

1001_2nd Exam_1001109

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) Of the following gases, the one with the greatest density at STP is:

A) CH₄ B) He C) NH₃ D) Ne E) H₂

Answer: D

- 2) What is the work done in joules by the system when H₂ expands against a constant pressure of 75 atm at 45.3°C? The change in volume is 24.0 L.

A) 1.8×10^5 J B) -1.8×10^5 J C) 1.8×10^3 J D) 8.2×10^4 J E) -8.2×10^4 J

Answer: B

- 3) Which of the following has a standard enthalpy of formation of zero?

A) I₂(g) B) Br₂(g) C) P(s, red) D) Ar(g) E) O₃(g)

Answer: D

- 4) The relationship between the "absolute temperature" on the Kelvin scale and the Celsius temperature is given by:

A) $t(^{\circ}\text{C}) = T(\text{K}) + 273.15$
B) $t(^{\circ}\text{C}) = 98.6 + T(\text{K})$
C) $T(\text{K}) = 5/8[t(^{\circ}\text{C})] - 32$
D) $T(\text{K}) = 8/5[t(^{\circ}\text{C})] + 32$
E) $T(\text{K}) = t(^{\circ}\text{C}) + 273.15$

Answer: E

- 5) A 2.4917 g sample of an unknown solid hydrate was heated to drive off all the water of hydration. The remaining solid, which weighed 1.8558 g, was analyzed and found to be 27.74% Mg, 23.57% P, and 48.69% O, by mass. What is the formula of the unknown solid hydrate?

A) Mg₂(PO₄)₃·2H₂O
B) Mg₃(PO₄)₂·5H₂O
C) Mg₃(PO₄)₂·12H₂O
D) Mg(PO₃)₂·H₂O
E) Mg(PO₄)·7H₂O

Answer: B

- 6) Lead, water, sulfur, and arsenic have specific heats of 0.128, 4.18, 0.706, and 0.329 J g⁻¹°C⁻¹, respectively. Which of the following would need the smallest quantity of heat to change the temperature of 5 g by 10°C?

A) water B) arsenic C) sulfur D) lead

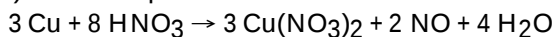
Answer: D

- 7) What is the final temperature in the bomb calorimeter if 1.785 grams of benzoic acid (HC₇H₅O₂) is combusted in a calorimeter with a heat capacity of 5.02 kJ/°C and initial temperature of 24.62 °C? The heat of combustion of benzoic acid is -26.42 kJ/g.

A) 31.2°C B) 51.0°C C) 15.5°C D) 29.8°C E) 34.01°C

Answer: E

- 8) A 0.411 g sample of powdered copper mixed with an inert, soluble additive was fully consumed by 23.4 mL of 0.602 M nitric acid, producing copper(II) nitrate, water, and nitric oxide (NO) gas. What was the percent copper (by mass) in the sample?



- A) 34.4% B) 81.7% C) 65.3% D) 68.3% E) 56.9%

Answer: B

- 9) The substance NaOH in water solution is a:

- A) weak acid
B) nonelectrolyte
C) strong electrolyte
D) weak base
E) weak electrolyte

Answer: C

- 10) Choose the INCORRECT statement.

- A) A natural law is a generalization of natural phenomena.
B) An experiment is a test of conclusions about natural law.
C) A hypothesis is a conclusion that must follow logically from observations of nature.
D) The scientific method is the combination of observations, experimentation, and the formulation of laws, hypothesis, and theories.
E) A theory is a model of nature that can be used to describe natural phenomena.

Answer: C

- 11) The statement, "For a fixed mass of gas at constant temperature, gas volume is inversely proportional to gas pressure." is known as:

- A) Avogadro's Law
B) Boyle's Law
C) Kelvin's Law
D) Charles' Law
E) Graham's Law

Answer: B

- 12) Gases tend to behave ideally at:

- A) gases always behave ideally
B) low temperature and low pressure
C) low temperature and high pressure
D) high temperature and high pressure
E) high temperature and low pressure

Answer: E

- 13) Which of the following, in aqueous solution, is most likely to behave as a weak acid?

- A) NH_3 B) HCl C) NaCl D) NaCN E) HCN

Answer: E

14) Choose the INCORRECT statement.

- A) Pressure volume work is calculated by $w = P \cdot V$.
- B) Potential energy is energy in action.
- C) Heat moves from a warmer body to a colder one.
- D) Kinetic energy is the energy of motion.
- E) Heat is energy transferred as a result of a temperature difference.

Answer: B

15) Choose the INCORRECT statement.

- A) A strong electrolyte is completely ionized in water solution.
- B) A non-electrolyte is not ionized and does not conduct an electric current.
- C) A weak electrolyte is partially ionized in a water solution.
- D) A weak electrolyte in solution is a good electrical conductor.
- E) A strong electrolyte in solution is a good electrical conductor.

Answer: D

16) 2.24 L $\text{NH}_3(\text{g})$ at 2.0 atm and 0°C :

- A) contains 6.02×10^{22} molecules of NH_3
- B) contains 0.050 mole NH_3
- C) contains 3.6×10^{23} N atoms
- D) contains 3.6×10^{23} H atoms
- E) weighs 1.70 g

Answer: D

17) Choose the INCORRECT statement.

- A) The heat capacity is the quantity of heat required to change the temperature of the system by one degree.
- B) The specific heat is the heat capacity for one mole of substance.
- C) Temperatures of two bodies are equal when the average kinetic energies of the two bodies become the same.
- D) Most metals have low specific heats, as metals can be heated quickly.
- E) The law of conservation of energy can be written: $q_{\text{system}} + q_{\text{surroundings}} = 0$.

Answer: B

18) Which of the following are thermodynamic state functions?

- I) heat
- II) volume
- III) temperature
- IV) enthalpy
- V) density

- | | | | | |
|--------------|------------------|-------------------|-----------------|-----------|
| A) I, III, V | B) I, II, III, V | C) II, III, IV, V | D) I, II, IV, V | E) II, IV |
|--------------|------------------|-------------------|-----------------|-----------|

Answer: C

19) The substance BaCl_2 is a:

- | | | | | |
|----------------|--------------|----------------|--------------|---------|
| A) strong acid | B) weak acid | C) strong base | D) weak base | E) salt |
|----------------|--------------|----------------|--------------|---------|

Answer: E

20) Convert 8.50 kg/cm^2 to the equivalent pressure in atmospheres.

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|-------------|-------------|-------------|-------------|-------------|
| A) 8.23 atm | B) 9.53 atm | C) 7.47 atm | D) 1.12 atm | E) 8.78 atm |
|-------------|-------------|-------------|-------------|-------------|

Answer: A

21) Select a statement that best describes the oxidation process.

- A) In oxidation process some elements experience oxidation state increase.
- B) In oxidation process all elements experience an increase in oxidation state.
- C) In oxidation process all elements change oxidation state.
- D) In oxidation process some elements change their oxidation state.
- E) In oxidation process only oxygen increases its oxidation state.

Answer: A

22) Most water-soluble compounds of Group 1A or 2A elements are:

- A) strong electrolytes
- B) weak electrolytes
- C) strong acids
- D) nonelectrolytes
- E) weak acids

Answer: A

23) Assuming ideal gas behavior, which of the following gases would have the lowest density at standard temperature and pressure?

- A) SF₆
- B) Kr
- C) CO₂
- D) N₂
- E) CF₂Cl₂

Answer: D

24) $2 \text{NOCl(g)} \rightarrow 2 \text{NO(g)} + \text{Cl}_2\text{(g)}$ $\Delta H^\circ = +75.56 \text{ kJ}$

$2 \text{NO(g)} + \text{O}_2\text{(g)} \rightarrow 2 \text{NO}_2\text{(g)}$ $\Delta H^\circ = -113.05 \text{ kJ}$

$2 \text{NO}_2\text{(g)} \rightarrow \text{N}_2\text{O}_4\text{(g)}$ $\Delta H^\circ = -58.03 \text{ kJ}$

Compute ΔH° of $\text{N}_2\text{O}_4\text{(g)} + \text{Cl}_2\text{(g)} \rightarrow 2 \text{NOCl(g)} + \text{O}_2\text{(g)}$ in kJ.

- A) -246.65
- B) +246.65
- C) -95.52
- D) +95.52
- E) none of these

Answer: D

25) Choose the INCORRECT statement.

- A) Thermal energy is energy associated with random molecular motion.
- B) Work is done when a force acts through a distance.
- C) Chemical energy is associated with chemical bonds and intermolecular forces.
- D) Energy is the capacity to do work.
- E) The surroundings are the part of the universe that is studied.

Answer: E

26) If gas volume is doubled but the temperature remains constant:

- A) the molecules move slower
- B) the pressure stays the same
- C) the molecules move faster
- D) the final pressure is twice the pressure before the volume change.
- E) the final pressure is 1/2 of the pressure before the volume change.

Answer: E

27) The fact that a balloon filled with helium will leak more slowly than one filled with hydrogen is explained by citing:

- A) Dalton's Law
- B) van der Waals Theory
- C) Graham's Law
- D) Avogadro's Hypothesis
- E) ideal gas law

Answer: C

28) Enthalpy is defined as:

- A) the energy contained within a system
- B) the heat of combustion
- C) the sum of the internal energy and the pressure-volume product of a system
- D) the work not limited to pressure volume work
- E) the sum of the kinetic and potential energies

Answer: C

29) The substance C_5H_5OH in water solution is a:

- A) strong electrolyte
- B) strong acid
- C) weak electrolyte
- D) strong base
- E) nonelectrolyte

Answer: E

30) Among the following reactions, find those that are redox reactions:

- 1) $MnO_4^- (aq) + 5 Fe^{2+} (aq) + 8 H^+ \rightarrow 5 Fe^{3+} (aq) + Mn^{2+} (aq) + 4 H_2O(l)$
- 2) $6 HF + Al(OH)_3 + 3 NaOH \rightarrow Na_3AlF_6 + 6 H_2O$
- 3) $Au(s) + 4 H^+ + NO_3^- + 4 Cl^- \rightarrow [AuCl_4]^- + 2 H_2O + NO(g)$
- 4) $FeS + 2 HCl \rightarrow FeCl_2 + H_2S$
- 5) $SiO_2 + 4 HF \rightarrow SiF_4 + H_2O$

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

Answer: E

31) The volume correction term in the van der Waals equation is present because:

- A) molecules occupy volume
- B) molecules attract each other
- C) molecules are diatomic
- D) barometers are inaccurate
- E) molecules repel each other

Answer: A

32) Which of the following is probably the poorest electrical conductor?

- A) 0.5 M K_2SO_4
- B) 0.5 M CH_3OH
- C) 0.5 M CaCl_2
- D) 0.5 M NH_3
- E) 0.5 M HF

Answer: B

33) Under conditions for which chlorine gas has an effusion rate of 2.4×10^{-6} mol/sec, what would be the effusion rate for bromine gas, in mol/sec?

- A) 3.6×10^{-6} mol/sec
- B) 1.1×10^{-6} mol/sec
- C) 2.3×10^{-6} mol/sec
- D) 5.4×10^{-6} mol/sec
- E) 1.6×10^{-6} mol/sec

Answer: E

34) Which of the following solutions has the lowest concentration of sulfate ion?

- A) 0.3 M Li_2SO_4
- B) 0.4 M K_2SO_4
- C) 0.5 M CuSO_4
- D) 0.1 M $\text{Al}_2(\text{SO}_4)_3$
- E) 0.2 M MgSO_4

Answer: E

35) If someone were to light a cigar at one end of a closed room, persons at the other end of the room might soon perceive an odor due to gaseous emissions from the cigar. Such a phenomenon is an example of:

- A) effusion
- B) diffusion
- C) ideality
- D) barometry
- E) monometry

Answer: B

36) The mutual attraction of gas molecules is an important aspect of:

- A) Dalton's Law
- B) ideal gas law
- C) van der Waals Theory
- D) Avogadro's Hypothesis
- E) Graham's Law

Answer: C

37) The substance HI is a:

- A) weak base
- B) strong acid
- C) strong base
- D) salt
- E) weak acid

Answer: B

38) Which of the following is a characteristic of an ideal gas?

- A) Collisions between gas particles and container walls are not elastic
- B) Inter-particle forces are prominent.
- C) Gas cannot be compressed infinitely.
- D) Individual gas particles occupy fixed volume.
- E) Collisions between gas particles are perfectly elastic

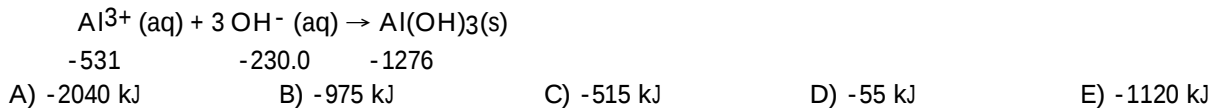
Answer: E

39) Choose the INCORRECT statement.

- A) A structural formula shows which atoms are bonded together and by what type of bond.
- B) Formula mass is the mass of a formula unit.
- C) Molecular mass is the mass of a molecular compound.
- D) The molecular mass of hydrogen is 1.008 u.
- E) The molecular formula is the same as, or a multiple of, the empirical formula.

Answer: D

40) Calculate the enthalpy change for the following reaction at 25°C. The value of ΔH°_f in kJ/mol is given below each species:



Answer: D