Name: _____   **Date:** _____

1. What is the total number of calories of heat energy absorbed by 15 grams of water when it is heated from 30°C to 40°C

    A. 10   B. 15   C. 25   D. 150

2. A 10-gram sample of water would lose the greatest amount of heat when its temperature is changed from 50°C to

    A. 10°C   B. 20°C   C. 30°C   D. 40°C

3. How many calories of heat are absorbed when 50 grams of water at 100°C are completely vaporized? (Heat of vaporization = 540 cal/g)

    A. 590   B. 5400   C. 27000   D. 54000

4. When 20 calories of heat is added to 2.0 grams of water at 15°C the temperature of the water increases to

    A. 5.0°C   B. 15°C   C. 25°C   D. 50°C

5. When a 3.0-gram sample of water at 20°C absorbs 12 calories of heat, the final temperature of the sample is

    A. 9.0°C   B. 16°C   C. 24°C   D. 60°C

6. How many calories are equivalent to 35 kilocalories?

    A. 0.035 calorie   B. 0.35 calorie

    C. 3,500 calories   D. 35,000 calories

7. The number of calories needed to raise the temperature of 10 grams of water from 20°C to 30°C is

    A. 10   B. 20   C. 100   D. 40

8. When a quantity of electricity is converted to heat, the heat energy produced is measured in

    A. volts   B. amperes

    C. calories   D. degrees

9. How many calories of heat are required to raise the temperature of 20 grams of water from $30°C$ to $40°C$?

   A. 10 cal   B. 20 cal

   C. 100 cal   D. 200 cal

10. In an experiment using a calorimeter, the following data were obtained:

   Mass of calorimeter + water ...... 150 g
   Mass of calorimeter .... 100 g
   Final temperature of water .... $55°C$
   Initial temperature of water .... $25°C$

   What is the total number of calories absorbed by the water?

   A. 1,000   B. 1,500   C. 3,000   D. 4,500

11. How many calories of heat energy are released when 50 grams of water are cooled from $70°C$ to $60°C$?

   A. 10 calories   B. 50 calories

   C. 500 calories   D. 1,000 calories

12. A 5-gram sample of water is heated and the temperature rises from $10°C$ to $15°C$. The total amount of heat energy absorbed by the water is

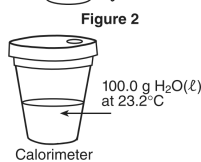   A. 25 cal   B. 20 cal   C. 15 cal   D. 5 cal

13. How many kilocalories of heat are needed to raise the temperature of 500 grams of water from $10.0°C$ to $30.0°C$?

   A. 10.0 kcal   B. 25.0 kcal
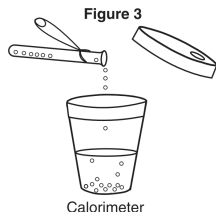
   C. 50.0 kcal   D. 40.0 kcal

14. Base your answer(s) to the following question(s) on the information below.
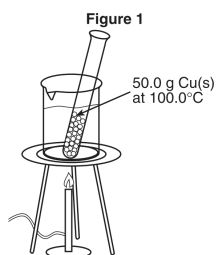
Figure 1
50.0 g Cu(s) at 100.0°C

In a laboratory investigation, a 50.0-gram sample of copper is at 100.0°C in a boiling water bath.

Figure 2
100.0 g H$_2$O(ℓ) at 23.2°C
Calorimeter

A Styrofoam cup with a lid is used as a calorimeter. The cup contains 100.0 grams of distilled water at 23.2°C.

Figure 3
Calorimeter

The hot copper is poured into the cup of water, and the cup is quickly covered with the lid.

Figure 4
Calorimeter

A thermometer is inserted through the lid. The copper and water are gently stirred in the cup. The temperature is checked periodically. The highest temperature noted is 26.3°C.

Using the information given, complete the data table provided below.

Quantity Measured	Data (units are given)
Mass of copper	g
Temperature of hot copper	$°C$
Mass of H$_2$O in calorimeter	g
Initial temperature of H$_2$O in calorimeter	$°C$
Final temperature of H$_2$O and copper	$°C$

15. The temperature of 15 grams of water increased 3.0 Celsius degrees. How much heat was absorbed by the water?

   A. 5.0 calories   B. 12 calories

   C. 18 calories   D. 45 calories

16. What is the total number of grams of ice at $0°C$ that can be changed to water at the same temperature by absorbing 240 calories of heat?

   A. 160 g   B. 80 g   C. 3.0 g   D. 0.33 g

17. The temperature of 100 grams of water changes from $16°C$ to $20°C$. What is the total number of calories of heat energy absorbed by the water?

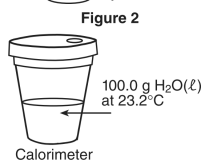   A. 25   B. 40   C. 100   D. 400

18. A sample of water is cooled from $45°C$ to $25°C$ by the removal of 20 calories of heat. What is the mass of the water?

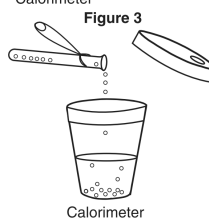   A. 10 g   B. 2.0 g   C. 20 g   D. 200 g

19. Base your answer(s) to the following question(s) on the information below.
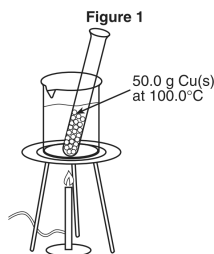
Figure 1

50.0 g Cu(s) at 100.0°C

In a laboratory investigation, a 50.0-gram sample of copper is at $100.0°C$ in a boiling water bath.

A Styrofoam cup with a lid is used as a calorimeter. The cup contains 100.0 grams of distilled water at $23.2°C$.

Figure 2

100.0 g $H_2O(\ell)$ at 23.2°C

Calorimeter

The hot copper is poured into the cup of water, and the cup is quickly covered with the lid.

Figure 3

Calorimeter

A thermometer is inserted through the lid. The copper and water are gently stirred in the cup. The temperature is checked periodically. The highest temperature noted is $26.3°C$.

Figure 4

Calorimeter

In the space provided below, show a correct numerical setup for calculating the number of joules of heat gained by the water.

20. In this investigation, the change in heat of the copper is greater than the change in heat of the water. What error could account for this apparent violation of the Law of Conservation of Energy? Do *not* use human error as part of the answer.

21. How many kilocalories are equivalent to 10 calories?

    A. 0.001 kcal   B. 0.01 kcal

    C. 1000 kcal   D. 10,000 kcal

22. What is the total number of calories of heat energy absorbed when 10.0 grams of water is vaporized at its normal boiling point?

    A. 7.97   B. 53.9   C. 5390   D. 7970

23. What is the maximum number of grams of water at 10°C that can be heated to 30°C by the addition of 40.0 calories of heat?

    A. 1.0 g   B. 2.0 g   C. 20 g   D. 30 g

24. Which quantity of heat does a kilocalorie represent?

    A. 100 calories   B. 1000 calories

    C. $\frac{1}{100}$ calories   D. $\frac{1}{1000}$ calories

25. The energy absorbed when ammonium chloride dissolves in water can be measured in

    A. degrees   B. kilocalories

    C. moles per liter   D. liters per mole

26. The greatest amount of heat energy would be required to raise the temperature of a 1 gram sample of water from

    A. 10°C to 30°C   B. 20°C to 30°C

    C. 30°C to 60°C   D. 40°C to 60°C

27. How many calories of heat energy are absorbed in raising the temperature of 10 grams of water from 5.0°C to 20°C?

    A. 2.5×10^2 B. 2.0×10^2

    C. 1.5×10^2 D. 5.0×10^1

28. How many kilocalories of heat are needed to raise the temperature of 500 grams of water from 15°C to 20°C?
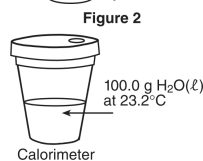
    A. 1.0   B. 2.5   C. 10   D. 25

29. The heat of vaporization for water is 540 calories per gram. What is the minimum number of calories needed to change 40.0 grams of water at $100°C$ to steam at the same temperature and pressure?

    A. 43,200   B. 21,600

    C. 540   D. 40.0

30. What occurs when the temperature of 10.0 grams of water is changed from $15.5°C$ to $14.5°C$?

    A. The water absorbs 10.0 calories.

    B. The water releases 10.0 calories.

    C. The water absorbs 155 calories.

    D. The water releases 145 calories.

31. When 20 grams of water is cooled from $20°C$ to $10°C$, the number of calories of heat released is

    A. 10   B. 20   C. 30   D. 200

32. An 80-gram sample of water at $10°C$ absorbs 400 calories of heat energy. What is the final temperature of the water?

    A. $50°C$ B. $15°C$ C. $5.0°C$ D. $4.0°C$

33. The temperature of a sample of water changes from $10°C$ to $20°C$ when the sample absorbs 418 joules of heat. What is the mass of the sample?

    A. 1 g   B. 10 g

    C. 100 g   D. 1000 g

34. How many kilocalories of heat energy are absorbed when 100 grams of water is heated from $20°C$ to $30°C$?

    A. 1 kcal   B. 10 kcal

    C. 100 kcal   D. 0.1 kcal

35. The heat given off by an acid solution as it is neutralized by a base solution could be measured by using a

    A. eudiometer   B. pH meter

    C. calorimeter   D. colorimeter

36. Base your answer(s) to the following question(s) on the information below.
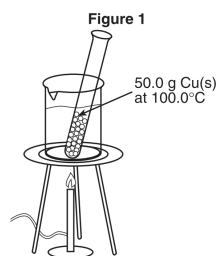
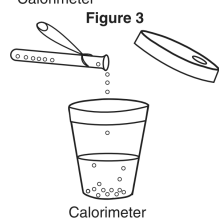**Figure 1**

50.0 g Cu(s) at 100.0°C

In a laboratory investigation, a 50.0-gram sample of copper is at 100.0°C in a boiling water bath.

A Styrofoam cup with a lid is used as a calorimeter. The cup contains 100.0 grams of distilled water at 23.2°C.

Figure 2

100.0 g H₂O(ℓ) at 23.2°C

The hot copper is poured into the cup of water, and the cup is quickly covered with the lid.

Calorimeter

Figure 3

A thermometer is inserted through the lid. The copper and water are gently stirred in the cup. The temperature is checked periodically. The highest temperature noted is 26.3°C.

Calorimeter

Figure 4

Calorimeter

In terms of energy flow, explain why the temperature of the water in the calorimeter increases.

37. Which unit is used to express the amount of energy absorbed or released during a chemical reaction?

   A. degree
   B. torr
   C. gram
   D. calorie

38. As a 1-gram sample of $H_2O(\ell)$ changes to $H_2O(g)$ at $100°C$, the potential energy of the molecules

   A. decreases
   B. increases
   C. remains the same

39. What is the total number of calories of heat absorbed by 65.0 grams of water when the temperature of the waters is raised from $25.0°C$ to $40.0°C$?

   A. 15.0 cal
   B. 25.0 cal
   C. 975 cal
   D. 1630 cal

40. What is the total number of calories of heat that must be absorbed to change the temperature of 100 grams of H_2O from $25°C$ to $30°C$?

   A. 100   B. 500   C. 2,500   D. 3,000

41. How many calories of heat are absorbed when 70.00 grams of water is completely vaporized at its boiling point?

   A. 7,706
   B. 77.06
   C. 3,776
   D. 37,760

42. When a 500-gram sample of water at $19°C$ absorbs 2000 calories of heat, the temperature of the water will change to

A. $23°C$ B. $19°C$ C. $15°C$ D. $4.0°C$

untitled   4/15/2018

1.
Answer: D

2.
Answer: A

3.
Answer: C

4.
Answer: C

5.
Answer: C

6.
Answer: D

7.
Answer: C

8.
Answer: C

9.
Answer: D

10.
Answer: B

11.
Answer: C

12.
Answer: A

13.
Answer: A

14.
Answer:

Data Table

Quantity Measured	Data (units are given)
Mass of copper	50 g
Temperature of hot copper	100°C
Mass of H_2O in calorimeter	100 g
Initial temperature of H_2O in calorimeter	23.2°C
Final temperature of H_2O and copper	26.3°C

15.
Answer: D

16.
Answer: C

17.
Answer: D

18.
Answer: B

19.
Answer: $q = (100.0\,\text{g})(4.18\,\text{J/g} \cdot {}^{\circ}\text{C})(3.1{}^{\circ}\text{C})$
                $(100)(4.18)(26.3 - 23.2)$

20.
Answer: heat lost to surroundings
                heat absorbed by the thermometer
                heat absorbed by the calorimeter

21.
Answer: B

22.
Answer: C

23.
Answer: B

24.
Answer: B

25.
Answer: B

26.
Answer: C

27.
Answer: C

28.
Answer: B

29.
Answer: B

30.
Answer: B

31.
Answer: D

32.
Answer: B

33.
Answer: B

34.
Answer: A

35.
Answer: C

36.
Answer: Heat is transferred from the copper to the
               water.

               Heat flows from the hotter object to the
               cooler object.

               copper heat →water

37.
Answer: D

38.
Answer: B

39.
Answer: C

40.
Answer: B

41.
Answer: D

42.
Answer: A