Final Examination
2018/2019 Academic Session

June 2019

JIF423– Atomic Physics
(Ilmu Fizik Atom)

Time : 3 hours
(Masa : 3 jam)

Please check that this examination paper consists of **FIVE (5)** pages of printed material before you begin the examination.

*[Sila pastikan bahawa kertas peperiksaan ini mengandungi **LIMA (5)** muka surat yang bercetak sebelum anda memulakan peperiksaan ini].*

Instructions : Answer **ALL** questions. You may answer **either** in Bahasa Malaysia or in English.

*[**Arahan** : Jawab **SEMUA** soalan. Anda dibenarkan menjawab soalan **sama ada** dalam Bahasa Malaysia atau Bahasa Inggeris].*

In the event of any discrepancies, the English version shall be used.

[Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah digunapakai].

Answer **ALL** questions.

*Jawab **SEMUA** soalan*

1. (a). State the difference between standing and traveling waves.
Nyatakan perbezaan antara gelombang pegun dan gelombang kembara.

(20 marks/*markah*)

(b). Describe the wave-like properties of an electron.
Jelaskan sifat elektron seperti gelombang.

(20 marks/*markah*)

(c). State the wave function in a one-dimensional stationary state of fixed energy with an explanation on each of the symbol presented.
Nyatakan fungsi gelombang dalam keadaan pegun satu dimensi bertenaga tetap dengan penjelasan terhadap setiap simbol yang dibentangkan.

(20 marks/*markah*)

(d). Write the three-dimensional time-independent Schrödinger equation in quantum mechanics
Tulis persamaan Schrödinger bebas-masa tiga dimensi dalam mekanik kuantum.

(40 marks/*markah*)

2. (a). Explain the Pauli's exclusion principle.
Jelaskan prinsip pengecualian Pauli.

(40 marks/*markah*)

(b). State **ONE (1)** application of Pauli's principle in daily life.
*Nyatakan **SATU (1)** aplikasi prinsip Pauli dalam kehidupan seharian.*

(20 marks/*markah*)

(c). With an aid of a diagram, explain the Stern-Gerlach Experiment.
Dengan bantuan satu gambar rajah, terangkan eksperimen Stern-Gerlach.

(40 marks/*markah*)

3. (a). Define Zeeman Effect.
Takrifkan Kesan Zeeman.

(10 marks/*markah*)

(b). Explain briefly about the "Anomalous" Zeeman Effect. Define the symbol used in the equation.
Terangkan secara ringkas tentang Kesan Zeeman "Anomali". Takrifkan simbol yang digunakan dalam persamaan.

(30 marks/*markah*)

(c). Give **TWO (2)** differences between Normal Zeeman Effect and "Anomalous" Zeeman Effect.
*Berikan **DUA (2)** perbezaan antara Kesan Normal Zeeman dan Kesan Zeeman "Anomali".*

(40 marks/*markah*)

(d). The magnetic spin quantum number, m_s, has only two values.
Nombor kuantum magnet berputar, m_s, hanya mempunyai dua nilai.

(i). State the two values.
Nyatakan dua nilai tersebut.

(5 marks/*markah*)

(ii). With an aid of a diagram, provide the intrinsic spin angular momentum.
Dengan bantuan satu gambar rajah, sediakan momentum sudut berputar intrinsik.

(15 marks/*markah*)

4. (a). Figure 1 shows molecular potential energy curve. Interpret the graph as shown in Figure 1.
Rajah 1 menunjukkan lengkung tenaga keupayaan molekul. Tafsirkan graf dalam Rajah 1 tersebut.

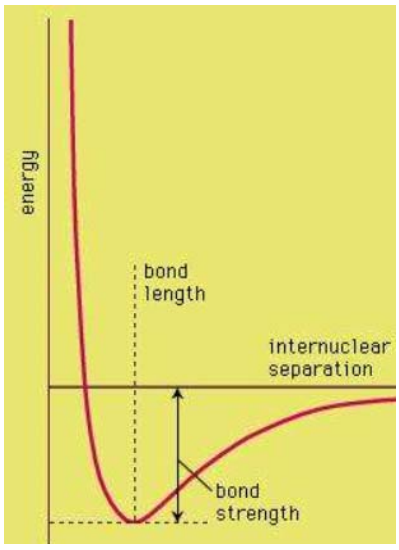

Figure 1
Rajah 1

(40 marks/*markah*)

(b). Explain briefly the valence band theory.
Terangkan secara ringkas teori jalur valens.

(20 marks/*markah*)

(c). Describe **THREE (3)** types of energy levels in molecules.
*Terangkan **TIGA (3)** jenis tahap tenaga dalam molekul.*

(30 marks/*markah*)

(d). State **TWO (2)** applications of Raman spectroscopy.
*Nyatakan **DUA (2)** aplikasi spektroskopi Raman.*

(10 marks/*markah*)

5. (a). Describe the **THREE (3)** interactions of X-rays with matter.
*Terangkan **TIGA (3)** interaksi sinar-X dengan jirim.*

(30 marks/*markah*)

(b). With an aid of a diagram, explain the principle of Geiger counter in radiation detection.
Dengan bantuan satu gambar rajah, jelaskan prinsip pembilang Geiger dalam pengesanan sinaran.

(30 marks/*markah*)

(c). State two general methods to generate nuclear particles.
Nyatakan dua kaedah umum untuk menghasilkan zarah nuklear.

(20 marks/*markah*)

(d). Describe **THREE (3)** factors that affect the interaction of ionising radiation on a human body or any other living organism.
*Huraikan **TIGA (3)** faktor yang mempengaruhi interaksi sinaran mengion pada tubuh manusia atau sebarang organisma hidup yang lain.*

(20 marks/*markah*)

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