IB Physics
FA27.1 - Photon Theory

Name_____

Best Reason to Rebel_____

Show your work, circle your answers, and use sig figs to receive full credit.

1. What is the wavelength of a 150. kHz radio wave?

What is the frequency of a 2.00 m radio wave?

2. What is the wavelength of a 1.80 eV photon?

What is the energy in electron volts of a 150. nm photon?

3. 400. nm light ejects photo-electrons from a metal that have a stopping potential of 1.17 V. What is the work function of the metal in electron volts?

What wavelength of light would eject photo electrons with a stopping potential of 2.60 V?

4. A photon creates an electron/positron pair each having 0.211 MeV of kinetic energy. What is the wavelength of the photon?

5. What is the velocity of an electron with a wavelength of 12.0 nm?

IB Physics
FA27.2 - Atomic and Particle

Name_____

Best Reason to Conform_____

Show your work, circle your answers, and use sig figs to receive full credit.

1. How fast must an alpha particle ($m = 6.64 \times 10^{-27}$ kg) go to get within 5.0×10^{-15} m of an Iron nucleus (Z = 26)

2. What is the wavelength of the photon associated with an electron transition from n = 2 to n = 7 in a hydrogen atom? Is the photon being absorbed, or emitted?

3. What is the radius of U-235?

If the uncertainty of an electron's position is 1.20×10^{-10} m, what is the minimum uncertainty (the total range) of its velocity?

4. For the decays, find the missing particle. For the reactions, indicate if it is possible, or indicate every law it violates:

$\mu^+ \rightarrow ?? + \upsilon_e + \overline{\upsilon_\mu}$ e+	$\mu^+ \rightarrow e^+ + ?? + \overline{\upsilon_\mu} + e^+ + e^-$ υ_e	$p + p \rightarrow n + \Xi^+ + \Lambda^+$ not, baryon number	$p + n \rightarrow K^+ + n + n + n + \bar{p}$ not, charge

5. Write the quark combinations that make up a proton and a neutron: p =_____ n =_____
Identify the following quark combinations as either a meson, or a baryon. Determine the baryon number, strangeness, and the charge of each:

	Baryon or Meson?	B = ?	S = ?	q = ?
usb	B	1	-1	0
$d\bar{s}$	M	0	+1	0
uuc	B	1	0	+2
$c\bar{u}$	M	0	0	0

IB Physics
FA 30.1 - Radioactive Decay

Name_____

What you will miss least about TuHS_____

Show your work, circle your answers, and use sig figs to receive full credit.

1 u = 1.6605×10^{-27} kg = 931.5 MeV, $^{1}_{0}n$ = 1.008665 u

1. Find the missing particle or nucleus in these decays: (These are fictitious - ignore neutrinos for now)

$^{83}_{39}Y \rightarrow ?? + \alpha$	$?? \rightarrow {}^{49}_{22}Ti + \beta^-$	$^{50}_{24}Cr \rightarrow {}^{50}_{23}V + ??$	$^{54}_{26}Fe \rightarrow ?? + \gamma$
$^{79}_{37}Rb$	$^{49}_{21}Sc$	β^+	$^{54}_{26}Fe$

2. What is the kinetic energy of the alpha particle that ^{208}Po (m = 207.981222 u) gives off becoming ^{204}Pb (m = 203.973020) in MeV?

3. Imagine it is possible for $^{14}_{7}N$ undergo both β^- and β^+ decay. Write the complete decay equation below for each (complete with neutrino or anti-neutrino)

$^{14}_{7}N \rightarrow {}^{14}_{8}O + \beta^- + \overline{\upsilon_e}$
$^{14}_{7}N \rightarrow {}^{14}_{6}C + \beta^+ + \upsilon_e$

4. You have 24.0 grams of a radioactive substance with a half life of 14.0 minutes. In what time will you have 3.00 grams of it left?

5.The activity of a sample with a half-life of 23.5 minutes is initially 3.412×10^6 counts/second. What will it be in 6.00 hours?

If K-40(m = 39.964 u) had a half life of 14.0 hours, (It's actually stable) what would be the activity of 0.0240 grams of it?

IB Physics
FA 30.2 - Nuclear Reactions

Name_____

What you will miss the most about TuHS Physics

Murray Dedicated

Show your work, circle your answers, and use sig figs to receive full credit.

1 u = 1.6605E-27 kg = 931.5 MeV, $^{1}_{1}H$ = 1.007825 u, $^{1}_{0}n$ = 1.008665 u

1. What is the binding energy and the binding energy per nucleon of Ca-44?

2. Fill in the table (not all these reactions occur)

$^{16}_{8}O$ (α , t) ?? $^{17}_{9}F$	?? (p , n) $^{239}_{94}Pu$ $^{239}_{93}Np$	$^{16}_{8}O$ (α , ??) $^{19}_{10}Ne$ $^{1}_{0}n$	$^{28}_{14}Si$ (?? ,n) $^{28}_{15}P$ $^{1}_{1}p$

3. Find the Q value for this nuclear reaction: $^{7}_{3}Li(t,n)^{9}_{4}Be$. Label the reaction as either energy requiring (endoergic) or energy releasing (exoergic) (you will have to look up the masses in the table...)

4-5: Consider this fission reaction: $^{235}_{92}U + ^{1}_{0}n \rightarrow ^{148}_{57}La + ^{85}_{35}Br$ + some neutrons

U-235 = 235.043923 u, La-148 = 147.932191 u, Br-85 = 84.915608 u (These masses will be given to you here)

4. How many neutrons are released? (3)

5. What is the Q value for this reaction?