


Jordan University of Science & Technology
Dept of Applied Chemistry, General Chemistry
Chem 102, 1st Exam

10

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Q	1	2	3	4	5	6	7	8
A	D	B	B	B	A	B	A	D

Q	9	10	11	12	13	14	15
A	A	A	A	B	B	D	B



**PERIODIC TABLE
OF THE ELEMENTS**

I 18
1 H 2 He
3 Li 4 Be 5 B 6 C 7 N 8 O 9 F 10 Ne
11 Na 12 Mg 13 Al 14 Si 15 P 16 S 17 Cl 18 Ar
19 K 20 Ca 21 Sc 22 Ti 23 V 24 Cr 25 Mn 26 Fe 27 Co 28 Ni 29 Cu 30 Zn 31 Ga 32 Ge 33 As 34 Se 35 Br 36 Kr
37 Rb 38 Sr 39 Y 40 Zr 41 Nb 42 Mo 43 Tc 44 Ru 45 Rh 46 Pd 47 Ag 48 Cd 49 In 50 Sn 51 Sb 52 Te 53 I 54 Xe
55 Cs 56 Ba 57 *La 72 Hf 73 Ta 74 W 75 Re 76 Os 77 Ir 78 Pt 79 Au 80 Hg 81 Tl 82 Pb 83 Bi 84 Po 85 At 86 Rn
87 Fr 88 Ra 89 **Ac 104 Unq 105 Unp 106 Unh

Atomic weights are based on ¹²C = 12 and conform to the 1987 IUPAC report values rounded to 5 significant digits. Numbers in [] indicate the most stable isotopes.

* Lanthanides

58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
140.12	140.91	144.24	[145]	150.36	151.97	157.25	158.93	162.50	164.93	167.26	168.93	173.04	174.97

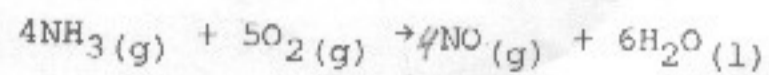
** Actinides

90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
232.04	231.04	238.03	237.05	[244]	[243]	[247]	[247]	[251]	[252]	[257]	[258]	[259]	[261]

1. A solution containing 100 g unknown liquid and 900 g water has a freezing point of $-3.33\text{ }^{\circ}\text{C}$. Given $K_f = 1.86\text{ }^{\circ}\text{C/m}$ for water, the molecular weight in amu of the unknown liquid is
 A) 69.0
 B) 333
 C) 619
 D) 62.1
2. What is the molality of KBr in a solution made by dissolving 2.21 g of KBr in 897 g of water?
 A) 2.46 m
 B) 0.0167 m
 C) 0.0207 m
 D) 2.07×10^{-5} m
3. A 1.96 g sample of titanium (Atomic weight = 47.9 g/mol) was burned in a bomb calorimeter that had a heat capacity of $9.84\text{ kJ/}^{\circ}\text{C}$. The temperature of the calorimeter increased from $36.84\text{ }^{\circ}\text{C}$ to $98.82\text{ }^{\circ}\text{C}$. Calculate the amount of heat that would be released from the combustion per one mole of titanium.
 A) 62.0 kJ
 B) 610 kJ
 C) 1.49×10^4 kJ
 D) 311 kJ
4. According to the first law of thermodynamics
 A) all spontaneous processes are accompanied by an increase in disorder
 B) energy is conserved during any process
 C) the entropy of a pure, crystalline substance at absolute zero is zero
 D) the amount of work done during a change is independent of the pathway of that change
5. What is the ΔE of a system that releases 12.4 J of heat and does 4.2 J of work on the surroundings?
 A) 16.6 J
 B) 12.4 J
 C) 4.2 J
 D) -16.6 J
6. The change in which one of the following depends on the pathway of the change?
 A) S
 B) H
 C) q
 D) E

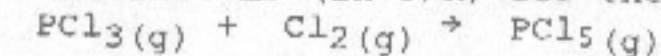
Substance	ΔH_f (kJ/mol)
$\text{H}_2\text{O}(l)$	-286
$\text{NO}(g)$	90
$\text{NO}_2(g)$	34
$\text{HNO}_3(aq)$	-207
$\text{NH}_3(g)$	-46

Calculate the value of ΔH (in kJ) for the following reaction.



- A) -1172
 B) -150
 C) -1540
 D) -1892

8. Calculate the concentration of nitrogen gas in water with a nitrogen gas at a partial pressure of 0.826 atm above it. Henry's Law constant for this system is $6.8 \times 10^{-4} \text{ mol/L atm}$
- A) $5.6 \times 10^{-4} \text{ M}$
 B) $1.2 \times 10^3 \text{ M}$
 C) $8.2 \times 10^{-3} \text{ M}$
 D) 0.43 M
9. Which one of the following is most soluble in water?
- A) CH_3OH
 B) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
 C) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
 D) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
10. Which liquid will have the lowest freezing point?
- A) pure H_2O
 B) aq. 0.60 m glucose
 C) aq. 0.24 m FeI_3
 D) aq. 0.50 m KF
11. Which one of the following is always positive when a spontaneous process occurs?
- A) ΔS_{system}
 B) $\Delta S_{\text{surroundings}}$
 C) $\Delta S_{\text{universe}}$
 D) $\Delta H_{\text{universe}}$
12. Of the processes below, which one is accompanied by an increase in entropy?
- A) $\text{Ca}(\text{OH})_2(\text{s}) + 2 \text{HCl}(\text{g}) \rightarrow \text{CaCl}_2(\text{s}) + 2 \text{H}_2\text{O}(\text{g})$
 B) $\text{CO}_2(\text{s}) \rightarrow \text{CO}_2(\text{g})$
 C) $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2 \text{HCl}(\text{g})$
 D) $\text{N}_2(\text{g}) + 3 \text{H}_2(\text{g}) \rightarrow 2 \text{NH}_3(\text{g})$
13. The third law of thermodynamics states that
- A) during any spontaneous process, the entropy of the universe increases
 B) energy is conserved in any process
 C) $\Delta E = q + w$
 D) the entropy of a pure crystalline substance at absolute zero is zero
14. The vapor pressure of pure ethanol at 60°C is 349 mm Hg. Raoult's Law predicts what vapor pressure in mm Hg at 60°C for a solution prepared by dissolving 10.0 mmol naphthalene (nonvolatile) in 90.0 mmol ethanol?
- A) 34.9 C) 600
 B) 314 D) 279
15. Calculate ΔS (in J/K) for the reaction below at 25°C .



Substance	S_f° (J/mol·K)
$\text{PCl}_3(\text{g})$	312
$\text{Cl}_2(\text{g})$	223
$\text{PCl}_5(\text{g})$	353

- A) -364 B) -182 C) 182 D) 353