AP Test #2 Spring 2010
Shakeri

1. The electron affinity value expected for the process
$F(g) + e^- \longrightarrow F^-(g)$
would be

[A] zero. [B] a large negative number. [C] a small positive number.
[D] a small negative number. [E] a large positive number.

2. The balanced net ionic equation for the reaction of calcium carbonate with nitric acid is

[A] $Ca(HCO_3)_2(s) + 2HNO_3(aq) \longrightarrow Ca^{2+}(aq) + 2NO_3^-(aq) + 2CO_2(g) + 2H_2O(l)$.

[B] $CaCO_3(s) + 2HNO_2(aq) \longrightarrow Ca^{2+}(aq) + 2NO_2^-(aq) + CO_2(g) + H_2O(l)$.

[C] $Ca^{2+}(aq) + CO_3^{2-}(aq) + 2H^+(aq) + 2NO_3^-(aq) \longrightarrow Ca(NO_3)_2(aq) + CO_2(g) + H_2O(l)$.

[D] $CaCO_3(s) + 2HNO_3(aq) \longrightarrow Ca^{2+}(aq) + 2NO_3^-(aq) + CO_2(g) + H_2O(l)$.

[E] $CaCO_3(s) + 2H^+(aq) \longrightarrow Ca^{2+}(aq) + CO_2(g) + H_2O(l)$.

3. All the following compounds are soluble in water **EXCEPT**

[A] LiCl. [B] AgCl. [C] CsCl. [D] NH_4Cl. [E] $CuCl_2$.

4. The oxidation numbers of nitrogen in N_2O and N_2F_4 are, respectively,

[A] +1 and –1. [B] –2 and –3. [C] +1 and +2. [D] –2 and +2. [E] +1 and –3.

5. The maximum number of electrons that can occupy one f orbital is

[A] 2. [B] 4. [C] 8. [D] 10. [E] 18.

6. In the balanced equation
$3Na^+ + 3OH^- + P_4 + 3H_2O \longrightarrow 3Na + 3H_2PO_2^- + PH_3$
the reducing agent is

[A] PH_3. [B] Na^+. [C] P_4. [D] OH^-. [E] H_2O.

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7. From a consideration of electronic configurations, which of the elements indicated below would be classified as a **TRANSITION** element?

[A] $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2$ [B] $1s^2, 2s^2, 2p^2$

[C] $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^5, 4s^2$ [D] $1s^2, 2s^2, 2p^6, 3s^2, 3p^5$

[E] $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^{10}, 4s^2, 4p^6$

8. What orbital has the quantum numbers $n = 4$, $l = 3$, $m_l = -1$?

[A] d [B] s [C] f [D] p [E] g

9. What is the wavelength of light emitted when the hydrogen atom undergoes a transition from level $n = 5$ to level $n = 2$?
$R_H = 2.180 \times 10^{-18}$ J

[A] 663 nm [B] 833 nm [C] 546 nm [D] 521 nm [E] 434 nm

10. Which of the following sets of the four quantum numbers n, l, m_l, and m_s describes one of the outermost electrons in a ground-state radium atom?

[A] $7, 0, 0, -\frac{1}{2}$ [B] $6, 1, 1, \frac{1}{2}$ [C] $7, 1, 0, \frac{1}{2}$ [D] $7, 0, 1, -\frac{1}{2}$ [E] $7, 2, 1, -\frac{1}{2}$

11. Under what set of conditions does HCl(*g*) deviate the most from ideal behavior?

[A] high temperature and high pressure [B] high temperature and low pressure

[C] low temperature and low pressure [D] low temperature and high pressure

[E] standard temperature and pressure

A

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12. From a consideration of the van der Waals constants for water and sulfur dioxide,

	$\mathbf{a}(\text{atm} \cdot \text{L}^2/\text{mol}^2)$	$\mathbf{b}(\text{L}/\text{mol})$
H_2O	5.54	0.0305
SO_2	6.87	0.0568

we can conclude that

[A] H_2O molecules are smaller and more attracted to each other than SO_2 molecules.

[B] H_2O molecules are smaller and less attracted to each other than SO_2 molecules.

[C] H_2O molecules are larger and more attracted to each other than SO_2 molecules.

[D] H_2O molecules are larger and less attracted to each other than SO_2 molecules.

[E] None of these conclusions is correct.

13. In the van der Waals equation of state for 1 mol of gas,

$$\left(P + \frac{a}{V^2}\right)(V - b) = RT$$

the effect of intermolecular forces is accounted for by

[A] $V - b$. [B] $P + \frac{a}{V^2}$. [C] b. [D] P. [E] $\left(P + \frac{a}{V^2}\right)(V - b)$.

14. Which of the following is a strong acid?

[A] tartaric acid [B] ascorbic acid [C] acetic acid

[D] acetylsalicylic acid [E] hydroiodic acid

15. Which of the following is a weak base?

[A] $Ba(OH)_2$ [B] HOCl [C] KOH [D] LiOH [E] NH_3

16. According to the quantum theory, what is the energy contained in a single quantum of ultraviolet light with a frequency of $7.00 \times 10^{14}\ s^{-1}$? (Planck's constant is $6.63 \times 10^{-34}\ J \cdot s$.)

[A] 1.75×10^{-48} J [B] 4.64×10^{-19} J [C] 2.63×10^{5} J

[D] 4.38×10^{13} J [E] 6.02×10^{23} J

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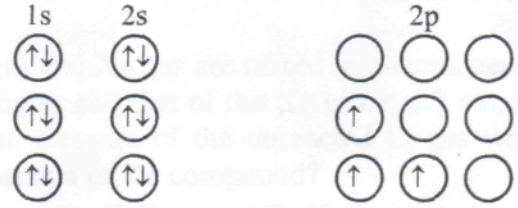
17. All the following are strong acids **EXCEPT**

[A] HBr [B] HF [C] HI [D] HCl [E] H_2SO_4

18. The density of a gas is 3.48 g/L at STP. What is its molecular weight?

[A] 44.6 g/mol [B] 224 g/mol [C] 78.0 g/mol [D] 32.0 g/mol [E] 147 g/mol

19. Which of the following orbital diagrams represents a paramagnetic atom?



[A] 1 only [B] 2 only [C] 3 only [D] 1 and 2 only [E] 2 and 3 only

20. The behavior of $PH_3(g)$ is most likely to approach ideal behavior at

[A] 0.10 atm and –100°C. [B] 10 atm and 100°C. [C] 1.0 atm and 100°C.
[D] 1.0 atm and 0°C. [E] 0.10 atm and 100°C.

21. All the following are strong electrolytes in aqueous solution **EXCEPT**

[A] NaHS. [B] NH_4Cl. [C] Na_2S. [D] HNO_2. [E] NH_4F.

22. Which of the following atoms has the **LARGEST** atomic radius?

[A] P [B] Sr [C] I [D] Mg [E] Kr

23. When solutions of barium chloride and sodium sulfate are mixed, the spectator ions in the resulting reaction are

[A] only Na^+. [B] only Ba^{2+}. [C] only Cl^-.
[D] only SO_4^{2-}. [E] both Na^+ and Cl^-.

24. What is the ratio of the average speed of SO_2 molecules to that of oxygen molecules at 298 K?

[A] 2:1 [B] 1:2 [C] $\sqrt{64} : \sqrt{32}$ [D] 1:1 [E] $\sqrt{32} : \sqrt{64}$