

Multiple Choice

1. At what temperature in degree Celcius is the value in degree Fahrenheit twice of that in degree Celcius?

- A) 160°C
- B) -24.6°C
- C) 6.4°C
- D) 22.2°C
- E) 32°C

Ans: A

Multiple Choice

2. The correct name for NaOCl is,

- A) Sodium hypochlorite
- B) Sodium oxygenchloride
- C) Sodium chlorite
- D) Sodium chlorate
- E) Sodium chloro oxygenate

Ans: A

Multiple Choice

3. The chemical behavior of an atom is directly determined by

- A) the number of electrons it has.
- B) the mass of the atom.
- C) the number of neutrons it has.
- D) the number of protons it has.
- E) the identity of an isotope of a particular element.

Ans: A

Multiple Choice

4. Which ion has the INCORRECT charge?

- A) Xe^-
- B) Te^{2-}
- C) Ba^{2+}
- D) I^-
- E) S^{2-}

Ans: A

Multiple Choice

5. Which of the following samples contains the greatest number of atoms?

- A) 2.0 mole of Ar
- B) 100 g of Pb
- C) 0.1 mole of Fe
- D) 5 g of He
- E) 20 million O_2 molecules

Ans: A

Multiple Choice

6. How many grams of Cl_2 can be prepared from the reaction of 16.0 g of MnO_2 and 30.0 g of HCl according to the following chemical equation?



- A) 13.0 g
- B) 0.82 g
- C) 5.8 g
- D) 14.6 g
- E) 58.4 g

Ans: A

Multiple Choice

7. A 1.375 g sample of mannitol, a sugar found in seaweed, is burned completely in oxygen to give 1.993 g of carbon dioxide and 0.9519 g of water. The empirical formula of mannitol is,

- A) $C_3H_7O_3$
- B) CHO
- C) CH_7O_3
- D) C_3H_2O
- E) CH_2O

Ans: A

Multiple Choice

8. A 79.64 mg sample of potassium dichromate ($K_2Cr_2O_7$) is dissolved in enough water to make 200 mL of solution. The molarity of the K^+ ions in this solution is,

- A) $2.71 \times 10^{-3} \text{ M}$
- B) $1.00 \times 10^{-3} \text{ M}$
- C) $0.500 \times 10^{-3} \text{ M}$
- D) $2.50 \times 10^{-2} \text{ M}$
- E) $4.00 \times 10^{-5} \text{ M}$

Ans: A

Multiple Choice

9. The effusion rate of an unknown gas is 31.50 mL/min and the effusion rate of oxygen gas under identical experimental conditions is 30.50 mL/min. The unknown gas would be,

- A) NO
- B) NO_2
- C) CO_2
- D) CO
- E) CH_4

Ans: A

Multiple Choice

10. What mass of $\text{KClO}_3(\text{s})$ must be decomposed to produce 126 L of $\text{O}_2(\text{g})$ at 133°C and 0.880 atm ?



- A) 272 g
- B) 24.6 g
- C) 70.8 g
- D) 408 g
- E) 612 g

Ans:A

Multiple Choice

11. A container is filled with an ideal gas to a pressure of 40.0 atm at 0°C . At what temperature would the pressure be 25.0 atm ?

- A) -102°C
- B) $+102^\circ\text{C}$
- C) -56.8°C
- D) -25.4°C
- E) $+135^\circ\text{C}$

Ans:A

Multiple Choice

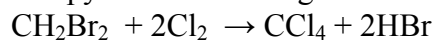
12. How many Rn-O double bonds in the most appropriate Lewis structure of RnO_3 ?

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

Ans: A

Multiple Choice

13. The enthalpy of the following reaction



can be approximated using bond energies. Average bond energies are 339 kJ/mol for C-Cl, 276 kJ/mol for C-Br, 413 kJ/mol for C-H, 239 kJ/mol for Cl-Cl, and 363 kJ/mol for H-Br.

Calculate ΔH for this reaction.

- A. - 226 kJ
- B. + 452 kJ
- C. + 226 kJ
- D. - 452 kJ
- E. + 125 kJ

Ans: A

Multiple Choice

14. According to the VSEPR model, what is the structure of XeF_2 ?

- A. linear
- B. bent
- C. trigonal bipyramidal
- D. tetrahedral
- E. octahedral

Ans: A

Multiple Choice

15. How many degrees of temperature rise will occur when a 25.0 g block of aluminum absorbs 10.0 kJ of heat? The specific heat of Al is 0.900 J/g·°C.

- A) 444°C
- B) 0.44°C
- C) 225°C
- D) 360°C
- E) 250°C

Ans: A

Multiple Choice

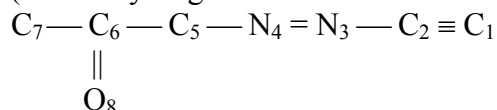
16. Which one of the following is *NOT* isoelectronic with Xe?

- A) Sn^{4+}
- B) Te^{2-}
- C) I^-
- D) Cs^+
- E) Ba^{2+}

Ans: A

Multiple Choice

17. For the molecule below, what is the hybridization for the atoms C_1 , N_3 and C_6 in this structure? (*Note:* Hydrogen atoms are not shown.)



- A) sp , sp and sp^2
- B) sp^3 , sp^2 and sp
- C) sp^2 , sp and sp^2
- D) sp^3 , sp^2 and sp^3
- E) sp^2 , sp^3 and sp

Ans: A

Multiple choice

18. Consider the possibility of a Na_2 molecule. Which of the following electron configurations correctly shows the filling of molecular orbitals after the core electrons?

- A) $(\sigma_{3s})^2$
- B) $(\sigma_{2s})^2$
- C) $(\sigma^*_{2s})^2$
- D) $(\sigma_{1s})^2$
- E) $(\sigma_{2s})^2 (\sigma_{3s})^2$

Ans: A

Multiple choice

19. Bond order is positively correlated to;

- A) bond energy
- B) bond length
- C) bond weakness
- D) diamagnetism
- E) paramagnetism

Ans: A

Multiple choice

20. The maximum number of electrons that can be placed in a bonding orbital is,

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

Ans: A

Multiple choice

21. How many sigma (σ) and pi (π) bonds, respectively, are in $\text{CH}_3\text{CH}_2\text{CHCHCH}_2\text{CH}_3$ molecule?

- A) 17 σ bonds, 1 π bond
- B) 14 σ bonds, 5 π bonds
- C) 19 σ bonds, 3 π bonds
- D) 18 σ bonds, 1 π bond
- E) 12 σ bonds, 2 π bonds

Ans: A

Multiple Choice

22. Which of the following molecules is paramagnetic?

- A) NO
- B) HF
- C) CO
- D) CN^-
- E) NO^+

Ans: A

Multiple Choice

23. Which of the following has the highest bond order?

- A) C_2^-
- B) C_2
- C) C_2^+
- D) O_2
- E) F_2

Ans: A

Multiple Choice

24. Which of the following statements is correct?

- A) The NO_3^- ion is planar.
- B) O_2 is diamagnetic.
- C) F_2 is paramagnetic.
- D) The NO_3^- ion is tetrahedral.
- E) N_2 has a bond order of 1.5.

Ans: A

Multiple Choice

25. Which of the following molecules has dipole-dipole intermolecular forces?

- A) CO
- B) C_{graphite}
- C) O₂
- D) CH₄
- E) SO₃

Ans: A

Multiple Choice

26. Which one of the following arrangements is correct in order of increasing boiling point?

- A) CH₄ < CH₃Cl < CH₃OH < RbCl
- B) CH₄ < CH₃OH < CH₃Cl < RbCl
- C) RbCl < CH₃OH < CH₃Cl < CH₄
- D) CH₄ < RbCl < CH₃OH < CH₃Cl
- E) CH₃OH < CH₄ < RbCl < CH₃Cl

Ans:A

Multiple Choice

27. The first order diffraction of X-rays by a LiF crystal was detected at an angle of 34.68 degrees. If the distance between layers of atoms in the LiF crystal is 201 pm, what was the wavelength of the diffracted X-rays? (1 cm = 10⁸ Å)

- A) 2.29 Å
- B) 4.53 Å
- C) 1.19 Å
- D) 3.24 Å
- E) 5.34 Å

Ans: A

Multiple Choice

28. The vapor pressure of ethanol is 400 mmHg at 63.5°C. Its molar heat of vaporization is 39.3 kJ/mol. What is the vapor pressure of ethanol, in mmHg, at 34.9°C?

- A) 108.4
- B) 1510
- C) 200
- D) 0.0099
- E) 354.4

Ans: A

Multiple Choice

29. A quantitative measure of how efficiently spheres pack into unit cells is called packing efficiency, which is the percentage of the cell space occupied by the spheres. Calculate the packing efficiency of a face-centered cubic crystal. (volume of a sphere is $(4/3)\pi r^3$, where "r" is the radius of the sphere)

- A) 74
- B) 54
- C) 84
- D) 94
- E) 50

Ans:A

Multiple Choice

30. A solid that is insoluble in water and nonpolar solvents, melts at temperatures greater than 800°C, and is a poor conductor of electricity could probably be classified as,

- A) network covalent

- B) hydrogen-bonded
 - C) ionic
 - D) metallic
 - E) molecular
- Ans:A

Multiple Choice

31. The phase transition with the smallest dependence on pressure is,
- A) melting
 - B) boiling
 - C) sublimation
 - D) condensation
 - E) vaporization
- Ans: A

Multiple Choice

32. Which of the following liquids would have the highest viscosity at the same temperature?
- A) HO-CH₂-CH₂-OH
 - B) CH₃Br
 - C) C₂H₅OH
 - D) CH₂Cl₂
 - E) CH₃-O-CH₃
- Ans: A

Multiple Choice

33. What is the molarity of a 98% H_2SO_4 by mass solution? The density of the solution is 1.83 g/mL.
- A) 18.3 M
 - B) 36.6 M
 - C) 5.02 M
 - D) 12.6 M
 - E) 11.5 M
- Ans: A

Multiple Choice

34. The vapor pressure of pure water is 23.76 mmHg at 25 °C. The molality of an aqueous NaCl solution having a vapor pressure of 22.98 mmHg is,
- A) 1.89 m
 - B) 0.626 m
 - C) 0.0813 m
 - D) 0.942 m
 - E) 0.733 m
- Ans: A

Multiple Choice

35. What is the percent CdSO_4 by mass in a 1.00 molal aqueous CdSO_4 solution?
- A) 17.2 %
 - B) 0.100 %
 - C) 0.00100 %
 - D) 20.8 %
 - E) 24.4 %
- Ans: A

Multiple Choice

36. During osmosis,

- A) pure solvent diffuses through a membrane but solutes do not.
- B) solutes diffuse through a membrane but solvent does not.
- C) pure solvent and a solution both diffuse at the same time through a membrane.
- D) gases diffuse through a membrane into a solution and build up pressure.
- E) solutes diffuse through a membrane.

Ans: A

Multiple Choice

37. Calculate the freezing point of a solution made from 22.0 g of octane (C_8H_{18}) dissolved in 148.0 g of benzene. Benzene freezes at $5.50^\circ C$ and its K_f value is $5.12^\circ C \cdot kg/mol$.

- A) $-1.16^\circ C$
- B) $0.98^\circ C$
- C) $6.66^\circ C$
- D) $12.2^\circ C$
- E) $5.49^\circ C$

Ans: A

Multiple Choice

38. Which of the following will lower the melting point of ice the most?

- A) $Al_2(SO_4)_3$
- B) $(NH_2)_2CO$ (urea)
- B) $NaCl$
- D) $C_6H_{12}O_6$ (glucose)
- E) CH_4 (methane)

Ans:A

Multiple Choice

39. The increasing order of solubility in water of the following substances is,

A) $O_2 < Br_2 < LiCl < CH_3OH$

B) $CH_3OH < LiCl < Br_2 < O_2$

C) $CH_3OH < Br_2 < LiCl < O_2$

D) $LiCl < O_2 < Br_2 < CH_3OH$

E) $O_2 < LiCl < CH_3OH < Br_2$

Ans:A

Multiple Choice

40. Methanol (CH_3OH) is more volatile than ethanol (C_2H_5OH). Which of the following statements is correct in a CH_3OH / C_2H_5OH solution having 0.5 mole fraction of C_2H_5OH ?

A) The boiling point of CH_3OH is less than the boiling point of C_2H_5OH .

B) The boiling point of CH_3OH is greater than the boiling point of C_2H_5OH .

C) The vapor pressure of CH_3OH is less than the vapor pressure of C_2H_5OH .

D) Intermolecular attraction is greater in CH_3OH than in C_2H_5OH .

E) CH_3OH has no vapors and its boiling point becomes greater.

Ans:A