Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME	:	PHYSICS FOR LIFE SCIENCES
COURSE CODE	:	DAU 34203
PROGRAMME CODE	:	DAU
EXAMINATION DATE	:	DECEMBER 2018 / JANUARY 2019
DURATION	:	2 HOURS AND 30 MINUTES
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) State the characteristic of image formed at retina.

(2 marks)

(b) i) State the function of ciliary muscle of the eye.

ii) Explain the changes made by ciliary muscle during sighting near and far object.

(3 marks)

(c) Explain the phenomenon of Blue Sky appear at atmosphere.

(2 marks)

(d) Calculate optical power of eyeglass lens is needed to allow a farsighted person, whose near point is 1.00 m, to see an object clearly that is 25.0 cm from the eye. Assume the corrective lens is fixed 1.5 cm from the eye.

(5 marks)

(e) Write **three (3)** Postulates Bohr's model of Hydrogen atom.

(3 marks)

(f) i) State the definition of Bremstrahlung Radiation.

ii) List **two (2)** applications of the aforementioned radiation.

(3 marks)

(g) Calculate the wavelength of the radiation emitted when electron in hydrogen atom makes a transition from the 4^{th} orbital to ground state.

(5 marks)

(h) Calculate the frequency of the radiation

(2 marks)

Q2 (a) State the definition of photon.

(2 marks)

(b) Define nuclear fission and nuclear fusion reaction.

(4 marks)

(c) Sketch graph of binding energy per nucleon versus atomic number.

(4 marks)

(d) Calculate the binding energy and binding energy per nucleon of the $^{14}N_7$ nucleus.

Given : Mass of $^{16}O_8$ nucleus = 15.999u

(8 marks)

(f) Explain 'wave-particle duality' behavior of light.

(2 marks)

(g) Calculate the radius of Helium atom using Bohr atomic model approach.

(5 marks)

Q3 (a) State de Broglie's hypothesis of matter waves and write the relation involved.

(3 marks)

(b) Show that $T_{moving} = \frac{T_{stationary}}{\sqrt{1-\left(\frac{v}{c}\right)^2}}$.

(7 marks)

(c) Show that angular momentum for every orbital is given by $L_n = \frac{nh}{2\pi}$ n=1,2,3…

(5 marks)

(d) Calculate the de Broglie wavelength of:

(i) A tennis ball with mass 0.35 kg thrown at a speed of 15 cm/s.,

(5 marks)

(ii) An electron accelerated at potential 108 keV.

(5 marks)

Q4 (a) Define Plank hypothesis of energy quanta and write the formula involved

(3 marks)

(b) (i) Write electron configuration of an atom that consist of 35 electron.

(2 marks)

(ii) State the name of the atom.

(1 marks)

(c) Electrons accelerated by cathode ray tube by potential applied at 50keV. If the energy of electron directly converted to X-ray radiation, find the minimum wavelength generated.

(5 marks)

(d) Explain the difference technique used to focus light and electron beam inside optical and electron microscope.

(4 marks)

(e) When a nucleus couldn't reach stability:

(i) List **four (4)** reactions that possibly occur.

(4 marks)

(ii) Write formula for each reaction.

(4 marks)

(f) An ancient ship was found at sea by archaeologist. If the ^{14}C only remain 80% on the ship, calculate the age of the ship. (Given $t_{1/2}$ of ^{14}C is 5730 yr.)

(2 marks)

-END OF QUESTIONS –

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LIST OF FORMULA

$\frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f}$	$M = \frac{h_i}{h_o} = -\left\|\frac{d_i}{d_o}\right\|$
$E = \frac{hc}{\lambda} = hf$	$KE = (\gamma - 1)m_o c^2$
$n = \frac{c_0}{v}$	$n_1 \sin\theta_1 = n_2 \sin\theta_2$
$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$	$E^2 = m_o^2 c^4 + p^2 c^2$
$\frac{pc}{E} = \frac{v}{c}$	$E = \gamma m_o c^2$
$\lambda = \frac{h}{e}\sqrt{\frac{4\pi\varepsilon_o r}{m}}$	$v = \frac{e}{\sqrt{4\pi\varepsilon_o r}}$
$n\lambda = 2\pi r_n$	$2\pi r_n = \frac{nh}{e}\sqrt{\frac{4\pi\varepsilon_o r_n}{m}}$
$r_n = \frac{n^2 h^2 \varepsilon_o}{\pi m e^2}$	$r_n = n^2 a_o$
$E_n = -\frac{e^2}{8\pi\varepsilon_o r_n}$	$E_n = -\frac{me^4}{8\varepsilon_o^2 h^2}\left(\frac{1}{n^2}\right) = \frac{E_1}{n^2}$
$\frac{1}{\lambda} = -\frac{E_1}{ch}\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)$	$\Delta m = Z(m_H) + (A - Z)(m_n) - m_x$
$E = mc^2$	$E_i - E_f = hf$

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LIST OF CONSTANT

Avogadro's Number, $N_A = 6.023 \times 10^{23}$ atoms
Electron charge, $e = 1.6 \times 10^{19}C$
Electron mass, $m_e = 9.109 \times 10^{-31}kg$
Neutron mass, $m_n = 1.675 \times 10^{-27}kg$
Proton mass, $m_p = 1.673 \times 10^{-27}kg$
Atomic mass number, $u = 1.6605 \times 10^{-27}kg$
$= 931.5MeV$
Plank's Constant, $h = 6.626 \times 10^{-34}J$
Speed of light, $c = 3 \times 10^{8}ms^{-1}$
Electric constant permitivitty of free space, $\varepsilon = 1.6 \times 10^{-12}C^2/Nm^2$
Radius of the orbit contain wavelength, $r_n = 5.3 \times 10^{-11}m$
Mass of electron $m_e = 9.1 \times 10^{-31}kg$