

X

NPTEL

reviewer1@nptel.iitm.ac.in ▼

Courses » Chemistry - II

Announcements

Course

Ask a Question

Progress

Mentor

Unit 6 - Week 5

Course outline

How to access the portal

Week 1

Week 2

Week 3

Week 4

Week 5

● 10 questions for a video tutorial 1: Elementary problem solving sessions

● Lecture 17 : Methodology of solving problems

● Lecture 18 : Rotational and Vibrational Line Intensities

● Lecture 19 : Microwave Spectra of Polyatomic molecules (Symmetric top)

○ Quiz : Assessment 7

Week 6

Week 7

Week 8

Assessment 7

The due date for submitting this assignment has passed. **Due on 2016-03-18, 23:59 IST.**

Submitted assignment

Assume speed of light to be 3×10^8 m.s⁻¹ ; Planck's constant $h = 6.626 \times 10^{-34}$ J.s.

Boltzmann

constant $K_B = 1.38 \times 10^{-23}$ J.K⁻¹

1) The SI unit for the moment of inertia of a diatomic molecule is

1 point

- Kg
 N m⁻¹
 Kg m²
 Joule

No, the answer is incorrect.

Score: 0

Accepted Answers:

$Kg m^2$

2) The rotational constant for a diatomic molecule is given by the formula (I is the moment of inertia about an axis passing through the centre of mass and perpendicular to the bond axis)

1 point

$$\frac{h^2}{8\pi^2 I c}$$

$$\frac{h}{8\pi^2 I c}$$

$$\frac{h I c}{8\pi^2}$$

$$\frac{h^2 c}{8\pi^2 I}$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\frac{h}{8\pi^2 I c}$$

3) The spherical top molecule has the following relation between its moments of inertia about the three principal axes which are mutually perpendicular to each other, **1 point**

$I_x \neq I_y \neq I_z$

$I_x = I_y \neq I_z$

$I_x = I_y, I_z = 0$

$I_x = I_y = I_z$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$I_x = I_y = I_z$

4) A linear molecule has only two rotational degrees of freedom because **1 point**

- there are only two non-zero moments of inertia in the point mass approximation
- two of the moments of inertia are equal and the third is very large
- all three moments of inertia sum to a constant and only two of them are therefore independent
- the sum of any two of them is equal to the third and therefore only two need to be considered

No, the answer is incorrect.

Score: 0

Accepted Answers:

there are only two non-zero moments of inertia in the point mass approximation

5) The molecule BF_3 is planar and is a symmetric top. The following statement is the correct statement, **1 point**

- The sum of two moments of inertia about the principal axes is equal to the moment of inertia about the perpendicular axis.
- One of its moments of inertia is zero
- All three moments of inertia are unequal
- All three moments of inertia are equal

No, the answer is incorrect.

Score: 0

Accepted Answers:

The sum of two moments of inertia about the principal axes is equal to the moment of inertia about the perpendicular axis.

6) The energy difference between successive rotational levels (J and $J+1$) in a rigid diatomic molecule (interms of its rotational constant B) is **1 point**

- $hcB(2J+1)$
- $2hcBJ$
- $2hcB(J+1)$
- $hcB(J+1)$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$2hcB(J+1)$

7) The rotational levels of a rigid diatomic molecule with the quantum number J are **1 point**

- $(2J+1)$ -fold degenerate
- J -fold degenerate

- doubly degenerate except for the quantum number K , projection of J onto an axis, equal to zero
- nondegenerate

No, the answer is incorrect.

Score: 0

Accepted Answers:

$(2J+1)$ -fold degenerate

8) The rotational constants of the two molecules HCl and DCl (Deuterium chloride) are in the ratio, (assuming the equilibrium bond lengths to be the same) **1 point**

$\frac{B_{HCl}}{B_{DCl}} = \frac{\mu_{HCl}}{\mu_{DCl}}$

$\frac{B_{HCl}}{B_{DCl}} = \frac{\mu_{DCl}}{\mu_{HCl}}$

$\frac{B_{HCl}}{B_{DCl}} = \frac{\mu_{HCl}^2}{\mu_{DCl}^2}$

$\frac{B_{HCl}}{B_{DCl}} = \frac{\mu_{DCl}^2}{\mu_{HCl}^2}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$\frac{B_{HCl}}{B_{DCl}} = \frac{\mu_{DCl}}{\mu_{HCl}}$

9) The rotational constant for a certain molecule is 10 cm^{-1} . The ratio of the number of molecules in $J=1$ to $J=2$ states at 300 K, $\frac{N_1}{N_2}$ is **1 point**

- 1.4
- 0.73
- 1
- 5

No, the answer is incorrect.

Score: 0

Accepted Answers:

0.73

10) A molecule with the formula AB_2 has a microwave spectrum with lines which are equidistant. The structure of the molecule is, **1 point**

- Linear A-A-B
- Linear A-B-A
- Bent A-B-B
- Bent B-A-B

No, the answer is incorrect.

Score: 0

Accepted Answers:

Linear A-A-B

Previous Page

End

© 2014 NPTEL - Privacy & Terms - Honor Code - FAQs -



A project of



In association with



Funded by

Government of India
Ministry of Human Resource Development

Powered by

