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$\qquad$
$\qquad$

## Midterm practice test

## Multiple Choice

Choose the correct answer for each question. You may write on the test, however only answers on the scantron will be graded.
$\Delta H_{\text {fus }}=6.01 \mathrm{~kJ} / \mathrm{mol}$ or $334 \mathrm{~J} / \mathrm{g}$
$\Delta H_{\text {vap }}=40.7 \mathrm{~kJ} / \mathrm{mol}$ or $2260 \mathrm{~J} / \mathrm{g}$
$c=4.18 \mathrm{~J} / \mathrm{g}^{\circ} \mathrm{C}$ or $1.00 \mathrm{cal} / \mathrm{g}^{\circ} \mathrm{C}$

## *Remember your midterms covers everything back to January and the common topics from first semester. <br> *Your test is very heavy on ch 7 and 8. <br> **If you need help you must come see me before Thursday! <br> *You will not have time to review on Thursday before the test or add anything on to your midterm sheet.

$\qquad$ 1. What is the net charge of the ionic compound calcium fluoride?
a. 2-
c. 0
b. 1-
d. 1+
$\qquad$ 2. Which of the following is NOT a characteristic of most ionic compounds?
a. They are solids.
b. They have low melting points.
c. When melted, they conduct an electric current.
d. They are composed of metallic and nonmetallic elements.
$\qquad$ 3. What causes water molecules to have a bent shape, according to VSEPR theory?
a. repulsive forces between unshared pairs of electrons
b. interaction between the fixed orbitals of the unshared pairs of oxygen
c. ionic attraction and repulsion
d. the unusual location of the free electrons
$\qquad$ 4. What type of substance is malleable and ductile?
a. Metallic compounds
c. Molecular compounds
b. Ionic compounds
d. Noble Gases
$\qquad$ 5. What compound should dissolve in water?
a. $\mathrm{PCl}_{3}$
c. $\mathrm{CCl}_{4}$
b. Hexane $\left(\mathrm{C}_{6} \mathrm{H}_{14}\right)$
d. $\mathrm{SiO}_{2}$
$\qquad$ 6. Some of the molecules found in the human body are $\mathrm{NH}_{2} \mathrm{CH}_{2} \mathrm{COOH}$ (glycine), $\mathrm{C}_{6} \mathrm{H}_{12} \mathrm{O}_{6}$ (glucose), and $\mathrm{CH}_{3}\left(\mathrm{CH}_{2}\right)_{16} \mathrm{COOH}$ (stearic acid). The bonds they form are
a. Ionic
c. Metallic
b. Covalent
d. Nuclear

| SOLUBILITY OF SUBSTANCES IN WATER @ $20^{\circ} \mathrm{C}$ |  |  |
| :--- | :---: | :---: |
| Substance | Formula/State | Solubility $(\mathrm{g} / 100 \mathrm{~g} \mathrm{H} 2 \mathrm{O})$ |
| Magnesium chloride | $\mathrm{MgCl}_{2} /$ solid | 54.6 |
| Ammonia | $\mathrm{NH}_{3} /$ gas | 34.0 |
| Ethanol | $\mathrm{CH}_{3} \mathrm{CH}_{2} \mathrm{OH} /$ liquid | infinite |
| Benzoic Acid | $\mathrm{C}_{6} \mathrm{H}_{5} \mathrm{COOH} /$ solid | 0.29 |

7. 

Which of the substances in the table can act as either the solute or the solvent when mixed with 100 grams of water at $20^{\circ} \mathrm{C}$ ?
a. Magnewium Chloride
c. Ethanol
b. Ammonia
d. Benzoic Acid
8. List the following atoms in order of decreasing first ionization energy: $\mathrm{B}, \mathrm{Li}, \mathrm{C}, \mathrm{F}, \mathrm{O}$.
a. F, O, C, B, Li
c.
Li, B, F, O, C
b. $\quad \mathrm{B}, \mathrm{Li}, \mathrm{C}, \mathrm{O}, \mathrm{F}$
d. $\mathrm{Li}, \mathrm{B}, \mathrm{C}, \mathrm{O}, \mathrm{F}$
9. What is the correct noble gas electron configuration for a Chloride ion?
a. $\quad[\mathrm{Ar}] 3 \mathrm{~s}^{2} 3 \mathrm{p}^{5}$
b. $\quad[\mathrm{Ar}] 3 s^{2} 3 \mathrm{p}^{6}$
c. $\quad[\mathrm{Ne}] 3 \mathrm{~s}^{2} 3 \mathrm{p}^{5}$
d. $[\mathrm{Ne}] 3 s^{2} 3 \mathrm{p}^{6}$
10. What is the volume of 63.8 g of Carbon Dioxide at a pressure of 75.0 kPa and a temperature of 345 K ?
a. $\quad 22.4 \mathrm{~L}$
b. $\quad 55.4 \mathrm{~L}$
c. $\quad 8.23 \mathrm{~L}$
d. $\quad 78.4 \mathrm{~L}$
11. Which of the following elements has the smallest atomic size?
a. Cesium
c. Calcium
b. Oxygen
d. Chlorine
12. Which of the forces below is the weakest?
a. intermolecular
c. metallic
b. electrostatic
13. A 25.0 g sample of water at $100^{\circ} \mathrm{C}$ has an energy change of -1670 J . What is the new temperature of the water?
a. $116^{\circ} \mathrm{C}$
b. $\quad 84.0^{\circ} \mathrm{C}$
c. $\quad 104.18^{\circ} \mathrm{C}$
d. $58.5^{\circ} \mathrm{C}$
14. Arrange the following elements: $\mathrm{P}^{3-}, \mathrm{S}^{2-}, \mathrm{K}^{+}, \mathrm{Ca}^{2+}, \mathrm{Sc}^{3+}$, in order of increasing ionic size.
a. $\quad \mathrm{Sc}^{3+}, \mathrm{Ca}^{2+}, \mathrm{K}^{+}, \mathrm{S}^{2-}, \mathrm{P}^{3-}$
b. $\quad \mathrm{K}^{+}, \mathrm{Ca}^{2+}, \mathrm{Sc}^{3+}, \mathrm{S}^{2-}, \mathrm{P}^{3-}$
c. $\mathrm{P}^{3-}, \mathrm{S}^{2-}, \mathrm{K}^{+}, \mathrm{Ca}^{2+}, \mathrm{Sc}^{3+}$
d. $\quad \mathrm{Sc}^{3+}, \mathrm{Ca}^{2+}, \mathrm{K}^{+}, \mathrm{P}^{3-}, \mathrm{S}^{2-}$
15. How many valence electrons are in an atom of phosphorus?
a. 2
b. 3
c. 4
d. 5
16. What is the electron configuration of the gallium ion?
a. $1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6}$
b. $\quad 1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{5} 4 s^{1}$
c. $\quad 1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6} 4 s^{2} 4 p^{6}$
d. $1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6} 3 d^{10}$
17. The electron configuration of a fluoride ion, $\mathrm{F}^{-}$, is $\qquad$ .
a. $\quad 1 s^{2} 2 s^{2} 2 p^{5}$
c. $1 s^{2} 2 s^{2} 2 p^{6} 3 s^{1}$
b. the same as that of a neon atom
d. the same as that of a potassium ion
18. Which of these elements does not exist as a diatomic molecule?
a. Ne
c. H
b. F
d. I
19. Which of the following will conduct electricity?
a. $\mathrm{CO}_{2}$
b. LiCl
c. CO
d. $\mathrm{N}_{2}$
20. What causes dipole interactions?
a. sharing of electron pairs
b. attraction between polar molecules
c. bonding of a covalently bonded hydrogen to an unshared electron pair
d. attraction between ions
21. What causes hydrogen bonding?
a. attraction between ions
b. motion of electrons
c. sharing of electron pairs
d. bonding of a covalently bonded hydrogen atom with an unshared electron pair
22. Which of the following pairs of elements is most likely to form an ionic compound?
a. magnesium and fluorine
c. nitrogen and sulfur
b. sodium and aluminum
d. oxygen and chlorine
23. Which of the following compounds would you expect to be the best conductor of electricity?
a. $\mathrm{CH}_{4(\mathrm{~g})}$
b. $\mathrm{H}_{2} \mathrm{O}_{(\mathrm{I})}$
c. $\mathrm{MgCl}_{2(\mathrm{aq})}$
d. $\quad \mathrm{N}_{2(\mathrm{~g})}$
24. Which of the following covalent bonds is the most polar?
a. $\quad$ C---C
b.
b. $\quad C--C l$
c.
c. $C---B r$
d.
d. $\quad \mathrm{C}---\mathrm{H}$
e.
e. $C--S$
25. How many lone pairs of electrons are on the central atom of dihydrogen sulfide?
a. 0
b. 1
c. 2
d. 3
e. 4
26. What is the shape of a molecule of $\mathrm{NI}_{3}$ ?
a. Bent
d. Trigonal Pyramidal
b. Linear
e. Tetrahedral
c. Trigonal Planar
27. What is the shape of a molecule of $\mathrm{CHCl}_{3}$ ?
a. Linear
d. Trigonal Pyramidal
b. Bent
e. Tetrahedral
c. Trigonal Planar
28. What is the shape of a molecule of NBrO ?
a. Linear
c. Trigonal Planar
b. Bent
d. Trigonal Pyramidal
29. Which of the following is the shape of $\mathrm{C}_{2} \mathrm{H}_{2}$ ?
a. Linear
c. Trigonal Tetrahedral
b. Bent
d. Trigonal Planar
30. What intermolecular force holds together molecules of $\mathrm{SiO}_{2}$ ?
a. Dispersion
c. Hydrogen Bonding
b. Dipole-Dipole
d. Ionic Bonding
31. According to the octet rule, Sulfur will gain or share $\qquad$ electrons.
a. 0
b. 1
c. 2
d. 3
e. 6
32. How many valence electrons does an atom of any halogen have?
a. 5
b. 8
c. 7
d. 1
33. Using the electron dot structure, what would a chlorine atom look like?
a.

c.

b.

d.

34. What is the correct electron dot structure for Sulfur?
a.

c.
$[: \ddot{S}:]^{2-}$
$\stackrel{\circ}{5}$
b.
d.

35. Using the electron dot structure, a phosphide ion would most look like $\qquad$ -
a.

b.
c.
$[: \ddot{P} \cdot]^{3-}$
d.

36. Which of these is not a characteristic of most ionic compounds?
a. They have low melting points.
c. When melted they conduct an electric current.
b. They are composed of metallic and
d. They are crystalline solids with repeating patterns.
37. What force is found between all molecules?
a. dipole-dipole
c. hydrogen bonding
b. dispersion
d. ionic bonding
38. Which of the forces of molecular attraction is the weakest?
a. Dispersion
c. dipole interactions
b. Hydrogen bonding
d. ionic bonding
39. What type of intermolecular force is the most imortant in $\mathrm{SiO}_{2}$ ?
a. Dispersion
c. Hydrogen Bonding
b. Dipole-Dipole Forces
40. What type of intermolecular force is the most imortant in $\mathrm{NH}_{3}$ ?
a. Hydrogen Bonding
c. Dipole-Dipole Forces
b. Dispersion Forces
41. What type of intermolecular force is the most imortant in $\mathrm{CHCl}_{3}$ ?
a. Hydrogen Bonding
c. Dipole-Dipole Forces
b. Dispersion Forces
42. According to the octet rule, Sulfur will gain or share $\qquad$ electrons
a. 0
b. 4
c. 2
d. 6
43. What is the correct name for this compound: $\mathrm{HNO}_{3}$ ?
a. Hydronitric Acid
c. Nitric Acid
b. Hydronitrous Acid
d. Nitrous Acid
44. What is the mass of $5.3 \times 10^{22}$ molecules of ethyl alcohol $\left(\mathrm{C}_{2} \mathrm{H}_{5} \mathrm{OH}\right)$ ?
a. 4.0 grams
b. 40 grams
c. 46 grams
d. 5.2 grams
45. Select the set of coefficients that properly balance the equation below.
$\ldots \mathrm{Fe}_{2} \mathrm{O}_{3} \rightarrow$ _ $\mathrm{Fe}+\ldots \mathrm{O}_{2}$
a. $2,4,3$
c. $1,2,3$
b. 2, 2, 3
d. $3,4,4$
46. How many moles of $\mathrm{HNO}_{3}$ are needed to prepare 5.0 liters of a 2.0 M solution of $\mathrm{HNO}_{3}$ ?
a. 2.5
b. 5
c. 10
d. 20
47. Which of these is an example of an exothermic chemical process?
a. evaporation of water
c. photosynthesis of glucose
b. melting ice
d. combustion of gasoline
48. A sample of a gas with a volume of 3.9 L at $27^{\circ} \mathrm{C}$ and 1.00 atm is cooled at a constant pressure until the temperature is $11^{\circ} \mathrm{C}$. Calculate the new volume.
a. $\quad 3.7 \mathrm{~L}$
b. $\quad 4.0 \mathrm{~L}$
c. $\quad 5.1 \mathrm{~L}$
d. $\quad 1.4 \mathrm{~L}$
49. How much energy would be required to raise the temperature of 75.0 g of water from $25.0^{\circ} \mathrm{C}$ to $75.0^{\circ} \mathrm{C}$ ?
a. $\quad 15.7 \mathrm{~kJ}$
b. $\quad 334$ kJ
c. $\quad 1.25 \times 10^{6} \mathrm{~J}$
d. $\quad 4.85 \mathrm{~kJ}$
50. How many molecules of nitrogen gas are in a 5.50 L at 75.0 kPa and $125^{\circ} \mathrm{C}$ ?
a. $\quad 7.51 \times 10^{22}$
b. $\quad 3.50 \times 10^{23}$
c. $6.02 \times 10^{23}$
d. $4.35 \times 10^{19}$
51. What is the correct formula for cobalt (II) cyanide?
a. CoCN
b. $\quad \mathrm{Co}(\mathrm{CN})_{2}$
c. $\mathrm{CoCN}_{2}$
d. $\quad \mathrm{Cr}(\mathrm{CN})_{2}$
52. $\mathrm{P}_{4} \mathrm{O}_{10}+\mathrm{H}_{2} \mathrm{O}$--> $\mathrm{H}_{3} \mathrm{PO}_{4}$

How many molecules of water are needed to produce 66.8 g of phosphoric acid?
a. $\quad 2.74 \times 10^{1}$
b. $\quad 6.16 \times 10^{1}$
c. $\quad 6.16 \times 10^{23}$
d. $61.6 \times 10^{-23}$
53. Which compound represents a molecular compound?
a. $\quad \mathrm{S}_{2} \mathrm{Br}_{6}$
b. $\quad \mathrm{KF}$
c. HBr
d. $\quad \mathrm{NaNO}_{3}$
$\qquad$ 54. $\qquad$ Mg + $\qquad$ $\mathrm{HCl} \rightarrow$ $\qquad$
The correct products for the following reaction is:
a. $\mathrm{MgCl}+\mathrm{H}_{2}$
c. $\mathrm{MgCl}_{2}+\mathrm{H}_{2}$
b. $\mathrm{MgH}_{2}+\mathrm{Cl}_{2}$
d. no reaction
55. How many moles of $\mathrm{H}_{3} \mathrm{PO}_{4}$ are produced when $71.0 \mathrm{~L} \mathrm{P}_{4} \mathrm{O}_{10}$ reacts completely to form $\mathrm{H}_{3} \mathrm{PO}_{4}$ ?

$$
\mathrm{P}_{4} \mathrm{O}_{10}(s)+6 \mathrm{H}_{2} \mathrm{O}(\mathrm{l}) \rightarrow 4 \mathrm{H}_{3} \mathrm{PO}_{4}(a q)
$$

a. $\quad 6.35 \mathrm{~mol}$
b. $\quad 397.6 \mathrm{~mol}$
c. $\quad 16.0 \mathrm{~mol}$
d. $\quad 12.7 \mathrm{~mol}$
56. The graph below represents the uniform cooling (freezing) of a substance, starting with the substance as a gas above its boiling point.


Choose the correct formula to find the amount of heat change from $D$ to $E$.
a. $\quad Q=m \Delta H_{\text {vap }}$
b. $\quad Q=m \Delta H_{\text {fus }}$
c. $\quad Q=m\left(-\Delta H_{f u s}\right)$
d. $\quad Q=m\left(-\Delta H_{\text {vap }}\right)$
e. $\quad Q=m C \Delta T$
57. How much heat in kJ is absorbed when 50.0 g of ice at $0^{\circ} \mathrm{C}$ melts?
a. 20.9 kJ
b. 226 kJ
c. 0 J
d. $\quad 16.7 \mathrm{~kJ}$
58. What is the molality of a solution containing 8.0 grams of solute in 0.50 kg of solvent? (molar mass of solute $=24 \mathrm{~g}$ )
a. 0.17 m
b. 0.67 m
c. $4 m$
d. 1.67 m

## Multiple Response

Identify one or more choices that best complete the statement or answer the question.
$\qquad$ 59. What intermolecular forces are present between molecules of water?
a. Dispersion
c. Hydrogen Bonding
b. Dipole-Dipole
d. Ionic Bonding
$\qquad$ 60. Which of the following molecules are nonpolar?
a. $\mathrm{CHCl}_{3}$
b. $\mathrm{SCl}_{2}$
c. HNO
d. $\mathrm{F}_{2}$
e. $\mathrm{CO}_{2}$
61. Which of the following molecules are polar?
a. $\mathrm{NH}_{3}$
c. $\mathrm{CCl}_{4}$
b. HF
d. HCOOH

## Midterm practice test

Answer Section

## MULTIPLE CHOICE

1. ANS: C

OBJ: 7.2.1
2. ANS: B

OBJ: 7.2.2
3. ANS: A

OBJ: 8.3.2
4. ANS: A
5. ANS: A
6. ANS: B
7. ANS: C
8. ANS: A

St. 1c

PTS: 1
9. ANS: D
10. ANS: B

Stt. 4h
PTS: 1 STA: 4h
11. ANS: B

St. 1c

PTS: 1
12. ANS: A
13. ANS: B
14. ANS: A
15. ANS: D OBJ: 7.1.1
16. ANS: D

OBJ: 7.1.1
17. ANS: B

OBJ: 7.1.4
18. ANS: A

OBJ: 8.2.1
19. ANS: B

OBJ: 8.2.1|8.2.4
20. ANS: B

OBJ: 8.1.1|8.4.3
21. ANS: D

OBJ: 8.4.3
22. ANS: A
23. ANS: C

PTS: 1
DIF: L1

DIF: L1

DIF: L2
STA: Ch.2.a
PTS: 1
PTS: 1
PTS: 1
PTS: 1

STA: 1c
PTS: 1

PTS: 1
PTS: 1
PTS: 1
PTS: 1 DIF: L1
STA: Ch.1.c|Ch.2.a|Ch.1.d
PTS: 1 DIF: L2
STA: Ch.1.g
PTS: 1
STA: Ch.1.g
PTS: 1
STA: Ch.2.a
PTS: 1
STA: Ch.2.a
PTS: 1
STA: Ch.2.a
PTS: 1
STA: Ch.2.a
PTS: 1
PTS: 1

DIF: L1

DIF: L1

DIF: L2

DIF: L1

DIF: L2

REF: p. 187

REF: p. 190

REF: p. 192

REF: p. 217

REF: p. 222
REF: p. 240

REF: p. 241
24. ANS: B
25. ANS: C
26. ANS: D
27. ANS: E
28. ANS: B
29. ANS: A
30. ANS: A
31. ANS: C
32. ANS: C
33. ANS: A
34. ANS: D
35. ANS: C
36. ANS: A
37. ANS: B
38. ANS: A
39. ANS: A
40. ANS: A
41. ANS: C
42. ANS: C
43. ANS: C

ST 2A, 2B
PTS: 1
44. ANS: A
45. ANS: A
46. ANS: C

St. 6d
PTS: 1
47. ANS: D

St. 7b
PTS: 1
48. ANS: A

St. 4c
PTS: 1
49. ANS: A

St. 7d
PTS: 1
STA: 7d
50. ANS: A

St. 4h
PTS: 1
STA: 4h
PTS: 1
PTS: 1

STA: 6d d

KEY: Representative Particles to Mass
STA: 3a KEY: Balancing Equations
51. ANS: B ST 2A

PTS: 1
52. ANS: C
53. ANS: A

ST 2A, 2B
PTS: 1
54. ANS: C ST 3

PTS: 1
55. ANS: D
56. ANS: C
57. ANS: D
58. ANS: B

OBJ: 16.4.1

## MULTIPLE RESPONSE

59. ANS: A, B, C

PTS: 1
60. ANS: D, E
61. ANS: A, B

PTS: 1

STA: 3a

DIF: L2 REF: p. 491

KEY: Balancing Equations
PTS: 1
PTS: 1
PTS: 1
STA: Ch.6.d

PTS: 1

