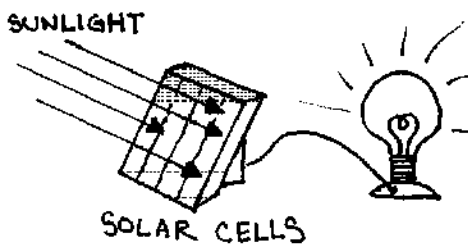


- What basic form of energy is present in radioactive substances.
A) nuclear B) chemical
C) mechanical D) electrical
- What basic form of energy is present in a blowing wind?
A) nuclear B) chemical
C) mechanical D) electrical
- What kind of energy is stored in natural gas?
A) chemical B) nuclear
C) mechanical D) heat
- In a battery, the energy is usually stored in the form of
A) mechanical energy. B) nuclear energy.
C) chemical energy. D) heat energy.
- Energy associated with the motion of molecules is an example of
A) electrical energy. B) nuclear energy.
C) heat energy. D) chemical energy.
- Which pair of units measures the same quantity?
A) kilogram and kilocalorie
B) kilocalorie and degree
C) joule and kilocalorie
D) degree and joule
- Solar cells can capture energy from our Sun and transfer this energy for many practical purposes.



List in the correct order the energy exchanges shown by the diagram above.

- Light → Electrical → Light
- Light → Mechanical → Light
- Electrical → Mechanical → Light
- Light → Electrical → Mechanical

- When oil is burned to produce electricity, the electrical energy produced is less than the potential energy in the oil. Which best explains this observation?
A) As oil is heated, some of the molecules move so fast that they are destroyed.
B) Some of the energy in oil is destroyed by the intense heat required to release its potential energy.
C) Some of the potential energy in oil is converted into forms of energy other than electricity.
D) The amount of potential energy in fuels is overestimated.
- Identify the energy change(s) that take place in the Sun?
A) nuclear to light and heat
B) chemical to light and heat
C) nuclear to chemical
D) chemical to nuclear
- As steam is produced, it can be used to move piston in a train. The mechanical energy is formed from
A) heat energy B) light energy
C) nuclear energy D) electrical energy
- In a cars engine, burning vaporized gas pushes the pistons. The energy transfer in this process is from chemical energy to
A) electrical energy. B) heat energy.
C) mechanical energy. D) magnetic energy.

Base your answers to questions **12** through **14** on the statements in which the italicized word makes some of them incorrect. For each incorrect statement, write the word that would make the statement true. For each correct statement, just write the word "True".

- The energy released by the fission of atoms is known as *electrical* energy. _____
- Friction* changes mechanical energy into heat energy. _____
- In every transfer of energy, the total amount of energy *remains the same*. _____

15. When electrical energy is converted into any other form of energy, the total amount of energy

- A) increases.
- B) decreases.
- C) remains the same.
- D) cannot be determined.

16. A hydroelectric plant produces electrical energy from

- A) nuclear energy. B) chemical energy.
- C) electrical energy. D) mechanical energy.

17. What energy change occurs when a rock falls off of a cliff?

- A) potential to kinetic
- B) kinetic to potential
- C) chemical to kintetic
- D) potential to chemical

18. Which situation below has the least potential energy?

- A) a spring that is stretched for 1 cm.
- B) a spring that is stretched for 2 cm.
- C) a spring with a heavy weight hung on it
- D) a spring that is not stretched

19. Which particle below has the *greatest* kinetic energy?

- A) a 1 gram particle moving at 50 m/s
- B) a 1 gram particle moving at 100 m/s
- C) a 2 gram particle moving at 50 m/s
- D) a 2 gram particle moving at 100 m/s

20. One factor that determines the kinetic energy of an object is its

- A) direction of motion. B) mass.
- C) volume. D) shape.

21. "Stored" energy is known as

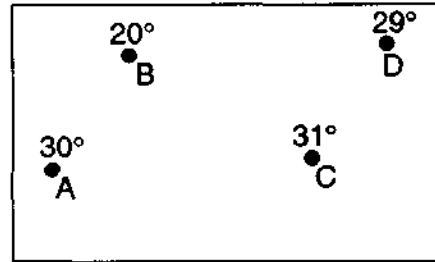
- A) mechanical energy. B) kinetic energy.
- C) nuclear energy. D) potential energy.

22. Base your answer to the following question on whether the following examples have kinetic energy, potential energy, both or neither.

A bowling ball rolling down the lane.

- A) kinetic energy B) potential energy
- C) both D) neither

23. The map below shows four locations in a temperature field. The temperature of each location is given in degrees Celsius.



Heat energy will normally flow from

- A) *A* to *B* B) *A* to *C*
- C) *B* to *D* D) *D* to *C*

24. Two objects, *A* and *B*, are in contact with one another. Initially, the temperature of *A* is 300 K and the temperature of *B* is 400 K. Which diagram best represents the net flow of heat in the closed system? [Arrows represent the direction of heat flow.]

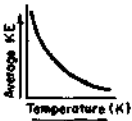
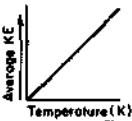
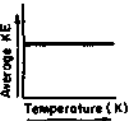
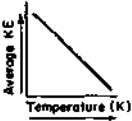
- A) B)
- C) D)

25. When 100 grams of copper at 100°C is placed into 100 grams of water at 0°C, the heat will flow from the copper to the water. The direction of the heat energy transfer is determined by the

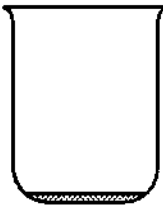
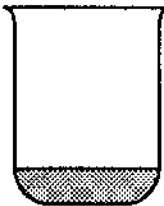
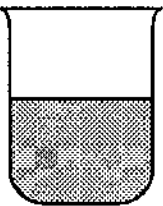
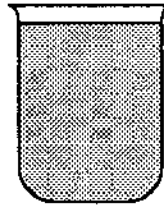
- A) temperature of the copper and the water
- B) mass of the copper and the water
- C) heat of fusion of the copper
- D) specific heat of the water

26. The direction in which heat will flow between two bodies depends on their

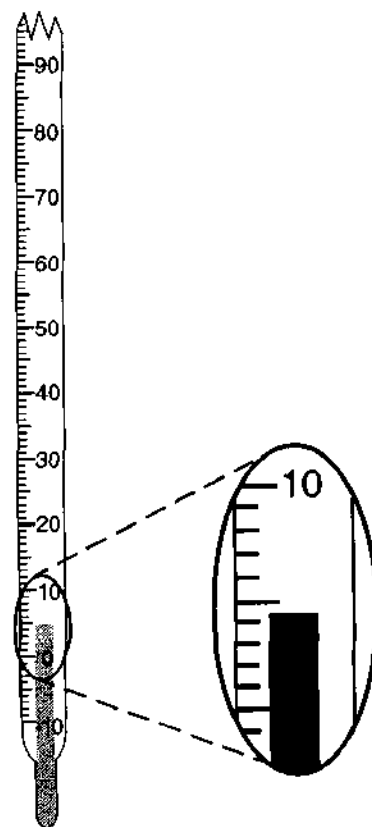
- A) temperature B) total internal energy
- C) specific heat D) potential energy

27. Which statement best describes the major heat flow associated with an iceberg as it drifts south from the Arctic Ocean into warmer water?
- Heat flows from the water into the ice.
 - Heat flows from the ice into the water.
 - A state of equilibrium exists, with neither ice nor water gaining or losing energy.
 - Heat flows equally from the ice and the water into the surrounding air.
28. Which statement best describes the pattern of energy flow in a closed system?
- Energy flows out of the system.
 - Energy flow is cyclical, so that equilibrium is never reached.
 - Energy flows from energy sinks to energy sources.
 - Energy flows from energy sources to energy sinks.
29. As a lake's water temperature decreases on a cloudy night, what occurs at the boundary between the lake's surface and the air above the lake?
- Energy given up by the lake is lost directly to outer space.
 - More energy is gained by the lake than is gained by the air.
 - The temperature of the air remains constant.
 - Energy is gained by the air from the lake.
30. Which graph best shows the relationship between the average kinetic energy (KE) of a gas sample and its absolute temperature (K)?
- 
 - 
 - 
 - 
31. The average kinetic energies of the molecules in two gas samples could best be compared by measuring their
- temperatures
 - volumes
 - pressures
 - densities

32. In which beaker would the particles have the highest average kinetic energy?

<p>A)</p>  <p>10 milliliters 0.1 M HCl at 20°C</p>	<p>B)</p>  <p>50 milliliters 0.1 M HCl at 10°C</p>
<p>C)</p>  <p>200 milliliters 0.1 M HCl at 30°C</p>	<p>D)</p>  <p>400 milliliters 0.1 M HCl at 15°C</p>

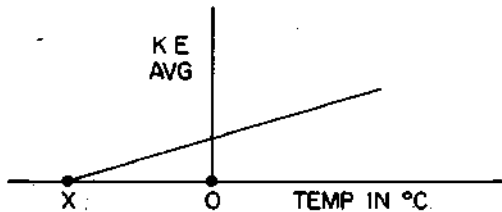
33. The diagram below represents a Celsius thermometer recording a certain temperature.



What is the correct reading of the thermometer?

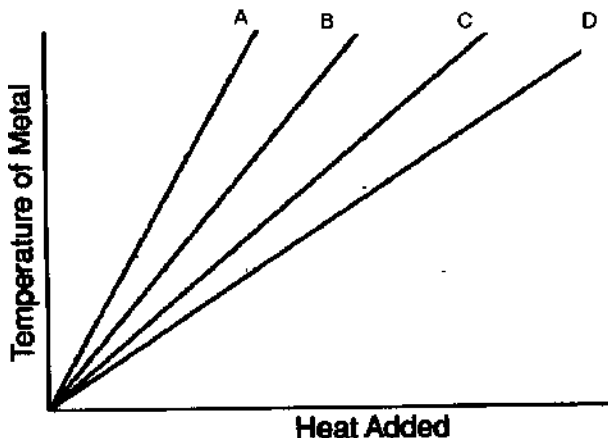
- A) 5°C B) 4.3°C C) 0.3°C D) 4°C

34. The graph below represents the relationship between the temperature of a gas and the average kinetic energy (KE) of the molecules of the gas.



The temperature represented at point *X* is approximately

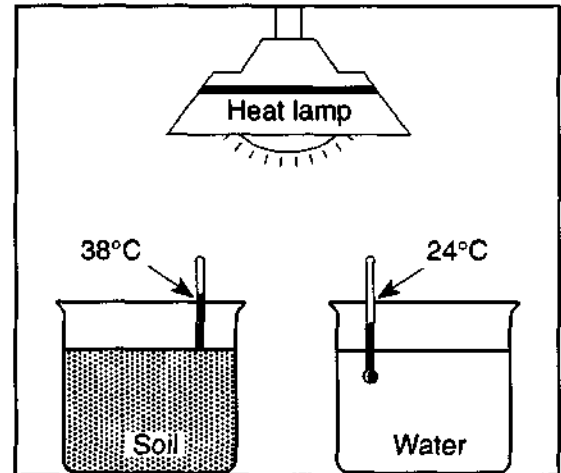
- A) 273°C B) 0°C
C) -273°C D) -373°C
35. On the graph below, the four lines show the relationship between temperature and heat added to equal masses of different metals.



Which metal has the highest specific heat?

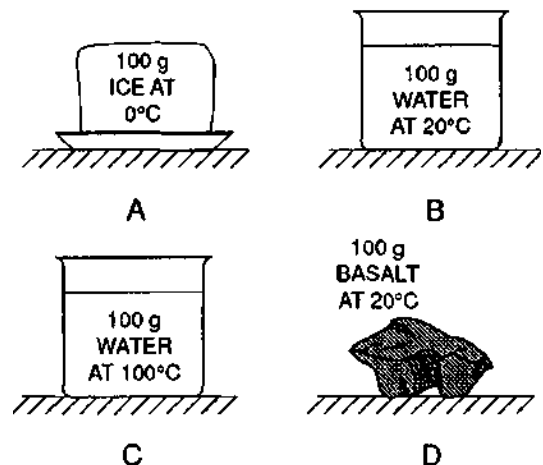
- A) *A* B) *B* C) *C* D) *D*

36. Base your answer to the following question on the diagram below. Soil and water were heated for 10 minutes from a starting temperature of 20°C .



What were the rates of heating for the soil and water?

- A) soil: $1.8^{\circ}\text{C}/\text{min}$; water: $0.4^{\circ}\text{C}/\text{min}$
B) soil: $9^{\circ}\text{C}/\text{min}$; water: $2^{\circ}\text{C}/\text{min}$
C) soil: $20^{\circ}\text{C}/\text{min}$; water: $20^{\circ}\text{C}/\text{min}$
D) soil: $38^{\circ}\text{C}/\text{min}$; water: $24^{\circ}\text{C}/\text{min}$
37. Base your answer to the following question on the diagrams below. The diagrams represent equal masses of ice, water, and basalt under standard atmospheric pressure conditions and at the temperatures shown.



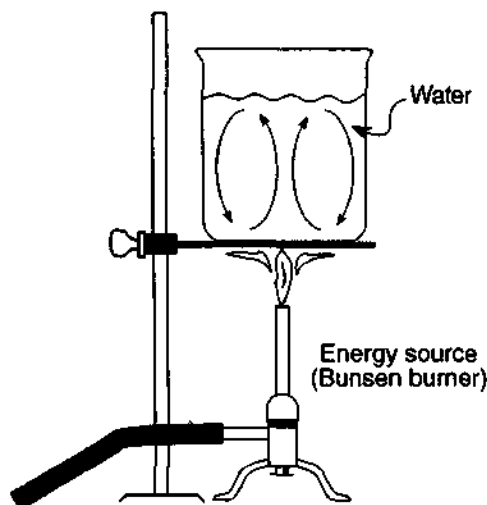
The ice was heated until it was completely melted, and the 100°C water was heated until it was completely vaporized. Compared with the amount of heat needed to vaporize the water, the amount of heat needed to melt the ice was

- A) less B) greater
C) the same
38. Which substance has the highest specific heat?
- A) iron B) water
C) lead D) granite

39. Conduction is the transfer of heat energy by

- A) density differences
- B) molecular contact
- C) electromagnetic waves
- D) movement through a vacuum

40. The diagram below shows the heating of water.



The main method of heat transfer occurring within the water is called

- A) conduction
- B) convection
- C) radiation
- D) insolation

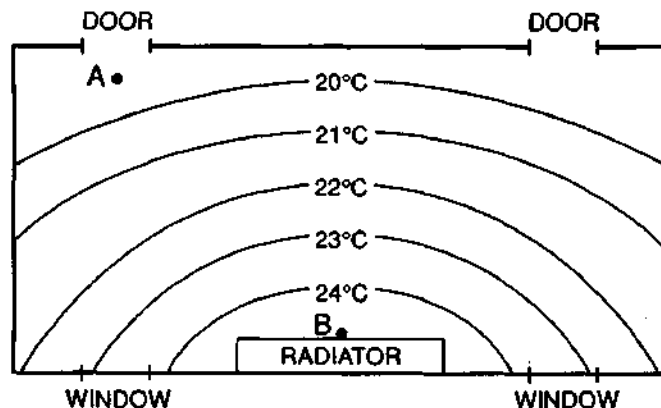
41. All objects warmer than 0 Kelvin (absolute zero) must be

- A) Radiating electromagnetic energy
- B) condensing to form a gas
- C) warmer than 0° Celsius
- D) expanding in size

42. Changing the shingles on the roof of a house to a lighter color will most likely reduce the amount of solar energy that is

- A) scattered
- B) absorbed
- C) reflected
- D) refracted

43. The diagram below shows the isothermal pattern obtained at a height of 1 meter above the floor in a classroom during a temperature study in November.



Which conclusion is best supported by this diagram?

- A) A heat source is located at A.
- B) A heat sink is located at B.
- C) Room temperature at the floor and at the ceiling can be determined.
- D) The isotherms indicate the temperatures at only one level in the room.

44. Which change is exothermic?

- A) freezing of water
- B) melting of iron
- C) vaporization of ethanol
- D) sublimation of iodine

45. Which is an example of a phase change?

- A) heating an iron bar
- B) ice melting
- C) mixing salt and sugar
- D) painting a wagon

46. Dry ice changes from a solid phase to a gas phase without becoming a liquid. This process is known as

- A) sublimation
- B) evaporation
- C) condensation
- D) diffusion

47. As pressure on a sample of water decreases, the boiling point of the water will

- A) decrease
- B) increase
- C) remain the same

48. As the pressure is increased on a piece of ice, the melting point of the ice

- A) decreases
- B) increases
- C) remains the same

49. As water evaporates from a surface, the temperature of the surface

- A) decreases B) increases
- C) remains the same

50. As water is vaporized by boiling, its temperature

- A) decreases B) increases
- C) remains the same

51. The melting point of lead is 328°C. At what temperature will liquid lead solidify?

- A) 6°C B) 228°C
- C) 328°C D) 1,740°C

52. When a block of ice at zero degrees Celsius melts, the ice absorbs energy from its environment. As the ice is melting, the temperature of the remaining portion of the block

- A) decreases B) increases
- C) remains the same

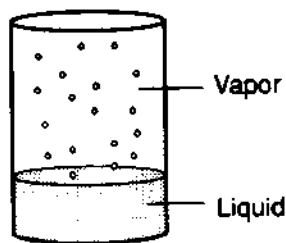
53. Which two temperatures are identical for the same substance?

- A) melting point, freezing point
- B) melting point, boiling point
- C) freezing point, boiling point
- D) freezing point, condensation point

54. As the atmospheric pressure increases, the temperature at which water boils in an open vessel

- A) decreases B) increases
- C) remains the same

55. A closed system is shown in the diagram below.



The rate of vapor formation at equilibrium is

- A) less than the rate of liquid formation
- B) greater than the rate of liquid formation
- C) equal to the rate of liquid formation

56. A student obtained the following data while cooling a substance. The substance was originally in the liquid phase at a temperature below its boiling point.

Time (minutes)	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
Temperature (°C)	70.	63	57	54	53	53	53	53	53	52	51	48

What is the freezing point of the substance?

- A) 70.°C B) 59°C C) 53°C D) 48°C

Base your answers to questions 57 through 59 on the data table below which shows the melting and boiling points of common substances.

Substance	Melting Point (°C)	Boiling Point (°C)
Water	0	100
Alcohol	-117	78
Nitrogen	-210	-196
Oxygen	-218	-183

57. Because alcohol freezes and boils at lower temperatures than water, mixing alcohol and water could be a useful application for a

- A) clean and inexpensive alternative to gasoline.
- B) a better battery acid
- C) better radiator coolant in cars during the summertime.
- D) better windshield-washer fluid in cars during the wintertime.

58. As each substance in the table is cooled down, the atoms and molecules undergo a

- A) physical change as they move faster.
- B) physical change as they move slower.
- C) chemical change as they move faster.
- D) chemical change as they move slower.

59. In order to change water from a solid to a liquid, energy must be

- A) removed. B) created.
- C) added. D) destroyed.

60. Which process releases energy?

- A) a gas condensing to a liquid
- B) a solid changing to a liquid
- C) an evaporating liquid
- D) a gas being heated

61. Which change absorbs energy?

- A) water \rightarrow ice B) ice \rightarrow water
C) steam \rightarrow water D) steam \rightarrow ice

62. During which change is energy absorbed?

- A) the melting of ice
B) the cooling of ice
C) the freezing of water
D) the condensation of water

63. Water loses energy when it changes phase from

- A) liquid to solid B) solid to liquid
C) liquid to gas D) solid to gas

64. A push or pull on an object is the definition for

- A) gravity. B) energy.
C) a force. D) motion.

65. A block is being pulled across the floor. Which of the following forces would create the least amount of friction?

