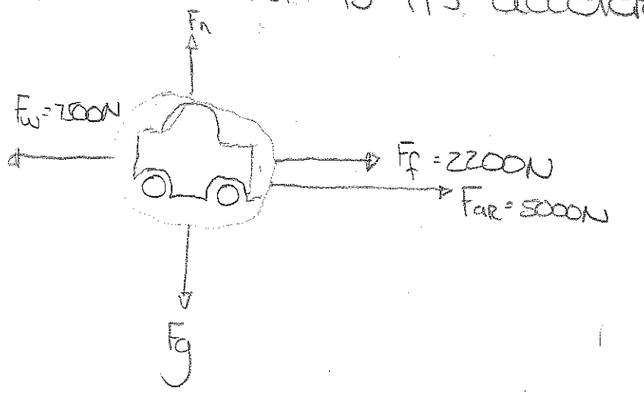
Physics 11 Unit 4
Forces: Newton's Laws
Review Worksheet pt 2

9. 1200 kg car [@ 50 km/h] has air resistance = 5000N, road friction = 2200N and wheel push = 7500N, what is it's acceleration



$F = ma$

$m = 1200\ kg$

$F_{AR} = -5000N$

$F_f = -2200N$

$F_p = 7500N$

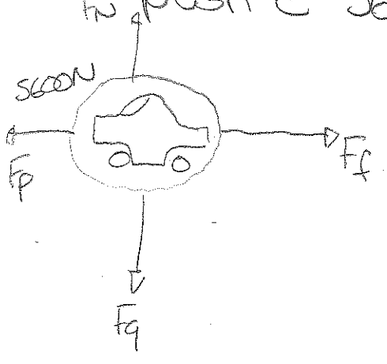
$F_{net} = 300N$

$300N = 1200kg \cdot a$

$\div 1200kg \quad \div 1200kg$

$0.25\ m/s^2 = a$

10. 1100 kg car accelerates @ $3.40\ m/s^2$ & wheels push @ 5600N, what is & force of friction?



$m = 1100kg \quad a = 3.40\ m/s^2$

$F_p = 5600N \quad F_f = ?$

$F_{net} = ma$

$F_{net} = 1100kg \cdot 3.40\ m/s^2$

$= 3740N$

$5600N + F_f = 3700N$

$F_f = -1900N$

11. What is V_f of an 150kg bike + 50kg rider, accelerated from rest for 11s, by an unbalanced $F_p = 800N$ [South]

$m = 150kg + 50kg = 200kg$

$\Delta t = 11s$

$F_{net} = 800N$ [South]

$\vec{F}_{net} = m\vec{a}$

$V_f = V_i + at$

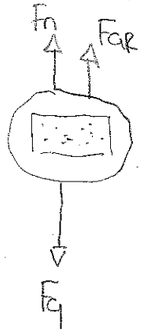
$800N = 200kg \cdot a$

$\div 200kg \quad \div 200kg$

$4 m/s^2 = a \longrightarrow V_f = 0 + (4 m/s^2)(11s)$

$V_f = 44 m/s$ South

12. A 2.0kg sponge is dropped from rest. How fast (V_f) will it be going after 6.0s if 5.0N of air resistance acts on it?



$m = 2.0kg$
$t = 6.0s$
$F_{AR} = 5.0N$ } 2SF

$F_g = (2.0kg)(9.8 m/s^2)$
$= 19.6N$

$F_n = 19.6N - 5.0N$
$= 14.6N$

*SF = 2

$\vec{F}_{net} = m\vec{a}$

$V_f = V_i + at$

$14.6N = (2.0kg)(a)$
$\div 2.0kg \quad \div 2.0kg$
$7.3 m/s^2 = a$

$V_f = 0 + (7.3 m/s^2)(6.0s)$
$= 43.8 m/s^2 = 44 m/s^2$

13. inside a resting elevator your weight is 600N; when the elevator goes up your weight = 610N; what is the upward acceleration of the elevator?

$F_g = 600N \quad g = 9.8 m/s^2$
$m = ? (61.22kg)$

$F_g = mg$
$600N = (m)(9.8 m/s^2)$
$\div 9.8 m/s^2 \quad \div 9.8 m/s^2$
$61.22kg$

$F_{net} = 610 - 600N$
$= 10N$

$\vec{F} = m\vec{a}$

$10N = (61.22kg)(a)$
$\div 61.22kg \quad \div 61.22kg$
$0.1633 m/s^2 \rightarrow 0.16 m/s^2$

14. A cable with a 1650kg load has a tension of $2.20 \times 10^4 N$ before breaking. What is the max upward acceleration it can give w/o breaking?

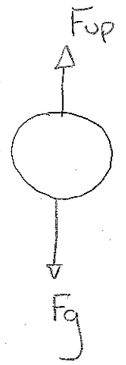
22000.

$m = 1650kg$
$F_{net} = 2.2 \times 10^4 N$

$F_g + F_{up} = F_{net}$

$F_g = mg$

$\vec{F}_{net} = m\vec{a}$



$F_g = (1650kg)(9.8 m/s^2)$
$= -16,170N$

$F_{net} = 22,000 - 16,170N$
$= 5830$

$5830N = (1650kg)(a)$
$\div 1650 \quad \div 1650$
$= 3.53 m/s^2$

7. 1.0 kg mass stretches a line by 10 cm what is ∴ spring constant (k)?

$F_s = F_n = mg$

$\vec{F} = k\vec{x}$

$m = 1.0\,kg$

$x = 10\,cm \times \frac{1\,m}{100\,cm} = 0.10\,m$

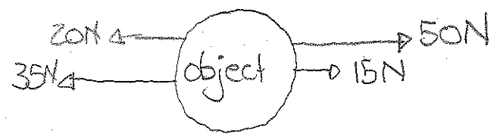
SF = 2

$(1.0\,kg)(9.8\,m/s) = (k)(0.1\,m)$

$\frac{9.8\,N}{\div 0.1\,m} = \frac{(k)(0.1\,m)}{\div 0.1\,m}$

$98\,N/m = k$

8.



difference ∴ 10N West

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Physics 11 Unit 4

Forces & Newton's Laws

Review Worksheet pt 1

1. weight ∴ 454 g object

$F_g = gm$

$g = 9.8\,m/s^2$ [gravitational acceleration]

$m = 454\,g \times \frac{1\,kg}{1000\,g} = 0.454\,kg$

$F_g = ?$ [weight]

$= \underbrace{9.8\,m/s^2}_{\text{constant}} \times \underbrace{0.454}_{\#3SF}\,kg = 4.4492\,kg \cdot m/s^2$

$= 4.45\,kg \cdot m/s^2 = \boxed{4.45\,N}$

*S.F.

2. F_g [gravitational pull/weight] = 1688 N on a 453 kg object on mars. What is g [gravitational field/acceleration]

$F_g = gm$

$F_g = 1688\,N$

$m = 453\,kg$

$g = ?$

$\frac{1688\,N}{\div 453} = \frac{453\,kg \cdot g}{\div 453}$

$3.7262 = 1g$

*SF = $\boxed{3.73\,m/s^2 = g}$

3. 62 N salmon has a mass of what, on earth?

$F_g = gm$

$F_g = 62\ N$

$g = 9.8\ m/s^2$

$62\ N = 9.8\ m/s^2 \cdot m$

$\div 9.8 \quad \div 9.8$

* $6.3265g = m$

SF → $\boxed{6.3g = m}$

4. 200kg sled pulled @ *constant speed by a force of 30N. a) What is μ? b) add 2x 60kg ♀♀, how much force is needed to pull ↑ sled?

*constant speed = no acceleration = balanced forces

$F_{pull} = F_f$

* not moving up or down ∴ $F_n = F_g = mg$

$\boxed{F_{ff} = \mu \cdot F_n}$

$F_f = 30\ N$

$F_n = 20.0\ kg \cdot 9.8\ m/s^2$ (3 S.F.)

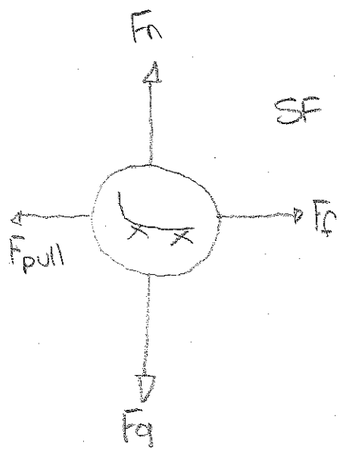
$= 196\ N$

$30\ N = \mu \cdot 196\ N$

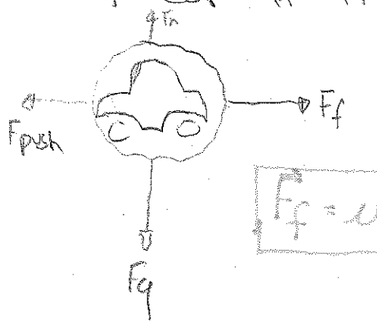
$\div 196 \quad \div 196$

SF * $0.1530 = \mu$

$\boxed{1.53 \times 10^{-1} = \mu \text{ or } 0.153}$



5. $\mu = 0.45$ between car/road, what's ↑ mass of ↑ car if it takes 5400 N to push it?



$F_n = F_g = mg$ (2 FS)

$F_f = 5400\ N$

$\boxed{F_f = \mu \cdot F_n}$

$\mu = 0.45$ m = ?

$g = 9.8\ m/s^2$

$5400\ N = (0.45)(?)(9.8\ m/s^2)$

$5400\ N = (4.41)(m)$

$\div 4.41\ m/s^2 \quad \div 4.41$

SF * $1224.48 = m$

$\boxed{1.2 \times 10^3\ kg}$

6.

2.0 kg mass suspended from a spring whose $k = 400\ N/m$; how far in cm will ↑ spring stretch?

$\boxed{\vec{F} = k\vec{x}}$

$F_s = F_g = mg$

$m = 2.0\ kg$ *2SF

$k = 400\ N/m$

$(2.0\ kg)(9.8\ m/s^2) = (400\ N/m)(x)$

$19.6\ N = 400\ N/m \cdot x$

$\div 400\ N/m \quad \div 400$

$0.049\ m = x$

$0.049\ m \times \frac{100\ cm}{1\ m}$

*2SF $\boxed{x = 4.9\ cm}$