

Q1. In which one of the following processes is $\Delta E = \Delta H$?

- A) Two moles of hydrogen iodide gas react to form hydrogen gas and iodine gas in a 40-L closed container.
- B) Two moles of ammonia gas are cooled from 325°C to -50°C at 1.2 atm.
- C) One gram of liquid water is vaporized at 100°C and 1 atm.
- D) Solid calcium carbonate is heated to form solid calcium oxide and carbon dioxide gas in an open container.
- E) One mole of solid carbon dioxide sublimates to the gas phase.

Sec# 6-1

Grade# 50

Q2. A system gives out 125 kJ of heat while 104 kJ of work is done on it. Calculate ΔE .

- A) -21 kJ
- B) 21 kJ
- C) 229 kJ
- D) -229 kJ
- E) -300 kJ

Sec# 6-3

Grade# 65

Q3. Which is the correct order of increasing atomic radii?

- A) F < Cl < S < As
- B) As < S < Cl < F
- C) S < As < Cl < F
- D) As < S < F < Cl
- E) As < Cl < S < F

Sec# 7-12

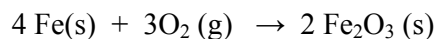
Grade# 65

Q4. When 2.55 g of sodium hydroxide is dissolved in 81.0 g of water in a coffee cup calorimeter, the temperature of the water rises from 21.02 °C to 29.44 °C. Calculate the q for the dissolution of one mole of solute. (Assume that the specific heat capacity of the solution is 4.18 J/g °C)

- A) 46.1 kJ/mol
- B) 1.12 kJ/mol
- C) 2.85 kJ/mol
- D) 156 kJ/mol
- E) 21.5 kJ/mol

Sec# 6-4
Grade# 65

Q5. The heat of formation of Fe_2O_3 (s) is -826.0 kJ/mol. Calculate the heat of the reaction,

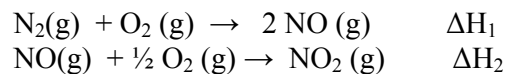


when 57.48 g of iron is reacted with excess oxygen.

- A) -425.1 kJ
- B) -212.5 kJ
- C) -850.1 kJ
- D) $-1700.$ kJ
- E) -2.374×10^4 kJ

Sec# 6-5
Grade# 60

Q6. Consider the following two reactions at 298 K and 1 atm.



Which statement is TRUE?

- A) ΔH_f° for NO_2 (g) = $\Delta\text{H}_2 + \frac{1}{2} \Delta\text{H}_1$
- B) ΔH_f° for NO_2 (g) = $2\Delta\text{H}_2$
- C) ΔH_f° for NO_2 (g) = ΔH_1
- D) ΔH_f° for NO_2 (g) = $\Delta\text{H}_2 + \Delta\text{H}_1$
- E) ΔH_f° for NO_2 (g) = ΔH_2

Sec# 6-5
Grade# 65

Q7. Which one of the following sets of quantum numbers can correctly represent a $3p$ orbital?

a.	b.	c.	d.	e.
$n = 3$	$n = 1$	$n = 3$	$n = 3$	$n = 3$
$l = 1$	$l = 3$	$l = 2$	$l = 1$	$l = 0$
$m_l = 2$	$m_l = 3$	$m_l = 1$	$m_l = -1$	$m_l = 1$

- A) d
- B) b
- C) c
- D) a
- E) e

Sec# 7-6
Grade# 75

Q8. How many electrons are there in all the p orbitals of selenium (Se) in its ground state?

- A) 16
- B) 4
- C) 6
- D) 10
- E) 8

Sec# 7-11
Grade# 65

Q9. What is the energy of a photon having a wavelength of 25 nm?

- A) 7.9×10^{-18} J
- B) 1.3×10^{17} J
- C) 4.8×10^6 J
- D) 1.3×10^{-17} J
- E) 4.0×10^{-20} J

Sec# 7-1
Grade# 75

Q10. Which one of the following atoms would have the largest second ionization energy?

- A) Cs
- B) Ba
- C) Tl
- D) Pb

E) Bi

Sec# 7-12

Grade# 65

Q11. Calculate the velocity of a neutron with a de Broglie wavelength of 75 pm. (The mass of neutron = 1.675×10^{-27} kg)

- A) 5.3×10^3 m/s
- B) 3.0×10^{-17} m/s
- C) 1.9×10^{-4} m/s
- D) 1.5×10^{23} m/s
- E) 2.9×10^1 m/s

Sec# 7-1

Grade# 75

Q12. An excited hydrogen atom with an electron in the $n = 6$ during an electronic transition emits light having a frequency of $2.74 \times 10^{14} \text{ s}^{-1}$. Determine the principal quantum number for the final state in this electronic transition.

- A) 3
- B) 1
- C) 2
- D) 4
- E) 5

Sec# 7-2

Grade# 60

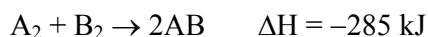
Q13. Atomic orbitals developed using quantum mechanics

- A) describe the 90 % probability of finding an electron in the space around the nucleus.
- B) describe exact paths for electron motion.
- C) suggest that Bohr model can be correctly applied to all atoms.
- D) show that the electron has only mass property.
- E) determine that the two electrons can have same four quantum numbers in the same orbital.

Sec# 7-4

Grade# 65

Q14. Consider the following reaction:



The bond energy of A_2 is one-half the amount of the AB bond energy. The bond energy of B_2 is 432 kJ/mol. What is the bond energy of A_2 ?

- A) +239 kJ/mol
- B) -239 kJ/mol
- C) +73.5 kJ/mol
- D) -73.5 kJ/mol
- E) +143 kJ/mol

Sec# 8-8

Grade# 65

Q15. Which one of the following ionic compounds has the least exothermic lattice energy?

- A) CsI
- B) LiF
- C) NaCl
- D) BaO
- E) MgO

Sec# 8-5

Grade# 60

Q16. In the Lewis structure for PCl_2^- , which obeys the octet rule, how many lone pairs of electrons are around the central atom?

- A) 2
- B) 4
- C) 1
- D) 3
- E) 0

Sec# 8-10

Grade# 70

Q17. What is the formal charge on the central atom of ClO_3^- , which obeys octet rule?

- A) +2
- B) -2
- C) -1
- D) +4
- E) +3

Sec# 8-11
Grade# 60

Q18. Predict the molecular structure for XeO_2F_2 (where Xe is the central atom).

- A) See-saw
- B) Tetrahedral
- C) Square planar
- D) Trigonal planar
- E) Square pyramid

Sec# 8-13
Grade# 65

Q19. Which one of the following molecules is polar?

- A) ICl_3
- B) CH_4
- C) SeF_6
- D) SO_3
- E) PCl_5

Sec# 8-3
Grade# 70

Q20. Which one of the following molecules is expected to exhibit resonance?

- A) NO_2^-
- B) CH_2Cl_2
- C) HCN
- D) NH_4^+
- E) PF_5

Sec# 8-12
Grade# 70