Physics
Final Exam Review
2011-2012

Name: Answers

Metric Measuring and Conversion:

1. Estimate the length of line below, in centimeters.

1 3 11 25 30 34 42 50

2. 0.4m = _____ cm	0.004	0.04	0.4	4	40	400	4,000
3. 62 cm = _____ m	0.062	0.62	6.2	62	620	6,200	
4. Estimate the length of a car in meters		0.05	0.5	5	50	500	5,000

Units:

N g/cm^3 kg s m psi m/s m/s^2 kg m/s

5. Time s	6. Acceleration m/s^2	7. Force N
8. Mass kg	9. Velocity m/s	10. Weight N
11. Distance m	12. Density g/cm^3	13. Pressure psi

Magnitudes of Units:

1cm 1 m 1 m/s 1 N 10m/s^2 1 kg 1 s 14.7psi 1g/cm^3

14. long step 1m
15. Earth's gravity 10m/s^2
16. Walking pace (about 2mph) 1m/s
17. Pinky Fingernail Width 1cm
18. Atmospheric pressure at sea level 14.7psi
19. Water 1g/cm^3
20. ¼ pound 1N
21. 2.2 pounds 1kg

Formulas: Δv/Δt mg ma mv d/t final v – starting v F/A

22. Acceleration Δv/Δt
23. Force ma
24. Average velocity d/t
25. Change in velocity final V - starting V
26. Pressure F/A

F=PA P=F/A

Understanding Velocity and Acceleration:

27. A runner has a velocity of 6m/s. What does that mean?
    a. It takes the runner 6 seconds to go one meter.
    b. The runner travels 6 meters in one second.
    c. Each second, the runner travels 6 seconds.
    d. Each second, 6 meters is added to the runner's speed.

28. The runner from the last question had a velocity of 6m/s. If a second runner has a velocity of -6m/s, this means the second runner is…
    a. …going downhill b. …slowing down c. …getting tired
    d. …going the same speed in the opposite direction e. …upside-down

29. A third runner has an acceleration of -2m/s^2. What does that mean?
    a. Each second, 2m/s is subtracted from the runner's velocity.
    b. Each second, the runner moves 2m backward
    c. Each second, 2 meters are added to the runner's speed.
    d. The runner travels -2meters in one second.
    e. Every two seconds, the runner travels 1 meter backward.

Terms: a. Weight b. Inertia c. Momentum d. Acceleration e. pitch
f. Volume g. Velocity h. Mass i. density j. pressure k. frequency
l. compression wave m. transverse wave n. red o. violet
p. refraction q. reflection r. scattering s. inertia

30. The amount of stuff in an object volume mass (h)
31. This tells you how much something's position changes during a second velocity (g)
32. The highness or lowness of a sound pitch (e)
33. The amount of space something takes up; size volume (f)
34. How often something happens Frequency (k)
35. A measure of something's resistance to changes in motion inertia (b)
36. The property of an object that causes it to resist change in motion inertia (b)
37. Speed and direction velocity (g)
38. The amount of force that is applied to a given area pressure (j)
39. A measure of how something's velocity is changing acceleration (d)
40. The force of gravity acting on an object weight (a)
41. how crowded something's molecules are density (i)
42. A wave that oscillates perpendicular to the direction in which it travels transverse (m)
43. A wave that oscillates parallel to the direction in which it travels compression (l)
44. Shortest wavelength of visible light violet (o)
45. Longest wavelength of visible light red (n)
46. The phenomenon whereby light bounces off of something reflection (q)
47. The phenomenon whereby light turns as it enters a material of different density refraction (p)
48. The phenomenon whereby light breaks apart and bounces randomly throughout a material scattering (r)
49. This phenomenon causes blue skies and red sunsets scattering (r)
50. This color of light makes the sharpest turn when it enters a material of a new density violet (o)

Problems (Answers below are for standard units. Units have been intentionally left out so that they cannot be used to answer previous questions.)

51. Over a time of 20 seconds, a dog ran 62 meters. What is the dog's average velocity?
82 1240 42 3.1 0.032

52. A bicycle was traveling 10m/s. After accelerating for 2 seconds, its velocity was 5m/s faster. What was the bicycle's acceleration? 12 8 5 0.2 20 2.5 m/s² 2.5 m/s²

53. The same 90kg football player accelerates at a rate of 4m/s². What force does the player have to generate in order to do this? 360 0.04 22.5 86 94

54. Approximately how much does the 90kg player weigh? F=ma
0.11 9 80 0.100 900

A fish has a velocity of 3 m/s. Then the fish speeds up. After accelerating for 8 seconds, the fish has a new velocity of 10 m/s.

55. What is the fish's change in velocity? 3 10 13 7 -4

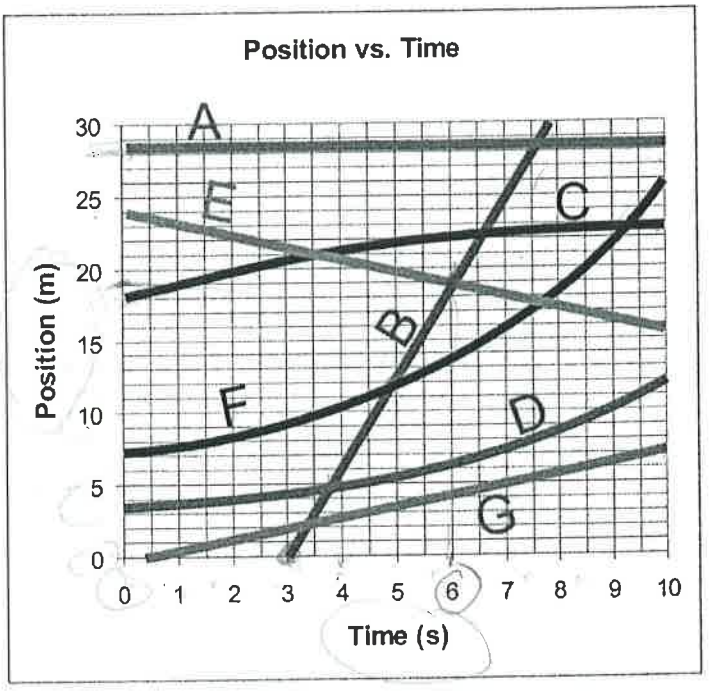
56. What is the fish's acceleration during those 8 seconds? 1.25 0.88 0.3 7 13

57. An airplane is traveling at a velocity of 300 m/s. If the airplane has an acceleration of 10 m/s², what velocity will the airplane have after one more second? 310 3,000 290 30 0.033

58. If you drop a ball off of a tall building what velocity will it have after falling for 6 seconds?
60 6 36 600 6,000

Interpreting Graphs

59. On a graph of position versus time (like the one on the right), you can determine who has the fastest velocity by looking at ___e___.
   a. …the height of each line.
   b. …whether each line curves upward or downward.
   c. …where each line starts.
   d. …where each line ends.
   e. …how steepness (slope) of each line.



The graph on the right shows the positions at different times for seven different people. Choose all of the answer choices that apply.

60. Which person (people) is (are) moving at a constant speed? A B C D E F G

61. Which person (people) is (are) not moving at all? A B C D E F G

62. Which person (people) is (are) accelerating? A B C D E F G

63. Which person (people) is (are) decelerating? A B C D E F G

64. Which person is accelerating the fastest? A B C D E F G

65. Which person has the fastest constant speed? A B C D E F G

66. If something has negative acceleration, that means it is ___.
   a. moving slowly
   b. slowing down
   c. moving fast
   d. speeding up
   e. moving backward
   f. accelerating upside-down

67-74, A sled is held still at the top of a hill. Then the sled is released. The slides down the hill for 8 seconds with a constant acceleration. During those 8 seconds, the sled travels 40 meters. The blanks below are provided to help you organize your answers. Your grade will be determined by your answers to the following multiple choice questions. Each answer will be used at least once.

Beginning
d = 0m
t = 0s
v = 0 m/s

Midpoint
v = 9 m/s
54m / 6s = 9 m/s

End
d = 54 m
t = 6s
v = 18 m/s

67. What distance had the sled traveled at the beginning of its run? 0 3 6 9 18 54
68. What was the time at the beginning of the sled's run? 0 3 6 9 18 54
69. What was the sled's velocity at the beginning of its run? 0 3 6 9 18 54
70. What was the sled's velocity half-way through its run? 0 3 6 9 18 54
71. What distance had the sled traveled at the beginning of its run? 0 3 6 9 18 54
72. What was the time at the end of the sled's run? 0 3 6 9 18 54
73. What was the sled's velocity at the end of its run? 0 3 6 9 18 54
74. What was the sled's acceleration? 0 3 6 9 18 54

6 9 54m 6s 18 m/s
6 18 3m/s 6 m/s

75-82. Fill in the blanks below to complete Newton's three laws.

1st Law: Objects in motion stay in motion in a straight line at a constant speed, and objects at rest stay at rest unless acted upon by an unbalanced force

2nd Law: F = ma

3rd Law: For every action there is an equal + opposite reaction

---

83. The forces acting on an object are **balanced** if the object is _____ (circle all that apply)

a. Accelerating b. Sitting motionless c. Turning
d. Decelerating e. Moving at a constant speed in a straight line

84. A ball is accelerating down a ramp. The force of air resistance acting on the ball is 5N. What do you know for certain about the NET FORCE acting on the ball?

a. Net force is pointing down the ramp b. Net force is pointing up the ramp
c. Net force = 5N d. Net force more than 5N
e. Net force is zero

Imagine that you are pushing a block of wood, causing it to slide across a floor…

85. If the wood's mass the stays the same, but your pushing force decreases, what happens to the wood's acceleration?

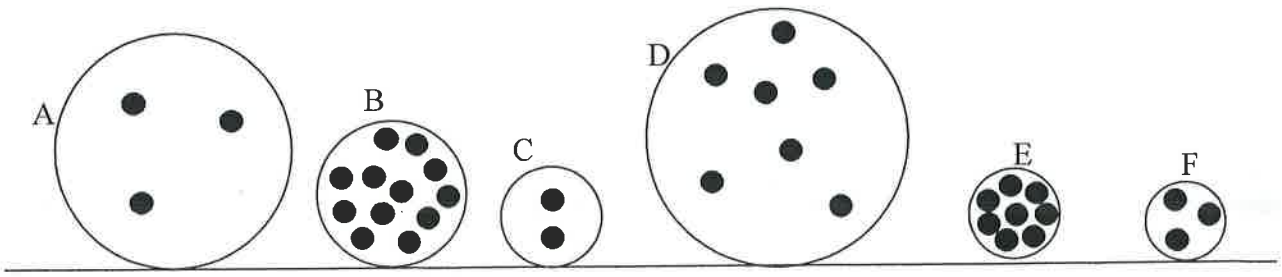
a. it increases b. it decreases c. it stays the same d. can't tell

86. If your pushing force stays the same, but the wood accelerates more slowly, what must have happened to the wood's mass?

a. it increased b. it decreased c. it stayed the same d. can't tell

The objects below are mostly empty space. The circle is the edge of each object. The dots inside represent all of each object's mass. The empty space inside the objects has no air or mass of any kind. Which object has the...

87. ...most volume? d
88. ... least mass? C
89. ...most density? E
90. ... least volume? f
91. ...most weight? B
92. ... least density A
93. ...most mass? B
94. ... least weight? C



95. You push a 4kg chair, and you cause it to accelerate at a rate of 2m/s^2. What is the net force acting on the chair?

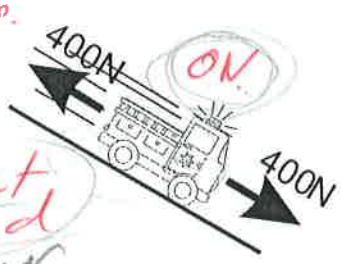
4kg(2m/s^2) = 8N

96. ~~Define weight~~

97. When you jump upward, you move upward because of an action and a reaction. What is the action? What is the reaction? Describe them both below, and make sure you give the direction of each.

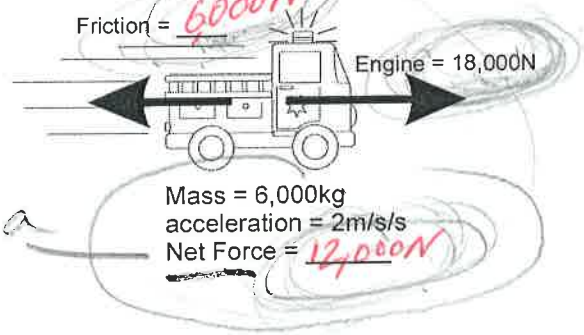
Action: You push down Reaction: Floor pushes "up".

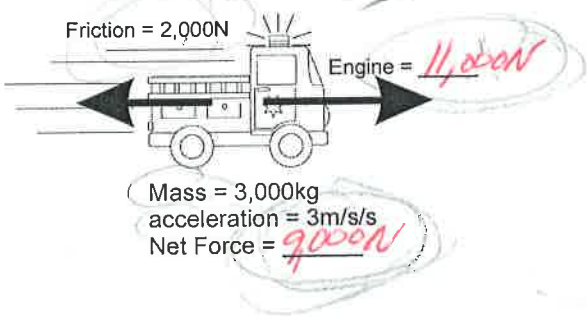
98. Examine the situation on the right and determine the net force. **Then draw and label a vector showing that net force. Also tell whether the object is accelerating, decelerating, or moving at a constant speed.**



Constant speed

99. Fill in **all** of the missing forces in the two diagrams below





100-101. Your Putt-putt boat's motor starts working, and your boat begins to move **to the right**. Your boat's motor has a force of 0.5N. Eventually, your boat reaches a terminal velocity.

100. Choose all of the following that are true: *Before* your boat reaches terminal velocity…
a. Water drag > 0.5 N
b. Water drag < 0.5 N
c. Water drag = 0.5 N
d. Net force is to the left
e. Net force is to the right

101. Choose all of the following that are true: *After* your boat reaches terminal velocity…
a. Water drag > 0.5 N
b. Water drag < 0.5 N
c. Water drag = 0.5 N
d. Net force is to the left
e. Net force is to the right

102-104. A Newton car is a car with a slingshot on top. When objects are launched in one direction from the slingshot, the car moves in the opposite direction. If you use a lot of rubber bands, a very light ping-pong ball can be launched from a Newton car with great speed. If you use the same number of rubber bands to launch a heavy weight, the weight will travel much more slowly than the ping pong ball.

102. When you launch the ping-pong ball, which of the following is true?
a. The force pushing the ball is greater than the force pushing the car.
b. The force pushing the car is greater than the force pushing the ball.
c. The force pushing the ball is equal to the force pushing the car.

103. If you use the same number of rubber bands, stretched the same amount, to launch a ping-pong ball and a heavy weight, which of the following is true?
a. The ping-pong ball is launched with more force
b. The heavy weight is launched with more force
c. They are launched with the same force

104. Suppose your friend does not believe your answer to the last question. Explain how you can use a Newton car to prove that you are correct. What evidence do you show your friend?

The car moves farther when you launch a heavy weight

A 2kg rubber band-powered car is wound up and held motionless at a starting line. When the car is released, its mousetrap "motor" pushes it for the first 4 seconds. During that time, the car travels 20 meters. After the car's motor stops pushing, the car continues to "coast" for another 10 seconds.

105. What is the car's average velocity while the motor is pushing? 5m/s
106. What is the change in velocity during the car's acceleration period? 10m/s
107. What is the car's acceleration while the motor is pushing? 2.5m/s²
108. What net force is acting on the car while the motor is pushing? 5N
109. What is the change in velocity during the car's *deceleration* period? -10m/s
110. What is the car's acceleration during the car's *deceleration* period? -1m/s²
111. What net force is acting on the car during the car's *deceleration* period? -2N
112. What force of friction is acting on the car? 2N or -2N
113. What force is provided by the car's motor? 7N

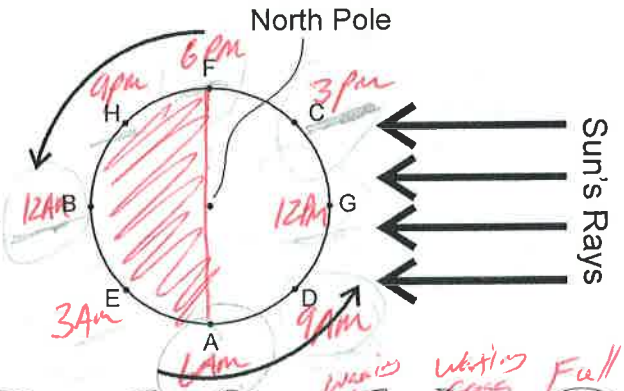
5N
2N 7N

Solar System

114. What is the name for a cloud of dust and frozen gasses that eventually turns into a solar system? Nebula
115. During its formation, the solar system shrank. Why? Gravity
116. Our solar system has always been spinning. What caused its spinning to become faster? Shrinking
117. When the solar system began to spin faster, what shape did it become? disc
118. a. What happened to the temperature of the solar system as it shrank? heated up
     b. Why did the temperature change? Compression
119. $E=mc^2$ can be used to calculate the energy given off by the sun. Explain what the parts (e, m, and c) of the formula mean. e=energy, m=mass, c=speed of light
120. The planets have stable orbits. They don't fly away from the sun, and they don't fall into the sun.
     A. What keeps them from flying away from the sun? gravity
     B. What keeps them from falling into the sun? momentum/inertia

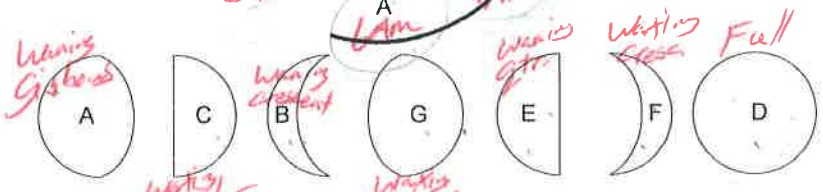
Day/Night Cycles

121. Shade the dark part of the Earth on the right. Then give the time of day at each of the lettered locations. Answer choices are: 12AM, 12PM, 3AM, 3PM, 6AM, 6PM, 9AM, 9PM



Moon Phases

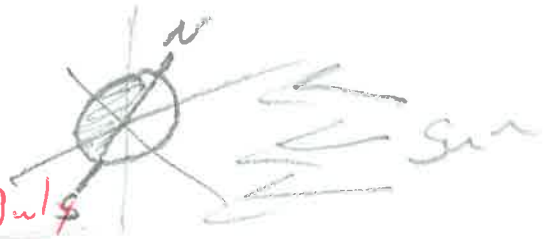
122. Write the full name of each moon below.



123. Put the moons above in order, starting with F. F, C, G, B, A, E, B

124. a. What is the name of the moon phase that is missing from the diagrams above? New Moon
     b. Why was that moon phase left out?
     You can't see it.

Seasons

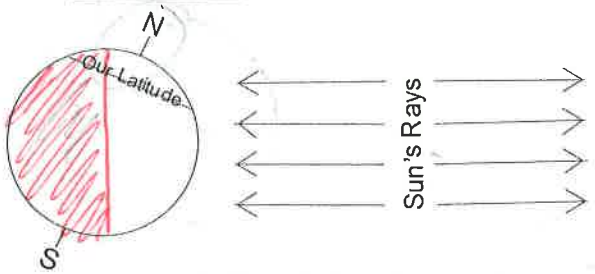


125. During what month are we farthest from to the sun? July
126. During what month are we closest to the sun? January
127. The diagram below shows the Earth during two different parts of its orbit. The one line of latitude shows where we live.

A) Properly shade the Earths in the diagram.
B) Label the Earth's according to the season we would be experiencing.
C) Estimate the hours of daylight that we would be experiencing in each position.

Season in our hemisphere: Summer

Estimated hours of daylight at our latitude: 16



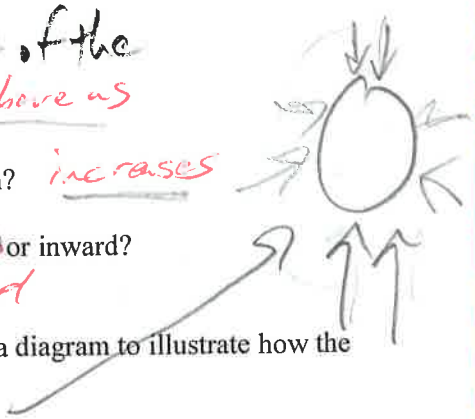
Season in our hemisphere: Winter

Estimated hours of daylight at our latitude: 8

Answer Choices: A) Earth's rotation B) Earth's Revolution C) Moon's Revolution

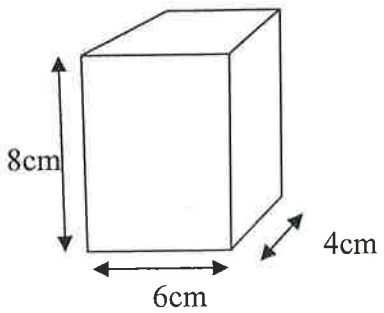
128. B This takes 1 year.
129. A This takes 24 hours.
130. C This motion causes moon phases to change.
131. B This motion causes seasons.
132. A This motion causes day and night cycles.
133. C This takes about 1 month.

Pressure and Density



134. What causes atmospheric pressure (the air pressure around us)? weight of the air above us
135. What does "psi" mean? pounds per square inch
136. a. How does atmospheric pressure change as you move to a **lower** elevation? increases
b. Why? more air above us
137. a. When you move to a **higher** elevation, do your eardrums stretch outward or inward?
b. Explain why. Less pressure outside your head
138. Buoyancy is the force that causes bubbles to float upward. Use arrows and a diagram to illustrate how the force of buoyancy pushes a bubble upward.
139. A hovercraft rides on a cushion of air with 3psi of pressure. If the surface area of the hovercraft is 200in^2, how much weight can the hovercraft lift (including its own weight)? 600lbs

The diagram on the right shows a box…



140. Calculate the volume of the box. 192cm^3
141. If the box has a mass of 250g, what is its density? 1.3g/cm^3
142. The density of water is 1g/cm^3. Will this box float or sink in water? sink

143-147. As each of the following changes occur, what happens to each of the following...
a. density b. mass c. weight d. volume

143. When a blob in a lava lamp heats up, it begins to rise. When this happens, what happens to its...

144. A 2-liter bottle is full of water, and it also contains a "Cartesian diver." The "diver" is a test tube with its open end pointing downward. An air bubble is trapped in the diver. At first, the diver is floating at the top of the bottle. As the bottle is squeezed, the test tube begins to sink to the bottom. *As the bottle is being squeezed, what is happening to the test tube's...*

145. Someone exercises and gets much stronger. The person gets smaller, but his/her weight does not change. What has happened to the person's...

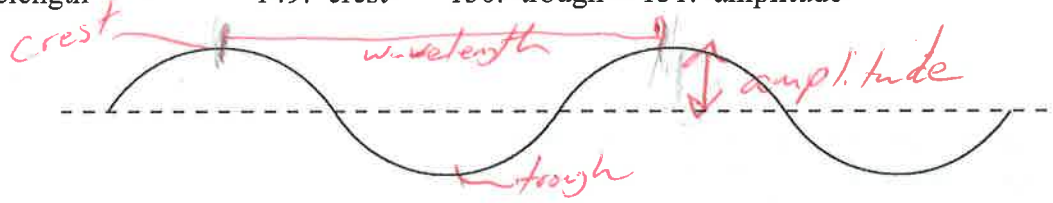
146. Someone lights a large flame in a hot air balloon, and the balloon begins rising higher in to the sky. The size of the balloon does not change. While the flame is heating the balloon, what happens to the balloon's...

147. You take a piece of paper to the moon. What happens to the paper's...

Waves

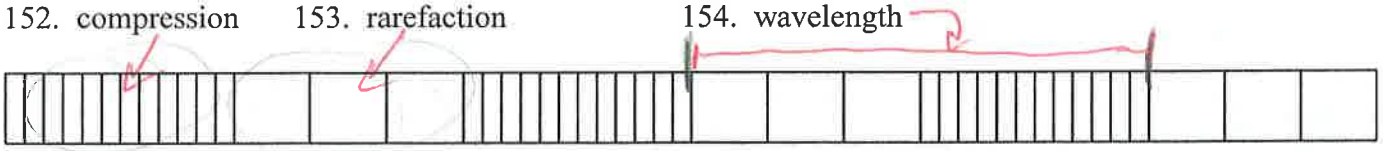
Show/label each of the following on the diagram of a transverse wave:

148. wavelength 149. crest 150. trough 151. amplitude



Show/label each of the following on the diagram of a compression wave:

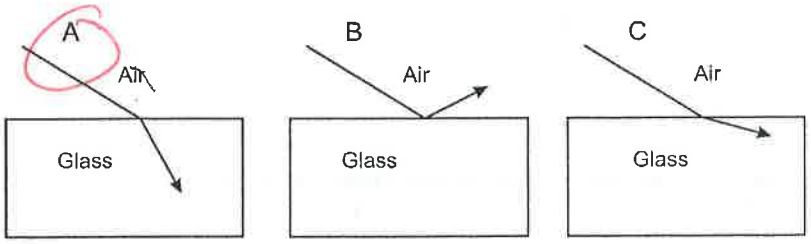
152. compression 153. rarefaction 154. wavelength



155. Radio waves, microwaves, infrared waves, visible light, ultraviolet radiation, x-rays, and gamma rays are all types of electromagnetic radiation

156. Which frequencies of electromagnetic radiation are most dangerous?
a. low frequencies b. high frequencies?

157. Which of the diagrams on the right correctly shows light **refracting** as it passes from air to glass?



160-170. The final section of the Final Exam will come from the Putt-Putt Boat Notes.