Physics 101 **FINAL EXAM** **Spring 2014**

There are 25 problems on this test with only one correct answer per question. The backs of the pages are left blank to leave additional working area. On the back is an information sheet containing useful equations/definitions. This test will be hand graded, so be sure to clearly identify your answers. **You do not need to use your clickers!** You should not have your phones out at any point during this test.

NAME KEY

~~Circle your section time~~
~~11:30~~ ~~12:30~~

These were hand graded, so I do not have percentages. Sorry.

1. What is the reason that adding salt to water makes it boil faster?
   a) This increases the mass of the water
   b) This increases the specific heat of the water
   c) This decreases the specific heat of the water
   d) This increases the latent heat of the water
   e) This decreases the latent heat of the water

2. Convert 300 K to Fahrenheit. $T_C = T_K - 273.15 = 26.85°C$ $T_F = \frac{9}{5}T_C + 32$

   a) -2.86°F b) 16.3°F c) 80.3°F d) 300.6°F e) 1064°F

3. The temperature difference between the inside and outside of a house on a specific day is 40°C. What is that temperature difference on the Fahrenheit scale? $\Delta T_F = \frac{9}{5}\Delta T_C$

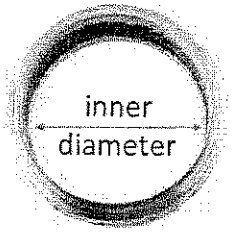
   a) 4.4°F b) 22°F c) 72°F d) 104°F e) 273.15°F

4. If the average temperature of the ocean were to increase by 5°C, what would be the increase of the average depth of the ocean. The current average depth is about 14,000 **feet**.

   a) 0.295 m b) 0.996 m c) 1.47 m d) 4.83 m e) 7.35 m

5. Why does hot air rise?
   a) It has a smaller mass than colder air.
   b) It has a larger mass than colder air.
   c) It has a smaller volume than colder air.
   d) It has a larger volume than colder air.
   e) None of these reasons.

6. A wedding ring is heated by running it under hot water. As a result, the inner radius of the ring



(a) slightly increases

b) slightly decreases

c) stays the same

d) may increase or decrease depending on which metal it is made from

7. The heat transfer mechanism mainly responsible for global warming is

a) conduction b) convection c) superposition (d) radiation

8. Let's say you are going to use your hand to poke a rod into a fire (such as to roast marshmallows). In order to **minimize** the heat transfer that might burn your hand, you would want to pick a material with a

a) high latent heat

b) low latent heat

c) high thermal conductivity

(d) low thermal conductivity

(Sticks are a great choice, except, of course, for the fact that they are highly flammable.)

9. Why does water make a good coolant for your car?

a) high latent heat

b) low latent heat

(c) high specific heat

d) low specific heat

10. You get 200 grams of -15°C ice cubes out of the freezer, put it in a glass, and forget about it. You come back to it when all of the ice is now water with a temperature of 20°C. How much energy was absorbed from the environment to cause this result?

a) 6,270 J b) 29,300 J c) 66,600 J (d) 89,600 J d) 90,000,000 J

$Q = mc_{ice}\Delta T_{ice} + mL_f + mc_{water}\Delta T_{water}$

11. If you hear thunder 5 seconds after seeing the lightning bolt it comes from, how far away from you is the lightning bolt? Assume that it is 20°C outside. (Do not trust the old wives' tell about this).

a) 1 mile b) 2 miles c) 2.5 miles d) 5 miles e) 10 miles

12. A few minutes later you hear another thunder clap. For this new thunder clap, you are able to figure out that you are 2 miles away from this lightning bolt. If you were instead 1 mile away from the lightning bolt, how would the intensity of the sound change? $I = \frac{P}{4\pi r^2}$

a) If I divide my distance from the sound by two, the intensity decreases by two.

b) If I divide my distance from the sound by two, the intensity increases by two.

c) If I divide my distance from the sound by two, the intensity decreases by four.

d) If I divide my distance from the sound by two, the intensity increases by four.

13. I determine that the intensity of the sound of the thunder where I am standing (2 miles away) is 0.0009 W/m^2. If I had an instrument with me to read the intensity in decibels, what would it say?

a) 9 dB b) 45 dB c) 90 dB d) 4.5×10^9 dB e) 9×10^9 dB

14. The speed of sound in water is affected by all of the following except.

a) mass

b) temperature

c) salinity (saltiness)

d) pressure

15. Let's say I push both my son and my daughter on two identical swings. If I push them with the same force, how do the periods of their oscillation compare?

a) The heavier child has a longer period of oscillation.

b) The heavier child has a shorter period of oscillation.

c) They both have the same period of oscillation.

16. By compressing a vertical spring by 1 cm, I launch a ball up in the air 1 meter. If I instead want the ball to go up 4 meters, how much will I need to compress the spring? $E_p = mgh$

a) 2 cm b) 4 cm c) 8 cm d) 16 cm e) 32 cm

$E_i = \frac{1}{2}kx^2$

17. I hang a 1.0 kg weight from a spring, which stretches the spring by 1 cm. What answer is closest to the spring constant of the spring? $\Sigma F_y = 0 \Rightarrow mg = kx \quad k = \frac{mg}{x}$

a) 1 N/m b) 10 N/m c) 100 N/m d) 1000 N/m e) 100,000 N/m

18. A radio station broadcasts at 100.1 MHz. Which answer is closest to the wavelength for the radio wave it produces?

a) 3 μm b) 3 mm c) 3 m d) 30,000 m e) 3,000,000 m (or 3 Mm)

19. On a football field, I launch a cannonball at an angle of 30 degrees from the ground. The speed of the cannonball is 50 m/s. Horizontally how far does it go before it hits the ground? (Ignore the height of the cannon.)

x	y
$a_x = 0$	$a_y = -9.8$

a) 110 m b) 128 m c) 221 m d) 255 m e) 442 m

20. A 100 kg refrigerator slides down a ramp which we can treat like as an inclined plane. The angle of the incline is 35 degrees. Do **not** ignore friction and assume a coefficient of kinetic friction of 0.4. What will be the resulting acceleration of the car down the incline assuming the driving is not pushing either the brakes or the accelerator?

B 2.2

a) 5.3 m/s^2 b) 5.6 m/s^2 c) 6.0 m/s^2 d) 7.8 m/s^2 e) 8.0 m/s^2

21. A car of mass m is traveling with a speed of 2v. A truck with mass 2m is traveling in the opposite direction at a speed of v. If they collide head on, which driver experiences the greater impulse due to the collision?

$\overrightarrow{m(2v)} + \overleftarrow{2m(-v)} = 0$

a) The driver of the car.

b) The driver of the truck.

c) They experience the same non-zero impulse.

d) Neither one of them experiences an impulse (zero impulse).

22. Determine the angular velocity of the minute hand (smaller hand) of a clock.

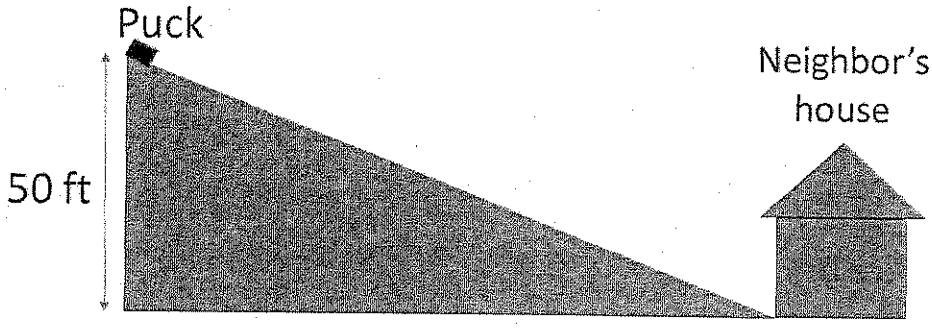
a) 0.00175 rad/s b) 0.105 rad/s c) 6.28 rad/s d) 377 rad/s e) 22,600 rad/s

$\omega = \frac{\Delta\theta}{t} = \frac{2\pi \text{ radians}}{1 \text{ hour}} = \frac{2\pi \text{ rad}}{60 \frac{\text{min}}{\text{hr}} \, 60 \frac{\text{s}}{\text{min}}}$

23. ~~The~~ My son hits a hockey puck and I fail to stop it. As a result, it slides down our largely sloped yard, until it runs into the house behind/below us. If my son hits the puck at 5 m/s and ignoring friction, what will the speed of the ball be when it hits the neighbor's house 50 **feet** below where he hit it?

a) 17.3 m/s b) 18 m/s c) 31.3 m/s d) 31.7 m/s

e) Impossible to determine without knowing the mass of the puck.



24. Let's say you either let a book drop one meter straight down or let it slide down a one meter tall incline (do not ignore friction). In which case (if either) is more work done by gravity.

a) More work is done by gravity when the book drops straight down.

b) More work is done by gravity when the book slides down the incline.

c) The same amount of work is done by gravity in both cases.

25. I throw a ball straight up in the air. While it is in the air, when is its acceleration zero?

a) On the way up

b) At its maximum height

c) On the way down

d) Never while it is in the air