Honors Physics: *Final Review Packet*

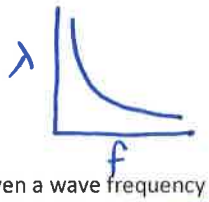
KEY

Units 1/2 – Wave Motion

Number of Questions: 6

Key Vocab Words: transverse wave, longitudinal wave, trough, crest, wavelength, frequency

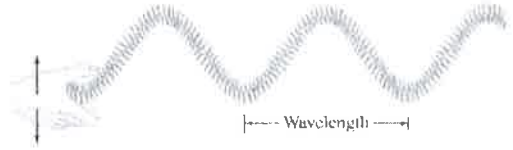
Problems:



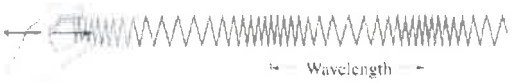
1. When frequency increases, wavelength decreases.
2. When frequency decreases, wavelength increases.
3. If sound travels at 5600 m/s through a steel rod, what is the wavelength, given a wave frequency of 2480 Hz?

$s = 5600\ \frac{m}{s}$ $\lambda = ?$ $f = 2480\ Hz$ $s = \lambda f$ $5600 = \lambda \cdot 2480$ $\lambda = 2.56m$

4. Label these waves as either **Longitudinal** or **Transverse**.



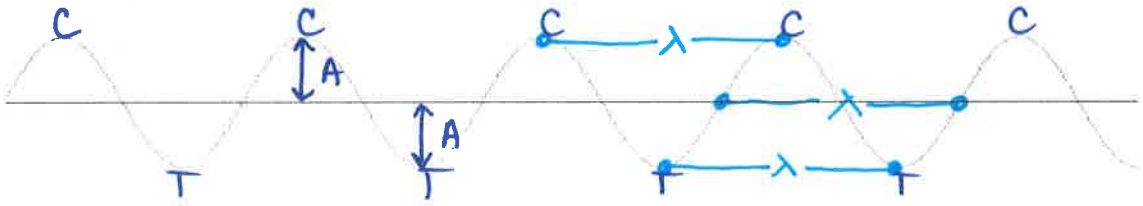
TRANSVERSE



LONGITUDINAL

5. Label the following wave diagram. Include these terms: **crest, trough, amplitude, wavelength (all 3 ways to indicate wavelength).**

(C) (T) (A) (λ)

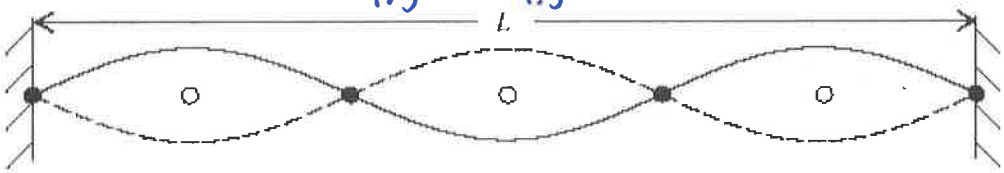


6. A complete wavelength has a crest phase and a trough phase.

7. The distance between these two walls is 9 meters.

A) How many wavelengths are shown? 1.5

B) How long is one wavelength in meters? $\frac{1.5\lambda}{1.5} = \frac{9m}{1.5}$ $\lambda = 6.0m$



Unit 3 – Electrostatics

Number of Questions: 3
Key Vocab Words: electrostatics, neutral, insulator, conductor, charging by conduction, charging by friction

Problems:

1. The movement of which subatomic particle is responsible for electricity? ELECTRON

2. a) An object with more electrons than protons is NEGATIVELY charged.
   b) An object with more protons than electrons is POSITIVELY charged.
   c) An object with an equal number of protons and electrons is NEUTRAL charged.

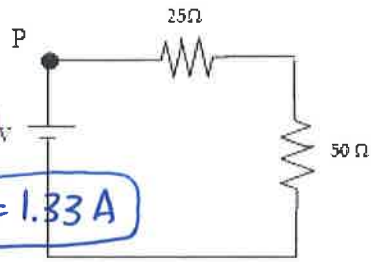
3. When you touch a positive to a neutral, both objects get a POSITIVE charge.
4. When you touch a negative to a neutral, both objects get a NEGATIVE charge. > Charging by conduction

Unit 4 – Electric Circuits

Number of Questions: 4
Key Vocab Words: electric current, electric circuit, resistance, voltage, series circuit, equivalent resistance, parallel circuit, kilo-watt hour

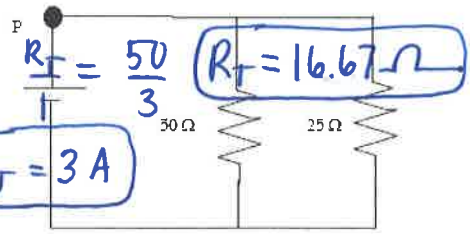
Problems:

1. For this circuit,



   a) Is this a series or parallel circuit? SERIES
   b) What is the equivalent/total resistance of the circuit? $R_T = 25 + 50 = 75\,\Omega$
   c) What is the current in the circuit? $V_T = I_T R_T$ $100 = I_T \cdot 75$ $I_T = 1.33\ A$
   d) What will happen if one lightbulb is removed? The other goes out

2. For this circuit,



   a) Is this a series or parallel circuit? PARALLEL
   b) What is the equivalent/total resistance of the circuit? $\frac{1}{R_T} = \frac{1}{50} + \frac{1}{25} = \frac{3}{50}$ $R_T = \frac{50}{3}$ $R_T = 16.67\,\Omega$
   c) What is the current in the current? $V_T = I_T R_T$ $50 = I_T \cdot 16.67$ $I_T = 3\ A$
   d) What will happen if one lightbulb is removed? The other stays on

3. A coffee pot rated at 950 W (P), is used for 4 hours (t).
   a) How much energy (in kWh) does the coffee pot use? (1000 W = 1 kW).
   $E = Pt = 0.950\ kW \cdot 4h = 3.8\ kWh$
   b) If it costs $0.14 for every kilowatt-hour, how much does it cost to run the coffee pot?
   $3.8\ kWh \cdot \$0.14 = \$0.532$

Unit 5 – Motion in 1D

Number of Questions: 14

Vocab: displacement, distance, average velocity, average speed, instantaneous velocity, acceleration, acceleration due to gravity (free fall)

Problems:

1. Tim drove his car for 15,000 meters for 450 seconds. What was his average speed? Can we be sure he went that speed the whole time?

$d = 15{,}000\text{m}$, $t = 450\text{s}$ $\quad S = \frac{d}{t} = \frac{15{,}000\text{m}}{450\text{s}}$ $\quad S = 33.3\ \frac{\text{m}}{\text{s}}$

↓ no. Its an average ∴ he could have gone faster or slower.

2. An airplane flying at a velocity of 165 m/s accelerates at a rate of 7.0 m/s² for 5.0 seconds.

$V_i = 165\ \frac{\text{m}}{\text{s}}$, $a = 7\ \frac{\text{m}}{\text{s}^2}$, $t = 5\text{s}$

a) What is the final velocity of the plane?

$V_f = ?$ use $V_f = V_i + at \rightarrow V_f = 165 + 7 \cdot 5$ $\quad V_f = 200\ \frac{\text{m}}{\text{s}}$

b) How far does the plane travel during the 5.0 seconds?

$\Delta x = ?$ use $\Delta x = V_i t + \frac{1}{2}at^2 \rightarrow \Delta x = (165 \cdot 5) + \frac{1}{2}(7)(5^2)$ $\quad \Delta x = 912.5\text{m}$

3. A motorcycle starts from rest and accelerates for 5.0 seconds. During this time, it travels a distance of 140 meters. What was his acceleration?

$V_i = 0\ \frac{\text{m}}{\text{s}}$, $t = 5\text{s}$, $\Delta x = 140\text{m}$

$a = ?$ use $\Delta x = \cancel{V_i t} + \frac{1}{2}at^2 \rightarrow 140 = \frac{1}{2} \cdot a \cdot 5^2$ $\quad a = \oplus 11.2\ \frac{\text{m}}{\text{s}^2}$

4. A wrecking ball is hanging at rest and is dropped. It hits the ground in 2.4 s. How far has the ball traveled during this time?

$V_i = 0\ \frac{\text{m}}{\text{s}}$, $t = 2.4\text{s}$, $a = \ominus 9.8\ \frac{\text{m}}{\text{s}^2}$

$\Delta x = ?$ use $\Delta x = \cancel{V_i t} + \frac{1}{2}at^2 \rightarrow \Delta x = \frac{1}{2} \cdot -9.8 \cdot 2.4^2$ $\quad \Delta x = \ominus 28.2\text{m}$

5. When you drop any two objects (ignoring air resistance) , what do we know about the time it takes for them to hit the ground?

Same time!

6. A ball is thrown upward, it reaches its highest point and then comes back down.

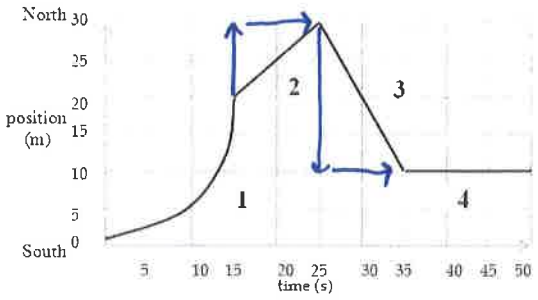
	Sign of velocity	Sign of Acceleration	Is The Ball Accelerating?
On the way up	⊕	⊖	yes → slowing down
*** At the top ***	0 m/s	⊖	yes !!!
On the way back down	⊖	⊖	yes → speeding up

7. Using the **position vs. time** graph, answer the following questions.

a) What is the object's velocity from 15-25 s? $10\text{m}/10\text{s} = \oplus 1\ \frac{\text{m}}{\text{s}}$

b) What is the object's velocity from 25-35 s? $-20\text{m}/10\text{s} = \ominus 2\ \frac{\text{m}}{\text{s}}$

c) What is the object's velocity from 35-50 s? $0\ \frac{\text{m}}{\text{s}}$

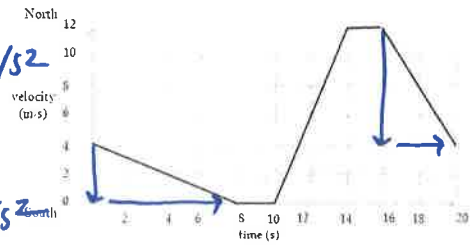


8. Use the **velocity vs. time** graph below to answer the questions .

a) What is the object's acceleration from 0-8 seconds? $-4\ \frac{\text{m}}{\text{s}}/8\text{s} = \ominus 0.5\ \text{m/s}^2$

b) What is the object's acceleration from 8-10 seconds? $0\ \frac{\text{m}}{\text{s}^2}$

c) What is the object's acceleration from 16-20 seconds? $-8\ \frac{\text{m}}{\text{s}}/4\text{s} = \ominus 2\ \text{m/s}^2$



Unit 6– Newton's Laws

Number of Questions: 13

Key Vocab Words: force, free-body diagram, net force, Newton's first law, Newton's second law, inertia, weight, Newton's third law

Problems:

1. If a bug and a truck windshield collide head-on, which one experiences a greater impact force? SAME FORCE!

2. What are the three ways an object can accelerate? Speeding up, slowing down, changing directions

3. An object's resistance to acceleration is also known as its INERTIA.

4. Identify if there is a net force acting on the underlined object.
   a) An apple sits still on a table. net F = 0
   b) The apple is in midair, freefalling. net F
   c) A ball is rolling at constant velocity. net F = 0
   d) The ball is rolling to a stop due to friction. net F
   e) A car makes a left turn. net F

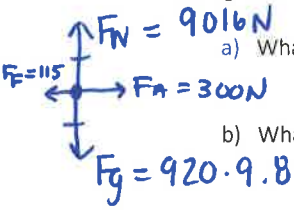
5. What is mass? measure of the amount of inertia
   a) What is weight? a result of the force of gravity
   b) How are they different? mass is the same everywhere. Weight changes

$F_g = mg$

6. John has a mass of 100 kg. What is his weight in Newtons?

   $m = 100\ kg$ $F_g = ?$ use $F_g = mg \rightarrow F_g = 100 \cdot 9.8 = \boxed{980N}$

7. A 920-kg car is towed into the body shop with a force of 300 N. The friction between the car tires and the road surface is 115 N.



   a) What is the net force acting on the car? net F = 300 − 115 = $\boxed{185N}$

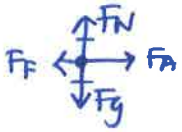
   b) What is the acceleration of the car? net F = ma

   $185 = 920 \cdot a$ $\boxed{a = 0.20 \frac{m}{s^2}}$

8. Draw free-body diagrams for the following problems. Be sure to draw all the forces with arrows that are of appropriate length to reflect the given descriptions.

   a) Object is sitting still on a desk.

   b) An object is being pushed across the floor and it is speeding up.



   c) An object is being pushed on the floor at constant velocity; friction is present.

   d) An elevator is still.

   e) The elevator is accelerating upward.

   f) The elevator is accelerating downward.

9. What is your **seat belt's** job in a car accident?

A) cancel out the forces on you B) provide a net force backward on you C) provide a net force forward on you

10. What is your **head rest's** job in a car accident?

A) cancel out the forces on you B) provide a net force backward on you C) provide a net force forward on you

11. Which type of friction is stronger: static or kinetic? STATIC

12. How much frictional force is acting on a 20 kg object that has a coefficient of kinetic friction of 0.6?

$F_N = 196N$, $? = F_F$, $F_g = 20 \cdot 9.8 = 196N$

$F_F = \mu F_N = 0.6 \cdot 196$

$F_F = 117.6N$

Unit 7 – Motion in 2D

Number of Questions: 6
Key Vocab Words: projectile, trajectory, net centripetal force, radius, period

Problems:

1. What will hit the ground first, a dropped tennis ball, or a horizontally launched tennis ball? SAME TIME !!

2. Draw what a parabolic trajectory looks like.

Type 1 

Type 2 

3. A car drives at 25 m/s and falls off of a 10 meter high cliff. A) How long is it in the air? B) What is its range (How far does it land from the edge)?

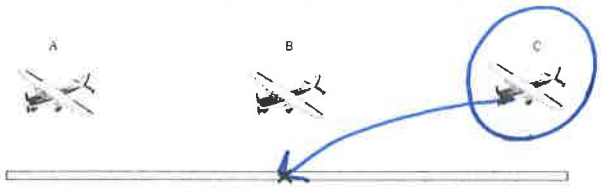
	H		V	
v_{ix}	25 $\frac{m}{s}$	v_{iy}	0 $\frac{m}{s}$
v_{fx}	25 $\frac{m}{s}$	v_{fy}	
a_x	0 $\frac{m}{s^2}$	a_y	$-9.8 \frac{m}{s^2}$
Δx		Δy	$-10m$
t		t	

a) $t = ?$

$\Delta y = v_{iy} t + \frac{1}{2} a_y t^2$

$-10 = \frac{1}{2} \cdot -9.8 \cdot t^2$

4. At which position should the airplane drop its cargo to hit the target X? (The plane is flying right to left)



5. The following diagram represents an overhead view of a ball attached to a string that is being spun in a horizontal circle.

A. left **B. right** **C. up** **D. down**

Use these choices to show:

* the net centripetal force acting on the ball. B
* the velocity of the ball. C
* the acceleration of the ball. B
* I f the string broke, indicate which way the ball would travel. C

6. Tim drives in a circle of radius 50 meters, and the period is 8 seconds. How fast is he driving in this circle?

$S = \frac{2\pi r}{T} = \frac{2\pi \cdot 50}{8}$

$S = 39.25 \frac{m}{s}$

Unit 8 – Work & Energy

Number of Questions: 7

Key Vocab Words: energy, kinetic energy, work, gravitational potential energy, law of conservation of energy

Problems:

1. A student applies a force of 185 N. The box is lifted 0.800 m. How much work does the student do on the box?

↑F ↑Δx $W = F\Delta x \cos\theta = 185 \cdot 0.80 \cdot \cos 0$ W = (+) 148 J

2. Define each of the following scenarios as positive work, negative work or no work.
   a) Lifting a bag of groceries. ↑F ↑Δx $W = F\Delta x \cos 0 = (+)W$
   b) Holding the grocery bag still in the air. no Δx = 0 W
   c) Lowering a crate of books to the floor. ↑F ↓Δx $W = F\Delta x \cos 180 = (-)W$
   d) Sliding a box across the floor. →F →Δx $W = F\Delta x \cos 0 = (+)W$
   e) Pushing on a truck that does not move. no Δx = 0 W

3. A 950-kg car moves with a speed of 37 m/s. What is its kinetic energy? $KE = \frac{1}{2}ms^2 = \frac{1}{2} 950 \cdot 37^2$ KE = 650,275 J

4. An 875-kg compact car speeds up from 22.0 m/s to 44.0 m/s while passing another car.
   a) What were its initial and final kinetic energies? $KE_i = \frac{1}{2} \cdot 875 \cdot 22^2$ $KE_f = \frac{1}{2} \cdot 875 \cdot 44^2$ KE_i = 211,750 J, KE_f = 847,000 J
   b) How much work was done on the car to increase its speed? $W = \Delta KE = KE_f - KE_i = 847{,}000 - 211{,}750$ W = 635,250 J

5. A 90-kg rock climber climbs 45 m up to the top of a quarry. What is the the climber's gravitational potential energy?

$GPE = mgh = 90 \cdot 9.8 \cdot 45$ GPE = 39,690 J

6. An 800 kg roller coaster is still at the top of a 120m tall hill.
   a) What is the gravitational potential energy at the top of the ride)?

$GPE = mgh = 800 \cdot 9.8 \cdot 120$ GPE = 940,800 J

   b) How fast is the car moving at the bottom of the hill?

$GPE = KE = 940{,}800 = \frac{1}{2} \cdot 800 \cdot s^2$ $s = 48.5 \frac{m}{s}$

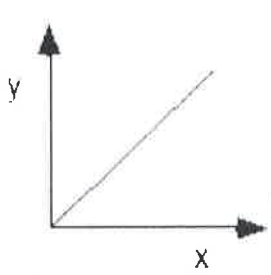
7. Complete this statement: energy cannot be created or destroyed, it just changes type.

8. When a pilot puts gas in his plane, not all of the fuel goes to making the plane move. Where does the rest of the energy go?

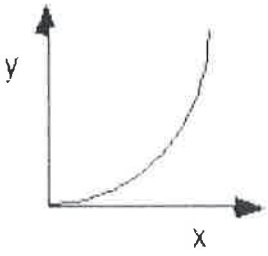
Heat → Leaves into atmosphere.

Extra Skills – Graphing and Proportions

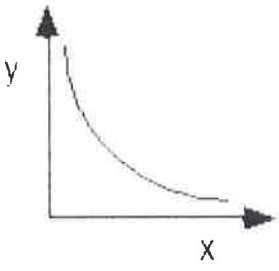
1. Identify each of these graphs as : **No Relationship, Linear, Inverse, Squared, Square Root.**



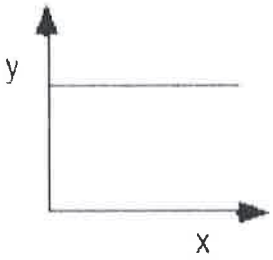
Linear
Direct



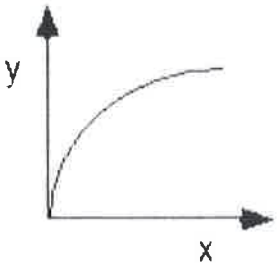
Squared



Inverse



No Relationship



Square Root

2. Use this data table to identify which choice best relates (x) and (Y).

Speed ($\frac{m}{s}$)	Centripetal Force (N)
1	2
2	8
3	18
4	32
5	50
6	72

Double < > Quadruple

A) no relationship B) linear C) inverse D) squared E) square root

3. Using the same table from #2, what is the effect on centripetal Force if the speed of the object is doubled? Quadruples

4. Which proportion best describes this data set?

A) $F_c \propto s$ B) $F_c \propto \frac{1}{s}$ C) $F_c \propto s^2$ D) $F_c \propto \sqrt{s}$

5. What is the effect on electrical current if you make the following changes to voltage and resistance? (Hint: find the equation that relates current, voltage, and resistance) $V = IR$

A) voltage is doubled and resistance is kept constant — I doubles
B) voltage is doubled and resisttance is also doubled — I cut in $\frac{1}{2}$ — I doesn't change
C) voltage is doubled and resistance is cut in half — I doubles — I doubles — I quadruples
D) voltage is quadruples and resistance is doubled — I quadruples — I cut in $\frac{1}{2}$ — I doubles