Regents Unit Review Packet



Practice Questions Linear Motion

① 1

$v_f = v_i + at$

$11.2\ m/s = 9.6\ m/s + a(4\ s)$

$a = 0.4\ m/s^2$

② 2

$v_f^2 = v_i^2 + 2ad$

$v_f^2 = (0)^2 + 2(9.81\ m/s^2)(12\ m)$

$v_f^2 = 235.44$

$v_f = 15\ m/s$

③ 1

Graph with an acceleration

Choice 2 is negative constant velocity

Choice 3 is nothing we learned

Choice 4 is positive constant velocity

④ 4.

Acceleration is uniform in a free fall ($-9.81\ m/s^2$)

⑤ 1.

$d = v_i t + \frac{1}{2}at^2$

$6\ m = 0 + \frac{1}{2}a(2.75)^2$

$a = 1.6\ m/s^2$

⑥ 2.

Split up your x and y directions for your vectors. Don't forget positive and negative

| x-direction | y-direction |
| --- | --- |
| +4 m | + 5 m |
| | − 2 m |
| Sum x +4 m | Sum y = 3 m |

$\text{resultant} = \sqrt{(4)^2 + (3)^2}$

resultant = 5 m

⑦ 3

$v_f^2 = v_i^2 + 2ad$

$v_f^2 = 0 + 2(4.9)(200)$

$v_f = 44.3\ m/s$

⑧ 3.

$\frac{\Delta v}{\Delta t} = \frac{4.5\ m/s}{3\ s} = 1.5\ m/s^2$

⑨ 2.

$v_f = v_i + at$

$v_f = (-0.5) + (-9.81)(.7)$

$v_f = -7.4\ m/s$

note: $v_i$ is negative because it is being thrown down in the same direction as the acceleration

⑩ 2.

$v_f^2 = v_i^2 + 2ad$

$v_f^2 = 0 + 2(4.9)(200)$

$v_f = 44.3\ m/s$

⑪ 2

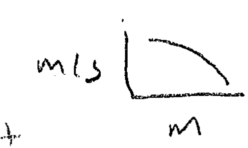
Choice one and three are too big. Choice four is too small

⑫ 3

10 m is about 10 m or 30 feet, 10 ft per story

⑬

a. Plot




b. best fit

c. $v_f^2 = v_i^2 + 2ad$

$v_f^2 = 0 + 2(-9.81)(12.5)$

$v_f = 15.66\ m/s$

(14) a. 4.4cm ± 0.2cm

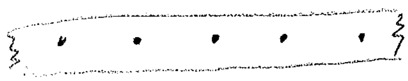
b. $d = v_i t + \frac{1}{2}at^2$

$4.4\text{cm} = \frac{1}{2}a(0.3s)^2$

$a = 97.78 \text{ cm/s}$

c. $v_f = \frac{4.4\text{cm}}{0.3s} = 14.67 \text{ cm/s}$

d. evenly spaced dots



(15) $v_f^2 = v_i^2 + 2ad$

$(0\text{m/s})^2 = (70\text{m/s})^2 + 2(-2)d$

$d = 1225\text{m}$

*acceleration is negative because we are slowing down

(16) Acceleration should point South about 4cm

Practice Questions - Forces

(1) 3. Mass never changes

(2) 1 $F = ma$ units $(\text{kg})\left(\frac{m}{s^2}\right)$

(3) 1 Going from 0° 

6+8=14N

to 180° 

8−6=2N

(4) 4 Object with the Greatest mass!

(5) 1. $F_f = \mu F_N$

$F_f = (.67)(60N)$

$F_f = 40N$

.67 comes from Ref tables

(6) 1 Same as question #3 in first section

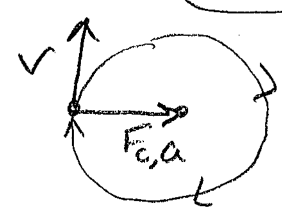
(7) 3 $F_{applied} - F_f = ma$

$50N - F_f = (4\text{kg})(10\text{m/s}^2)$

$50 - F_f = 40$

$F_f = 10N$

(8) 4




Know this diagram

(9) 4 $a_c = \frac{v^2}{R} = \frac{(4)^2}{0.25}$

$a_c = 64 \text{ m/s}^2$

(10) 3 $F = \frac{G m_1 m_2}{r^2}$

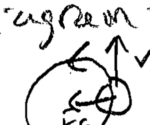
Ref table

$F = \frac{(6.67 \times 10^{-11})(7)(7)}{(2)^2}$

$F = 8.17 \times 10^{-10} N$

(11) 3. Mass always stays the same!

(12) 2 Diagram from #8.




Fc and a always into center

(13) Gravity

(14) $F = \frac{G m_1 m_2}{r^2}$

$F = \frac{(6.67\times10^{-11})(8.73\times10^{25})(1.03\times10^{26})}{(1.63\times10^{12})^2}$

$\boxed{F = 2.26\times10^{17}\,N}$

(15) Sun is larger in mass than Uranus

Practice Questions - Momentum

(1) 3

$J = F_{net}t$

$J = (10N)(0.20)$

$\boxed{J = 2.0\,N\cdot s}$

(2) 3 the boat's velocity will be smaller because it is a more massive object.

(3) 2

$P_i = P_f$

$mv = mv$

$(100kg)(15m/s) = (500kg)v$

$\boxed{v = 3\,m/s}$

(4) 3

$J = \Delta p = F_{net}t$

$F_{net}t = mv_f - mv_i$

$(-6N)(2s) = (2kg)(v_f) - (2kg)(4m/s)$

$-12 = 2v_f - 8$

$+8 \qquad +8$

$\boxed{v_f = -2\,m/s}$

negative b/c it acts in other direction

(5) 4.

$J = F_{net}t$

$3\,kg\cdot\frac{m}{s} = (6N)t$

$\boxed{t = 0.5\,s}$

(6) 1.

$m_1v_{1i} + m_2v_{2i} = (m_1+m_2)v_f$

$(1kg)(6m/s) + (3kg)(0) = (1kg+3kg)v_f$

$6 = 4v_f$

$\boxed{v_f = 1.5\,m/s}$

(7) 4

Use the formula and then plug in the "numbers" that they give you aka the variables.

$m_1v_{1i} + m_2v_{2i} = (m_1+m_2)v_f$

$mv + 0 = (m+M)v$

$v = \frac{mv}{(m+M)}$ or $\left(\frac{m}{m+M}\right)v$

(8) 3.

$F_{net}t = (5N)(2s) = 10\,N\cdot s$

greatest overall impulse

(9) 2.

$\longrightarrow + \longleftarrow$

$= \longrightarrow$

(10)

$J = F_{net}t = \Delta P$

$J = \Delta P$

$6000\,N\cdot s = \Delta P$

$\Delta p = 6000\,N\cdot s$

impulse is just the change in momentum (trick question)

Practice Questions - Projectiles



① 4. greater the speed more time in the air

angle increases time from $1°-45°$, since we are at $25°$, we would want to increase

② 2. $V_x = V_i \cos\theta$

$V_x = 10\,m/s \cos(30°)$

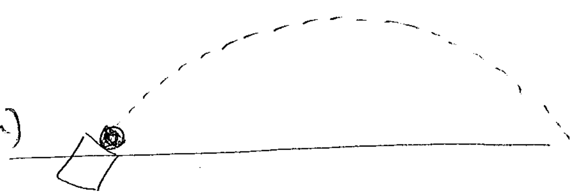
$V_x = 8.7\,m/s$

③ 2. No matter the lauch speed or mass, if 2 objects are lauched horizontally, they will hit the ground at the same time. The faster one will travel more distance though

④ 2. Horizontal velocity never changes because we are never accelerating in the x-direction

⑤ 3. Same as question #2 from momentum

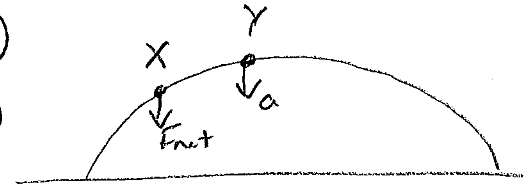
⑥

a) 

b) increase

c) increase

⑦ ⑧




Practice Questions - Energy

① 2. $F = kx$

$5N = k(0.075m)$

$k = 66.67\,N/m$

② 3. $PE = mgh$

$PE = (2kg)(9.81)(3m)$

$PE = 58.86J$

So $58.8J - 50J = 8.8J$

③ 4. Object A $KE = \frac{1}{2}mv^2 = 8J$

B $KE = 4J$

C $KE = 4J$

D $KE = 2J$

④ 3 Same mass, same height, it doesn't matter how you get there.

⑤ 1. $P = W/t$

$P = \frac{(110)(9.81)}{4}$

$P = 269.77W$

$P = W/t$

$P = \frac{(55)(9.81)}{2}$

$P = 269.77W$

⑥ 1. $PE = \frac{1}{2}kx^2$

$PE = \frac{1}{2}(80\,N/m)(0.3m)^2$

$PE = 3.6J$

⑦ 4.