Assignment 0

The due date for submitting this assignment has passed. **Due on 2018-01-21, 23:59 IST.**

Submitted assignment

1) Energy required to knock out the electron from Hydrogen atom in the ground state is approximately

- 6.8 eV
- 3.4 eV
- 13.6 eV
- 1.5 eV

No, the answer is incorrect.
Score: 0

Accepted Answers:
- 13.6 eV

2) Energy eigenstates of a quantum system are $\Psi_1$ and $\Psi_2$ corresponding to the energy eigenvalues $E_1$ and $E_2$, respectively, such that $E_2 > E_1$. At time $t = 0$, the system is in $\Psi = a\Psi_1 + b\Psi_2$ state. What is the state of the system at a later time $t$?

- $\Psi = (a\Psi_1 + b\Psi_2) e^{-i(E_2-E_1)t}$
- $\Psi = a e^{-iE_2 t} \Psi_1 + b e^{-iE_1 t} \Psi_2$
- $\Psi = (a\Psi_1 + b\Psi_2) e^{-i(E_1+E_2)t}$
- $\Psi = a e^{-iE_2 t} \Psi_1 + b e^{-iE_1 t} \Psi_2$

No, the answer is incorrect.
Score: 0

Accepted Answers:
4) Two electrons have relative angular momentum \( \mathbf{\ell} = 1 \). What are the possible total angular momentum states of the system?

- 1
- 2
- 0
- 3/2

No, the answer is incorrect.
Score: 0
Accepted Answers:
\( \frac{3}{2}, \frac{5}{2} \)

5) What is the frequency of light emitted from Hydrogen atom in the first excited state, when it comes down to the ground state (Planck's constant = 4.1357 \times 10^{-15} \text{ eV s})?

- 4.11 \times 10^{15} \text{ Hz}
- 0.82 \times 10^{15} \text{ Hz}
- 3.29 \times 10^{15} \text{ Hz}
- 2.47 \times 10^{15} \text{ Hz}

No, the answer is incorrect.
Score: 0
Accepted Answers:
2.47 \times 10^{15} \text{ Hz}

6) The magnetic field at a distance \( r \) from a long straight wire carrying current \( I \) is proportional to

- \( \frac{I}{r^2} \)
- \( \frac{I}{r} \)
- \( IR \)
- \( \frac{I}{r^2} \)

No, the answer is incorrect.
Score: 0
7) Which of the following sets corresponds to fundamental particles alone  

- Quark, electron and meson
- Proton, electron and neutron
- Proton, electron and photon
- Electron, photon and neutrino

No, the answer is incorrect.
Score: 0

Accepted Answers:
Electron, photon and neutrino

8) The decay process $n \rightarrow p^+ + e^- + \bar{\nu}_e$ violates  

- Strangeness
- Baryon number
- Third component of Isospin
- Lepton number

No, the answer is incorrect.
Score: 0

Accepted Answers:
Third component of Isospin

9) The ground state wave function for a Hydrogen atom is given by, where $r$ is the radial coordinate of the electron and $a_0$ is the Bohr radius

\[
\Psi_0(r) = \frac{1}{\sqrt{\pi a_0}} e^{-\frac{2}{a_0} r}
\]

\[
\Psi_0(r) = \frac{1}{\sqrt{\pi a_0}} e^{-\frac{r}{a_0}}
\]

\[
\Psi_0(r) = \frac{1}{\sqrt{\pi a_0}} e^{-\frac{2r}{a_0}}
\]

\[
\Psi_0(r) = \frac{1}{\sqrt{\pi a_0}} e^{-\frac{r}{a_0}}
\]

No, the answer is incorrect.
Score: 0

Accepted Answers:
\[
\Psi_0(r) = \frac{1}{\sqrt{\pi a_0}} e^{-\frac{r}{a_0}}
\]

10) The quantum mechanical operator for the momentum of a particle moving in one dimension is  

\[
-i\hbar \frac{d}{dx}
\]

\[
\hbar \frac{d}{dx}
\]
11) The probability current density for the real part of the wave function \( \Psi = e^{ikx} + 2e^{-ikx} \) is given by

\[
\frac{\hbar}{m} \frac{d^2}{dx^2} \]

No, the answer is incorrect.
Score: 0
Accepted Answers:
\( -i\hbar \frac{d}{dx} \)

12) For the parity operator \( P \), which of the following statements is NOT true?

- \( P^2 = -P \)
- \( P^1 = P \)
- \( P^2 = I \)
- \( P^1 = P^{-1} \)

No, the answer is incorrect.
Score: 0
Accepted Answers:

13) The radius of a \( ^{64}_{29}Cu \) nucleus is measured to be \( 4.8 \times 10^{-13} \) cm. The radius of a \( ^{27}_{12}Mg \) nucleus can be estimated to be

- \( 8.6 \times 10^{-13} \) cm
- \( 2.86 \times 10^{-13} \) cm
- \( 5.2 \times 10^{-13} \) cm
- \( 3.6 \times 10^{-13} \) cm

No, the answer is incorrect.
Score: 0
Accepted Answers:
14) In the nuclear reaction $^{13}_6 C + \nu_e \rightarrow^{13}_7 N + X$, the particle $X$ is

- a muon
- a pion
- an electron
- an anti-neutrino

No, the answer is incorrect.
Score: 0
Accepted Answers: an electron

You were allowed to submit this assignment only once.