

Name \_\_\_\_\_

### Unit 4 Conceptual Questions

**Please circle the best answer- turn in two days before unit exam. Please use a Scantron. Otherwise you will receive a zero!**

1. In physics, heat is defined as
  - a. energy transfer resulting from a temperature difference.
  - b. energy that is contained in an object.
  - c. the energy required to make something hotter or colder.
  - d. how hot or how cold an object is.
  
2. Which of the following processes involves the process of energy transfer called heat:
  - a. The heating of a cup of water in the microwave oven.
  - b. The very rapid compression of a gas.
  - c. The melting of an ice cube in a room.
  - d. The smoke resulting from a high-powered laser that is directed on a wooden block.
  - e. The increase in temperature produced when you rub your hands together.
  
3. Many motorcycles have black exhaust pipes to more effectively transfer heat from the pipes by the process of
  - a. conduction
  - b. convection
  - c. radiation
  - d. None of the above
  
4. In a cold climate, is it more economical to heat a house if the house is kept warm all the time, so it doesn't need to be re-heated?
  - a. yes
  - b. no
  
5. Carbon dioxide tends to cause the atmosphere to heat up, because it absorbs
  - a. infrared radiation
  - b. visible light
  - c. microwave radiation
  - d. x-rays
  
6. The above answer has to do with the fact that free electrons move \_\_\_\_\_, compared to the speed of whole atoms.
  - a. faster
  - b. slower
  
7. Heat is transferred to the Earth from the Sun. The percent of this heat energy which is transferred by the process of **radiation** is
  - a. 0%
  - b. 30%
  - c. 66%
  - d. 100%
  
8. If you notice only one house on a street with no snow on the roof, it is quite likely that the house
  - a. is unoccupied
  - b. is poorly insulated
  - c. is properly insulated
  
9. When a row of dominoes falls over, the effect is similar to the process of heat transfer by
  - a. conduction
  - b. convection
  - c. radiation
  
10. A bucket of water sitting outside can freeze on a clear night, even though the air temperature is above freezing because energy is transferred away from the water by the process of
  - a. condensation
  - b. sublimation
  - c. evaporation
  - d. radiation

11. Condensation of water on the outside of a glass containing a cold drink is a (hint...this is similar to the freezing process)  
a. cooling process      b. warming process      c. neither a cooling nor a warming process
12. When water freezes, thermal energy is  
a. released by the water      b. absorbed by the water  
c. neither absorbed nor released by the water
13. Objects that radiate well are also good reflectors  
a. True      b. False
14. Boiling is a      a. cooling process      b. heating process
15. Compared to Rocklin, at the top of a mountain the boiling temperature is  
a. lowered      b. raised      c. same as Rocklin
16. A pound of hot iron is added to a pound of cold water. The temperature change is greater for the a  
a. iron      b. water
17. Your answer above is true because the specific heat is greater for  
a. water      b. iron      c. is the same for iron and water
18. Which cools faster by radiation...a black body or a white body? \_\_\_\_\_  
a. black body      b. white body
19. The inside of your refrigerator is cooled by the process of  
a. vaporization of the refrigerant      b. condensation of the refrigerant
20. Glass feels cooler than plastic because  
a. the molecules are lighter      b. the molecules are heavier  
c. the molecules have lower velocity      c. glass conducts heat better
21. What is the lowest possible temperature in Kelvin units? \_\_\_\_\_  
a. -273      b. 0      c. 98.6      d. 100
22. Which has the greater amount of thermal energy  
a. a cup of hot water      b. an iceberg at the freezing point of water
23. Consider a process involving an ideal gas in which P, V, and n change but T remains constant. Which of the following mathematical statements is true regarding the process:  
a.  $P_1V_1 = P_2V_2$   
b.  $P_1V_1/n_1 = P_2V_2/n_2$   
c.  $P_1T_1 = P_2T_2$   
d.  $n_1P_1 = n_2P_2$   
e.  $n_1P_1V_1 = n_2P_2V_2$

24. Which of the following statements is a direct application of the Zeroth Law of Thermodynamics?
- Block A has twice the temperature of Block B before they are brought into contact. Upon contact, thermal energy flows from A to B.
  - A sample of gas within a cylinder with a piston is held at constant temperature and pressure while it is allowed to expand. During this process, the gas absorbs heat from its surroundings.
  - The motor of a refrigerator uses electric energy to remove heat from inside the refrigerator and transfer it to the room.
  - A thermometer is calibrated by placing it in an ice water bath within an adiabatic container until the thermometer is in thermal equilibrium with the ice water.
25. In one stage of a reversible process the temperature of an ideal gas remains constant as its volume is decreased. Which of the following statements regarding this situation is true?
- The process is adiabatic
  - Heat flows out of the gas into the surroundings.
  - The pressure of the gas decreases.
  - The gas does positive work on its surroundings.
26. Through a suitable apparatus, or by using suitable electric motor/generator systems, it is possible to construct a machine that continuously takes in 5 units of energy, and puts out 7 units of energy.
- True
  - False
27. A fixed amount of ideal gas expands adiabatically. Which entry in the table below correctly depicts the *sign* of the *work done*, the *change in the internal energy*, and the *heat exchanged* with the environment?
- |    | <i>work done</i> | <i>change in internal energy</i> | <i>heat exchanged</i> |
|----|------------------|----------------------------------|-----------------------|
| a. | positive         | negative                         | zero                  |
| b. | negative         | zero                             | positive              |
| c. | negative         | negative                         | zero                  |
| d. | positive         | positive                         | zero                  |
| e. | negative         | positive                         | zero                  |
28. An *isochoric* process is represented on a *pressure-volume* graph by which one of the following:
- a parabola
  - a hyperbola
  - a vertical line
  - a horizontal line
29. The key limit to the efficiency of a "heat engine" is
- the temperature difference
  - the energy density of the fuel
  - the availability of oxygen
  - the speed of fuel burning
30. A fixed amount of ideal gas undergoes an isochoric process in which its pressure increases. Which entry in the table below correctly depicts the *sign* of the *work done*, the *change in the internal energy*, and the *heat exchanged* with the environment?
- |    | <i>work done</i> | <i>change in internal energy</i> | <i>heat exchanged</i> |
|----|------------------|----------------------------------|-----------------------|
| a. | zero             | negative                         | negative              |
| b. | positive         | zero                             | negative              |
| c. | zero             | negative                         | positive              |
| d. | zero             | positive                         | positive              |
| e. | negative         | positive                         | zero                  |





31. The fact that heat flows spontaneously from hot to cold is
- not always true
  - the First Law of Thermodynamics
  - the Second Law of Thermodynamics
  - only true for isothermal processes
32. Area on a P-V diagram has units associated with
- Work
  - momentum
  - temperature
  - change in temperature
33. A thermodynamic system contains  $5.0 \text{ m}^3$  of air whose pressure and temperature are 300 kPa,  $127^\circ\text{C}$  respectively. The weight of the air is:
- 93N
  - 127N
  - 192N
  - 256N
34. Which of the reversible processes listed below are used to form a Carnot cycle?
- Isometric, isobaric
  - Isometric, adiabatic
  - Isobaric, adiabatic
  - Isothermal, adiabatic
35. Which of the following mathematical expressions states Boyle's Law (let  $k=\text{constant}$ )?
- $V=kn$
  - $V=kT$
  - $V=k/P$
  - $V=nT$
  - $V=n/PT$
36. Which of the following is not a state function
- pressure
  - volume
  - heat
  - temperature
  - entropy
37. Consider a ball thrown at an angle  $\theta \neq 90^\circ$  (measured from the horizontal) through the air. Which of the following statements is true regarding the thrown ball?
- Its acceleration is negative on the way up and positive on the way down.
  - The magnitude of its velocity is never zero during its entire flight.
  - The magnitude of the velocity vector is zero at its maximum height.
  - Its acceleration is zero at its maximum height.
38. Two objects are fired from separate launchers with an initial velocity of 30m/s. One object is fired at 15 degrees while the other is fired at 75 degrees. The final vertical position of both objects is exactly the same as their initial vertical positions. The following quantities are measured for both objects.

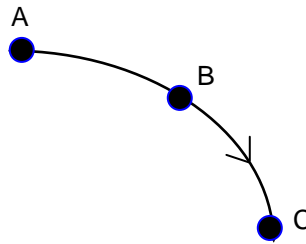
I. Range                      II. Time of flight                      III. Final speed

The results will show that the objects have the same

- I
- II
- I and II
- I and III
- I, III, and III

39. An object is thrown such that it follows the path shown below. The direction of the acceleration vector at point B is

- a. 
- b. 
- c. 
- d. 



40. A ball is thrown off a cliff. To determine the range and maximum height above the cliff, the minimum amount of information needed to solve the problem is

- a. the initial speed and cliff height.
- b. the maximum height above the cliff and the cliff height.
- c. the initial speed, launch angle, and cliff height.
- d. the initial speed, launch angle, time of flight, and cliff height.
- e. the initial speed, launch angle, time of flight, speed when it hits the ground, and cliff height.