**Chemistry 122 Midterm**

**Answer Section**

**MULTIPLE CHOICE**

1. ANS: B PTS: 1 DIF: L1 REF: p. 505

OBJ: 17.1.1 Explain how energy, heat, and work are related.

2. ANS: B PTS: 1 DIF: L2 REF: p. 506

OBJ: 17.1.1 Explain how energy, heat, and work are related.

3. ANS: B PTS: 1 DIF: L1 REF: p. 508

OBJ: 17.1.3 Identify the units used to measure heat transfer.

4. ANS: B PTS: 1 DIF: L2 REF: p. 509 | p. 510

OBJ: 17.1.3 Identify the units used to measure heat transfer.

5. ANS: A PTS: 1 DIF: L2 REF: p. 516

OBJ: 17.2.2 Construct thermochemical equations.

6. ANS: A PTS: 1 DIF: L1 REF: p. 546

OBJ: 18.1.2 Identify four factors that influence the rate of a chemical reaction.

7. ANS: C PTS: 1 DIF: L1 REF: p. 550

OBJ: 18.2.1 Describe how the amounts of reactants and products change in a chemical system at equilibrium.

8. ANS: A PTS: 1 DIF: L2 REF: p. 554

OBJ: 18.2.2 Identify three stresses that can change the equilibrium position of a chemical system.

9. ANS: A PTS: 1 DIF: L2 REF: p. 552 | p. 553

OBJ: 18.2.2 Identify three stresses that can change the equilibrium position of a chemical system.

10. ANS: C PTS: 1 DIF: L1 REF: p. 556

OBJ: 18.2.3 Explain what the value of Keq indicates about the position of equilibrium.

11. ANS: C PTS: 1 DIF: L2 REF: p. 512

OBJ: 17.2.1 Describe how calorimeters are used to measure heat flow.

12. ANS: C PTS: 1 DIF: L2 REF: p. 516

OBJ: 17.2.2 Construct thermochemical equations. | 17.2.3 Solve for enthalpy changes in chemical reactions by using heats of reaction.

13. ANS: B PTS: 1 DIF: L2 REF: p. 531

OBJ: 17.4.2 Solve for enthalpy changes by using Hess' law or standard heats of formation.

14. ANS: A PTS: 1

15. ANS: D PTS: 1

16. ANS: C PTS: 1

17. ANS: E PTS: 1 REF: K/U OBJ: 6.4

STA: EC1.04

18. ANS: C PTS: 1 REF: C OBJ: 5.3

STA: EC1.05

**SHORT ANSWER**

19. ANS:

*K* = 

=  8.5

PTS: 1 DIF: L3 REF: p. 556 | p. 557

OBJ: 18.2.3 Explain what the value of Keq indicates about the position of equilibrium.

20. ANS:

Specific heat =  = 0.14 

PTS: 1 DIF: L2 REF: p. 512

OBJ: 17.2.1 Describe how calorimeters are used to measure heat flow.

21. ANS:

- since concentration is a factor that affects the rate of reaction, by increasing the concentration of the acid, the reaction rate would be increased

- temperature is another factor that affects the rate of reaction, by increasing the temperature of the reaction, the reaction should proceed at a faster rate

- since surface area of a solid would affect the rate of a reaction, by powdering the magnesium, the rate of the reaction would be increased

- perhaps a catalyst could be added that could speed up the reaction (unknown)

- perhaps using a different acid and/or metal (although this would change the reaction though)

PTS: 1 REF: C OBJ: 6.2 STA: EC1.04

22. ANS:

- the energy that is required in an "effective collision" is needed to overcome the activation energy of the reaction

- the activation energy is the minimum increase in potential energy of a system required for particles to react

- if this amount of energy is not produced by the collision of the particles, the collision will be ineffective

PTS: 1 REF: K/U OBJ: 6.4 STA: EC1.05

23. ANS:

|  |  |  |
| --- | --- | --- |
| 2NO(*g*)  N(*g*) + 2O(*g*) |  | *H* = –67.7 kJ |
| N(*g*) + 2O(*g*)  NO(*g*) |  | *H* = 9.7 kJ |
| 2NO(*g*)  NO(*g*) |  | *H* = –58 kJ |

PTS: 1 DIF: L3 REF: p. 528

OBJ: 17.4.2 Solve for enthalpy changes by using Hess' law or standard heats of formation.

24. ANS:

10*M*

PTS: 1 DIF: L2 REF: p. 562

OBJ: 18.3.1 Describe the relationship between the solubility product constant and the solubility of a compound.

**PROBLEM**

25. ANS:

|  |  |  |  |
| --- | --- | --- | --- |
| AgC2H3O2(s) <====> | Ag1+(aq) | + | C2H3O21-(aq) |
| initial | 0.45 mol/L |  |  |
| @E | 0.45 mol/L + (negligible) |  |  |

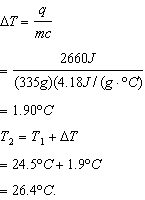
2.5  10-3 = 0.45 

**solubility = 5.6  10-3 mol/L**

PTS: 1 REF: I OBJ: 7.6 STA: CS2.04

26. ANS:

|  |  |
| --- | --- |
| m = | 335 g |
| q = | 2.66 kJ |
| = | 2660 J |
| c = | 4.18 J/(g·ºC) |
| T1 = | 24.5ºC |



**The final temperature of the water would be 26.4ºC.**

PTS: 1 REF: I OBJ: 5.1 STA: EC2.03

27. ANS:

AgNO3(aq) + NaCl(aq)  AgCl(s) + NaNO3(aq)

[Ag1+] = (0.45 mol/L)(0.045 L) / (0.045 L + 0.085) L

[Cl1-] = (1.35  10-2 mol/L)(0.085 L) / (0.045 L + 0.085) L

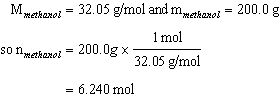
**ion product AgCl is [Ag1+][Cl1-] = 1.4  10-3 > Ksp, yes a precipitate forms**

PTS: 1 REF: I OBJ: 7.6 STA: CS2.05

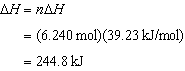
28. ANS:



Find the number of moles of methanol



Then find the enthalpy change



**Since the methanol vaporizes by absorbing heat, the enthalpy change is +244.8 kJ.**

PTS: 1 REF: I OBJ: 5.2 STA: EC2.03

29. ANS:

i. a. 

=[(2  –393 kJ) + (4  –242 kJ)] – [2  –638 kJ]

= –478 kJ

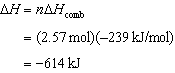
**The heat of reaction for the equation is –478 kJ**

b. Since this is for 2 moles of methanol,

|  |  |
| --- | --- |
|  | = –478 kJ /2 mol |
|  |  |
|  | = –239 kJ/mol |

**The molar heat of combustion of methanol is –239 kJ/mol**

c. Since the value is negative, the reaction is exothermic

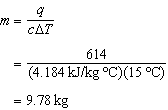
ii. 

since q = –

q = 614 kJ

 = 150 C

c= 4.184 kJ/kg0 C



**9.78 kg of water could be heated with 2.57 mol of methanol.**

PTS: 1 REF: I OBJ: 5.5 STA: EC2.05