Q1.
A 4.40-g piece of solid CO_2 (dry ice) is allowed to sublime to CO_2 (gas) in a balloon. The final volume of the balloon is 1.00 L at 300. K. What is the pressure of the gas?

A) 2.46 atm
B) 246   atm
C) 0.122 atm
D) 122   atm
E) 4.67 atm

Q2.
Calculate the root mean square velocity for the O_2 molecules in a sample of O_2 gas at 25.0°C.

A) 482 m/s
B) 2.32×10^5 m/s
C) 658×10^2 m/s
D) 853 m/s
E) 97.5 m/s

Q3.
What would happen to the average kinetic energy of the molecules of a gas sample if the temperature of the sample increased from 20°C to 40°C?

A) It would increase.
B) It would double.
C) It would decrease.
D) It would become half its value.
E) It would remain the same.

Q4.
It is found that 250. mL of gas at STP has a mass of 1.00 g. What is the molar mass?

A) 89.7 g/mol
B) 28.0 g/mol
C) 14.0 g/mol
D) 22.4 g/mol
E) 11.2 g/mol

Q5.
A gas absorbs 72.2 J of heat and undergoes expansion from 1.00 to 2.50 liters against a pressure of 1.00 atm at constant temperature. What is the change in internal energy of the gas? (1 L atm $=$ 101.3 J)

A) −79.8 J
B) +79.8 J

C) +224 J
D) −224 J
E) -101.3 J

Q6.

A 100.0 g copper calorimeter at a temperature of 15.0°C contains 200.0 g of H_2O at 15°C. A 540.0 g mass of titanium at a temperature of 100.0°C is plunged into the water. The temperature of water rises to 34.7°C. What is the specific heat of titanium?

(Notes: specific heat of Cu = 0.0930 J/°C.g; specific heat of water = 4.18 J/°C.g)

A) 0.472 J/g °C
B) 183.2 J/g °C
C) 1.647 J/g °C
D) 0.093 J/g °C
E) 540.0 J/g °C

Q7.
From the gaseous reactions,

$\frac{1}{2}$ H_2 + N_2 + $\frac{5}{2}$ O_2 → HNO_3 + NO_2 ΔH = -101 kJ

2 NH + H_2 → N_2H_4 ΔH = - 567 kJ

2 N_2O_5 → 2 N_2 + 5 O_2 ΔH = +22.6 kJ

calculate ΔH for the following reaction,

N_2H_4 + 2 N_2O_5 → 2 HNO_3 + 2 NO_2 + 2 NH

A) +388 kJ
B) −287 kJ
C) +590 kJ
D) +287 kJ
E) -388 kJ

Q8.
Find the wavelength in nanometers (nm) of the light that results from the electronic transition from level $n = 3$ to level $n = 2$ of an excited hydrogen atom.
(R_H = 2.178 x 10^{-18} J)

A) 656.7 nm
B) 432.5 nm
C) 222.5 nm
D) 832.5 nm
E) 121.5 nm

Q9.
Which quantum number determines the energy of an orbital?

A) The principal quantum number.
B) The angular momentum quantum number.
C) The magnetic quantum number.
D) The electron spin quantum number.
E) The energy of an orbital cannot be determined.

Q10.
A 1.00- L gas sample at 100.°C and 600. torr contains 50.0% of helium(He) and 50.0% of xenon(Xe) by mass. What is the partial pressure of the xenon gas?

A) 18 torr
B) 582 torr
C) 25 torr
D) 124 torr
E) 285 torr

Q11.
Which of the following atoms do not form stable isolated X⁻ ion?

A) Mg
B) C
C) O
D) F
E) Cl

Q12.
Arrange the following atoms in order of increasing size.
Si, F, Na, Sr, N
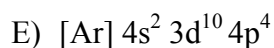
A) $F < N < Si < Na < Sr$
B) $Sr < Na < Si < N < F$
C) $F < N < Na < Si < Sr$
D) $F < N < Sr < Si < Na$
E) $Si < N < F < Na < Sr$

Q13.
The electron configuration for silver is,

A) $[Kr] 5s^1 4d^{10}$
B) $[Kr] 5s^2 4d^9$
C) $[Xe] 6s^2 4f^{14}5d^3$
D) $[Kr] 5s^2 4d^{10} 5p^1$

E) $[Ar]\ 4s^2\ 3d^{10}\ 4p^4$

Q14.
Which of the following molecules has no dipole moment?

A) SO_3
B) NH_3
C) $CHCl_3$
D) HF
E) H_2O

Q15.
Arrange the following bonds in order of decreasing ionic character?
N—O, Ca—O, C—F, Br—Br, K—F

A) K—F > Ca—O > C—F > N—O > Br —Br
B) K—F > Ca—O > N—O > C—F > Br —Br
C) Br —Br > K—F > Ca—O > N—O > C—F
D) Ca—O > N—O > C—F > Br —Br > K—F
E) Br —Br > N—O > C—F > Ca—O > K—F

Q16.
Calculate $\Delta H^{\circ}{}_{f}$ for potassium chloride.

$K(s) + 1/2\ Cl_2(g) \rightarrow KCl(s)$
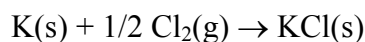
Given that,

Lattice energy	-690. kJ/mol
Ionization energy for K	419 kJ/mol
Electron affinity of Cl	-349 kJ/mol
Bond energy of Cl_2	239 kJ/mol
Enthalpy of sublimation for K	64 kJ/mol

A) -437 kJ/mol
B) +181 kJ/mol
C) -109 kJ/mol
D) +327 kJ/mol
E) – 289 kJ/mol

Q17.
Which of the following compounds has the most exothermic lattice energy?

A))Al_2O_3
B) $CaSO_4$
C) Na_2SO_4

D) KCl

E) LiF

Q18.

In the Lewis structure that obeys the octet rule for PO_3^{3-} ion, the number lone pair(s) of electrons on the phosphorus atom is,

A) 1

B) 2

C) 0

D) 3

E) 4

Q19.

Which of the followings have a molecular structure of See-saw?

A) TeF_4

B) SiF_4

C) $XeCl_4$

D) $CHCl_3$

E) NH_4^+

Q20.

What is the formal charge for chlorine atom in ClO_3^- whose Lewis structure obeys the octet rule?

A) +2

B) -2

C) +1

D) -4

E) +3