
CHE105 Summer 2016 EX3

Your Name: _____

Your ID: _____

Question #: 1

Calculate the internal energy change for a system that has 190 J of work done on it and gains 923 J of energy as heat.

- A. +1113 J
 - B. -1113 J
 - C. -733 J
 - D. +733 J
-

Question #: 2

A 52 g block of gold, initially at 89 °C, is submerged into 100. g of water at 24 °C in an insulated container. What is the final temperature of both substances at thermal equilibrium? The specific heat capacity of gold is 0.128 J/g•°C and of water is 4.18 J/g•°C.

- A. 25 °C
 - B. 56 °C
 - C. 35 °C
 - D. 42 °C
-

Question #: 3

How much work is done by a balloon on its surroundings when it inflates from 0.800 L to 1.400 L against an external pressure of 2.10 atm?

101.3 J = 1.00 L•atm

- A. +128 J
 - B. -128 J
 - C. -50.2 J
 - D. +50.2 J
-

Question #: 4

When a 2.4 g sample of C_5H_{10} is combusted in a constant-volume calorimeter, the temperature of the calorimeter increases from 22.3 °C to 42.0 °C. The heat capacity of the calorimeter was measured to be 8.21 kJ/°C. Calculate the enthalpy of reaction.

- A. +162 kJ
 - B. -162 kJ
 - C. +530. kJ
 - D. -530. kJ
-

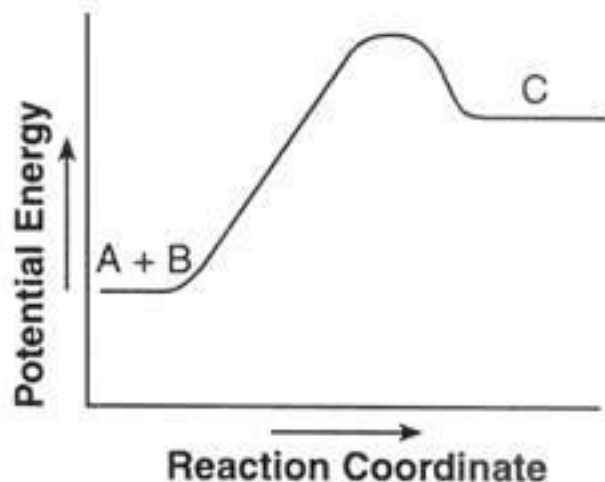
Question #: 5

Select the **two true** statements about enthalpy (H) and internal energy (E).

- A. Enthalpy is a state function.
 - B. Internal energy change is the sum of the heat released and the work performed by a chemical reaction.
 - C. Internal energy is the heat evolved by a chemical reaction at constant pressure.
 - D. Enthalpy change is the sum of the heat released and the work performed by a chemical reaction.
-

Question #: 6

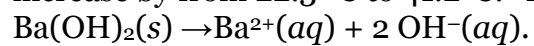
Is the reaction shown in this figure endothermic or exothermic? 1
 $A + B \rightarrow C$



1. _____

Question #: 7

Dissolving 4.20 g of $\text{Ba}(\text{OH})_2$ in 450. mL of water causes the temperature of the solution to increase by from 22.3 °C to 41.2°C. Determine ΔH per mol of $\text{Ba}(\text{OH})_2$ for the reaction.



The specific heat of the solution is 4.18 J/g·°C

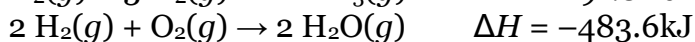
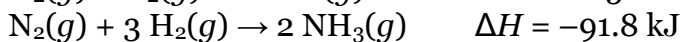
The density of water is 1.00 g/mL.

The calorimeter absorbs no significant amount of heat.

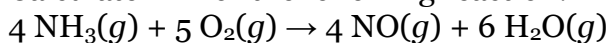
- A. 35.6 kJ/mol
 - B. -35.6 kJ/mol
 - C. -1450 kJ/mol
 - D. 1450 kJ/mol
-

Question #: 8

Given



Calculate ΔH for the following reaction:



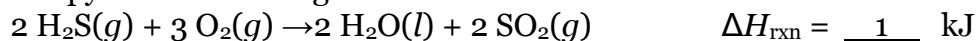
$$\Delta H_{\text{reaction}} = \underline{\quad 1 \quad} \text{ kJ}$$

Report your answer with **two** significant digits and do **not** include units in your answer. For scientific notation, use the format 2.2E2 or 2.2E-2.

1. _____

Question #: 9

What is the enthalpy of the following reaction?



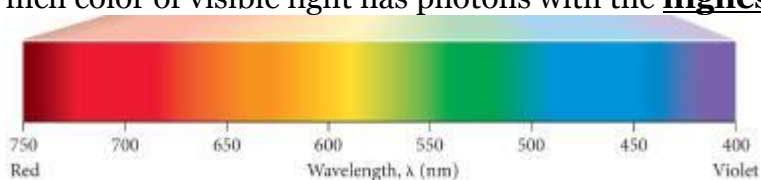
Report your answer with **three** significant digits and do **not** include units in your answer. Enter your answer using scientific notation in the form 2.22E2 or -2.22E2.

Substance	ΔH_f° (kJ/mol)
$\text{H}_2\text{S}(g)$	-20.1
$\text{SO}_2(g)$	-296.1
$\text{H}_2\text{O}(l)$	-285.8
$\text{H}_2\text{O}(g)$	-242

1. _____

Question #: 10

Which color of visible light has photons with the **highest** energy?



- A. red (700 nm)
 - B. orange (625 nm)
 - C. green (550 nm)
 - D. blue (450 nm)
-

Question #: 11

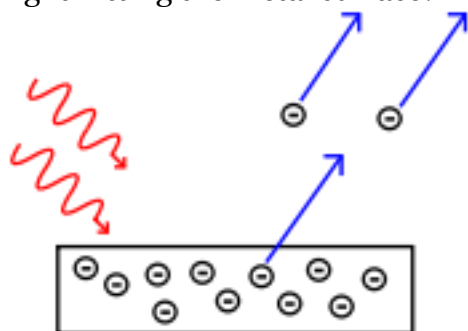
The energy of a photon of blue light with a wavelength of 450 nm is 1 J.

Report your answer with **two** significant figures. Do **not** include units in your answer using scientific notation in the format 2.2E2 or 2.2E-2.

1. _____

Question #: 12

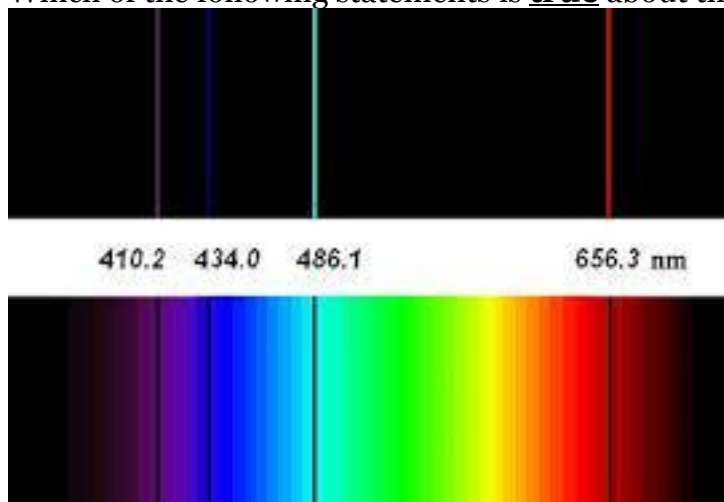
In order for an electron to be ejected from a metal surface what must be true about the energy of light hitting the metal surface?



- A. The energy of light must be greater than the binding energy of an electron.
 - B. The energy of light is independent to the binding energy of an electron.
 - C. The energy of light must be less than the binding energy of an electron.
 - D. The energy of light must be equal to the binding energy of an electron.
-

Question #: 13

Which of the following statements is **true** about the atomic spectra below?



- A. The absorption spectrum of an element is on top and the emission spectrum of a different element is on the bottom.
 - B. The emission spectrum of an element is on top and the absorption spectrum for the same element is on the bottom.
 - C. They are emission spectra for two different elements.
 - D. They are absorption spectra for two different elements.
-

Question #: 14

A atom of hydrogen emits a photon when its electron

- A. jumps from a lower-energy orbit to a higher-energy orbit.
 - B. jumps from a higher-energy orbit to a lower-energy orbit.
 - C. is shared with another atom.
 - D. is transferred to another atom.
-

Question #: 15

Which one of the following statements is **true** regarding Heisenberg's uncertainty principle?

- A. We cannot precisely know the charge of an electron.
 - B. The **less** precisely we know the position of an electron, the **less** precisely we know its momentum.
 - C. The **less** precisely we know the position of an electron, the **more** precisely we know its velocity.
 - D. We cannot precisely know the position of an electron.
-

Question #: 16

Select the **true** statement about quantum numbers.

- A. The angular momentum quantum number, **l** , determines the energy of an electron in an orbital.
 - B. The principal quantum number, **n** , determines the overall shape of the an orbital.
 - C. The magnetic quantum number, **m_l** , determines the orientation in space of an orbital.
 - D. An atomic orbital with a principal quantum number, **n** , can have an angular momentum quantum number of **$-n$ to $+n$** .
-

Question #: 17

The $n = 4$ principal shell includes a total of 1 **orbital(s)**.
Your answer should be a whole number.

1. _____

Question #: 18

Which orbital is associated with the quantum numbers $n = 5, l = 1$?

- A. $5d$
 - B. $4f$
 - C. $2s$
 - D. $5p$
-

Question #: 19

Select the **two** values of m_l below that are **allowed** for an electron in a p orbital.

- A. 2
 - B. -1
 - C. 1
 - D. -3
-

Question #: 20

An electron has quantum numbers $n = 3, l = 2, m_l = 0, m_s = -1/2$
Which type of orbital (sublevel or subshell) is this electron in? 1
(Your answer should consist of one number and one letter.)

1. _____

Question #: 21

What wavelength of light is emitted when an electron drops from the $n = 5$ state to the $n = 2$ state, using the Bohr model of the hydrogen atom?

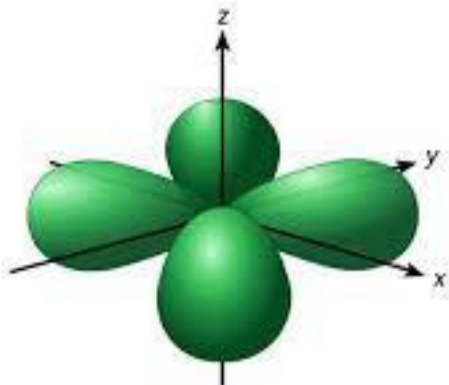
1 nm

Report your answer as a whole number (no decimal places) and do **not** include units in your answer.

1. _____

Question #: 22

The picture below illustrates the shape of which type of atomic orbital?



- A. *s*
 - B. *p*
 - C. *d*
 - D. *f*
-

Question #: 23

What is the electron configuration of a ground-state aluminum atom?

1

Use this format with spaces but no superscripts: 1s2 2s2 2p3...

1. _____

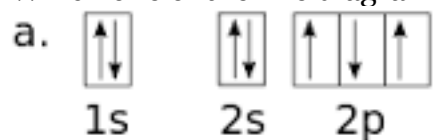
Question #: 24

Which electrons will experience the **greatest** amount of electron shielding in an atom?

- A. $2p$
 - B. $3s$
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-

Question #: 25

Which one of the five diagrams accurately represents a ground state electron configuration?



- A. A
- B. B
- C. C
- D. D
- E. E

CHE105 Summer 2016 EX3 - Confidential

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Periodic Table of the Elements

Period	1 IA																	18 VIIIA
1	H 1.008																	He 4.003
2	Li 6.941	Be 9.012											B 10.81	C 12.01	N 14.01	O 16.00	F 19.00	Ne 20.18
3	Na 22.99	Mg 24.31											Al 26.98	Si 28.09	P 30.97	S 32.07	Cl 35.45	Ar 39.95
4	K 39.10	Ca 40.08	Sc 44.96	Ti 47.87	V 50.94	Cr 52.00	Mn 54.94	Fe 55.85	Co 58.93	Ni 58.69	Cu 63.55	Zn 65.41	Ga 69.72	Ge 72.64	As 74.92	Se 78.96	Br 79.90	Kr 83.80
5	Rb 85.47	Sr 87.62	Y 88.91	Zr 91.22	Nb 92.91	Mo 95.94	Tc 98	Ru 101.1	Rh 102.9	Pd 106.4	Ag 107.9	Cd 112.4	In 114.8	Sn 118.7	Sb 121.8	Te 127.6	I 126.9	Xe 131.3
6	Cs 132.9	Ba 137.3	La 175.0	Hf 178.5	Ta 180.9	W 183.8	Re 186.2	Os 190.2	Ir 192.2	Pt 195.1	Au 197.0	Hg 200.6	Tl 204.4	Pb 207.2	Bi 209.0	Po 209	At 210	Rn 222
7	Fr 223	Ra 226	Ac 227	Rf 261	Db 262	Sg 266	Bh 264	Hs 277	Mt 288	Ds 291	Rg 292	Cn 285	Uut 284	Fl 289	Uup 288	Lv 292	Uus 293	Uuo 294
lanthanides (see earth)		57 La 138.9	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm 145	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0			
actinides		89 Ac 227	90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np 237	94 Pu 239	95 Am 243	96 Cm 247	97 Bk 247	98 Cf 251	99 Es 252	100 Fm 257	101 Md 258	102 No 259			

Molar volume of ideal gas at STP = 22.4 L	Ideal gas constant: $R = 8.314 \text{ J}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$	Speed of light, $c = 3.00 \times 10^8 \text{ m}\cdot\text{s}^{-1}$
Faraday constant, $F = 9.6485 \times 10^4 \text{ C}\cdot\text{mol}^{-1}$	$R = 1.987 \text{ cal}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$	Rydberg constant, $R_H = 2.18 \times 10^{-18} \text{ J}$
Avogadro's number, $N = 6.022 \times 10^{23} \text{ mol}^{-1}$	$R = 8.206 \times 10^{-2} \text{ L}\cdot\text{atm}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$	Electron charge, $e = 1.602 \times 10^{-19} \text{ C}$
Planck's constant, $h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$		Atomic mass unit, $u = 1.6605 \times 10^{-24} \text{ g}$

attachment_for_pubExamUID_Inxp114689811883741132XX_91.jpg

Question #: 1

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water is $4.18 \text{ J/g}\cdot^\circ\text{C}$.

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When a 2.4 g sample of C_5H_{10} is combusted in a constant-volume calorimeter, the temperature of the calorimeter increases from 22.3°C to 42.0°C . The heat capacity of the calorimeter was measured to be $8.21 \text{ kJ}/^\circ\text{C}$. Calculate the enthalpy of reaction.

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Question #: 5

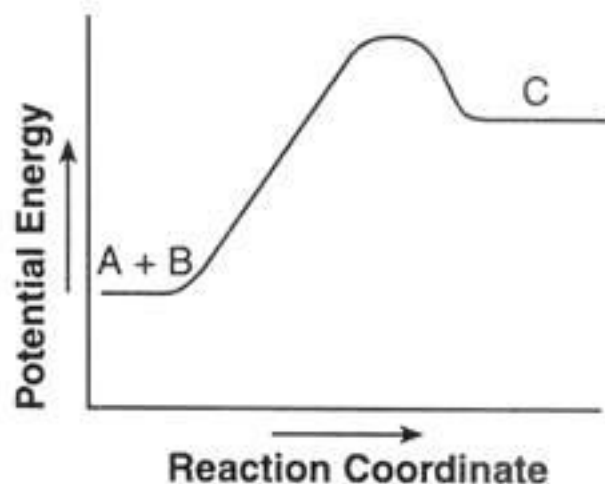
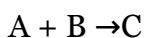
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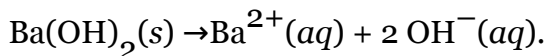
Is the reaction shown in this figure endothermic or exothermic? 1



1. endothermic|ENDOTHERMIC|endo|endotherm|

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The specific heat of the solution is 4.18 J/g·°C

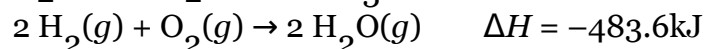
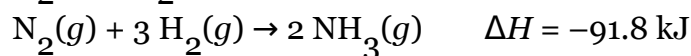
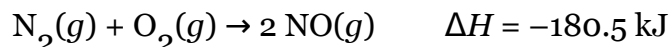
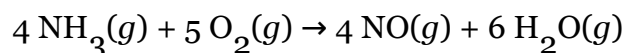
The density of water is 1.00 g/mL.

The calorimeter absorbs no significant amount of heat.

- A. 35.6 kJ/mol
- B. -35.6 kJ/mol
- ✓C. -1450 kJ/mol
- D. 1450 kJ/mol

Question #: 8

Given

Calculate ΔH for the following reaction:

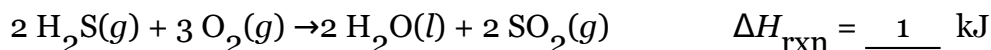
$$\Delta H_{\text{reaction}} = \underline{\quad 1 \quad} \text{ kJ}$$

Report your answer with **two** significant digits and do **not** include units in your answer. For scientific notation, use the format 2.2E2 or 2.2E-2.

1. -1.6E3|-1.6 E3|1.6 E 3|1600|

Question #: 9

What is the enthalpy of the following reaction?



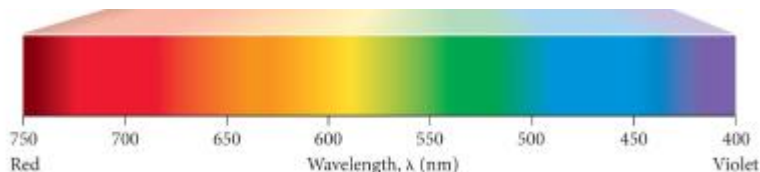
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Substance	H_f° (kJ/mol)
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$\text{H}_2\text{O}(l)$	-285.8
$\text{H}_2\text{O}(g)$	-242

1. -1.12E3|-1.12 E 3|-1.12E 3|

Question #: 10

Which color of visible light has photons with the **highest** energy?



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Question #: 11

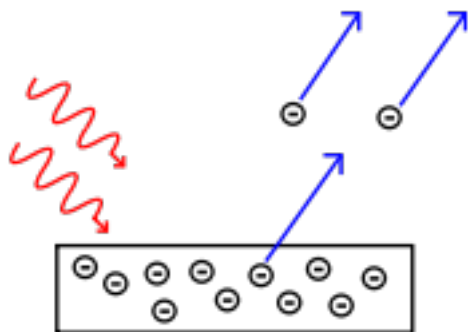
The energy of a photon of blue light with a wavelength of 450 nm is 1 J.

Report your answer with **two** significant figures. Do **not** include units in your answer using scientific notation in the format 2.2E2 or 2.2E-2.

1. 4.4E-19|4.4 E -19|4.4E -19|

Question #: 12

In order for an electron to be ejected from a metal surface what must be true about the energy of light hitting the metal surface?

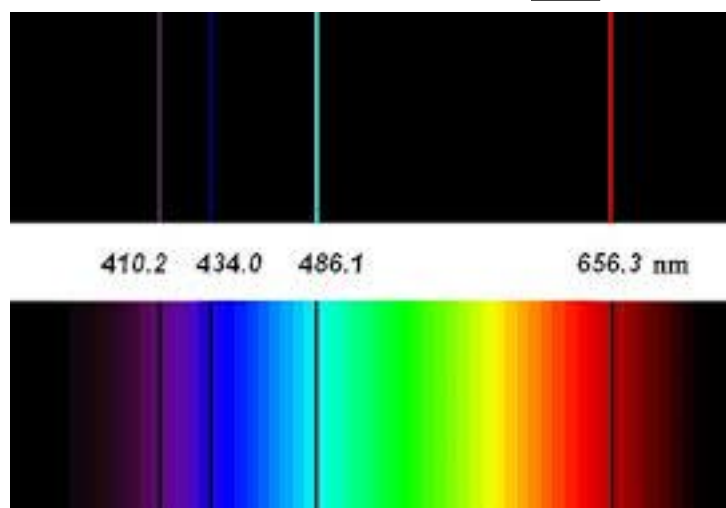


- ✓A. The energy of light must be greater than the binding energy of an electron.

- B. The energy of light is independent to the binding energy of an electron.
- C. The energy of light must be less than the binding energy of an electron.
- D. The energy of light must be equal to the binding energy of an electron.

Question #: 13

Which of the following statements is true about the atomic spectra below?



- A. The absorption spectrum of an element is on top and the emission spectrum of a different element is on the bottom.
- ✓B. The emission spectrum of an element is on top and the absorption spectrum for the same element is on the bottom.
- C. They are emission spectra for two different elements.
- D. They are absorption spectra for two different elements.

Question #: 14

A atom of hydrogen emits a photon when its electron

- A. jumps from a lower-energy orbit to a higher-energy orbit.
 - ✓B. jumps from a higher-energy orbit to a lower-energy orbit.
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Question #: 15

Which one of the following statements is true regarding Heisenberg's uncertainty principle?

- A. We cannot precisely know the charge of an electron.
 - B. The less precisely we know the position of an electron, the less precisely we know its momentum.
 - ✓C. The less precisely we know the position of an electron, the more precisely we know its velocity.
 - D. We cannot precisely know the position of an electron.
-

Question #: 16

Select the true statement about quantum numbers.

- A. The angular momentum quantum number, l , determines the energy of an electron in an orbital.
 - B. The principal quantum number, n , determines the overall shape of the an orbital.
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 - D. An atomic orbital with a principal quantum number, n , can have an angular momentum quantum number of $-n$ to $+n$.
-

Question #: 17

The $n = 4$ principal shell includes a total of 1 orbital(s).

Your answer should be a whole number.

1. 16|sixteen|

Question #: 18

Which orbital is associated with the quantum numbers $n = 5, l = 1$?

- A. $5d$
- B. $4f$
- C. $2s$
- ✓D. $5p$

Question #: 19

Select the two values of m_l below that are allowed for an electron in a p orbital.

- A. 2
- ✓B. -1
- ✓C. 1
- D. -3

Question #: 20

An electron has quantum numbers $n = 3$, $l = 2$, $m_l = 0$, $m_s = -1/2$

Which type of orbital (sublevel or subshell) is this electron in? 1

(Your answer should consist of one number and one letter.)

1. 3d|3D|3 d|3 D|

Question #: 21

What wavelength of light is emitted when an electron drops from the $n = 5$ state to the $n = 2$ state, using the Bohr model of the hydrogen atom?

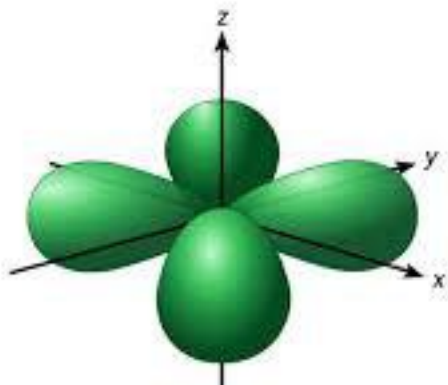
1 nm

Report your answer as a whole number (no decimal places) and do not include units in your answer.

1. 430|4.3E2|

Question #: 22

The picture below illustrates the shape of which type of atomic orbital?



- A. *s*
- B. *p*
- ✓ C. *d*
- D. *f*

Question #: 23

What is the electron configuration of a ground-state aluminum atom?

1

Use this format with spaces but no superscripts: 1s2 2s2 2p3...

1. 1s2 2s2 2p6 3s2 3p1|[Ne]3s2 3p1

Question #: 24

Which electrons will experience the **greatest** amount of electron shielding in an atom?

- A. *2p*
- B. *3s*
- ✓ C. *4d*
- D. *3p*

Question #: 25

Which one of the five diagrams accurately represents a ground state electron configuration?



A. A

B. B

C. C

D. D

✓E. E