

Exam 2  
Practice Questions

1. If the air pressure inside an automobile tire is 2.31 atm, Express the pressure in KPa  
A. 234 KPa  
B. 0.022 KPa  
C. 1748 KPa  
D. 2340 KPa
  
2. The pressure of a gas sample was measured to be 489 mmHg. Which of the following is NOT an equivalent statement of that pressure?  
A. 65.2 kPa  
B.  $6.52 \times 10^4$  Pa  
C. 489 torr  
D. 0.811 atm
  
3. A sample of ethane gas has a volume of 125 mL at 20 °C and 725 torr. What is the volume of the gas at 20 °C when the pressure decreases to 475 torr?  
A. 82 ml  
B. 100 ml  
C. 200 ml  
D. 191 ml
  
4. A 275 L helium balloon is heated from 20 °C to 40 °C. Calculate the final volume assuming the pressure remains constant.  
A. 294 L  
B. 137.5 L  
C. 200 L  
D. 145 L

5. A steel container filled with nitrous oxide at 15.0 atm is cooled from 2 °C to -40 °C. Calculate the final pressure assuming the volume remains constant.

- A. 12.7 atm
- B. 20 atm
- C. 77 atm
- D. 1 atm

6. An oxygen gas sample occupies 50.0 mL at 27 °C and 765 mm Hg. What is the final temperature if the gas is cooled to a volume of 35.5 mL and a pressure of 455 mm Hg?

- A. 127 K
- B. 50 K
- C. 237 K
- D. 670 K

7. Under conditions of fixed temperature and amount of gas, Boyle's law requires that

I.  $P_1V_2=P_2V_1$

II.  $PV= \text{constant}$

III.  $P_1/P_2=V_2/V_1$

- A. I only
- B. II only
- C. I and II
- D. II and III

8. An atmospheric sample contains nitrogen, oxygen, argon, and traces of other gases. If the partial pressure of N is 587 mm Hg, O is 158 mm Hg, and Ar is 7 mm Hg, what is the observed total pressure?

- A. 400 mm Hg
- B. 752 mm Hg
- C. 587 mm Hg
- D. 158 mm Hg

9. How many moles of hydrogen gas occupy a volume of 0.500 L at STP?

- A. 0.0223 mol
- B. 22.4 mol
- C. 1 mol
- D. 0.5 mol

10. What is the temperature of 0.250 mol of chlorine gas at 655 torr if the volume is 3.50 L?

- A. 273 K
- B. 50 K
- C. 147 K
- D. 400 K

11. Calculate the molar mass of dry air if it has a density of 1.17 g/L at 21 °C and 740.0 torr.

- A. 29 g/mol
- B. 54 g/mol
- C. 60 g/mol
- D. 150 g/mol

12. A gas is collected over water at 50 °C and a barometric pressure of 105.00 kPa. Determine the pressure of the gas if the water vapor pressure is 12.34 kPa.

- A. 24 kPa
- B. 105 kPa
- C. 13 kPa
- D. 92.7 kPa

13. An empirical formula of a gaseous is  $\text{NO}_2$ . A 5.25 g sample of the gas occupies a volume of 1 L and exerts a pressure of 1.26 atm at 4.0°C. Which is its molecular formula?

- A. NO
- B.  $\text{NO}_2$
- C.  $\text{N}_3\text{O}_6$
- D.  $\text{N}_2\text{O}_4$

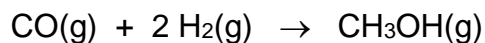
14. Nitrogen gas is collected over water at 25.0°C and 740 torr. How many grams of nitrogen gas were collected if the volume was 10.5 L? The vapor pressure of water at 25.0°C is 23.8 torr

- A. 0.380 g
- B. 5.66 g
- C. 11.3 g
- D. 15.7 g

15. What is the total volume of products formed at STP when 1.2 g of carbon is burned?

- A. 0.1 L
- B. 2.24 L
- C. 12 L
- D. 22 L

16. Methanol (CH<sub>3</sub>OH) can be synthesized by the reaction:



What volume (in liters) of methanol gas, measured at a temperature of 473 K and a pressure of 820 mmHg, is produced from 100.0 g of carbon monoxide CO?

- A. 128 L
- B. 50 L
- C. 140 L
- D. 400 L

17. Which of the following is the general electron configuration for the outermost electrons of elements in the alkaline earth group?

- A. ns<sup>1</sup>
- B. ns<sup>2</sup>
- C. ns<sup>2</sup>np<sup>4</sup>
- D. ns<sup>2</sup>np<sup>5</sup>

18. Consider the element with the electron configuration  $[\text{Kr}]5s^24d^{10}5p^5$ . This element is

- A. a representative element
- B. a transition metal
- C. an actinide element
- D. a noble gas

19. Which two electron configurations represent elements that would have similar chemical properties?

(1)  $1s^22s^22p^4$     (2)  $1s^22s^22p^5$     (3)  $[\text{Ar}]4s^23d^{10}4p^3$     (4)  $[\text{Ar}]4s^23d^{10}4p^4$

- A. (1) and (2)
- B. (1) and (3)
- C. (1) and (4)
- D. (2) and (4)

20. Which one of the following pairs are isoelectronic?

- A.  $\text{Mn}^{2+}$  and Ar
- B.  $\text{Zn}^{2+}$  and  $\text{Cu}^{2+}$
- C.  $\text{Cl}^-$  and S
- D.  $\text{K}^+$  and  $\text{Cl}^-$

21. How many 3d electrons does the copper(I) ion,  $\text{Cu}^+$ , have?

- A. 10
- B. 9
- C. 8
- D. 7

22. What values for n are allowed for  $l = 3$ ?

- A.  $n = 3$
- B.  $n < 3$
- C.  $n > 3$
- D.  $n = 1$

23. Which sketch represents an orbital with the quantum numbers  $n = 3$ ,  $l = 0$ , and  $m_l = 0$ ?

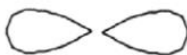
A)



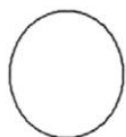
B)



C)



D)



24. Which one of the following represents an acceptable possible set of quantum numbers (in the order  $n$ ,  $l$ ,  $m_l$ ,  $m_s$ ) for an electron in an atom?

- A. 2, 1, 0, 0
- B. 2, 2, 0, +1/2
- C. 2, 0, 2, +1/2
- D. 2, 1, -1, +1/2

25. The electron configuration of a ground-state Ag atom is \_\_\_\_\_.

- A.  $[\text{Kr}]5s^14d^{10}$
- B.  $[\text{Kr}]5s^24d^{10}$
- C.  $[\text{Ar}]4s^24d^9$
- D.  $[\text{Kr}]5s^23d^9$

26. When the electron in a hydrogen atom moves from  $n = 6$  to  $n = 2$ , light with a wavelength of \_\_\_\_\_ nm is emitted.

- A. 657
- B. 93.8
- C. 411
- D. 434

27. Using Bohr's equation for the energy levels of the electron in the hydrogen atom, determine the energy (J) of an electron in the  $n = 4$  level.

- A.  $-5.45 \times 10^{-19}$
- B.  $-1.84 \times 10^{-29}$
- C.  $-1.36 \times 10^{-19}$
- D.  $+1.84 \times 10^{-29}$

28. What is the frequency of light that has a wavelength of  $1.23 \times 10^{-6}$  cm?

- A.  $2.44 \times 10^{16}$
- B.  $1.04 \times 10^{-13}$
- C.  $9.62 \times 10^{12}$
- D. 3.69

29. All of the orbitals in a given electron shell (energy level) have the same value of the \_\_\_\_\_ quantum number.

- A. spin
- B. principal
- C. angular
- D. magnetic

30. There are \_\_\_\_\_ possible values for the magnetic quantum number of an electron in a 5f subshell.

- A. 7
- B. 3
- C. 14
- D. 5

31. Which of the subshells below do not exist due to the constraints upon the angular momentum quantum number?

- A. 2p
- B. 2s
- C. 2d
- D. all of the above

32. Which one of the following is diamagnetic?

- A. Zn
- B. Cl
- C. N
- D. Ag

33. Which of the following atoms or ions has three unpaired electrons?

- A. N
- B. Al
- C. S<sup>2-</sup>
- D. Ti<sup>2+</sup>

34. The electron configuration for the barium (Ba) atom is:

- A.  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$
- B.  $[\text{Xe}] 6s^2$
- C.  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
- D.  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$



35. Which of the following is the electron configuration of a sulfide ion?

- A.  $[\text{Ne}]3s^23p^4$
- B.  $[\text{Ne}]$
- C.  $[\text{Ne}]3s^23p^1$
- D.  $[\text{Ar}]$

36. which atom has the largest radius?

- A. Si
- B. P
- C. S
- D. Cl

37. Which atom has the largest effective nuclear charge?

- A. Ca
- B. Ga
- C. Ge
- D. Se

38. Which one of the following is the correct order of increasing atomic/ionic radius?

- A.  $\text{P}^{3-} < \text{Cl}^- < \text{Ar} < \text{K}^+$
- B.  $\text{P}^{3-} < \text{Cl}^- < \text{K}^+ < \text{Ar}$
- C.  $\text{K}^+ < \text{Ar} < \text{P}^{3-} < \text{Cl}^-$
- D.  $\text{K}^+ < \text{Ar} < \text{Cl}^- < \text{P}^{3-}$

39. Which element lose electron easier?

- A. Mg
- B. Al
- C. Si
- D. P

40. Which one of the following is correct according to the electronegativity?

- A.  $\text{Mg} < \text{Ca}$
- B.  $\text{N} < \text{B}$
- C.  $\text{O} < \text{N}$
- D.  $\text{Si} < \text{C}$