	October 31, 2	2001 QUIZ #3	3	CHEM 101
Usefi	ul Information.	: $w = -P\Delta V$; $\Delta H_{rxn} = \Sigma n_p \Delta H_f(prod$	ducts) - $\Sigma n_r \Delta H_f(reactants);$	$\lambda v = c; E = hv; c =$
2.997	79 x 10 ⁸ m/s; h	$\mu = 6.626 \ x \ 10^{-34} \ J \ s; \ Hz = s^{-1}; \ \lambda =$	$h/p; p = mv; \Delta x \Delta p \ge h/4\pi;$	$E_n = -R_H(1/n^2)$
Avoga	dro's number	$r = 6.02214 \ x \ 10^{23} \ mol^{-1}$		
1) In the reactions determine whether the pressvol. work, w, is $< 0, = 0$, or > 0 . Use				> 0. Use blanks.
	Assume the p	pressure is constant.		
	a) Hg(l)	\rightarrow Hg(g)	<u> </u>	-
	b) $3O_2(g$	$g) \rightarrow 2O_3(g)$	<u> </u>	-
	c) CuSC	$D_4 \bullet 5H_2O(s) \rightarrow CuSO_4(s) + 5H_2O(g)$	()<0	_

d) $H_2(g) + F_2(g) \rightarrow 2HF(g)$	
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2) The overall reaction for photosynthesis in higher plants is shown below:

 $6CO_2(g) + 6H_2O(l) \rightarrow Glucose(C_6H_{12}O_6) + 6O_2(g)$

=0

- If 18.0 g of glucose are produced, $\Delta H_{rxn} = 283.6$ kJ.
- a) Is the reaction exothermic or endothermic? (Circle one)
- a) Given the information in the table below, calculate the ΔH_f of glucose.

Compound	ΔH_{f} (kJ/mol)
$CO_2(g)$	-393.5
$H_2O(1)$	-286

18.0 g gluc x (1 mol/180.156 g) = 0.100 mol gluc

 $\Delta H_{rxn} = 283.6 \text{ kJ/0.100 mol} = 2840 \text{ kJ/mol}$

 $\Delta H_{rxn} = 2840 = \Sigma n_p \Delta H_f(products) - \Sigma n_r \Delta H_f(reactants) = \Delta H_f(glucose) - 6(-393.5) - 6(-286)$

 $\Delta H_{f}(glucose) = [6(-393.5) + 6(-286) + 2840] \text{ kJ/mol} = -1240 \text{ kJ/mol}$

3) The lenses of sunglasses that darken in light contain AgCl(s). Light causes the reaction AgCl(s) \rightarrow Ag(s) + Cl(g) to take place and the silver atoms darken the glass. The energy needed to make the reaction take place is 310. kJ/mol.

(a) Calculate the maximum wavelength the photon can have to darken an AgCl molecule. (310. kJ/mol AgCl) x (1000 J/kJ) x (1 mol/6.022 x 10^{23} molecules) = 5.15 x 10^{-19} kJ/molec. E = hv = hc/ $\lambda \rightarrow \lambda$ = hc/E = (6.626 x 10^{-34} J s)(2.9979 x 10^8 m/s)/5.15 x 10^{-19} J = 3.86 x 10^{-7} m

$\lambda = 386 \text{ nm}$

(b) Explain the fact that light from a match can darken the sunglasses whereas the radiation from a microwave cannot.

Light from a match extends into the ultraviolet. These wavelengths are shorter than 386 nm, thus they are higher energy and will darken the sunglasses. Microwaves are much longer than 386 nm and thus are not energetic enough to darken the sunglasses.

4)

State which of the following sets of quantum numbers would be possible and which impossible for an electron in an atom. Circle the appropriate answer.

a)	$n = 1, l = 1, m_l = 0, m_s = +1/2$	possible	impossible
b)	$n = 0, 1 = 0, m_1 = 0, m_s = +1/2$	possible	impossible
c)	$n = 1, l = 0, m_l = 0, m_s = -1/2$	possible	impossible
d)	$n = 2, l = 1, m_l = -1, m_s = +1/2$	possible	impossible
e)	$n = 2, l = 1, m_l = -2, m_s = -1/2$	possible	impossible

INA	WIE					Form 2 (green)
	Octo	ober 31, 2001	QUIZ	, #3		CHEM 101
Usej 2.99	ful Info 7 9 x 1 (rmation: w = -P∆ 0 ⁸ m/s: h = 6.626 x	V; $\Delta H_{rxn} = \Sigma n_p \Delta H_f(pn)$ 10 ⁻³⁴ J s: $Hz = s^{-1}$: λ	$roducts) - \Sigma n_r$	$\Delta H_{f}(reactants); \lambda$ v: $\Delta x \Delta p \ge h/4\pi$: H	$v = c; E = hv; c = E_n = -R_H(1/n^2)$
vog	adro's	number = 6.02214	$x 10^{23} mol^{-1}$, <u> </u>	
l)	In th	e reactions determi	ne whether the press	vol. work, w,	is < 0, = 0, or >	0. Use blanks.
	Assu	me the pressure is	constant.			
	a) $\operatorname{Hg}(l) \operatorname{Hg}(g)$				<u> </u>	
	b)	b) $3O_2(g) \rightarrow 2O_3(g)$			<u> </u>	
	c)	c) $CuSO_4 \bullet 5H_2O(s) \rightarrow CuSO_4(s) + 5H_2O(g)$) (g)	<u> </u>	
	d)	$H_2(g) + F_2(g) \rightarrow$	· 2HF(g)		<u>=0</u>	
)	The	The aerobic oxidation reaction of glucose in the body (respiration) is shown below:				
	If 19	0 a of alucese are	$f_{12}O_6 + O_6$	$O_2(g) \to 0CO_2$	$2(g) + 0\Pi_2O(1)$	
	11 10 b)	Le the reaction	$\Delta \Pi_{\rm rxn} = -20.$	J.U KJ.	othormia? (Ciral	a ona)
	b)	Given the inform	exomething notion in the table bal	ow colculate	the ALL of glucos	
	$Compound AH_{\rm c}(kI/mol)$					
				$\Delta \Pi_{\rm f} (\rm KJ)$	/III01) 5	
	10 0	a alwa w (1 mal/10	$CO_2(g)$	<u>-393.</u>	5	
	10.0	g gluc x (1 mol/18)	(0.150 g) = 0.100 mol	giuc		
		$\Delta \Pi_{rxn} = -263.0 \text{ KJ/0.100 III01} = -2640 \text{ KJ/III01}$ AH = 2840 - Sn AH (products) Sn AH (reactants) - 6(-202.5) + 6(-286) AH (glucosc)				
	$\Delta \mathbf{H}_{r}$	$n = -2840 = 2n_p\Delta r$	$1_{\mathbf{f}}(\mathbf{products}) - \mathbf{\Sigma}\mathbf{n}_{\mathbf{r}} \Delta \mathbf{H}$	f(reactants) =	: 0(-393.5) + 0(-28	50) - $\Delta \mathbf{H}_{\mathbf{f}}(\mathbf{glucose})$
	лн .($AH_{1}(alucoso) = [6(-303.5) + 6(-286) - (-2840)] k I/mol = -1240 k I/mol$				
	Δ Π _f ((giucose) – [0(-575	(-200) = (-204))] KJ/IIOI – <u>-</u>	1240 KJ/III0I	
,	The	light sensitive subs	tance on most black-a	and-white phot	tographic film is s	ilver bromide,
,	AgB	r. The energy requ	ired to darken silver b	promide is 100). kJ/mol	
	(a)	(a) Calculate the maximum wavelength the photon can have to darken an AgBr molecule.				
	(100	$(100. \text{ kJ/mol AgBr}) \ge (1000 \text{ J/kJ}) \ge (1 \text{ mol/6.022} \ge 10^{23} \text{ molecules}) = 1.66 \ge 10^{-19} \text{ kJ/molec}.$				
	$\mathbf{E} = \mathbf{I}$	$h\nu = hc/\lambda \rightarrow \lambda = h$	$c/E = (6.626 \times 10^{-34} \text{ J})$	s)(2.9979 x 1	0^8 m/s)/1.66 x 10^{-10}	$^{.19}$ J = 1.19 x 10 ⁻⁶
	m					
	1 1	1100 mm				

- $\lambda = 1190 \text{ nm}$
- (b) Explain the fact that light from a match can expose photographic film whereas the radiation from a microwave cannot.

Light from a match is visible, which is between 400 nm – 700 nm. These wavelengths are Shorter than 1120 nm, thus they are higher energy and will expose the film. Microwaves Are much longer than 1120 nm and thus are not energetic enough to expose the film.

4) State which of the following sets of quantum numbers would be possible and which impossible for an electron in an atom. Circle the appropriate answer.

a)	$n = 0, 1 = 0, m_l = 0, m_s = +1/2$	possible	impossible
b)	$n = 1, l = 1, m_l = 0, m_s = +1/2$	possible	impossible
c)	$n = 1, 1 = 0, m_1 = 0, m_s = -1/2$	possible	impossible
d)	$n = 2, l = 1, m_l = -2, m_s = -1/2$	possible	impossible
e)	$n = 2, l = 1, m_l = -1, m_s = +1/2$	possible	impossible