

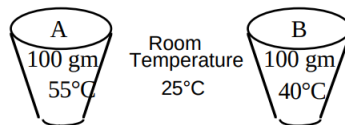
St John Baptist De La Salle Catholic School, Addis Ababa
Grade 11 Physics Final Examination Preparation
3rd Quarter

April, 2024

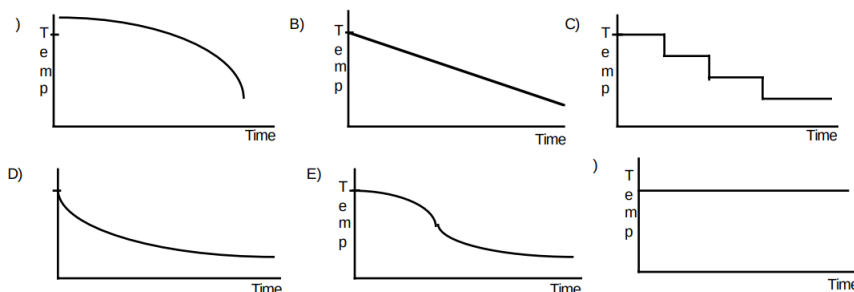
Questions

1. What is the maximum speed of a 2 kg metal ball dropped from a height of 2m?
2. A 3.0-kg and a 2.0-kg cart approach each other on a horizontal air track. They collide and stick together. After the collision their total kinetic energy is 40 J. The speed of their center of mass is:
3. Sphere A has mass m and is moving with velocity v . It makes a head-on elastic collision with a stationary sphere B of mass $2m$. After the collision their speeds (v_A and v_B) are:
4. Assume 2.0 kg of ice at 0°C starts to melt. It absorbs 600 kJ of energy by heat. What is the temperature of the water afterwards?

Questions 5-7 refer to two identical cups, A and B, each containing 100 grams of water. The cups are in a room where the temperature is 25 °C. The water in cup A is initially at 55°C, while that in cup B is initially at 40°C.



- ____5. Initially, which cup will cool down at a faster rate?
A) A will cool faster **B)** B will cool faster **C)** they both will cool at the same rate
D) not enough information is given to determine the answer
- ____6. Which cup will reach its final temperature most quickly?
A) Cup A **B)** Cup B **C)** Both take the same time
D) not enough information is given to determine the answer
- ____7. Which of the following graphs best represents the shape of the graph of the temperature of cup A over time? Answer **H** if you think that none is correct. (Note that the origin does not necessarily represent 0°C)



- Describe the methods of heat transfer and explain their factors, mathematically.
- Does condensation occur on the cooler side of a boundary or the hotter side? Why?
- Why don't we need to do work against gravity while traveling along the surface of the Earth (assuming it is level)? What do we call such surfaces?

8. How are the boiling and melting points of materials generally affected by pressure? How about water?
9. What are phase diagrams? What are the important points/lines on phase diagrams? Define them.
10. What is the temperature at which
 1. the fahrenheit and celcius scales are equal?
 2. the kelvin and celcius scales are equal?
 3. the fahrenheit and kelvin scales are equal?
11. When the temperature of a metal penny is increased by 200 K, its diameter increases by 0.5%. What is the percent with which the area of one of its faces increases by?
12. Samuel takes a can of coke and a plastic bottle of coke from the refrigerator, where they have been overnight. He quickly puts a thermometer in the coke in the can. The temperature is 7°C . What are the most likely temperatures of the plastic bottle and coke it holds?
13. Samuel, again, is boiling water in a saucepan on the stovetop. What do you think is in the bubbles that form in the boiling water?
14. Samuel, again, simultaneously picks up two cartons of chocolate milk, a cold one from the refrigerator and a warm one that has been sitting on the bench-top for some time. Why do you think the carton from the refrigerator feels colder than the one from the bench-top?
15. How does a thermos flask work? Why is it shiny?
16. How can we estimate the surface temperature of stars?
17. What is the LJ potential? What does it model? What do σ and ε represent?
18. At what net rate does heat radiate from a $400 - m^2$ black roof on a night when the roof's temperature is 40.0°C and the surrounding temperature is 20.0°C ? Assume the emissivity of the roof is 0.800.
19. How do thermometers work? State the law of thermodynamics associated with this.
20. What are conservative and non-conservative forces? How do they relate to conservation of energy? Explain using the concepts of conservative forces why Auto rickshaws (aka bajaj, aka tuktuk) travel in a zigzag manner when going uphill.
21. Why is it important to seal the lid of a pot to have it boil faster? What other factors affect the boiling of a material?
22. How much pressure builds up in a cylindrical metal($\alpha = 6 \times 10^{-6}/\text{K}$, $Y = 26 \times 10^8 \text{N}/\text{m}^2$) rod of length 10m when its temperature is increased by 200K? What is the force if the metal has a cross-sectional radius of 40cm? If the compressive strength of the metal is $2 \times 10^7 \text{N}/\text{m}^2$, does the metal break?
23. An 80-g ice cube at its melting point is dropped into an aluminum calorimeter of mass 200g in equilibrium at 20°C with 300.0 g of an unknown liquid. The final temperature is 4.0°C . What is the heat capacity of the liquid?
24. Steam at 390K is left to cool in a room where the air temperature is 20°C . Draw a graph that represents temperature vs time for the temperature of the water.
25. A 100g metal ball traveling at 200m/s encounters an 8 kg block of wood and stick together and move in the original direction of the ball. What is the final common velocity? If the metal ball passes through the wood instead emerging from the other side traveling only at 20m/s in the same initial direction it was going at, what would the final velocity of the wood be? How much momentum is transferred to the wood from the metal?