

1. An 86.0-g sample of chromium ($s=0.447 \text{ J}/(\text{g}\cdot^\circ\text{C})$), initially at 338.33°C is added to an insulated vessel containing 189.9 g of water ($s=4.18\text{J}/\text{g}\cdot^\circ\text{C}$), initially at 16.17°C . At equilibrium, the final temperature of the metal-water mixture is 28.06°C . How much heat is absorbed by the water? The heat capacity of the vessel is $0.220 \text{ KJ}/^\circ\text{C}$.
- A. 6.82 KJ B. 112 KJ C. 9.43 KJ D. 15.2 KJ E. 12 KJ
2. A bond in which both electrons of the bond are donated by one atom is called _____
- A. A double bond
B. A triple bond
C. A coordinate covalent bond
D. A polar covalent bond
E. An ionic bond
3. A student must prepare 7.00 L of 0.100 M Na_2CO_3 . Which is the best procedure for preparing this solution?
- A. Measure 74.2 g Na_2CO_3 and add 7.00 L of H_2O
B. Measure 74.2 g Na_2CO_3 and add 7.00 kg of H_2O
C. Measure 10.6 g Na_2CO_3 and add H_2O until the final homogeneous solution has a volume of 7 L.
D. Measure 74.2 g Na_2CO_3 and add H_2O until the final homogeneous solution has a volume of 7 L.
E. Measure 10.6 g Na_2CO_3 and add 7.00 kg of H_2O
4. An atom of which of the following elements has the highest fourth ionization energy.
- A. Se B. Si. C. Al D. Ga E. As
5. An atom of which of the following has the smallest atomic radius?
- A. B
B. Tl
C. Al
D. Ga
E. In
6. In the Lewis dot formula that minimizes formal charge, how many bonds are in the tetrathionate ion, $\text{S}_4\text{O}_6^{2-}$?
- A. 11 B. 7 C. 15 D. 9 E. 13

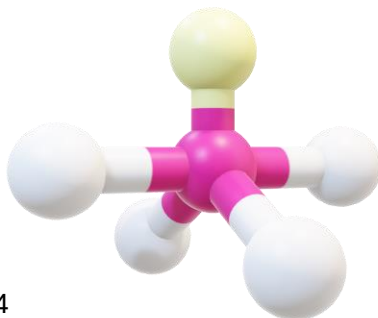
7. An impure sample of benzoic acid is titrated with 0.9855 M NaOH. A 3.412-g sample requires 24.43 mL of titrant to reach the endpoint. What is the percent by mass of benzoic acid in the sample?
- 2.407%
 - 0.01971%
 - 19.71%
 - 100%
 - 86.18%
8. A mixture of 0.140 mol N_2 , 0.037 mol O_2 , 0.104 mol CH_4 , and a known amount of CO_2 occupies a volume of 8.84 L at 27°C and 1.06 atm pressure. How many moles of CO_2 are there in this sample?
- 0.364 mol
 - 0.0839 mol
 - 0.719 mol
 - 2.45 mol
 - 3.77 mol
9. A 70.4-L sample of gaseous hydrocarbon, measured at 1.00 atm pressure and 25.0°C is burned in excess oxygen, liberating 4.06×10^3 kJ of heat at constant pressure. What is the identity of the hydrocarbon? ($R=0.0821$ L.atm/(K.mol)):
- | Substance | $\Delta H^{\circ}f$ (kJ/mol) |
|-----------|------------------------------|
| $CO_2(g)$ | -393.5 |
| H_2O | -285.8 |
- propylene (C_3H_6 , $\Delta H^{\circ}f=20.41$ kJ/mol)
 - ethane (C_2H_6 , $\Delta H^{\circ}f=-84.68$ kJ/mol)
 - acetylene (C_2H_2 , $\Delta H^{\circ}f=226.73$ kJ/mol)
 - ethylene (C_2H_4 , $\Delta H^{\circ}f=52.47$ kJ/mol)
 - propane (C_3H_8 , $\Delta H^{\circ}f=-104.7$ kJ/mol)
10. for each of the following species except _____. The electronic structure may be adequately described by two resonance structures.
- SO_2
 - NO_2^-
 - C_6H_6
 - SO_3^{2-}
 - O_3^-
11. Suppose atom 1 has the same number of protons as atom 2, and atom 2 has the same number of neutrons as atom 3. Atom 1 doesn't have the same number of neutrons as atom 3. Which of the following statements is true?
- Atoms 1 and 3 must be isotopes.
 - Atom 3 must have the same number of protons as atom 1.
 - Atom 3 must have the same number of protons as atom 2.
 - Atoms 1 and 2 must be isotopes.

- E. Atom 2 must have the same number of neutrons as atom 1.
12. What is the mass of NH_3 in an 80.0-cm^3 sample that has a density of $0.92\text{g} / \text{cm}^3$ and consists of 20% (by mass) NH_3 ?
- A. 74g
B. 15g
C. 25g
D. 45g
E. 20g
13. All the following statements about resonance are true except:
- A. Resonance describes a more stable situation than does any one contributing resonance formula.
B. Resonance describes the oscillation and vibration of electrons.
C. Resonance describes the bonding as intermediate between the contributing resonance formulas.
D. The contributing resonance formulas differ only in the arrangement of the electrons.
E. A single Lewis formula does not provide an adequate representation of the bonding.
14. What is the hybridization in IF_4^- ?
- A. sp^3d^2
B. sp^3
C. sp^2
D. sp
E. sp^3d
15. What is the bond angle in a trigonal planar molecule or ion?
- a. 180°
b. 109°
c. 90°
d. 72°
e. 120°
16. How many p orbitals are there in the $n=3$ shell?
- a. 5
b. 1
c. 3
d. 0
e. 6
17. A 1.50 L sample of a gas at STP has a mass of 4.75 g. What is one possible formula of the gas?
- a. C_2F_2
b. PCl_3
c. NF_3
d. NHF_2
e. NO_2
18. The approximate angle of CCO in acetone is:
- a. 109°
b. 90°

- c. 120°
 d. 180°
 e. 60°
19. A 4.94g sample of oxide chromium contains 3.06g of chromium. Calculate the simplest formula for the compound:
- a. CrO2
 b. CrO
 c. Cr2O3
 d. CrO5
 e. Cr2O
20. Analysis of a compound containing only C and Cl revealed that it contains 33.33% C atoms by number and has a molar mass of 248.75 g/mol. What is the molecular formula of this compound?
- a. C2Cl4
 b. C3Cl6
 c. C2Cl6
 d. CCl3
 e. CCl2

الأجابات

C	17	D	9	C	1
C	18	D	10	C	2
A	19	D	11	D	3
B	20	B	12	A	4
		E	13	A	5
		A	14	E	6
		E	15	E	7
		C	16	B	8



1) ~~C~~ Water
 $H = 4.18 \times 187.9 \times (28.06 - 16.17) \times \frac{1 \text{ kJ}}{1000} = 9.43 \text{ kJ}$

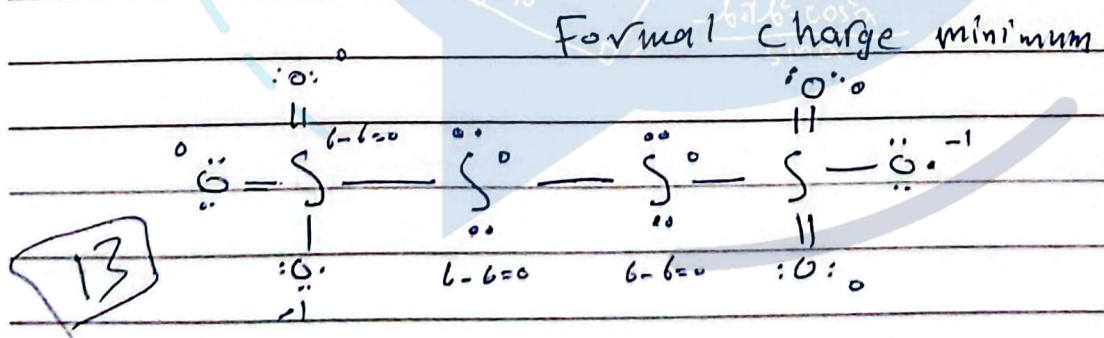
2) Definition → straight forward

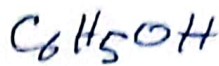
3) 66 g/mol
 $0.1 \times 7 \times 106 = 74.2 \text{ g}$
 measure until final solution is 7 L

4) ~~Ionization energy is at its highest with noble gases.~~
 Fourth ~~مستوى~~ ~~البرق~~
 General ~~الدوري~~ Se

5) B
 Decrease →
 ↑
 ↓ increase

6) S ~~requires 2 electrons~~ 6 electrons
 O → 6 electrons

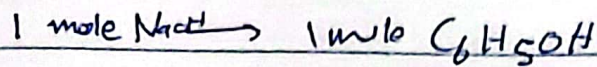




$$M_m = 122$$

$$7 \quad 0.9855 \text{ Mol} \times 24.43 \times 10^3 \text{ L} = 0.02407$$

1:1 → many titrations are designed 1:1



$$0.02407 \text{ mol} \rightarrow ??$$

$$0.02407 \times 122 \text{ g/mol} = 2.937 \text{ g}$$

$$\frac{2.937}{3.412} = 0.86$$

$$3.412$$

$$8 \quad P_{\text{tot}} = P_{N_2} + P_{O_2} + P_{CH_4} + P_{CO_2}$$

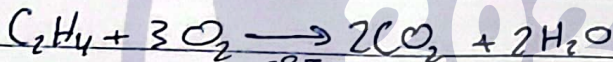
$$0.0839 \text{ mol}$$

$$9 \quad n = \frac{PV}{RT} = \frac{1 \times 70.4}{0.0821 \times (298)} = 2.88 \text{ mol}$$

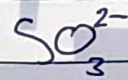
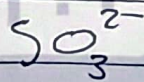
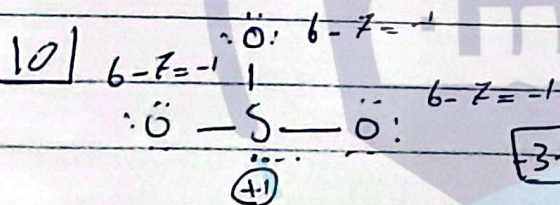
تفاعل احتراق

$$\Delta H^\circ = -1.409 \times 10^3 = -1410 \text{ KJ/mol}$$

تسوية واردة واردة



$$2 \times -393.5 + 2 \times -285.5 - 52.47 = -1410 \text{ KJ/mol}$$



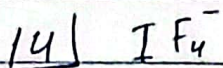
صنع الخيارات

$$-3+1=-2$$

11) D

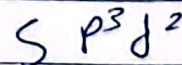
$$12 \quad 73.6 \text{ g} \times 0.2 = 15$$

13) E



$$7 + 7 \times 4 + 1 = 36$$

روح للحيول الدوري



15] 120°

16] P \rightarrow 3 orbitals

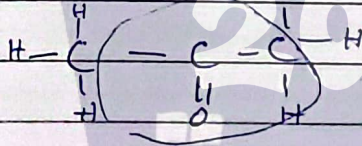
17] STP \rightarrow 0°C 1 atm

$$PV = \frac{m}{M} RT$$

$$1 \times 1.5 = \frac{4.75}{x} \times 0.0821 \times 273 \quad x = 71 \text{ g/mol}$$

$$\text{NF}_3 \quad 14 + 19 \times 3 = 71 \text{ g}$$

18] CH_3COCH_3



Trigonal Planar

19] $\text{CrO}_2 \quad \xrightarrow{\text{O}}$ $4.94 - 3.06 = 1.88$

$$3.06 \times \text{mm}_{\text{Cr}} = 0.056$$

$$1.88 \times \text{mm}_{\text{O}} = 0.1175$$

$$1:2$$

20] 33.33% C 1

66.67% Cl 2

Simple MW = 82.9

$$L = \frac{248.75}{82.9} = 3$$

