Name: McElwee

Period: KEY

Define the following terms:

1. "Force" – is a push or a pull

2. Pound – the English unit for Force (lb)

3. Newton – the SI unit for force (N)

4. Balanced force- no net force acting on the object (net force = zero)

5. Unbalanced force – a net force is acting on the object (net force > zero).

6. Net force – the sum of forces acting on the object

7. Equilibrium – the object is said to be in equilibrium when there are no net forces acting on the object.

8. Scalar value – physical quantities described by only a magnitude.

9. Vector – physical quantity described by both a magnitude and direction. For example, 30N east

10. Magnitude – strength of the force

11. Mass – is the measure of an object's inertia or the amount of matter it contains.

    The SI unit for mass is the kilogram (kg).

    The English unit for mass is the slug.

12. Weight – is the measure of the force of the Earth's gravitational pull on the mass of the object.

13. Gravity – the force that attracts a body toward the center of the earth, or toward any other physical body having mass.

14. Linear vs. Rotational

    Linear Forces are added together if in the same direction. Linear forces are subtracted if in opposite directions.

    Rotational forces cause torque and can be added if in the same direction (clockwise or counterclockwise). Torques are subtracted if in opposite directions.

14. Torque – is a quantity that cause rotation in mechanical systems

    Torque = Force x lever arm

    SI unit of Torque- N●m

    English unit of Torque - lb●ft

15. Axis of rotation – line about which an object rotates

16. Lever arm – the shortest distance from the axis of rotation to the line of action of the applied force.

17. 1 kilogram = _____9.8_____ newtons

18. hydraulic – uses a liquid as a working fluid.

19. pneumatic – uses gas as a working fluid.

20. density – amount of matter per unit volume

$$Density = \frac{mass}{volume}$$

$$\rho = \frac{m}{V}$$

The SI unit for density is kg/m³

The English unit for density is slug/ft³

Table 1.4 Densities of Several Solids and Liquids

	g/cm³	kg/m³
Solids		
Gold	19.3	19,300
Lead	11.3	11,300
Silver	10.5	10,500
Copper	8.9	8,900
Steel	7.8	7,800
Aluminum	2.7	2,700
Ice	0.9	900
Oak Wood	0.8	800
Balsa Wood	0.3	300
Liquids		
Mercury	13.6	13,000
Water	1.0	1,000
Oil	0.9	900
Alcohol	0.8	800

21. volume - the amount of space that a substance or object occupies, or that is enclosed within a container

22. specific gravity – the ratio of the density of a substance to the density of water. Specific gravity has no units.

23. buoyant force – the upward force exerted on a submerged object caused by the pressure difference between the top and bottom of the object.

Equals the weight of the fluid displaced by the object.

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24. pressure – the force divided by the area on which it acts.

$$\text{Pressure} = \frac{\text{force}}{\text{area}}$$

$$P = \frac{F}{A}$$

The SI unit of Pressure is N/m^2 or Pa (Pascal)

The English unit of Pressure is lb/ft^2

25. atmospheric pressure – is caused by the weight of air above an object.

$$\frac{1 \times 10^5 \, N}{1 \, m^2} = 10^5 \, Pa, \text{ or } 100 \, kPa \text{ at sea level.}$$

26. gage pressure – is the amount of pressure above atmospheric pressure

27. psi – pounds per square inch. A common unit for pressure

28. absolute pressure – is the total pressure measured above zero pressure

Absolute pressure = gage pressure + atmospheric pressure

29. barometer – an instrument used for measuring atmospheric pressure

Questions:

1. What force is exerted on a mass of 200 grams suspended from a spring?

$$\frac{200\,g}{}\left|\frac{1\,kg}{1000\,g}\right|\frac{9.8\,N}{1\,kg} = \frac{1960N}{1000} = \underline{1.96\,N}$$

2. A large torque wrench has a lever arm of 10 inches. A force of 15 lbs. is applied to the end of the wrench to tighten the bolt. What is the torque applied in lb-ft.?

$F = 15\,lbs$

$L = 10\,in$

$\tau = ?\ \ lb\text{-}ft$

$\tau = F \times L$

$= 15\,lbs \times \frac{10\,in}{}\left|\frac{1\,ft}{12\,in}\right| = \frac{150\,lbs \cdot ft}{12}$

$=$

$= \underline{\underline{12.5\ lb\cdot ft}}$

3. Find density of a 64 cm³ container with a mass of 216 grams.

$\rho = \frac{m}{V}$ $m = 216\,g$ $V = 64\,cm^3$

$= \frac{216g}{64\,cm^3} = \underline{\underline{3.375\ g/cm^3}}$

4. Find the magnitude and direction of the resultant vector for the following two forces: 15 N north and 20 N east.
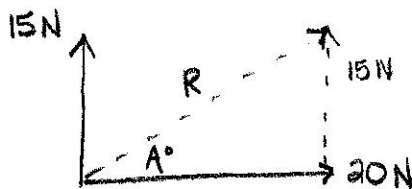
$R^2 = (15N)^2 + (20N)^2$

$R^2 = 225\,N^2 + 400\,N^2$

$R^2 = 625\,N^2$

$R = \sqrt{625\,N^2}$

$\underline{R = 25\,N}$

$TAN\ A^\circ = \frac{15\,N}{20\,N}$

$TAN\ A^\circ = \frac{3}{4}$

$A^\circ = Tan^{-1}\left(\frac{3}{4}\right)$

$A^\circ = 36.87^\circ$

above horizontal

Review the following Examples from the textbook.

| 1.4 | 1.5 | 1.6 | 1.7 |

| 1.8 | 1.9 | 1.10 |

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