

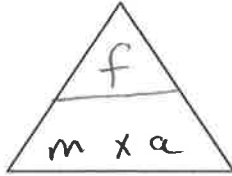
Key

Review: Final Exam
Integrated Science: Physics/Design

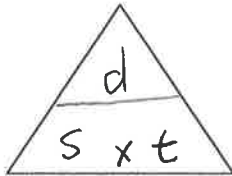
Name: _____ Per. _____

Complete the following triangles

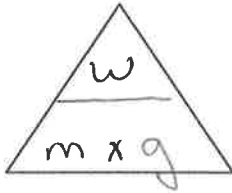
Acceleration
Force
Mass



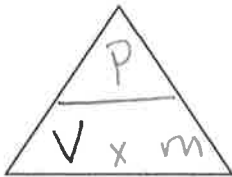
Distance
Time
Speed



Mass
Acceleration due to gravity
Weight



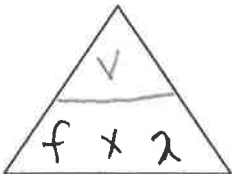
Momentum (P)
Mass
Velocity



Work
Force
Distance



Frequency
Speed
Wavelength λ



1. Define the following terms:

a. transverse wave

Matter is disturbed perpendicular to the wave direction.

b. longitudinal wave

Matter is disturbed parallel to the wave direction

c. frequency

Frequency is the number of waves passing a given point each second.

d. period

Period is the length of time it takes one complete wave to happen.

2. What type of wave is a sound wave?

Longitudinal

3. What type of wave is a microwave?

Transverse

4. What type of wave is a light wave?

Transverse

5. If the frequency of a wave is 100 Hz, what is the period?

$1/100$ s

6. If the period of a wave is 15 seconds, what is the frequency?

$1/15$ Hz

7. Consider a machine that vibrates 500 times per second. The speed of the wave is 700 m/s.

a. What is the period of the wave? $1/500$ s

b. What is the frequency of the wave? 500 Hz

c. What is the wavelength of the wave? 1.4 m

8. If a wave has a frequency of 50 Hz and a wavelength of 5 m, what is the wave's speed?

250 m/s

9. If a wave is traveling at 200 m/s and has a frequency of 40 Hz, what is the wavelength?

5 m

10. If a wave has a wavelength of 1.5 m and is moving at 45 m/s, what is the frequency?

30 Hz

11. If the frequency of a wave increases, what happens to the wavelength? (Does the frequency increase, decrease or stay the same?)

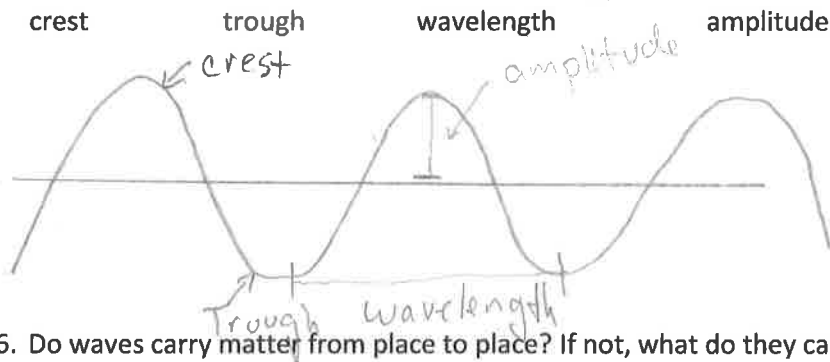
12. If the wavelength of a wave gets bigger, what happens to the frequency? (Does the frequency increase, decrease or stay the same?)

13. What characteristic of a sound wave has to do with the pitch? ("highness" or "lowness" of the sound.)

Wavelength

14. A high-pitched sound will have a short wavelength and a low-pitched sound will have a long wavelength.

15. Draw a transverse wave and label the following parts



16. Do waves carry matter from place to place? If not, what do they carry from place to place?
Energy

17. What happens to the amplitude of a sound wave as it gets louder? (Does the amplitude increase, decrease or stay the same?)

18. A water wave has a frequency of 2 hertz and a wavelength of 5 meters. Calculate its speed.

10m/s

19. A wave has a speed of 50 m/s and a frequency of 10 Hz. Calculate its wavelength.

5 m

20. A wave has a speed of 30 m/s and a wavelength of 3 meters. Calculate its frequency.

10 Hz

21. A wave has a period of 2 seconds and a wavelength of 4 meters. Calculate its frequency and speed. Note: *Recall that the frequency of a wave equals 1/period and the period of a wave equals 1/frequency.*

Frequency = $\frac{1}{2}$ and speed = 2 m/s

22. A sound wave travels at 330 m/s and has a wavelength of 2 meters. Calculate its frequency and period.

Frequency = 165 and period = $\frac{1}{165}$

23. A string vibrates at a frequency of 500 Hz. What is its period?

$\frac{1}{500}$ s

24. An oscillator makes 6 vibrations in one second. What is its period and frequency?

Period = $\frac{1}{6}$ s

Frequency = 6 Hz

25. A swing has a period of 15 seconds. What is its frequency?

$\frac{1}{15}$ Hz

26. A pendulum has a period of 1 second. What is its frequency?

1 Hz

27. You want to describe the harmonic motion of a swing. You find out it takes 3 seconds for the swing to complete one cycle. What is the swings period and frequency?

Frequency = $\frac{1}{3}$ Hz and period = 3 sec.

Chapter 4

28. An object travels 30 meters in 5 seconds. What is its speed?

6 m/s

29. How long would it take a cat to travel 200 meters if its speed was 10 m/s?

20 sec

30. What distance could a bird travel in 25 seconds if it was flying at 10 m/s?

250 m

31. A train travels 50.0 km in 3.00 hours. What is the average speed of the train? (Be sure and report your answer to the correct number of significant digits.)

16.7 km/hr

16.7 km/hr

32. What is the difference between speed and velocity?

Speed just describes how quickly something moves. Velocity describes both how quickly and in what direction something moves.

33. Can velocity change when speed stays constant? Explain.

Yes, if an object is traveling at a constant speed and it changes direction then its velocity will change.

34. Can speed change when velocity stays constant? Explain.

No

35. Define acceleration.

Acceleration is the rate in change in velocity.

36. What is the equation for determining acceleration?

$$a = \frac{V_{\text{finish}} - V_{\text{start}}}{\text{time}}$$

37. A jogger slows down from 10 m/s to 6 m/s in 10 seconds. What is her acceleration?

-0.4 m/s²

38. A boat goes from 3.3 m/s to 11 m/s. in 4.0 seconds. What is the boat's acceleration? (*Be sure your answer has the correct number of significant digits.*)

1.9m/s²

39. A skateboarder traveling at 4.0 meters per second rolls to a stop at the top of a ramp in 2.0 seconds. What is the skateboarder's acceleration?

-2.0 m/s²

40. If a racecar driver goes at a constant speed as she rounds a corner, is she accelerating? Explain.
The driver is accelerating because her direction is changing.

41. If a hockey player goes at a constant speed in a straight line, is he accelerating? Explain.
The hockey player is not accelerating because his velocity is not changing.

42. If a marathon runner puts on a burst of speed at the end of a race, is he accelerating? Explain.
The runner is accelerating because his speed is changing.

43. What is the acceleration due to gravity?

9.8 m/s²

44. A rock is in a freefall after being knocked off the edge of a cliff.

a. How fast will the rock be going in one second?

9.8 m/s

b. How fast will the rock be going in two seconds?

19.6 m/s

c. How fast will the rock be going in three seconds?

29.4 m/s

d. How fast will the rock be going in four seconds?

39.2 m/s

Chapter 5

45. Define mass.

Mass is the amount of matter an object has.

46. Define weight

Weight is the force of gravity pulling on the mass.

47. What is the SI unit for mass?

kg

48. What is the SI unit for weight?

Newton

49. What is the strength of gravity on earth?

9.8 N/kg

50. What is the value for g on earth?

9.8 N/kg

51. Is the value for g the same on Saturn as it is on earth? Explain.

The value for g is different on different planets because the force of gravity is different on different planets.

52. If you were to go to another planet, would your mass or your weight change? Explain.

Your weight would change on a different planet because the force of gravity is different on different planets. Your mass would stay the same, because the amount of matter in your body would not change.

53. A brick has a mass of 4.0 kg. How much does it weigh?

39 N

54. A rock with a mass of 58.3 kg weighs 35 N on Pluto. What is the strength of gravity there?

$g=0.60 \text{ N/kg}$

55. An engine weighs 200 newtons on the moon, where the strength of gravity is 1.6 N/kg. What is the mass of the engine?

125 kg

56. A Ferris wheel weighs 310,000 N. What is the mass of the Ferris wheel? (Be sure and have the correct number of significant digits in your answer.)

32,000 kg

57. If the same Ferris wheel were transported to Jupiter, what would its mass be? (The force of gravity is 23.1 N/kg on Jupiter.)

32,000 kg

58. Define force.

Force is a push or a pull.

59. What is the SI unit for force?

Newton

60. Define friction.

Friction is the force that opposes motion between two surfaces that are touching each other.

61. Which would be capable of generating more friction force: a 2N book or a 4N book?

4N

62. Define net force.

The net force is the combination of all the forces acting on an object.

63. What is the net force on an object at rest?

0N

64. What is the net force on an object going at a constant velocity?

0N

65. Is an object at rest in equilibrium?

Yes

66. What is the net force on an object at equilibrium?

0N

67. Is an object going at a constant velocity in equilibrium?

Yes

68. The net force on an object that is accelerating is:

- a. Zero
- b. Not zero

69. What is the net force on the roof over Sheldon High School? How do you know?

The net force is 0N. I know this because the roof is not accelerating.

70. A ladder is pushing on a wall with a force of 30 N. The wall is not moving. What is the force of friction between the ladder and the wall? Explain how you know.

30 N

71. If there is 60 N of friction slowing down a tricycle, how much force is needed to keep the tricycle moving at a constant velocity?

60 N

72. Air hockey tables have so little friction that we can neglect its effects. If a plastic puck is pushed across an air hockey table, how much force is required to keep the puck moving at a constant velocity?

0N

73. A pencil weighs 0.5 N when held at rest in front of you, what is the net force on the pencil?

0N

Chapter 6

74. Define normal force.

The normal force is the force that is created whenever an object is in contact with a surface.

75. How do you know the strength of the normal force?

The normal force has equal strength to the force pressing the object to the surface. The normal force is often the same as the weight of the object.

76. Which has more inertia, a car or a bicycle?

Car

77. Pretend that a 30 kg ball and a 20 kg ball are rolling toward you. They are both going 1.5 m/s. Which ball would take more force to stop? Explain your answer.

The 30 kg ball would take more force to stop because it has more mass and therefore more inertia.

78. If there is no friction acting on an object, how much force is needed to keep it going at a constant velocity?

0

79. What is the net force on a cart that is pushed at a constant velocity?

0

80. A cart is being pushed along the floor at a constant velocity. The normal force is 60 N. How much does the cart weigh?

60N

81. A block is dragged at a constant velocity. If the force of friction on the block is 10 N, how much force is required to keep the block moving at a constant velocity?

10 N

82. A car is driving along a road at a constant velocity. The engine produces a force of 2,500 N between the tires and the road and the normal force on the car is 11,000 N.

a. How much does the car weigh?

11,000 N

b. What is the force of friction?

2,500 N

c. The car hits a slippery patch of road and the force of friction is reduced to 2,000 N. What is the net force on the car if the engine force remains 2,500 N? Does the car still move at a constant velocity?

The net force is 500 N. The car would accelerate.

d. What is the normal force on the car if 500 N of groceries is added?

11,500 N

83. Which would be harder to turn, a 300 N block of ice or a 500 N block of ice?

500 N

84. Which would accelerate more, a 50 kg crate pushed with 20 N of force or the same crate pushed with 30 N of force? Give a reason for your answer

The crate that is pushed with 30 N of force would accelerate more. Newton's 2nd Law says that acceleration is directly proportional to force.

85. Which would accelerate more when pushed with the same force, a 60 kg cart or a 20 kg cart? Give a reason for your answer.

The 20 kg cart would accelerate more. Newton's 2nd Law says that acceleration is inversely proportional to mass.

86. Imagine two identical blocks. Block A is pushed with five times as much force as block B. How much more will block A accelerate?

5 times more

87. A force moves an object along a straight line path. If the force were doubled, what would be true of the acceleration?

The acceleration would double.

88. Imagine two grocery carts. Cart A has six times more mass than cart B. When they are pushed with the same force, how much more will cart B accelerate?

Car B will accelerate 6 times more.

89. What is the force of an object with a mass of 12 kg and an acceleration of 4 m/s^2 ?

48 N

90. Calculate the acceleration of a 25 kg object that is moved with a force of 300. N.

12 m/s^2

91. What is the mass of an object that is accelerating at 15 m/s^2 when a force of 3000 N is exerted?

200 kg

92. What is the force of a 30 kg block in a free fall?

$(30 \text{ kg})(9.8 \text{ m/s}^2) = 294 \text{ N}$

93. If a hammer hits a nail with a force of 250 N, how much force does the nail exert on the hammer?

250N

94. The action force is: a swimmer pushes the water backward. What is the reaction force?

The water pushes the swimmer forward.

95. A bat hits a ball with a force of 1500 N. How much force does the ball exert on the bat?
1,500 N

96. The action force is the tire pushes on the road. What is the reaction force?

The road pushes on the tire.

97. A big truck and a small car traveling at the same speed collide. How do the impact forces compare for the truck and the car?

The impact force is the same.

98. In the situation in question above, which vehicle would accelerate more? Explain your answer.

The small car would accelerate more because it has less mass.

99. What is the momentum of a 4 kg bat flying in a straight line at 2 m/s?

8 kg·m/s

100. A cart is traveling in a straight line at 3 m/s. Its momentum is 600. kg·m/s. What is its mass?
- 200 kg
101. A 150 kg bike is traveling in a straight line. Its momentum is 500. kg·m/s. What is its velocity? Use the correct number of significant digits in your answer.
- 3.3 m/s
102. A 150. kg bike is traveling in a straight line. Its momentum is 500. kg·m/s. What is its velocity? Use the correct number of significant digits in your answer. (This is not a repeat of the question above.)
- 3.33 m/s
103. Which would take more force to stop in 5 seconds: a 30 kg ball rolling in a straight line at a speed of 2 m/s, or a 25 kg ball rolling along the same path at a speed of 3 m/s?
- The 25 kg ball would take more force to stop because it has more momentum.

Chapter 7 – Energy and Work

104. A bicyclist moves 3 times as fast as another identical bicyclist. Compared to the slower bicyclist, the faster bicyclist has 9 times the KE.
105. A skateboarder moves 4 times as fast as another identical skateboarder. Compared to the slower skateboarder, the faster skateboarder has 16 times the KE.
106. If you push for 20 minutes on a stationary wall, how much work did you do on the wall? How do you know?
- You don't do any work on the wall. You know this because the wall did not move.
107. Which requires more work: lifting a 50 kg sack 4 m, or lifting a 100 kg sack 2 m?
- The same amount of work was done (200J)
108. What is the gravitational potential energy of a 10 kg sack of groceries on a shelf 2 m above the floor?
- 196 J

109. What is the gravitational potential energy of a 35 kg sack of rice on a shelf that is 3 m above the floor?

1029 J

110. A cheetah can run briefly with a speed of 31 m/s. Suppose a cheetah with a mass of 47 kg runs at this speed. What is the cheetah's KE?

22,583.5 J

111. What is the KE of a 4 kg rock that is falling with a velocity of 3 m/s?

18J

112. It takes 25 Newtons of force to move a large rock 6 m. How much work was done on the rock?

150 J

113. A big brick and a small brick are traveling through the air. They have the same amount of KE. Which brick is going faster? How do you know?

The small brick is going faster. You know this because if the KE is the same, the thing with less mass must have a greater velocity.

114. A bike crashes into a wall. The wall does not move. Was work done on the wall?
No

115. How much work would you do if you lifted a 300 N box up 2 meters high?

600 J

116. It takes of force of 25 Newtons to move a large rock 3 meters. How much work was done?

75J

117. A force of 5 Newtons was necessary to lift a weight. A total of 100 J of work was done. How far was the weight lifted?

20 m

118. A dog pulled a sled 6 m. It did 6J of work. How much force did the dog use?

1 N