Student name:\_\_\_\_\_\_\_\_\_\_

**MULTIPLE CHOICE - Choose the one alternative that best completes the statement or answers the question.**

1. A student of physics watching the *Star Wars* films knows that according to the laws of physics

the Rebel heroes can see the flash of an explosion in space.

the Rebel heroes can hear the sound of an explosion in space.

the Rebel heroes can communicate using their radios in space.

the Rebel heroes can see the flash of an explosion in space AND the Rebel heroes can communicate using their radios in space.

the Rebel heroes can see the flash of an explosion in space AND the Rebel heroes can hear the sound of an explosion in space.

1. In everyday language, speed and velocity are synonyms, but in physics

velocity has only magnitude.

speed has only direction.

velocity has magnitude and direction.

speed has magnitude and direction.

velocity has only direction.

1. In everyday language, power and force are similar, but in physics

force has only magnitude.

power has only direction.

force has magnitude and direction.

power has magnitude and direction.

None of these answers are correct.

1. Algebraic symbols in physics equations represent physical quantities, therefore

the symbols represent numbers only.

the symbols represent numbers and units.

the symbols consist of units only.

the symbols are only abstract.

the symbols are only imaginary.

1. The last page of a book is numbered 814 and the book is 3.00 cm thick. What is the average thickness of each page?

2.54 × 103 cm

2.54 × 10-3 cm

7.37 × 10-3 cm

3.92 × 10-3 cm

1. The diameter of a circle is doubled. By what factor is the area changed?

√2

2

4

√4

1

1. The radius of a circle is increased by 5%. The percentage increase of the circumference is

5%.

10%.

12%.

16%.

1. The radius of a circle is increased by 5%. The percentage increase of the area is about

5%.

10%.

12%.

16%.

1. The radius of a circle is tripled. By what factor is the area changed?

3

6

9

12

1. What is the percentage increase in area when ordering a 14 inch rather than a 12 inch pizza?

16%

26%

36%

46%

1. By what approximate factor is a 12 inch pizza larger in area than a 10 inch pizza?

1.2

1.1

1.4

1.6

1. If the surface area of a sphere increased by a factor of 3, by what factor did the radius of the sphere change?

1.14

1.73

2.00

2.24

1. If the surface area of a sphere is increased by 16%, by what percentage has the radius been changed?

16%

8.1%

7.7%

12%

1. The volume of a sphere is 8.00 m3. The radius of the sphere is

1.24 m.

2.00 m.

2.65 m.

3.00 m.

1. The radius of a sphere is 2.00 m. The surface area of the sphere is

36.7 m2.

50.3 m2.

72.5 m2.

75.0 m2.

1. By what factor does the volume of a cube increase if the lengths of the edges are doubled?

2

4

6

8

1. By what factor does the volume of a cube increase if the lengths of the edges are tripled?

6

9

3

27

1. The side of a cube is decreased by 6%. The percentage decrease of the volume of the cube is

6%.

9%.

12%.

17%.

1. If the length of a box is reduced by one-third and the width and height are doubled, by what factor has the volume changed?

4/3

2/3

3/4

3/2

1. The side of a cube is increased by 5%. The percentage increase of the surface area of the cube is about

5%.

10%.

12%.

16%.

18%.

1. The price of gasoline goes up 6% on Monday night and then goes down 7% the following day. What is the net percentage change in the price of gasoline from Monday morning?

1.0%

2.0%

−1.4%

−1.0%

1. 1.0 kilometer equals how many nanometers?

1.0 × 1012

1.0 × 106

1.0 × 104

1.0 × 10−3

1. 1.0 centimeter equals how many micrometers?

1.0 × 1012

1.0 × 106

1.0 × 104

1.0 × 10-3

1. 1.0 micrometer equals how many millimeters?

1.0 × 10−6

1.0 × 10−3

1.0 × 103

1.0 × 106

1. The number of significant figures in 3.24 cm is

2

3

4

5

1. The precision and number of significant figures in 1.003 km is

precision = 0.0001 km, significant figures = 4.

precision = 0.001 km, significant figures = 4.

precision = 0.0001 km, significant figures = 3.

precision = 0.001 km, significant figures = 3.

precision = 0.0001 km, significant figures = 2.

1. The precision and number of significant figures in 0.0045 mm is

precision = 0.0001 mm, significant figures = 4.

precision = 0.001 mm, significant figures = 4.

precision = 0.0001 mm, significant figures = 3.

precision = 0.001 mm, significant figures = 3.

precision = 0.0001 mm, significant figures = 2.

1. The length 4.221 cm is added to 0.01 cm. The appropriately rounded sum is

4.22 cm.

4.231 cm.

4.23 cm.

4.2 cm.

4.21 cm.

1. The length 3.76 mm is multiplied by 0.05 mm. The appropriately rounded product is

0.18 mm2.

0.2 mm2.

0.19 mm2.

0.1881 mm2.

0.29 mm2.

1. The length 3.76 mm is multiplied by 0.0232 mm. The appropriately rounded product is

0.082 mm2.

0.09 mm2.

0.087 mm2.

0.0872 mm2.

0.08723 mm2.

1. The length 3.76 mm is divided by 6 mm. The appropriately rounded ratio is

0.627.

0.63.

0.6.

0.62666.

0.6267.

1. The length 3.76 mm is divided by 0.0232 mm. The appropriately rounded ratio is

160.

162.

162.1.

162.07.

162.069.

1. A cube is 1.0 inch in length on the side (1 in = 2.54 cm). The volume of the cube is

1.64 × 101 cm3.

1.6387 × 101 cm3.

1.6 × 101 cm3.

1.639 × 101 cm3.

1. The number of seconds in exactly 30 days is

2.59 × 106.

2.592 × 106.

2.5920 × 106.

2.592000 × 106.

1. The population of the United States (in 2019) is approximately 329,000,000. Write this number in scientific notation.

3.3 × 107

329 × 106

3.29 × 107

3.29 × 108

32.9 × 107

1. Using the following unit conversions: 1.00 fluid ounce = 29.573 ml, 1.00 L = 1000 cm3, density of water = 1.00 g/cm3, the number of fluid ounces in a kg of water is

48.8 fluid ounces.

40.1 fluid ounces.

33.8 fluid ounces.

25.7 fluid ounces.

1. If the radius of the Earth is 6400.0 km and the atmosphere is 10.0 km high, then the volume of air around the Earth is

5.16 × 1018 m3.

3.605 × 1016 m3.

5.2 × 1018 m3.

5.1552 × 109 m3.

1. Approximately how many square centimeters are in 1 square foot (1 in = 2.54 cm)?

30.5 cm2

929 cm2

366 cm2

144 cm2

22.3 cm2

1. One angstrom = 10−10 m and one fermi = 10−15 m. What is the relationship between these units?

1 angstrom = 105 fermi

1 angstrom = 10−5 fermi

1 angstrom = 10−25 fermi

1 angstrom = 1025 fermi

1. Which of the SI prefixes is used to indicate 109?

kilo

mega

giga

tera

nano

1. Which of the following is not an SI base unit?

kelvin

kilogram

newton

second

meter

1. To be dimensionally consistent, distance [L], velocity [L/T], and time [T] must be related as follows.

distance = time/velocity

distance = velocity/time

distance = time/velocity2

distance = velocity × time2

distance = velocity × time

1. To be dimensionally consistent, distance [L], velocity [L/T], and acceleration [L/T2] must be related as follows.

distance = velocity2/acceleration

distance = velocity/acceleration

distance = velocity2 × acceleration

distance = velocity × acceleration2

1. To be dimensionally consistent, velocity [L/T], frequency [1/T], and wavelength [L] must be related as follows.

velocity = frequency2 × wavelength

velocity = frequency × wavelength

velocity = frequency/wavelength

velocity = frequency/wavelength2

1. To be dimensionally consistent, velocity [L/T], pressure [M/LT2], and density [M/L3] must be related as follows.

velocity = pressure/density

velocity2 = pressure/density2

velocity = pressure/density2

velocity2 = pressure/density

1. To be dimensionally consistent, velocity [L/T], force [ML/T2], mass [M], and length [L] must be related as follows.

velocity2 = force × length/mass

velocity2 = force × length/mass2

velocity = force × length2/mass

velocity = force × length/mass

1. To be dimensionally consistent, pressure [M/LT2], density [M/L3], and velocity [L/T] must be related as follows.

pressure2 = density × velocity2

pressure = density × velocity2

pressure = density × velocity

pressure = density2 × velocity

1. To be dimensionally consistent, force [ML/T2], pressure [M/LT2], and length [L] must be related as follows.

force = pressure2 × length2

force = pressure2 × length

force = pressure × length2

force = pressure × length

1. To be dimensionally consistent, distance [L], acceleration [L/T2], and time [T] must be related as follows.

distance = acceleration2 × time2

distance = acceleration × time

distance = acceleration × time2

distance = acceleration2 × time

1. To be dimensionally consistent, velocity [L/T], acceleration [L/T2] and time [T] must be related as follows.

velocity = acceleration × time

velocity = acceleration × time2

velocity = acceleration2 × time2

velocity = acceleration2 × time

1. Assume everyone in the United States consumes one soft drink in an aluminum can every two days. If there are 330 million Americans, estimate how many tons of aluminum need to be recycled each year if each can weighs 1/16 pound and one ton = 2000 pounds.

750,000 tons

1.9 million tons

1.0 million tons

3 million tons

1,600,000 tons

1. Estimate how many textbooks of 1000 pages stacked on top of each other would make a stack of books 15 feet high.

100

10

1000

1

500

1. Estimate the number of dollar bills (15.5 cm wide), placed end to end, that it would take to circle the Earth (radius = 6.40 × 103 km).

9.5 × 108

2.6 × 108

3.7 × 107

1.2 × 107

8.5 × 106

1. Find the equation *x* = *at* *+* *b* that fits the following data.  
   image001.png

*x* = 45 *t* + 20

*x* = 35 *t* + 20

*x* = 35 *t* + 15

*x* = 25 *t* + 45

1. Find the equation *x* = *at*2 + *b* that fits the following data.  
   image002.png</p>

*x* = 4*t*2 + 16

*x* = 2*t*2 − 16

*x* = 4*t*2 − 16

*x* = 2*t*2 + 16

1. Find the equation *x* *=* *at*2 + *b* that fits the following data.  
   image003.png</p>

*x* = *t*2 + 18

*x* = 4*t*2 − 2

*x* = *t*2 + 1

*x* = 2*t*2

1. Find the equation *v*2 = *ah* + *b* that fits the following data.  
   image004.png</p>

*v*2 = 4*h*

*v*2 = 2*h* + 8

*v*2 = 4*h* + 4.90

*v*2 = *h*

1. Find the equation *x* *=* *at* + *b* that fits the following data.  
   image005.png</p>

*x* = 20*t* − 80

*x* = −20*t* + 80

*x* = 40*t* + 80

*x* = −40*t* + 20

1. Find the equation *x* *=* *at*2 + *b* that fits the following data.  
   image006.png</p>

*x* = −4*t*2 + 60

*x* = 5*t*2 + 60

*x* = −2*t*2 + 60

*x* = 3*t*2 + 60

1. Find the equation *x* *=* *at*2 + *bt* that fits the following data.  
   image007.png</p>

*x* = 2*t*

*x* = *6t*2 − 3*t*

*x* = 2*t*2 + 2*t*

*x* = *t*2 + 2*t*

1. Find the equation *v*2 = *ah* + *b* that fits the following data.  
   image008.png</p>

*v*2 = 3*h* − 6

*v*2 = *h* − 2

*v*2 = 2*h* + 4

*v*2 = 2*h* − 4

1. Lake Superior has a shoreline of length 2726 miles. What would be its diameter in km if it were a perfectly circular lake? One mile is 1.609 km.

1694 km

1396 km

539 km

698 km

270 km

847 km

1. Lake Superior has a shoreline of length 2726 miles. What would be its area in km2 if it were a perfectly circular lake? One mile is 1.609 km.

1.53 × 106 km2

9.51 × 105 km2

5.91 × 105 km2

4.87 × 105 km2

6.12 × 106 km2

4.81 × 106 km2

1. The surface area of Antarctica is 13.2 million square kilometers. If 1 acre is equivalent to 4047 m2, what is the surface area of Antarctica in acres?

3.26 × 103 acres

3.26 × 106 acres

3.26 × 109 acres

8.05 × 103 acres

8.05 × 106 acres

8.05 × 109 acres

1. A liter is equivalent to 33.8 fluid ounces. How many liters of gasoline are required to fill a 21 gallon gas tank, if 1 gallon is equivalent to 128 fluid ounces?

710 liters

210 liters

80 liters

6 liters

1. A major league pitcher is recorded as having thrown a 105 mph fastball. What is the speed of the pitch in m/s? One mile is equivalent to 1609 m.

15 m/s

34 m/s

47 m/s

235 m/s

1. Acceleration has dimension [L/T2]. Use dimensional analysis to determine the ratio of accelerations for car A to car B, if, everything else being equal, car A travels a given distance in half the time required by car B.

2

4

1/2

1/4

1/√2

√2

1. Consider the ratio of the surface area of a cube to its volume. What happens to this ratio if the side length of the cube decreases by a factor of 2?

Increases by a factor of 4

Decreases by a factor of 4

Increases by a factor of 2

Decreases by a factor of 2

Remains the same

1. Consider the ratio of the surface area of a sphere to its volume. What happens to this ratio if the diameter of the sphere increases by a factor of 3?

increases by a factor of 3

decreases by a factor of 3

increases by a factor of 9

decreases by a factor of 9

stays the same

1. You can reason that the time required for a ball to fall is related to the height from which it falls and to the acceleration due to gravity. Time is measured in seconds, height in meters, and gravitational acceleration in meters per second squared. Using dimensional analysis, determine how the time to fall from height h compares to the time required to fall from height 2h.

It takes 1/2 as long.

It takes 2 times as long.

It takes 4 times as long.

It takes 1/4 as long.

<p>It takesformula3.mmltimes as long.</p>

<p>It takesformula5.mmlas long.</p>

1. What is the approximate volume of the average adult human body?

0.1 m3

0.01 m3

0.5 m3

1 m3

1. What is the approximate volume of an adult human’s head?

0.001 m3

0.005 m3

0.02 m3

1.0 m3

0.1 m3

1. Estimate the surface area of an adult human’s head.

0.01 m2

0.5 m2

1.0 m2

0.1 m2

1. Which of the following is a reasonable estimate for the total surface area of all the seats in a football stadium that seats 100,000 spectators? Consider only the horizontal portion of the seats (the part that people actually sit on).

1 × 103 m2

2 × 106 m2

5 × 102 m2

1 × 104 m2

2 × 105 m2

1. A graph of *x* vs. *t* is linear, and it intercepts the vertical axis at −15 m and the horizontal axis at 5 s. What is the value of *x* corresponding to *t* = 3 s?

6 m

−6 m

9 m

−9 m

26 m

−26 m

1. A graph of *x* vs. *t*2 is linear, and intercepts the vertical axis at 12 m and the horizontal axis at 4 s2. What is the function?

*x* = 12 m + (6 m/s2)*t*2

*x* = 12 m − (6 m/s2)*t*2

*x* = 12 m − (3 m/s2)*t*2

*x* = 12 m + (3 m/s2)*t*2