 11) What is the acceleration of a 5.0 kg mass when pulled on a frictionless surface with 10 N [E] and 12 N [W]?

#### C. Force of Friction

- 12) A 10 kg mass is pulled along a level surface at a constant speed using a force of 25 N. What is the coefficient of friction?
- 13) A force of 7.5 N is used to pull a rubber friction block across a table at constant speed. If the coefficient of friction is 0.35 what is the mass of the block?
- 14) What shape is a graph of  $F_f$  vs.  $F_n$  and what does the slope represent?
- 15) Calculate the force of friction between sandpaper and a desk if  $\mu = 0.60$  and the sand paper has a 0.50 kg mass resting on it.

- 16) A 7.6 kg object is resting on a horizontal surface. What is the normal force acting on the object?  
 17) If the object in #16 is pulled along a horizontal surface with  $\mu = 0.20$ , what is the force of friction?  
 18) Use the data below and the graph paper to determine the coefficient of friction.

$F_f$ (N)	$F_n$ (N)
0	0
0.25	1
0.63	2
0.94	3
1.15	4



#### D. Elastic Force

- 19) A 3.0 kg mass on a spring is 50 cm from its equilibrium position. If the spring constant is 25.0 N/m, what is the elastic force acting on the mass?  
 20) What is the spring constant of a coil which has length 10 cm but stretches to 15 cm when a 3.0 kg mass is hanging on it?  
 21) Joe has mass 75 kg, he sits on a spring with  $k = 7500$  N/m, how much will the spring compress?  
 22) Calculate the extension of a spring whose spring constant is 20 N/m when a 500 g mass is hung on it.  
 23) What is the spring constant of a desk if a force of 784 N compresses it from height 1.00 m to 0.92 m?

#### Answers:

- 1) 245 N      2) 35 kg      3) 130 N      4) 86 N      5) 3.0 m/s<sup>2</sup>      6) 32 N      7) 950 N  
 8) 110 N      9) 40 N      10) 500 N, 600 N      11) 0.4 m/s<sup>2</sup> [W]      12) 0.26  
 13) 2.2 kg      14) linear, coeff. of friction      15) 2.9 N      16) 74 N      17) 15 N      18) 0.29  
 19) 12.5 N      20) 588 N/m      21) 9.8 cm      22) 0.25 m      23) 9800 N/m