

Physics Chapter 9 and 10 Test Review

1. Internal Energy is the energy of a substance due to the Random motion of its component particles and equal to the TOTAL ENERGY of those particles. (4 Points)
2. Match the terms with their definitions: (3 Points)

A. Rotational	<u>C</u>	Small fast movements, back in forth
B. Translational	<u>B</u>	Forward or Backward movement
C. Vibrational	<u>A</u>	Spinning Motion
3. Define thermal equilibrium. (1 Point) heat is equal
4. Define expansion and contraction and give an example (3 Points)

↓ HOT
↓ COLD
↓ MARBLE
5. List and describe the 5 Phase changes

Melt - S to L
Freeze - L to S
EVAPORATE - L to G

SUBLIMATION - S to G
CONDENSATION - G to L
6. Match the terms with their definitions. (3 Points)

A. Conduction	<u>C</u>	The process by which energy is transferred by heat through a fluid, such as air.
B. Radiation	<u>B</u>	The process by which energy is transferred by the sun.
C. Convection	<u>A</u>	The process by which energy is transferred by heat through direct contact with another material between two points of different temperatures.
7. A thermodynamic process during which work is done but no energy is transferred as heat is called an Adiabatic process. (1 Point)
8. Entropy is the measure of a system's disorder. (1 Point)
9. When the system's temperature remains constant and the internal energy does not change when energy is transferred to or from the system as heat or work it is called an isothermal process. (1 Point)
10. When a gas undergoes a change in temperature but no change in volume, no work is done. This is an isovolumetric process. (1 Point)
11. Define the 1st and 2nd laws of thermodynamics. (4 Points)

1st - Conservation
2nd - Nothing is 100% efficient
12. A thermodynamic process in which a system returns to the same conditions under which it started is called a cyclic process. (1 Point)
13. What is ultimate "heat death" of the universe? (4 Points)

1.) thermal Equilibrium
2.) No heat
3.) We all die
14. Five Steps of a heat engine (5 points)

1.) Spark plug
2.) Gas ignites
3.) creates pressure
4.) moves piston
5.) moves crankshaft
15. What is the specific heat of a cup of coffee if it had heat energy of 14 Joules, mass of 16 kg, initial temperature of 34 degrees C and final temperature of 95 degrees C? (11 Points)

Specific heat = heat energy / (m * (Tf - Ti))

$$sh = \frac{14}{(16 \cdot (95 - 34))} = 0.014 \frac{J}{kg \cdot C}$$

16. A .64 kg cup has an initial temperature of 23.4 degrees Celsius when it is submerged in 9 kg of water with an initial temperature of 22 degrees Celsius. What is the cup's specific heat capacity if the final temperature is 26 degrees Celsius? Specific heat of water = 4186 J/kg x C. (11 Points)

Specific heat water * mass water * (Tf-Ti) of water = Specific heat cup * mass cup * (Tf-Ti) of cup

$$4186 \cdot 9 \cdot (26 - 22) = Sh \cdot .64 \cdot (26 - 23.4)$$

$$150696 = Sh \cdot 1.664$$

$$Sh = 90562.5 \frac{J}{kg \cdot C}$$

17. The temperature in England was 45 degrees Celsius. What is this temperature in Fahrenheit? (11 Points)

$$T_f = (9/5 \cdot T_c) + 32$$

$$T_f = ((9/5) \cdot 45) + 32$$

$$113^{\circ}F$$

18. The temperature recently has been 15 degrees Fahrenheit. Express this temperature in both Celsius and Kelvin. (11 Points)

$$T_c = 5/9 (T_f - 32) \quad T_k = T_c + 273$$

$$T_c = ((5/9) \cdot (15 - 32)) = -9.4^{\circ}C + 273 = 263.6K$$

19. A ball thrown into the air has a mass of .05 kg, is thrown to a height of 90 m, and has a velocity of 2.4 m/s. How much internal energy does the ball possess at the top of it's path? (11 Points)

$$m \cdot g \cdot h + .5 \cdot m \cdot v^2 + \text{internal energy} = 0$$

$$(.05 \cdot -9.8 \cdot 90) + (.5 \cdot .05 \cdot 2.4^2) + E = 0 \quad -43.8 + E = 0 \quad E = 43.8J$$

20. A basketball has a pressure of 9.5×10^5 Pa. If the ball has a starting volume of $1.5 \times 10^{-4} m^3$ and increases the volume to $5.6 \times 10^{-4} m^3$, how much work is done by the ball on the surrounding air? (11 Points)

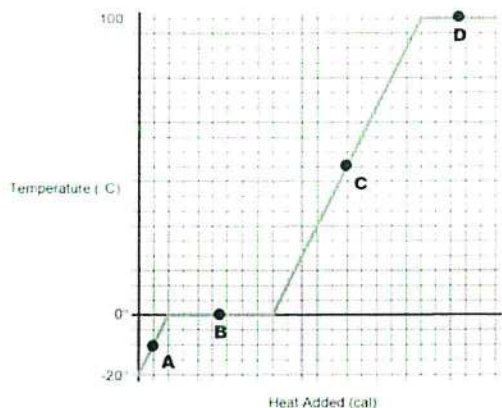
$$\text{Work} = \text{pressure} \times (V_f - V_i)$$

$$W = 9.5 \times 10^5 \cdot (5.6 \times 10^{-4} - 1.5 \times 10^{-4})$$

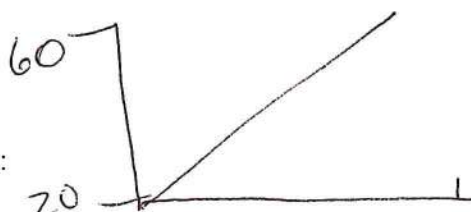
$$389.5 N \cdot m$$

21.

Ice is heated in a pot until it turns into steam. Identify ALL the points on the graph that represent a change of state (phase change)



B + D



22. What would the graph look like for the following:

Water is taken from the tap and measured at 20°C, placed on a hot plate, and then heated uniformly to 60°C over a period of 4 minutes. Which graph represents the correct data?

23.

A container of water with a mass of 200 grams is heated from 20°C to 70°C. The specific heat of water is 1 cal/g°C. Find the amount of heat added to the water.

☐ 14,000 cal

☐ 4,000 cal

☐ 18,000 cal

☒ 10,000 cal

$$\text{heat} = \text{mass} \cdot sh \cdot (T_f - T_i)$$

$$\text{heat} = 200 \cdot 1 \cdot (70 - 20)$$