Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2015/2016

COURSE NAME	:	PHYSICS FOR LIFE SCIENCES
COURSE CODE	:	DAU 34203
PROGRAMME	:	3 DAU
EXAMINATION DATE	:	DECEMBER 2015 / JANUARY 2016
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	SECTION A) ANSWER **ALL** QUESTIONS
		SECTION B) ANSWER **TWO** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

SECTION A

Q1 The simple hydrogen atom have atomic mass of a neutron is 1.0086650u, and that of $_1H^1$ (a proton plus electron) is 1.0078250u. The Uranium atom , $_{92}U^{238}$ which it atomic mass of a neutron is 238.050786u.

(a) Analyze the mass defect of an Uranium atom.
(5 marks)

(b) Calculate the binding energy of an Uranium atom.
(11 marks)

(c) Determine binding energy per nucleon of an Uranium atom.
(4 marks)

(d) Synthesis the minimum photon frequency necessary to separate the neutron and proton (photo-disintegration process).
(5 marks)

Q2 Consider an atom whose energy level diagram is given in **FIGURE Q2**. Suppose that the atom starts in level 3.

(a) Calculate the shortest wavelength photon that the atom can emit.
(7 marks)

(b) Determine the longest wavelength photon that it can absorb (starting in level 3).
(4 marks)

(c) Analyze the lowest frequency photon that can ionize the atom (starting in level 3).
(10 marks)

(d) If the atom starts in the ground state sinthesis energy photon is needed to ionize the aton and give the emitted electron a kinetic energy of 5 eV.
(4 marks)

SECTION B

Q3 A particle of rest mass 1.67×10^{-27}kg is moving with a velocity of 0.9998c.

(a) Synthesis the mass of the particle.
(7 marks)

(b) Calculate the momentum of the particle. Give your answer in SI unit.
(4 marks)

(c) Analyze the rest mass energy of the particle.
(4 marks)

(d) Determine the total energy of the particle.
(10 marks)

Q4 An x-ray diffraction grating has 4.0×10^{9} per lines in m. The wavelength between 0.125nm and 0.35nm.

(a) Determine the angle will at 0.125nm be diffracted in first order.
(7 marks)

(b) Analyze the angles between the first order of these range of wavelengths occur.
(7 marks)

(c) Determine the angle will at 0.125nm be diffracted in second order.
(4 marks)

(d) Synthesis the largest order that one can have with this grating at 0.125nm.
(7 marks)

Q5 (a) Differentiate between nearsighted eye and farsighted eye. Explain the method of these eye defect can be corrected.

(10 marks)

(b) A converging lens with a focal length of 10.0cm and diverging lens with a focal length of -5.0cm are 30.0cm apart. A 2.0cm tall obejct is 20.0cm in front of the converging lens.

(i) Draw ray tracing diagram to show this situation.

(6 marks)

(ii) Estimate the image distance and image height by making measurements on your diagram.

(2 marks)

(iii) Calculate the image distance and image height. Compare with your ray tracing answer in part **Q5 (b)(ii)**.

(7 marks)

- END OF QUESTION -

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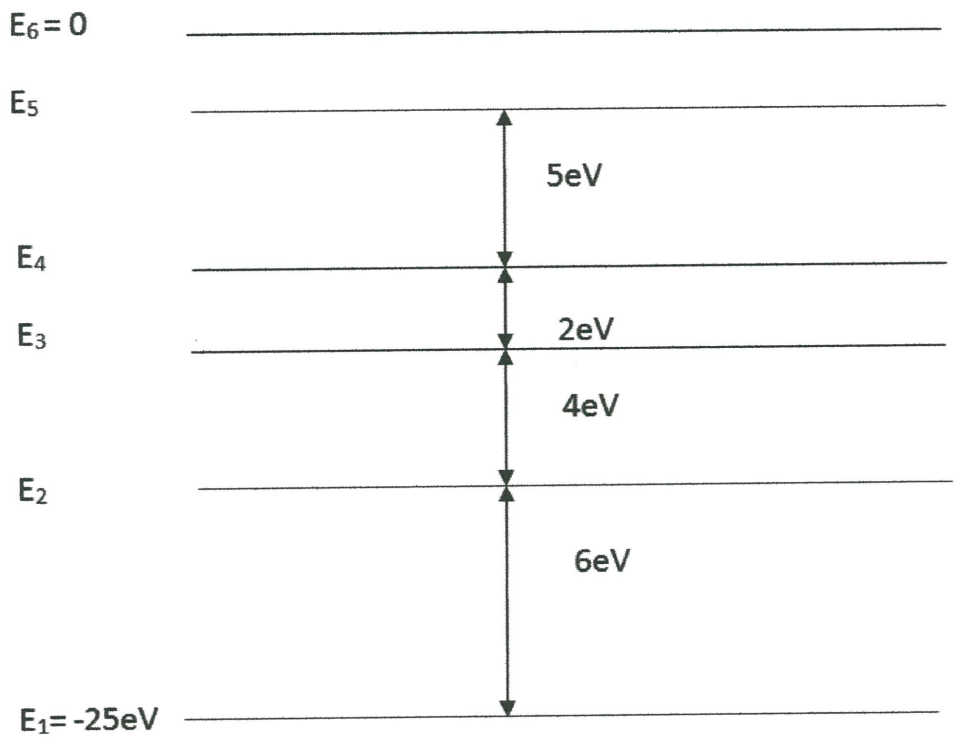

FIGURE Q2

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1 Electron Volt $1eV = 1.60 \times 10^{-19}J$	**Energy Gap** $E_n - E_{n-1} = hv$
Speed of Light $c = 3.00 \times 10^{8}m/s$	**Lorentz Factor** $\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$
Planck's Constant $h = 6.63 \times 10^{-34}J.s$	
Schrödinger's Equation $\frac{-\hbar^2}{2m}\nabla^2\psi + V\psi = i\hbar\frac{\partial\psi}{\partial t}$	**Snell's Law** $n_1 \sin\theta_1 = n_2 \sin\theta_2$
Image Location $\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$	**Binding Energy** $E = \Delta mc^2$
Image Size $M = \frac{h_i}{h_o} = -\frac{d_i}{d_o}$	**Mass- Energy** $E = mc^2$
Relativistic Energy $E = \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}}$	**Rest Mass** $m = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}$
Energy- Momentum $E^2 = p^2c^2 + m_0^2c^4$	**Total Energy** Total E= KE + Rest Energy
Mass Defect $\Delta m = [Z(m_p + m_e) + (A-Z)m_n] - m_{atom}$	**Kinetic Energy** $KE = mc^2 - m_0c^2$ $KE = \frac{m_0c^2}{\sqrt{1-\frac{v^2}{c^2}}} - m_0c^2$
Photon Momentum $p = \frac{h}{\lambda}$	
Photon Energy $E = hf$	**Periodic Waves** $v = f\lambda$
Interference Fringes $n\lambda = d\sin\theta$	**Half Life** $N = N_0 2^{-t/\tau}$