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Courses » Introduction to Chemical Thermodynamics and Kinetics

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## Unit 14 - Week 12

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Certification exam

### Course outline

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Reaction  
dynamics - part  
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## Assignment 12

The due date for submitting this assignment has passed.

As per our records you have not submitted this **Due on 2019-04-24, 23:59 IST.**  
assignment.

1) Determine the ratios of the mean speeds of H<sub>2</sub> molecules and Hg atoms at 20°C. **1 point**

Given Molecular weight of Hg = 200 u and Molecular weight of H<sub>2</sub> = 2 u

- 10.0  
 5.0  
 3.9  
 1.9

No, the answer is incorrect.

Score: 0

Accepted Answers:

10.0

2) A 1.0 dm<sup>3</sup> glass bulb contains  $1.0 \times 10^{23}$  N<sub>2</sub> molecules. If the pressure exerted by the gas is 100 kPa, what is the the root mean square speed of the molecules? Given the molecular weight of N<sub>2</sub> = 28.0 u **1 point**

- $2.54 \times 10^2 \text{ m s}^{-1}$   
  $2.54 \times 10^5 \text{ m s}^{-1}$   
  $2.54 \times 10^{12} \text{ m s}^{-1}$   
  $2.54 \times 10^{20} \text{ m s}^{-1}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$2.54 \times 10^2 \text{ m s}^{-1}$

3) Use the Maxwell distribution of speeds to estimate the fraction of N<sub>2</sub> molecules **1 point**

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Reaction dynamics - part 5

Reaction dynamics - part 6

Reaction dynamics - part 7

Lecture note 12

Quiz : Assignment 12

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Assignment 12 Solutions

$1.81 \times 10^{-13}$

$1.81 \times 10^{-30}$

$1.81 \times 10^{-2}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$1.81 \times 10^{-2}$

4) The best laboratory vacuum pump can generate a vacuum of about 1 nTorr. At **1 point** 25°C and assuming that air consists of H<sub>2</sub> molecules, calculate the mean speed of the molecules.

$17.76 \times 10^{12} \text{ m s}^{-1}$

$17.76 \times 10^{20} \text{ m s}^{-1}$

$17.76 \times 10^2 \text{ m s}^{-1}$

$17.76 \times 10^{10} \text{ m s}^{-1}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$17.76 \times 10^2 \text{ m s}^{-1}$

5) How many collisions does a single Ar atom make in 1.0 s when the **1 point** temperature is 25°C and the pressure is 100 atm?

Given collisional diameter ( $\sigma$ ) =  $0.36 \times 10^{-18} \text{ m}^2$ , Molecular weight of Argon = 39.95 u and  $k_B = 1.381 \times 10^{-23} \text{ J K}^{-1}$

$5 \times 10^{20} \text{ s}^{-1}$

$5 \times 10^{30} \text{ s}^{-1}$

$5 \times 10^{40} \text{ s}^{-1}$

$5 \times 10^{11} \text{ s}^{-1}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$5 \times 10^{11} \text{ s}^{-1}$

6) A solid surface with dimensions 5.0mm × 5.0 mm is exposed to argon gas at **90 point** Pa and 500 K. How many collisions do the Ar atoms make with this surface in 30 s?

Given molecular weight of Argon = 39.95 u and  $k_B = 1.381 \times 10^{-23} \text{ J K}^{-1}$

$1.3 \times 10^{21}$

$1.3 \times 10^{30}$

$1.3 \times 10^{10}$

$1.3 \times 10^{40}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$1.3 \times 10^{21}$

7) In a gas at 556 K at a concentration of 1 mole L<sup>-1</sup>, the number of HI molecules **1 point** colliding per second is  $5 \times 10^{30}$  per c.c. The activation energy of the reaction is 44500 cal. Calculate the number of molecules reacting per c.c.

- $3.2 \times 10^4 \text{ cm}^{-3} \text{ s}^{-1}$
- $3.2 \times 10^{20} \text{ cm}^{-3} \text{ s}^{-1}$
- $3.2 \times 10^{13} \text{ cm}^{-3} \text{ s}^{-1}$
- $3.2 \times 10^{10} \text{ cm}^{-3} \text{ s}^{-1}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$3.2 \times 10^{13} \text{ cm}^{-3} \text{ s}^{-1}$

8) Collision theory demands knowing the fraction of molecular collisions having at least the kinetic energy  $E_a$  along the line of flight. What is this fraction when  $E_a = 10 \text{ kJ mol}^{-1}$  at 300K. **1 point**

- 0.018
- 0.050
- 0.030
- 0.090

No, the answer is incorrect.

Score: 0

Accepted Answers:

0.018

9) The pre-exponential factor in Arrhenius equation for rate constant depends on **1 point**

- number of collisions
- relative orientation
- both number of collisions and relative orientation
- energy of activation

No, the answer is incorrect.

Score: 0

Accepted Answers:

both number of collisions and relative orientation

10) The root mean square speed, average speed and most probable speed for  $^{32}\text{O}_2$  at normal pressure and temperature are (in units of  $10^4 \text{ cm/sec}$ ) **1 point**

- 4.613, 4.25, 3.766
- 4.613, 3.766, 4.25
- 3.766, 4.25, 4.613
- 3.766, 4.613, 4.25

No, the answer is incorrect.

Score: 0

Accepted Answers:

4.613, 4.25, 3.766

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