Energy Transformations 2: Ek, Epg and Q – PRE-TEST PRACTICE

1. Imagine two very small samples of a substance. Sample 1 contains 1000 molecules, with an average kinetic energy of 2.0x10-20J. Sample 2 contains 100 molecules, with an average kinetic energy of 4.0x10-20J

A. Which sample is at a higher temperature? How do you know?

B. Which sample has more thermal energy? How do you know?

C. If the two samples were put into contact would thermal energy flow from sample 1 to sample 2 or from sample 2 to sample 1? How do you know?

2. Which of the following best describes thermal conduction?

A. The flow of thermal energy from a hot object to a cold object as a result of collisions between their molecules.

B. The flow of thermal energy from a cold object to a hot object as a result of collisions between their molecules.

C. The flow of thermal energy from a hot object to a cold object as a result of bulk flow of fluid.

D. The flow of thermal energy from a cold object to a hot object as a result of bulk flow of fluid.

E. The flow of thermal energy from a hot object to a cold object as a result of electromagnetic waves.

F. The flow of thermal energy from a cold object to a hot object as a result of electromagnetic waves.

3. Which of the following best describes thermal convection?

A. The flow of thermal energy from a hot object to a cold object as a result of collisions between their molecules.

B. The flow of thermal energy from a cold object to a hot object as a result of collisions between their molecules.

C. The flow of thermal energy from a hot object to a cold object as a result of bulk flow of fluid.

D. The flow of thermal energy from a cold object to a hot object as a result of bulk flow of fluid.

E. The flow of thermal energy from a hot object to a cold object as a result of electromagnetic waves.

F. The flow of thermal energy from a cold object to a hot object as a result of electromagnetic waves.

4. Which of the following best describes thermal radiation?

A. The flow of thermal energy from a hot object to a cold object as a result of collisions between their molecules.

B. The flow of thermal energy from a cold object to a hot object as a result of collisions between their molecules.

C. The flow of thermal energy from a hot object to a cold object as a result of bulk flow of fluid.

D. The flow of thermal energy from a cold object to a hot object as a result of bulk flow of fluid.

E. The flow of thermal energy from a hot object to a cold object as a result of electromagnetic waves.

F. The flow of thermal energy from a cold object to a hot object as a result of electromagnetic waves.

5. What is the kinetic energy of a 4kg plastic bag of mashed potatoes and black jelly beans travelling at 10m/s?

6. What is the kinetic energy of a 2kg salmon, wearing a belt but no pants, travelling at 8m/s?

7. What is the kinetic energy of a 6kg roast chicken, stuffed with raisins and Doritos, traveling at 4m/s?

8. What is the kinetic energy of an 800kg mass traveling at 0.5m/s?

9. What is the kinetic energy of a 250g mass travelling at 2m/s?

10. How much kinetic energy does a 400g mass have when it has a speed of 13m/s?

11. A 1000kg mas is moving with a speed of 72km/h. Find its kinetic energy.

12. A 74kg person has 148J of kinetic energy, determine their speed.

13. A man’s wallet with thinly sliced, assorted deli meats where the bills should be has a mass of 600g and has 16J of kinetic energy. Find its speed.

14. What is the gravitational potential energy of a 2.0kg mass when it is 5m above the ground?

15. What is the Epg of a 12kg sculpture of Donald Trump, wearing a diaper and holding a hot-dog in one hand and a sombrero in the other hand, resting on a 1.3m high shelf.

16. A 666g stuffed Satan doll is 666m above the ground. Find is gravitational energy.

17. How high would you need to lift a 666g stuffed Satan doll for it to have 666J of gravitational energy?

18. What is the mass of stuffed Satan doll that has 666J of gravitational energy when it is 666cm off of the ground.

19. Complete the table of values for the situation shown below:

A ball is thrown off of a cliff as shown below.





|  |  |  |  |
| --- | --- | --- | --- |
|  | Ek | Epg | ET |
| A | 13J | 27J |  |
| B | 11J |  |  |
| C | 8J |  |  |
| D |  | 21J |  |
| E |  | 4J |  |



20. A 250g ball is thrown off of a cliff as shown below.





|  |  |  |  |
| --- | --- | --- | --- |
|  | Ek | Epg | ET |
| A | 13J | 27J |  |
| B | 11J |  |  |
| C | 8J |  |  |
| D |  | 21J |  |
| E |  | 4J |  |



A. Find the speed of the ball at point C.

B. Find the height of the ball at point D.

C. Find the speed of the ball at point E.

D. Find the height of the ball at point B.

21. 20000J of energy must be added to 2kg of a material to increase its temperature by 50oC. What is the specific heat capacity of the material?

22. 20000J of energy must be added to 2kg of a substance to increase its temperature from 29oC to 79oC. What is the specific heat capacity of this material?

23. Given the following information about water, answer the questions below:

cice =2000J/kgoC Melting Point: 0oC

cwater =4200J/kgoC Boiling Point: 100oC

csteam =2200J/kgoC

Lf =330 000J/kg

Lv =2 300 000J/kg

A. How much energy is needed to raise the temperature of 200g of water from 20oC to 100oC?

B. How much energy is needed to convert 200g of water at 100oC to steam at 100oC?

C. How much energy is needed to raise the temperature of 200g of steam from 100oC to 150oC?

D. How much energy is needed to convert 200g of water at 20oC to steam at 150oC?

24. Given the following information about water, answer the questions below:

cice =2000J/kgoC Melting Point: 0oC

cwater =4200J/kgoC Boiling Point: 100oC

csteam =2200J/kgoC

Lf =330 000J/kg

Lv =2 300 000J/kg

A. How much energy is released as the temperature of 200g of steam decreases from 150oC to 100oC?

B. How much energy is released as 200g of steam at 100oC condenses to water at 100oC?

C. How much energy is released as the temperature of 200g of water decreases from 100oC to 20oC?

D. How much energy is released as 200g of steam at 150oC converts to water at 20oC?

25. Given the following information about ethanol, answer the questions below:

cs =970J/kgoC Melting Point: -114oC

cl =2300J/kgoC Boiling Point: 78oC

cg =1800J/kgoC

Lf =110 000J/kg

Lv =850 000J/kg

A. How much energy must be removed from 1.2kg of ethanol at 20oC to cool it to -30oC?

B. How much energy must be added to 1.2kg of ethanol to increase its temperature from 20oC to 78oC

C. How much energy would need to be removed from 1.2kg of ethanol liquid at -114oC to convert it to solid at -114oC?

D. How much energy would need to be removed from 1.2kg of ethanol gas at 100oC to cool it to a solid at

-120oC?

26. A 60.0g lump of solid aluminum (cAl=900J/kgoC) at 460oC is dropped into 1.5kg of water at 12.4oC. What is the temperature of the water (and aluminum) at equilibrium?

27. A 120.0g lump of solid copper (cCu=390J/kgoC) at 250oC is dropped into 1.4kg of water at 36.3oC. What is the temperature of the water (and copper) at equilibrium?

28. A 29kg lump of solid lead (cPb=130J/kgoC) at 800oC is dropped into 2000L of water at 75oC. What is the temperature of the water (and lead) at equilibrium?

29. A 150kg roller coaster cart rolls from rest down a 9m tall hill. Find the speed at the bottom.

30. A 250kg roller coaster cart rolls from rest down a 9m tall hill. Find the speed at the bottom.

31. A 90kg roller coaster cart rolls from rest down a 9m tall hill. Find the speed at the bottom.

32. A roller coaster cart rolls from rest down a 9m tall hill. Find the speed at the bottom.

Consider the graph shown below:

A

E

D

C

B

Temperature

Energy

33. In which segments is the substance present as a gas?

34. In which segments is the substance present as both a solid AND a liquid?

35. In which segments is this material boiling?

36. In which segments is the temperature increasing?

37. In which segments is the substance a pure solid?

38. What is graeter Lf or Lv?

39. Rank from least to greatest: cs, cl, cg.