Physics 11: Unit 2 Test Dynamics 2019 Ver D1 Name: Key

Multiple Choice Answers Mark

Written Question

Remember to first write down the equations before replacing with numbers, show all your work!!

1) A 400 kg Spaceship is orbiting Mars 2.45×10^7 m above its surface. What is the Mars's gravitational field strength at this height? $M_{Mars} = 6.39 \times 10^{23} kg$ *and* $r_{Mars} = 3.39 \times 10^6 m$

$r = 3.39\times10^6 + 2.45\times10^7 = 2.789\times10^7$ m ①

$g = \frac{GM}{r^2} = \frac{6.67\times10^{-11}(6.39\times10^{23})}{(2.789\times10^7)^2} = 0.0548\ m/s^2$ ②

g) 0.0548 m/s² /3

3) State Newton's 3rd Law of Motion

For every action force there is an equal but opposite reaction Force. /2

4) Santa weights 287.2 N on Mercury

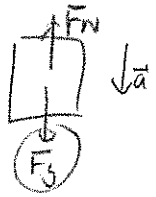
a) What is his mass on Mercury?
b) What is his mass on Earth?
c) How much would Santa weight if he is on earth?
d) Santa is riding in an elevator. Determine his apparent weight when he starts to move downward with an acceleration of 1.23 m/s^2. (drawing a FBD will help)

Acceleration Due to Gravity, "g" $[m/s^2]$	
Mercury	3.59
Venus	8.87
Earth	9.81
Mars	3.77
Jupiter	25.95
Saturn	11.08
Uranus	10.67
Neptune	14.07

a, $F_g = mg$ $\quad 287.2N = m(3.59)$ ② $\quad m = 80\ kg.$

b, $F_g = mg = 80(9.8) = 784\ N$ ②

d,



$F_{net} = F_g - F_N$ ③

$ma = 784 - F_N$

$80(1.23) = 784 - F_N$

$98.4 = 784 - F_N$

$F_N = 685.6\ N$

[2] mass) 80 kg

① mass) 80 kg

[2] weight) 784 N

[3] Apparent Weight) 685.6 N /8

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2019 D1 Key

5) Two elves and are pushing a 250 kg Santa's sleigh to the next house. Elf A can push with a force of 1225 N and Elf B with a force of 850 N. Assuming no friction force, find the acceleration of the sleigh:
a. if they are physics elves who know that they should both push from the back [to Right].
b. they are biology elves who decide that Elf A should push on the back [Right] while Elf B pushes on the front [Left].

a) $F_{net} = F_A + F_B$ (1225, 850) $\quad ma = 2075$ (250) $\quad a = 8.3\ m/s^2$ [R]

b) $F_{net} = F_A - F_B$ $\quad ma = 375\ N$ (250) $\quad a = 1.5\ m/s^2$ [R]

a) 8.3 m/s² [R]
b) 1.5 m/s² [R]

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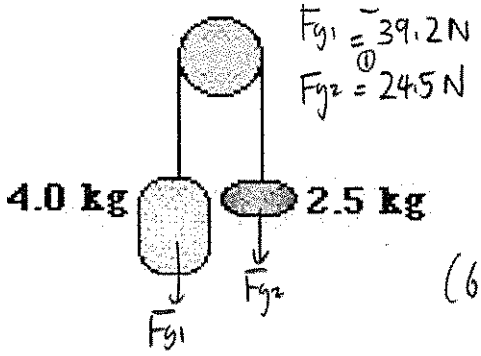
6) In the diagram below two masses is attached by a string over a pulley. Find the acceleration of the system



$F_{g1} = 39.2\ N$ ①
$F_{g2} = 24.5\ N$ ①

$F_{net} = F_{g1} - F_{g2}$ ①

$F_{net} = 39.2 - 24.5$

$Ma = 14.7$ ①

$(6.5\ kg)\ a = 14.7$

$a = 2.26\ m/s^2$ ①

[4] Accel) 2.26 m/s²
① Direction) Down for 4kg

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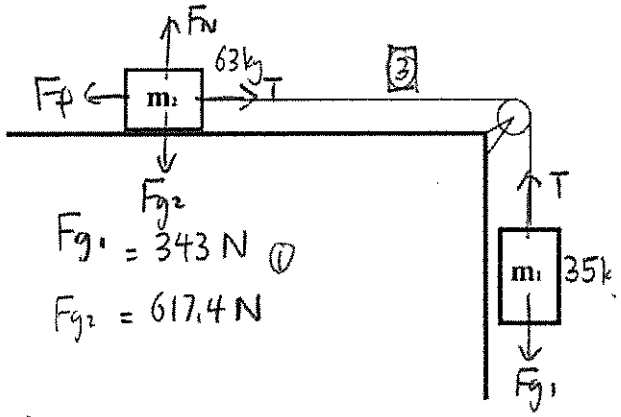
6) Two masses are attached by a string over a pulley as shown. If $m_1 = 35\ kg$ and $m_2 = 63\ kg$ (on table):

a. Drawing the FBD of both boxes on the diagrams
b. Calculate the acceleration of the system if the table has a coefficient of friction $\mu = 0.2$
c. Find the **tension** in the string



$F_N = F_{g2} = 617.4\ N$ ①

$F_f = \mu F_N = 0.2(617.4) = 123.5\ N$ ①

$F_{g1} = 343\ N$ ①

$F_{g2} = 617.4\ N$

$F_{net_{sys}} = F_{g1} - F_f = 343 - 123.5 = 219.52\ N$ ①

b) $Ma = 219.52\ N$ ① $\quad (98\ kg)\ a = 219.5$ $\quad a = 2.24\ m/s^2$ ①

c) 

$F_{net} = F_{g1} - T$ ①

$ma = 343 - T$

$78.4 = 343 - T$

$T = 264.6\ N$ ①

[6] accel) 2.24 m/s²
[1] direction) Right m2 / Down m1
[2] Tension) 264.6 N

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