STE
Pretest 2.3

Formulae:	$g = 9.8$ N/kg;	$F = mg$;	$W = \Delta E$;	$W = F*d$	$E_p = mgh$

1. In the following table, g_p/g_e, the ratio of a planet's gravitational acceleration to that of the earth, has been calculated for 8 planets and the earth's moon. Earth's gravitational acceleration is 9.8 m/s^2.

planet	**relative mass(earth =1)**	**relative size**	**g_p/g_e**
Mercury	0.0553	0.383	0.377
Venus	0.815	0.95	0.903
Earth	1	1	1
Mars	0.107	0.532	0.378
Jupiter	317.83	11.9	2.24
Saturn	95.159	9.4	1.08
Uranus	15.536	4.04	0.952
Neptune	17.147	3.88	1.14
Earth's moon	0.0123	0.27	0.169

Consider an 8.0 kg bowling ball.

a) Calculate the ratio of the ball's mass on Venus to its mass on Neptune. (2 marks)

1:1 mass is constant everywhere in the universe

b) Find the weight of the ball on Uranus. (2 marks)

From table : $g_u/g_e = 0.952$

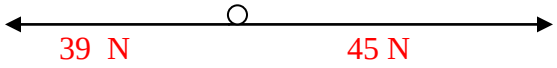
$g_u = 0.952 g_e$

$F = m\, g_u$

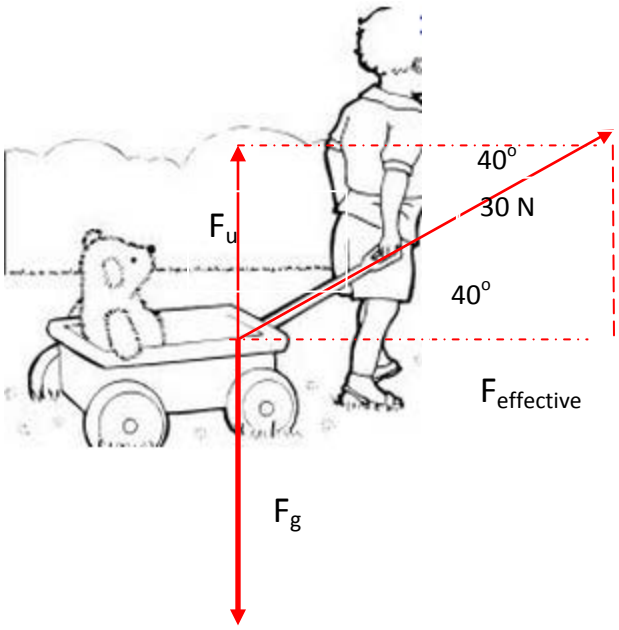
$= 8.0 \text{ kg}(0.952 g_e) = 8.0 \text{ kg}(0.952)*(9.8 \text{ N/kg})) = 74.6 \text{ N}$

2. Find the net force acting on a box if it's being pulled on by a boy with a 39 N force and in the opposite direction by a girl exerting 45 N. Draw a diagram. (2 marks)

45 N – 39 N = 6 N in the direction of the girl



3. A 20 kg wagon is pulled at an angle of 40^o with a 30 N force.
   a) Show mathematically that there is not enough force to lift the wagon. (2 marks)



$F_u/30\ N = \sin 40$
$F_u = 30\ N \sin 40 = 30\ N * (0.642787609686539326322643409907 26) = 19.3\ N$

$F_g = mg = 20\ kg * 9.8\ N/kg = 196\ N$

196 N >19.3 N, so the wagon is not lifted.

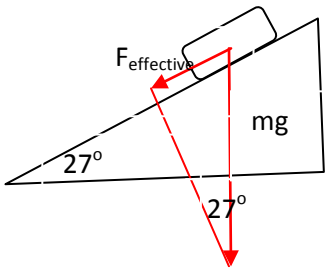
b) Find the acceleration of the wagon. (3 marks)

$F_{effective}/30\ N = \cos 40$

$F_{effective} = 30\ N * \cos 40 = 22.98\ N$

$F_{effective} = ma$
$22.98\ N = 20\ kg * a$
$a = 22.98\ N/20\ kg = 1.1\ m/s^2$

4. a) How much work is done to push a 22 kg mass up a 27^o inclined plane for a distance of 3.0 m?



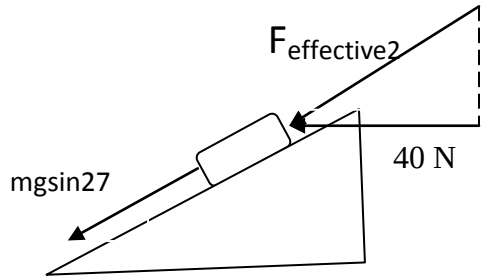
(3 marks)

$F_{effective}/\ mg = \sin 27$

$F_{effective} = mg * \sin 27 = 22\ kg * 9.8\ N/kg \sin 27 = 97.88\ N$

$W = F*d = 97.88\ N * 3.0m = 294\ J$

b) If an additional pushing force of 40.0 N was applied as shown, how fast would the mass accelerate?



40 N/ $F_{efective2}$ = cos27

$F_{efective2}$ = 40 N /cos27 = 44..89 N

Feffective total = mgsin27 + $F_{efective2}$

= 22 kg*9.8N/kg*sin27 + 44.89 N

= 97.88 N + 44.89 N = 142.77.. N

$F_{effective}$ = ma

143 N = 22 kg*a

= 142.77../22 = 6.5 m/s^2

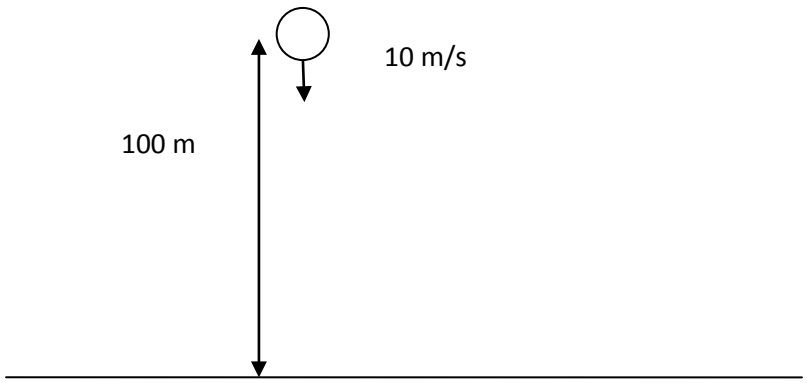
5. Calculate the gravitational potential energy of a 30.0 kg mass placed 100.0 m above the surface of Mars where g = 3.7 N/kg. (3 marks)

P.E = mgh = 30.0 kg(3.7 N/kg) (100.0 m) = 11 100 J

6. A 1.0 kg ball at a height of 100 m is whipped downward with an initial velocity of 3.0 m/s. Calculate the initial kinetic energy of the ball. (2 marks)

$K.E = 0.5\ mv^2 = 0.5\ (1.0\ kg)(\ 3.0\ m/s)^2 = 4.5\ J$

7. A second ball of unknown mass at a height of 100.0 m is whipped downward with an initial velocity of 10.0 m/s. Calculate the speed of the ball as it hits the ground. Do **not** use a mass of 2.00 kg. Simply represent its mass as ***m***. (4 marks)



E_{total} at the top		E_{total} at thebottom	
$KE= 0.5\ mv^2$	PE= mgh	KE	PE
$0.5m(10)^2$	mg(100)	$0.5mv^2$	0

$0.5m(10)^2$ +	mg(100) =	$0.5mv^2$

Divide through by m:

$0.5(100) + 100g = 0.5v^2$

$50 + 980 = 0.5v^2$

$V = \sqrt{2060} = 45\ m/s$

8. You drop two equally-sized balls out of a window. The first ball is made of solid metal. The second one is similar but a bit hallow inside. Which ball will hit the ground first? Why? (2 marks)

Neither. The fall with the same gravitational acceleration.

Flashback:

1. What is the least electronegative halogen?

At

2. If the toxic dose of drug X is 0.40 mg/kg, and a patient swallowed 37.5 mg, just enough to get sick, what is the mass of the patient? Physics-speaking, what is the weight of the patient?

Mass of patient = $\frac{37.5\ \text{mg}}{0.4\ \text{mg/kg}} = 93.75\ \text{kg}$

Weight = mg = 93.75 kg(9.8N/kg) = 920 N

3. Why doesn't sodium form a covalent bond with oxygen?

Each sodium(a metal) has a loose electron. An oxygen atom, an electronegative non-metal with room for two more electrons in its last shell , will pull an electron form two sodium atoms to form O^{-2} and a pair of Na^{+}.

4. If a 3.0 mole/L solution was diluted to 1.0 mole/L, how much water was added if ended up with a final volume of 300.0 ml?

$C_1V_1 = C_2V_2$

$3.0(V_1) = 1.0(0.300)$

$V_1 = 0.100$ L

So if the original volume was 0.100 L and we ended up with 0.300 L we added 0.300 – 0.100 l = 0.200 L, final answer, Mr. Alex Trebek 

5. Can you scramble the letters to get a common chemistry word?

a)	try me sich	chemistry
b)	no ici	ionic
c)	I modus	sodium