HW11 - due 6 pm Day 21 (Mon. Aug. 25) (6183276)

Question 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

1. Question Details OSColPhys1 13.P.001.WA. [2611586]

To conserve energy, a certain room's temperature is kept at 68.0°F in the winter and 78.5°F in the summer. What are these temperatures on the Celsius scale?

in the winter ☐ 🔑 20 °C

in the summer ☐ 🔑 25.8 °C

Supporting Materials

Physical Constants

2. Question Details OSColPhys1 13.P.003.WA. [2611646]

(a) At what temperature do the Fahrenheit and Celsius scales have the same numerical value?

☐ 🔑 -40 °

(b) At what temperature do the Fahrenheit and Kelvin scales have the same numerical value?

☐ 🔑 575 °

Supporting Materials

Physical Constants

3. Question Details OSColPhys1 13.P.042.WA. [2611590]

(a) What is the average kinetic energy of hydrogen atoms on the 5500°C surface of the Sun?

☐ 🔑 1.20e-19 J

(b) What is the average kinetic energy of helium atoms in a region of the solar corona where the temperature is 1.90×10^{6} K?

☐ 🔑 3.93e-17 J

Supporting Materials

Physical Constants

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4. Question Details OSColPhys1 13.P.047.WA. [2611568]

There are two important isotopes of uranium — ^{235}U and ^{238}U; these isotopes are nearly identical chemically but have different atomic masses. Only ^{235}U is very useful in nuclear reactors. One of the techniques for separating them (gas diffusion) is based on the different average speeds v_{rms} of uranium hexafluoride gas, UF_6. (Use $k = 1.38 \times 10^{-23}$ J/K for this question.)

(a) The molecular masses for $^{235}UF_6$ and $^{238}UF_6$ are 349.0 g/mol and 352.0 g/mol, respectively. What is the ratio of their average speeds? (Enter your answer to at least 4 decimal places.)

$\frac{v_{235}}{v_{238}} =$ ☐ 🔑 1.00429

(b) At what temperature would their average speeds differ by 1.65 m/s?

☐ 🔑 2090 K

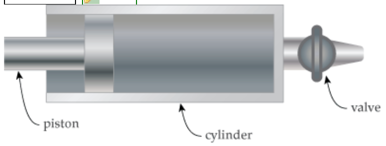
Supporting Materials

Physical Constants

5. Question Details OSColPhys1 13.P.031.Tutorial.WA. [2611951]

A cylinder has a piston at one end that can be moved in or out to change the volume of gas inside. The other end is fitted with a valve. Initially the cylinder contains 2.65 mol of an ideal gas. The piston is now pushed in to decrease the volume of gas to one-third its initial value without causing any change in temperature. In order to keep the pressure constant as well, how many moles of gas need to be released through the valve?

☐ 🔑 1.77 moles



Supporting Materials

Physical Constants

6. Question Details OSColPhys1 13.P.049.Tutorial.WA. [2611976]

There are 1.5 times as many molecules as Avogadro's number at a temperature of 1.5°C inside a sealed cube with dimensions 2.8 cm × 2.8 cm × 2.8 cm. How much force does the gas exert on one of the walls of the cube?

☐ 🔑 1.22e+05 N

Supporting Materials

Physical Constants

7. Question Details OSColPhys1 13.P.022.WA. [2611634]

The initial temperature of three moles of oxygen gas is 25.5°C, and its pressure is 7.80 atm.

(a) What will its final temperature be when heated at constant volume so the pressure is five times its initial value?

1220 °C

(b) Now the volume of the gas is also allowed to change. Determine the final temperature if the gas is heated until the pressure and the volume are quadrupled.

4510 °C

Supporting Materials

Physical Constants

8. Question Details OSColPhys1 13.P.028.WA. [2611776]

A high-pressure gas cylinder contains 90.0 L of toxic gas at a pressure of 2.20×10^7 N/m^2 and a temperature of 25.0°C. Its valve leaks after the cylinder is dropped. The cylinder is cooled to dry ice temperatures (−78.5°C), to reduce the leak rate and pressure so that it can be safely repaired.

(a) What is the final pressure in the tank, assuming a negligible amount of gas leaks while being cooled and that there is no phase change?

1.44e+07 N/m^2

(b) What is the final pressure if one-tenth of the gas escapes?

1.29e+07 N/m^2

(c) To what temperature must the tank be cooled to reduce the pressure to 1.00 atm (assuming the gas does not change phase and that there is no leakage during cooling)?

1.37 K

Supporting Materials

Physical Constants

9. Question Details OSColPhys1 13.P.034.WA. [2611504]

(a) The temperature of a gas increases from 23.5 K to 69.5 K while its volume remains constant. What is the new pressure? Give your answer as a multiple of the initial pressure P_1.

2.96 P_1

(b) The temperature of a gas increases from 23.5°C to 69.5°C while its volume remains constant. What is the new pressure? Give your answer as a multiple of the initial pressure P_1.

1.16 P_1

Supporting Materials

Physical Constants

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10. Question Details OSColPhys1 14.P.001.WA. [2611558]

The same amount of heat entering identical masses of different substances produces different temperature changes. Calculate the final temperature when 1.25 kcal of heat enters 1.43 kg of the following, originally at 29.2°C. The specific heat capacity for each material is given in square brackets below.

(a) water [1.00 kcal/(kg · °C)]

30.1 °C

(b) concrete [0.20 kcal/(kg · °C)]

33.6 °C

(c) steel [0.108 kcal/(kg · °C)]

37.3 °C

(d) mercury [0.0333 kcal/(kg · °C)]

55.5 °C

Supporting Materials

Physical Constants

11. Question Details OSColPhys1 14.P.003.WA. [2611822]

A 0.470-kg block of a pure material is heated from 20.0°C to 65.0°C by the addition of 2.98 kJ of energy. Calculate its specific heat.

0.141 kJ/(kg · °C)

Supporting Materials

Physical Constants

12. Question Details OSColPhys1 14.P.005.WA. [2611428]

Rubbing your hands together warms them by converting work into thermal energy. If a woman rubs her hands back and forth for a total of 28 rubs a distance of 7.50 cm each and with a frictional force averaging 61.3 N, what is the temperature increase? The mass of tissue warmed is only 0.100 kg, mostly in the palms and fingers. The specific heat of the tissue is 3500 J/(kg · °C).

0.368 °C

Supporting Materials

Physical Constants

13. Question Details OSColPhys1 14.P.009.WA. [2611762]

A piece of iron block moves across a rough horizontal surface before coming to rest. The mass of the block is 2.8 kg, and its initial speed is 1.6 m/s. How much does the block's temperature increase, if it absorbs 72% of its initial kinetic energy as internal energy? The specific heat of iron is 452 J/(kg · °C).

0.00204 °C

Supporting Materials

Physical Constants

14. Question Details OSColPhys1 14.P.011.WA. [2611448]

You pour 160 g hot coffee at 78.7°C and some cold cream at 7.50°C to a 115-g cup that is initially at a temperature of 22.0°C. The cup, coffee, and cream reach an equilibrium temperature of 63.0°C. The material of the cup has a specific heat of 0.2604 kcal/(kg · °C) and the specific heat of both the coffee and cream is 1.00 kcal/(kg · C). If no heat is lost to the surroundings or gained from the surroundings, how much cream did you add?

23.1 g

Supporting Materials

Physical Constants

15. Question Details OSColPhys1 14.P.012.WA. [2611747]

You have two containers of the same liquid. The first container has 124.0 g at T_1°C and the second has 25 g at 21°C. In order to consolidate and save space, you mix the two liquids into one container and find that the two portions have now reached an equilibrium temperature of 42.6°C. What was the initial temperature of the liquid in the first container?

47 °C

Supporting Materials

Physical Constants

16. Question Details OSColPhys1 14.P.016.WA. [2611832]

The number of kilocalories in food is determined by calorimetry techniques in which the food is burned and the amount of heat transfer is measured.

(a) How many kilocalories per gram are there in a 5.00-g peanut, if the energy from burning it is transferred to 0.530 kg of water held in a 0.134-kg aluminum cup, causing a 54.9°C temperature increase? (The specific heat capacity of water is 1.00 kcal/(kg · °C) and the specific heat capacity of aluminum is 0.215 kcal/(kg · °C).)

6.14 kcal/g

(b) The labeling information on a package of peanuts states that 1 serving is equal to 28 g and 170 Calories. Compare your answer in part (a) to this labeling information. Are the two values consistent? (Consider the values to be consistent if they are within 0.5 kcal/g of each other.)

○ Yes

○ No

Supporting Materials

Physical Constants

17. Question Details OSColPhys1 14.P.018.WA. [2611581]

An ice bag containing 0°C ice is much more effective in absorbing heat than one containing the same amount of 0°C water. The specific heat capacity of water is 1.00 kcal/(kg · °C), and its latent heat of fusion is 79.8 kcal/kg.

(a) How much heat in kcal is required to raise the temperature of 0.330 kg of water from 0°C to 27.0°C?

8.91 kcal

(b) How much heat is required to first melt 0.330 kg of 0°C ice and then raise its temperature to 27.0°C?

35.2 kcal

Supporting Materials

Physical Constants

18. Question Details OSColPhys1 14.P.024.WA. [2611782]

A 0.0450 kg ice cube at −30.0°C is placed in 0.497 kg of 35.0°C water in a very well insulated container. What is the final temperature? The latent heat of fusion of water is 79.8 kcal/kg, the specific heat of ice is 0.50 kcal/(kg · °C), and the specific heat of water is 1.00 kcal/(kg · °C).

24.2 °C

Supporting Materials

Physical Constants

Assignment Details

Name (AID): **HW11 - due 6 pm Day 21 (Mon. Aug. 25) (6183276)**	**Feedback Settings**
Submissions Allowed: **5**	Before due date
Category: **Homework**	Question Score
Code:	Assignment Score
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Author: **Chowdary, Krishna (** chowdark@evergreen.edu **)**	Question Part Score
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