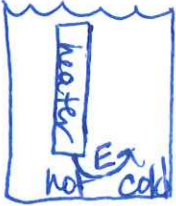


correct x 3.3

Unit 8 Thermodynamics Comprehensive Quiz

Name _____ Period _____ Date _____

1. Select the correct explanation for what happens to the water molecules of an aquarium when an aquarium heater is placed into a small aquarium while the heater is hot.



$\uparrow T = \uparrow \text{movement} = \uparrow v$

"heat em up = speed em up"

- a. The water molecules and the heater's molecules increase in velocity.
- b. The water molecules and the heater's molecules decrease in velocity.
- c. The water molecules increase in velocity and the heater's molecules decrease in velocity.
- d. The water molecules decrease in velocity and the heater's molecules increase in velocity.

2. In some countries, hot water supply is not available. People must boil a small portion of water and add it to a larger cold bath to create a comfortable temperature bath. If someone adds 8L of 100°C water that was heated on a stove to 100L of 25°C in a tub, what is the final temperature of the bath?

53%
 100°C / 8L / not loose E
 25°C / 100L / cold gain E
 - mix + equilibrium
 $T_{fn} = T_{fc} = T_f$

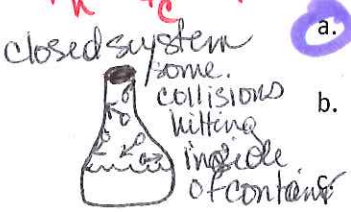
- a. 18.5°C
- b. 29.6°C
- c. 69.4°C
- d. 76.5°C

$-Q_{hot} = +Q_{cold}$
 $-m_h c_p \Delta T_h = m_c c_c \Delta T_c$
 $-V_h \rho_w (T_f - T_i)_h = V_c \rho_w (T_f - T_i)_c$
 $-8(T_f - 100) = 100(T_f - 25)$
 $-8T_f + 800 = 100T_f - 2500$
 $+8T_f + 2500 = 100T_f - 2500$
 $3300 = 92T_f$
 $T_f = 35.87$

$D = \frac{m}{V}$
 density H₂O
 $1 = \frac{m}{V}$
 $V = m$

3. Gas was collected in a sealed flask for a lab. The flask was accidentally left on a hot plate. Why did it explode?

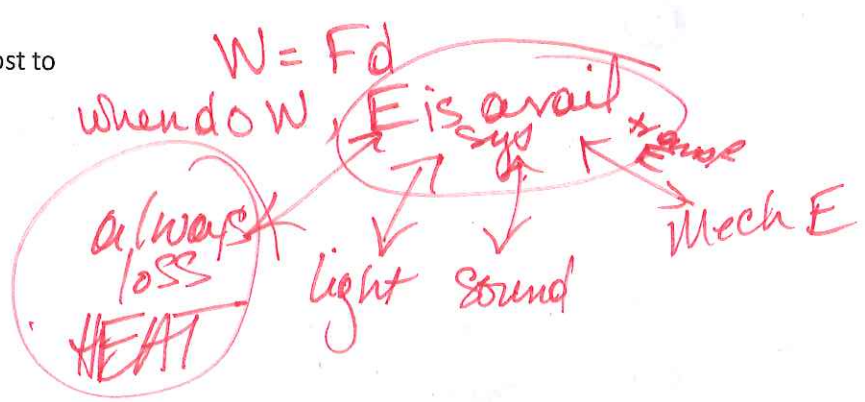
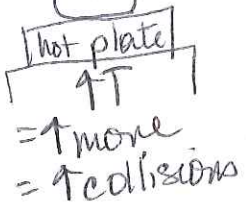
- a. As the temperature increased the number and velocity of the collisions with the inside of the container increased
 - b. The increases in kinetic energy caused the specific heat to increase resulting in a higher temperature.
- The temperature increase the mass of the particles causing them to hit the flask with a greater force.
 The increase in kinetic energy forced the molecules through the container



too many collisions → break out of closed system

4. When work is done some is lost to

- a. Specific heat
- b. Heat
- c. Change in mass
- d. cold





5. A person jumping into a tub of cold water of equal mass can drastically change the temperature of the person while only changing the temperature of water by a much smaller amount. Which statement accurately describes this phenomenon?

$T_{\text{person}} = \text{big}$
 $\text{little resistance to } \Delta T$
 $= \text{low } C$

$T_{\text{water}} = \text{small}$
 $\text{large resistance to } \Delta T$
 $= \text{high } C$

- a. Both the person and the water have similar low specific heat capacities
- b. People have a high specific heat capacity while water has a low specific heat capacity
- c. Water has a high specific heat capacity while people have a low specific heat capacity
- d. Both the person and water have similar high specific heat capacities.

92%
 what?

6. a.
 7. 3.7 kg of water absorbed how much heat in order to raise the temperature from 12.0°C to 56°C if the specific heat of water is $4,184\text{ J/g}^\circ\text{C}$

- a. 4,255 J
- b. 681,155 J
- c. 1,052,694 J
- d. 10,403,097 J

$Q = m C \Delta T$
 $Q = 3.7(4,184)(56-12)$
 $Q = 3.7(4,184) 44$

48%
 NOT OK!

8. The measure of the kinetic energy of a substance is its ____.

- a. heat
- b. Entropy
- c. Specific heat
- d. Temperature

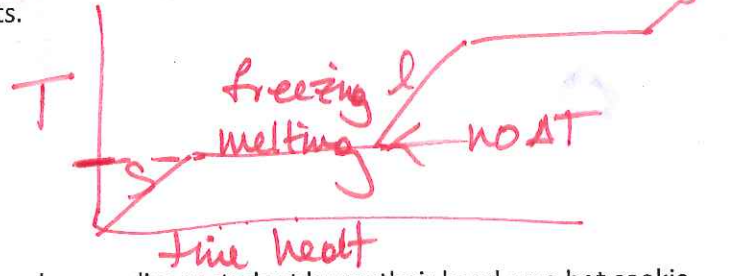
$T = \text{ave KE}$



9. Describe the change as a solid melts.

- a. ~~Decrease in temperature~~
- b. ~~Increase in temperature~~
- c. increase in entropy
- d. ~~increase in specific heat~~

51%



10. What is the main transfer of energy when a culinary student burns their hand on a hot cookie sheet that is cooling on the counter?

- a. Conduction
- b. Convection
- c. Radiation
- d. Specific heat

lowest $v = \text{biggest } m$
 fastest $v = \text{smallest } m$

11. What molecule has the slowest average speed?

52%

$KE = \frac{1}{2} m v^2$
 same T same KE
 $\uparrow \downarrow$
 $\downarrow \uparrow$

Gas	Molar mass	Temperature
Ammonia	17.02	20°C
Argon	39.948	20°C

Smallest mass = fastest velocity

largest mass = slowest velocity

Benzene	78.114	20°C
n Butane	58.124	20°C

- a. Ammonia
- b. Argon
- c. Benzene**
- d. n Butane

Same as #5 opps

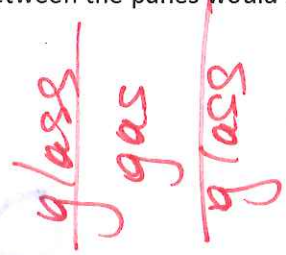
12. A person jumping into a tub of cold water of equal mass can drastically change the temperature of the person while only changing the temperature of water by a much smaller amount. Which statement accurately describes this phenomenon?

- E Both people and water have similar low specific heat capacities.
- F People have a high specific heat capacity while water has a low specific heat capacity
- G Water has a high specific heat capacity while people have a low specific heat capacity**
- H Both people and water have similar high specific heat capacities.

13. Double-pane windows can be used to prevent heat from being transferred between the inside of a house and the outside. Which trapped substance between the panes would best prevent heat transfer through the window?

66

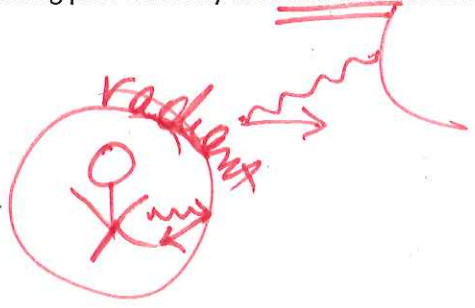
- a. A gas with a high specific heat**
- b. A gas with a low specific heat
- c. A liquid with a high specific heat
- d. A liquid with a low specific heat



14. Survival blankets are used to prevent heat transfer during the severe weather extremes.

What primary method of heat transfer is being prevented by the reflective barrier?

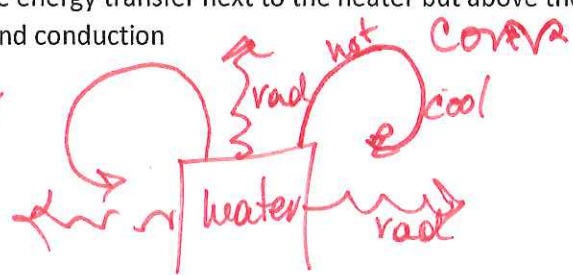
- a. Conduction
- b. Convection
- c. Entropy
- d. radiation**



15. Why is more heat generated above a room heater than next to it.

- a. convection describes the energy transfer next to the heater but above the heater is described by radiation and convection
- b. conduction describes the energy transfer next to the heater but above the heater is described by radiation and conduction

top = rad + conv
side = rad only



- c. Radiation describes the energy transfer next to the heater but above the heater is described by radiation and conduction
- d. Radiation describes the energy transfer next to the heater but above the heater is described by radiation and convection

16. What has the least entropy

- a. 100g of ice at -30°C
- b. 100g of ice at 0°C
- c. 100g of liquid water at 30°C
- d. 100g of water vapor at 1300°C

Entropy = measure of disorder
 ↑ chaos = ↑ Ent = gas = ↑ T ↓ P
 ↑ organized = ↓ Ent = solid = ↓ T ↑ P
 Caused by
 ↑ T
 ↑ space btwn molecules

17. A book is slid across a 0.15m table with 13N of force. With no change of mechanical energy, how much heat is produced?

- a. .01 J
- b. 1.95 J
- c. 13.15 J
- d. 86.7 J

$W = Fd$
 when work is done, E is available
 $W = \Delta E$
 $\Delta E = W = Fd = (13)(0.15)$

Use the Phase Diagram for the following questions

18. What letter represents the triple point

- A B C D E

19. What letter represents highest entropy

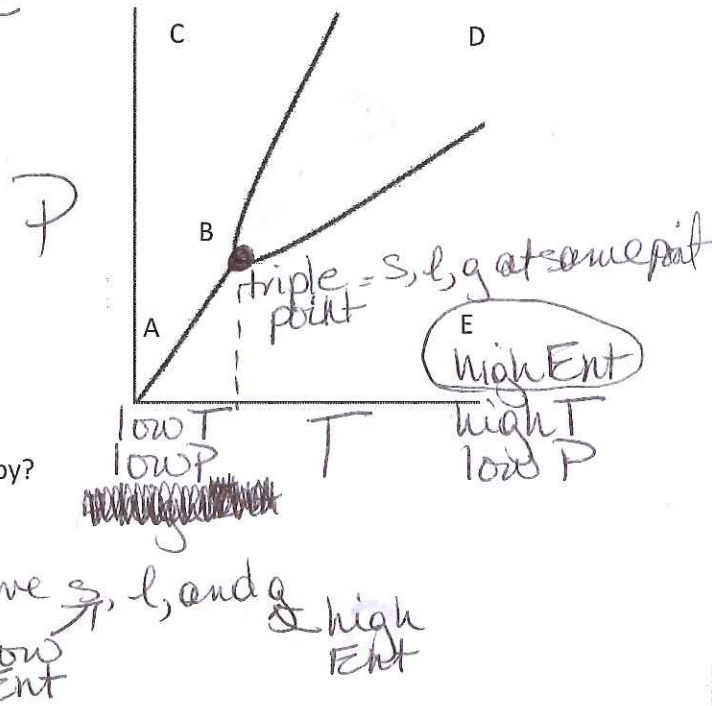
- A B C D E

20. What letter represents the lowest entropy

- A B C D E

21. What is the relationship of the triple point and entropy?

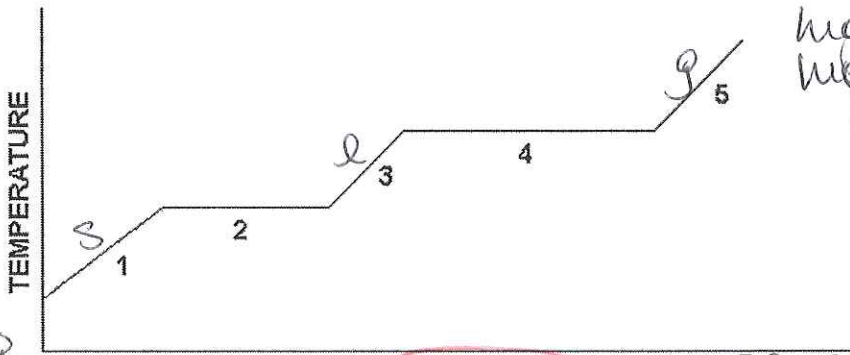
- a. Same temperature same entropies
- b. Different temperature different entropies
- c. Same temperature different entropies
- d. Different temperature same entropies



Use the Heating Curve for the following questions

Entropy = measure of disorder due to
 ↑ moving due to ↑ T
 ↑ space between molecules due to s → l → g more space ↑ Ent

organized tight packed solid
 doesn't melt = same mass
 ↑ gas = ↑ Ent ↑ Ent
 must have loss due to heat
 can be any trans Mechanical, electrical, etc



low Ent
low velocity

highest Ent
highest velocity

HEATING TIME

gas
high T, high low P
not on graph
so don't worry
about here

22. Which number represents the highest entropy?

- a. 1 b. 2 c. 3 d. 4 e. 5

23. Which number represents the lowest entropy?

- a. 1 b. 2 c. 3 d. 4 e. 5

24. Which number represents the highest velocity?

- a. 1 b. 2 c. 3 d. 4 e. 5

25. Which number represents the lowest velocity?

- a. 1 b. 2 c. 3 d. 4 e. 5

26. Which phase change involves the least amount of energy?

- a. 1 b. 2 c. 3 d. 4 e. 5

27. Which number represents the solid?

- a. 1 b. 2 c. 3 d. 4 e. 5

28. Which number represents the gas?

- a. 1 b. 2 c. 3 d. 4 e. 5

29. Which number represents the greatest amount of heat?

- a. 1 b. 2 c. 3 d. 4 e. 5

30. Which number represents the least amount of heat?

- a. 1 b. 2 c. 3 d. 4 e. 5

45

29

20

least short flat line

long on x axis

short line on x axis

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