Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2017/2018

COURSE NAME	:	PHYSICS FOR LIFE SCIENCES
COURSE CODE	:	DAU 34203
PROGRAMME CODE	:	DAU
EXAMINATION DATE	:	DISEMBER 2017 / JANUARY 2018
DURATION	:	2 HOURS AND 30 MINUTES
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

Q1 (a) Define of atomic mass unit (u).

(2 marks)

(b) i) State the function of pupil of the eye.

ii) Explain the changes during daytime and night time?

(4 marks)

(b) i) List **TWO (2)** types of abnormalities of human eyes

ii) Draw the solution to make correction for eyesight.

(6 marks)

(d) Write **THREE (3)** Postulates Bohr's model of Hydrogen atom.

(5 marks)

(e) i) State the definition of L.A.S.E.R.

ii) List **TWO (2)** applications of LASER.

(3 marks)

(f) Calculate the wavelength of the radiation emitted when a hydrogen atom makes a transition from the $n = 6$ to $n = 3$ state.

(5 marks)

Q2 (a) State the definition of photon.

(2 marks)

(b) Define nuclear fission and nuclear fusion reaction.

(4 marks)

(c) A beam of white light goes from air into flint glass at an incidence angle of 43.2° as shown in **Figure Q2(c)**. Find the angle between the red (660 nm) and violet (410 nm) parts of the refracted light? (Given the frequency of light in as entering flint glass become f_{red}=2.73x10^{14} Hz and f_{violet}=4.30 x10^{14} Hz)

(7 marks)

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

Given : Mass of $^{14}N_7$ nucleus = 13.9992338u

(10 marks)

(f) Explain briefly **TWO (2)** reasons radioactive radiation is dangerous to human.

(2 marks)

Q3 (a) State de Broglie's hypothesis of matter waves

(2 marks)

(b) A praying mantis preys along the central axis of a thin symmetric lens, 20 cm from the lens. The lateral magnification of the mantis provided by the lens is m =-0.25 and the index of refraction of the lens material is 1.65. Find the radius of curvature of the lens

(5 marks)

(c) Suppose a spaceship as shown in **Figure Q3(c)** heading directly toward Earth at half the speed of light sends a signal to us on a laser produced beam of light.

(i) Write the velocity transformation equation.

(3 marks)

(ii) Determine final speed as the light approach earth.

(5 marks)

(d) Calculate the de Broglie wavelength of:

(i) A a 0.65 kg basketball thrown at a speed of 10 m/s,

(ii) A relativistic electron with a kinetic energy of 108 keV.

(10 marks)

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

(3 marks)

(b) State **TWO (2)** types of electron microscope.

(2 marks)

(c) List **FOUR (4)** components of electron microscope along with its functions to produce image

(4 marks)

(d) Explain the technique 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) Explain the reason using electron for microscope give higher resolution and magnification than optical microscope.

(4 marks)

-END OF QUESTIONS –

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LIST OF FIGURES

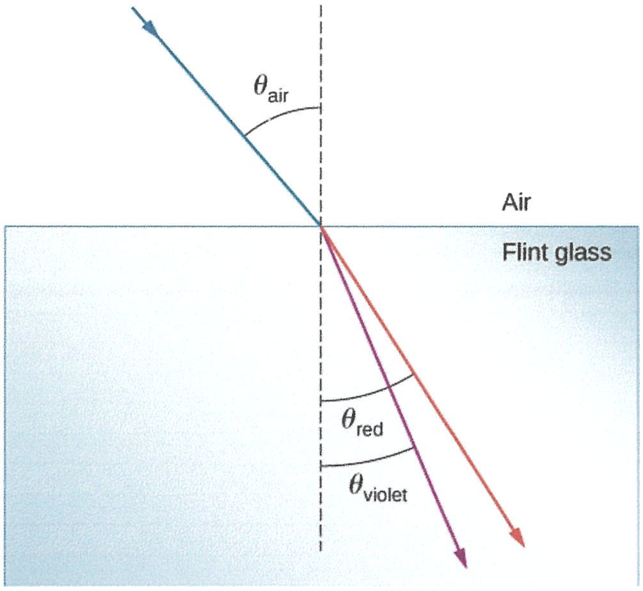

Figure Q2(c)

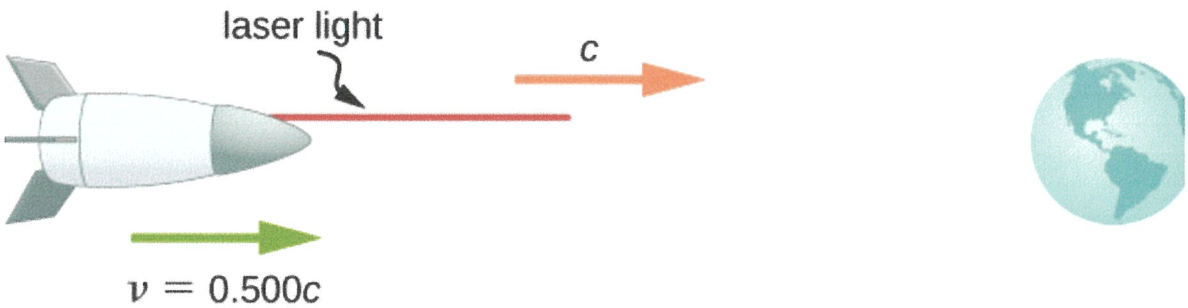

Figure Q3(c)

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LIST OF FORMULA

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

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LIST OF CONSTANT

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

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