單選題，4選1

1. Which one of the following is *incorrect*? (a) The more crystalline a polymer, the higher its melting point; (b) When a condensation polymer is formed, some small molecule like water is eliminated; (c) Elastomers are polymers with rubbery properties; (d) Thermoplastic materials are extremely rigid at high temperatures.

2. Of the following, which one is a condensation polymer? (a) polystyrene; (b) nylon; (c) polyethylene; (d) polypropylene.

3. The Henry's law constant for CO_2 3.1 x 10^{-2} mole/L-atm at 25 °C. What pressure would be necessary in order to have a 0.25 M solution? (a) 8.1 atm; (b) 0.12 atm; (c) 0.081 atm; (d) the pressure need would be excessive to reach such a concentration.

4. What is the vapor pressure over a 30°C water solution containing 652 g of sucrose, $C_{12}H_{22}O_{11}$, per liter of solution? (Assume the solution behaves ideally. The vapor pressure over pure water at this temperature is 31.8 torr. Sucrose is nonvolatile. The density of the solution is 1.61 g/ml.) (a) 18.9 torr; (b) 30.7 torr; (c) 25.9 torr; (d) 31.8 torr.

5. Which identification of the van't Hoff factor is *incorrect*? (a) $MgHPO_3$ – 3 ; (b) sugar – 1 ; (c) KBr – 2 ; (d) CaI_2 – 3

6. For the hypothetical gas-phase reaction 3A(g) --> 2B(g), the number of moles of A present at 25 min is found to be .022. If the initial number of moles of A and B were 0.050 mol and 0.00 mol, respectively, how much B is present at 25 min? (a) 0.019 mol; (b) 0.023 mol; (c) 0.031 mol; (d) 0.050 mol

7. A certain reaction has the following form: a A → b B. At a particular temperature, concentration versus time data were collected for this reaction and a plot of ln[A] versus time resulted in a straight line with a slope value of –6.9 x 10^{-2} s^{-1}. What is the half-life for this reaction: (a) 5 sec; (b) 10 sec; (c) 20 sec; (d) 25 sec. (ln0.5 = -0.69)

8. Both the forward and reverse reactions of the following equilibrium are believed to be elementary steps: CO(g) + Cl_2(g) ⇌ COCl(g) + Cl(g) At 25°C the rate constants for the forward and reverse reactions are 1.4 x 10^{-28} M^{-1} s^{-1} and 9.3 x 10^{10} M^{-1} s^{-1}, respectively. What is the value for the equilibrium constant at 25°C? (a) 1.5 x 10^{-39} ; (b) 6.6 x 10^{38}; (c) 1.3 x 10^{-17}; (d) 1.4 x 10^{-28}.

9. In which of the following reactions is K_{eq} independent of the pressure? (a) I_2(g) + H_2(g) ⇌ 2HI(g)　(b) 2NOBr(g) ⇌ 2NO(g) + Br_2(g)　(c) N_2(g) + $3H_2$(g) ⇌ $2NH_3$(g); (d) $CaCO_3$(s) ⇌ CaO(s) + CO_2(g)

10. The following equilibrium was obtained when some NO gas was placed into a 2.00-L container until the pressure was 0.650 atm: 2NO(g) ⇌ N_2(g) + O_2(g) The equilibrium pressure of N_2 was found to be 5.25 x 10^{-2} atm. What is K_{eq} for this reaction? (a) 6.52 x 10^{-3}; (b) 9.28 x 10^{-3}; (c) 8.08 x 10^{-2}; (d) 1.07 x 10^2.

11. Which of the following is **not a valid** expression for pOH? (a) pOH = - log(K_w/ [H^+]); (b) pOH = pK_w – pH; (c) pOH = -log [OH^-]; (d) pOH = 14 – log [H^+]

12. Predict whether aqueous solutions of the following compounds are acidic, basic, or neutral. Find the *incorrect* answer. (a) NH_4Br – basic; (b) $FeCl_3$ – acidic; (c) $NaHC_2O_4$ – basic; (d) $KClO_4$ – neutral.

13. A balance has a precision of ± 0.001 g. A sample that weighs about 25 g is weighed on this balance. How many significant figures should be reported for this measurement? (a)2, (b)3, (c)4, (d)5

14. Naturally occurring lithium consists of two isotopes: ^6Li and ^7Li. How many neutrons are in each isotope? (a)6,7, (b)3,3, (c)4,3, (d)3,4,

15. An $^{56}Fe^{2+}$ particle contains (a)26 protons, 26 neutrons, and 26 electrons, (b)28 protons, 28 neutrons, and 26 electrons, (c)26 protons, 30 neutrons, and 24 electrons, (d)54 protons, 56 neutrons, and 52 electrons

16. Which of these acids has a name that begins with hydro-? (a)$HClO_4$, (b)$HClO$, (c) $HClO_2$, (d)$HClO_3$

17. Elements belonging to which group of the periodic table form ions with a 2+ charge? (a)alkali metals, (b)alkaline earth metals, (c)chalcogens, (d)halogens

18. Complete the following statement: _____ are in 10.0 moles of $C_{10}H_8$. (a) 6.022 x 10^{24} atoms of C, (b)4.818 x 10^{24} atoms of H, (c)4.818 x 10^{25} atoms of H, (d) 10.0 moles of C

19. Ascorbic acid (vitamin C) contains 40.92%C, 4.58%H, and 54.50%O by mass. What is the empirical formula of ascorbic acid? (a)$C_3H_4O_3$, (b)$C_3H_5O_3$, (c)$C_4H_6O_4$, (d)$C_3H_5O_4$

20. Which reactions will *not* produce a precipitate from aqueous solution? (a)$AgNO_3$ + KI, (b)$FeSO_4$ + $Ba(OH)_2$, (c)NaBr + $Al_2(SO_4)_2$, (d)$ZnCl_2$ + $(NH_4)_2S$

21. Consider the following reactions:

$2AgNO_3(aq) + Zn(s) ---> 2Ag(s) + Zn(NO_3)_2$

$Zn(NO_3)_2(aq) + Co(s) ---> $ no reaction

$2AgNO_3(aq) + Co(s) ---> Co(NO_3)_2(aq) + 2Ag(s)$

Which is the correct order of increasing activity for these metals? (a)Zn < Co < Ag, (b)Ag < Co < Zn, (c)Co < Zn < Ag, (d)Ag < Zn < Co

22. When heat is absorbed by the system from the surroundings, the process is said to be _____, and the sign of $q_{process}$ is _____. (a)exothermic, negative, (b)exothermic, positive, (c)endothermic, positive, (d) endothermic, negative

23. Given the equation

$2H_2(g) + O_2(g) --> 2H_2O(l)$ $\Delta H? = -571.6$ kJ,

which statement is *incorrect*? (a)The standard heat of formation of liquid water is -571.6 kJ/mol. (b)$\Delta H°$ for the reverse reaction is +571.6 kJ/mol.(c)$\Delta H°$ for the formation of 1/2 mol of oxygen is 285.8 kJ/mol. (d) The equation forming gaseous water would have a different ΔH.

24. Identify the specific element that corresponds to the following electron configuration: $[Ne]3s^23p^1$ (a)Al, (b)Si, (c)B, (d)Ga

25. Rank the elements C, O, Na, and Al in order of *decreasing* ionization energy (largest first, etc.). (a) Na > Al > C > O, (b) O > C > Al > Na, (c) O > C > Na > Al, (d) C > O > Na > Al