UNIT 1 - CHAPTER 7 REVIEW ASSIGNMENT - KEY

1. $n=3$, $\ell=2$ → 3D → $10e^-$ (D.) $\quad 4s^2\,3D^8 \rightarrow 4s^1\,3D^{10}$

2. $c = \lambda \cdot \nu \quad 3.0\times10^8 = 6.0\times10^{14} \cdot \lambda \quad \lambda = 5\times10^{-7}\,M = 5.0\times10^2\,nm$ (B.)

3. $5f = 14e^-$ (D.)

4. $4D = 10e^- =$ 5 ORBITALS (B.)

5. $X \Rightarrow 1s^2\,2s^2\,2p^3$ $\quad \frac{\uparrow\downarrow}{2s} \quad \frac{\uparrow}{2p}\ \frac{\uparrow}{}\ \frac{\uparrow}{}$ (3 SPACES FOR ADDING e^- = X^3)

$Y \Rightarrow 1s^2\,2s^1$ $\quad \frac{\uparrow}{2s}$ (1 SPACE FOR ADDING e^- = Y^1) $\Rightarrow Y_3X$ (C.)

6. $E = \frac{h\cdot c}{\lambda}$ $\quad \frac{(6.63\times10^{-34})\,J\cdot SEC)(3\times10^8\,M/SEC)}{4.34\times10^{-7}\,M} \Big| \frac{6.02\times10^{23}\,PHOTONS}{1\,MOLE} = 2.759\times10^6$ (D.)

7. ↑ENERGY = ↑FREQUENCY (ν) + LOW WAVELENGTH (λ) → ↑E = ↓E + ↓ν (B.)

8. K = $4s^1$ $\quad 4, \emptyset, \emptyset, +\frac{1}{2}$ (A.)

9.

I	II	III	IV
Na	Mg	Al	P
$3s^1$	$3s^2$	$3s^2\,3p^1$	$3s^2\,3p^3$
↑	↑↓	↑↓ ↑ — —	↑↓ ↑ ↑ ↑

PARAMAGNETIC = UNPAIRED e^-

I, III, IV (C.)

10.

$2,2,1,+\frac{1}{2}$	$3,2,\emptyset,-\frac{1}{2}$	$4,3,-3,+\frac{1}{2}$	$5,4,4,+\frac{1}{2}$	$6,2,-1,+\frac{1}{2}$
~~2D~~	$3D^8$	$4f^7$	$5g^1$	$6D^2$
(A.)	↑↓ ↑↓ ↑↓ ↑ ↑	↑ ↑ ↑ ↑ ↑ ↑ ↑	THEORETICAL	↑ ↑ — — —
	−2 −1 ∅ 1 2	−3 −2 −1 ∅ 1 2 3		−2 −1 ∅ 1 2

FREE RESPONSE

1. A)

i. $(3\times10^{8}) = (656\times10^{-9}\,M)\cdot V$ $\quad V = 4.57\times10^{14}\ Hz$

ii. $E = (6.63\times10^{-34})(4.57\times10^{14}\ Hz) =$ $\boxed{3.03\times10^{-19}\ \frac{J}{PHOTON}}$

iii. $\frac{3.03\times10^{-19}\ J}{PHOTON} \left| \frac{6.02\times10^{23}\ PHOTONS}{1\ MOLE} \right| \frac{1\ KJ}{1000\ J} = \boxed{182\ \frac{KJ}{MOLE}}$

B) 656nm → VISIBLE, RED LIGHT

C) 656nm RED LINE = LOWEST ENERGY TRANSITION IN BOHR MODEL. SINCE IT IS VISIBLE, IT WOULD END ON THE $n=2$ ENERGY LEVEL. THE SMALLEST ENERGY WOULD COME FROM AN EXCITED e^- IN THE $n=3$ FALLING TO $n=2$.

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2. A) $1s^2 2s^2 2p^4$ PARAMAGNETIC

B) $1s^2$ $1,0,0,+1/2$; $1,0,0,-1/2$

$2s^2$ $2,0,0,+1/2$; $2,0,0,-1/2$

$2p^4$ $2,1,-1,+1/2$; $2,1,0,+1/2$; $2,1,1,+1/2$; $2,1,-1,-1/2$

C) $E = \frac{h\cdot c}{\lambda} = \frac{(6.63\times10^{-34})(3\times10^{8})}{2.40\times10^{-9}\ METERS} = 8.29\times10^{-19}\ \frac{J}{PHOTONS} \left| \frac{6.02\times10^{23}\ PHOT.}{1\ MOL} \right| \frac{1\ KJ}{1000\ J}$

$= \boxed{499\ \frac{KJ}{MOL}}$