Name: _____ Class: _____ Date: _____ ID: A

Motion Review Quiz

Short Answer

1. Estimate the number of seconds in a year.
2. Estimate the volume of water in a round reservoir approximately 1 km in diameter, if the average depth of the water is 15 m.
3. Approximately how many ping-pong balls with a radius of 1.8 cm could you put in a classroom whose dimensions are 18 m × 11 m × 4 m?
4. A student measures the acceleration due to gravity and finds it to be 9.72 m/s^2. What is his percent error, if the accepted value is 9.81 m/s^2?
5. A twelve-slit strobe "stops" the rotation of an electric drill when the strobe rotates 24 times in 10.0 s. If this is the highest "stopping" frequency, what is the rate of rotation of the drill, in revolutions per minute?
6. A ten-slit stroboscope was rotated at a constant rate for 20.0 s. It was used to determine that the period of a spinning motor shaft was 0.025 s. How many rotations did the stroboscope make during the 20 s interval?
7. In the following table of results, determine the relationship between F and r, using graphical techniques.

r	1	1.2	1.8	2.4	3.0
F	10	6.9	3.1	1.7	1.1

8. A slider that starts from rest and slides down an inclined air track covers the distances d in the times t. Using graphical methods, determine the relationship between d and t.

t	0	0.8	1.0	1.2	1.4
d	0	12.8	20.0	28.8	39.2

9. An experiment is performed to find the relationship between two physical quantities, B and A. The following data is obtained.

A	100	64	49	36	25	16
B	1.99	1.59	1.39	1.19	1.00	0.80

Determine the relationship between B and A.

10. The force of air resistance (F) on a moving body is related to the speed of the body (v) by the proportion $F \propto v^2$. If the speed triples, how many times greater is the force?
11. A cylindrical water tank holds 1.0 × 10^5 L of water. How much would it hold if all of its dimensions were doubled? The volume of a cylinder is given by $V = \pi^2 h$.
12. Write each of the following numbers in scientific notation.
    (a) 27 600
    (b) 0.000 45
    (c) 538 000
    (d) 0.39 × 10^{-5}
    (e) 84 × 10^{-3}
    (f) 297 × 10^3
    (g) 0.043 × 10^{-6}
    (h) 0.689 × 10^{24}
    (i) 860.3 × 10^{-19}
    (j) 0.000 000 079 36

13. Express each of the following in scientific notation in the basic SI unit.
    (a) 5.00×10^6 mm
    (b) 6.000 km
    (c) 25 nm
    (d) 55.00 min
    (e) 55 MW
    (f) 2.61 kPa
    (g) 102 MHz
    (h) 159 GHz

14. The wavelengths of red light is 6.5×10^{-7} m. How many wavelengths will fit along a line 1.0 cm long?

15. There are approximately 1.0×10^{11} stars in our galaxy. If the average mass of a star and its planets is 2.0×10^{30} kg, what is the approximate mass of our galaxy?

16. A thin film of rolled gold is used in Rutherford's scattering experiment. If the average thickness of the film is 1.0×10^{-6} m and the diameter of a gold atom is 2.5×10^{-10} m, approximately how many gold atoms make up the thickness of the gold foil? Assume that the gold atoms are lined up in a straight line.

17. Electric current flows through a conductor at a rate of 2.50 C/s. If a coulomb is composed of 6.24×10^{18} electrons, how many electrons will flow through the conductor in 10.0 min?

18. The total number of protons in the known universe is estimated to be about 10^{81}, and the radius of a proton is about 10^{-15} m. What is the order of magnitude of the radius of the sphere that would contain all of these protons if they were tightly packed together? Give your answer in metres.

19. Given $F_c = \dfrac{mv^2}{R}$
    What is the effect on F_c of each of the following?
    (a) increasing m by a factor of 3
    (b) decreasing v to $\dfrac{1}{3}$ of its former value
    (c) decreasing R to $\dfrac{1}{4}$ of its former value
    (d) all of the above

20. Given the relationship $E \propto mv^2$:
    (a) If E is 98 units when m is 4.0 units and v is 7.0 units, express the proportion as an equation.
    (b) What is the value of E when m is 10 units and v is 42 units?

21. Two neighbours have swimming pools with identical shapes. One pool holds 2.0×10^4 L of water. How many litres will the second pool hold if all its dimensions are 1.6 times as large?

22. If $a \propto b^3$ and $a = 4.0$ when $b = 3.5$, what is a when $b = 7.0$?

23. If light travels 3.00×10^8 m/s, estimate the number of kilometres to Proxima Centauri, the nearest star to our solar system, if it is located 4.3 light-years from the sun.

Problem

24. Find the order of magnitude of the number of basketballs required to fill a sphere of radius 6.4×10^3 km (the approximate radius of Earth). *Diameter of basketball 25 cm for ease.*

25. A spherical tank 30 m in diameter is full of water. Estimate the mass of the water (density of water = 1000 kg/m^3).