

1. Assume, as Dalton did, that the atomic weight of oxygen is 7. A sample of 11 g of a uranium oxide contains 10 grams of U. Which of the following is compatible with this data?

- (A) Uranium oxide is UO and the atomic weight of U is 70.  
 (B) Uranium oxide is  $U_3O_8$ , and the atomic weight of U is 70.  
 (C) Uranium oxide is  $UO_2$  and the atomic weight of U is 240.  
 (D) Uranium oxide is  $U_2O_3$  and the atomic weight of U is 240.

2. What is the molality of a solution made by dissolving 2 moles of NaOH in 400 grams of water?

- A. 5 mol/kg. solvent  
 B. 4 mol/kg solvent  
 C. 50 mol/kg. solvent  
 D. 40 mol/kg. solvent

3. Separation of the isotopes of uranium requires a physical method rather than a chemical method because

- (A) it is too dangerous to mix other chemicals with uranium.  
 (B) the isotopes are chemically the same element.  
 (C) the isotopes differ in number of neutrons.  
 (D) natural uranium contains only 0.7% U-235.

4. The symbol of the element whose nucleus contains 27 neutrons and 22 protons is

- A)  $\frac{49}{22}Ti$                       B)  $\frac{49}{22}Co$   
 C)  $\frac{49}{22}In$                         D)  $\frac{22}{49}Ti$

5. Analysis of a quantity of its compound shows that it contains 0.110 mol of C, 0.055 mol of N, and 0.165 mol of O. Its molecular weight is about 270. How many atoms of carbon are there in the empirical formula for the compound and how many in the molecular formula?

- (A) Empirical - 1, molecular - 3  
 (B) Empirical - 2, molecular - 2  
 (C) Empirical - 2, molecular - 6  
 (D) Empirical - 3, molecular - 2

6. A phenomenon that suggests that light is emitted in packets called quanta is

- (A) Hess's Law.  
 (B) diffraction of light.  
 (C) blackbody radiation.  
 (D) electron diffraction.

7. The observation that electrons can be diffracted is evidence that electrons

- (A) have particulate properties.  
 (B) have wave properties.  
 (C) are emitted by atoms.  
 (D) are absorbed by ions.

8. An electron can move from one orbital of a hydrogen atom to another. In which movement will the photon of highest energy be emitted?

- (A)  $2p \rightarrow 1s$   
 (B)  $1s \rightarrow 2p$   
 (C)  $3s \rightarrow 2s$   
 (D)  $2s \rightarrow 3s$

9. The energy in joules of a photon of radiation of wavelength  $1.23 \times 10^{-5}$  m is

- (A)  $(6.63 \times 10^{-34})(3.00 \times 10^8) / (1.23 \times 10^{-5})$   
(B)  $(6.63 \times 10^{-34})(1.23 \times 10^{-5})$   
(C)  $(3.00 \times 10^8) / (1.23 \times 10^{-5})$   
(D)  $(1.23 \times 10^{-5}) / (6.63 \times 10^{-34})$

10. Which has the greatest ionization energy?

- (A) He  
(B) Ne  
(C) Ar  
(D)  $\text{Cl}^-$

11. Which is the smallest?

- (A) K  
(B)  $\text{K}^+$   
(C) Ca  
(D)  $\text{Ca}^{2+}$

12. Which bond would be least polar?

- (A) H-F  
(B) B-F  
(C) Cl-F  
(D) Ca-F

13. Which end of the bonds Si-Cl, At-Br, and Hg-P are positively charged?

- (A) Si, At, P  
(B) Cl, At, Hg  
(C) Si, At, Hg  
(D) Cl, Br, P

14. Assuming the VSEPR theory, which of the following molecules or ions would you expect to be polar?

- (A)  $\text{GeCl}_2^{2-}$   
(B)  $\text{GaF}_2^+$   
(C)  $\text{Pb}(\text{CH}_3)_4$   
(D)  $\text{GeF}_4$

15. The neutral molecule  $\text{XCl}_3$  is found to have zero dipole moment. The element X is

- (A) B  
(B) N  
(C) P  
(D) I

16. The approximate OSO angle in the  $\text{SO}_2$  molecule is

- (A)  $90^\circ$   
(B)  $109^\circ$   
(C)  $120^\circ$   
(D)  $180^\circ$

17. The geometry of a molecule is best described in terms of the locations of the atomic nuclei. What geometries are possible for compounds whose bonding can be described using  $\text{sp}^3$  orbitals?

- (A) Trigonal planar or bent  
(B) Tetrahedral, bent, or trigonal bipyramidal  
(C) Square planar, tetrahedral, or trigonal planar  
(D) Trigonal bipyramidal or seesaw

18. A solution of which compound in water will best conduct electricity?

- (A)  $\text{CH}_3\text{OCH}_3$   
(B)  $\text{H}_2\text{SO}_4$   
(C)  $\text{NH}_3$   
(D)  $\text{C}_6\text{H}_6$  (benzene)

19. Which contains the shortest OO bond?

- (A)  $\text{O}_2$   
(B)  $\text{O}_3$   
(C)  $\text{O}_2^{2-}$   
(D)  $\text{HO}_2^-$

20. What is the probable shape of  $\text{RnCl}_3^+$ ?

- (A) Planar triangular
- (B) T-shaped
- (C) Pyramidal
- (D) Square pyramidal

21. 3 g of a salt of molecular weight 30 is dissolved in 250 g of water. The molality of the solution is \_\_\_\_\_

Answer: 0.4

22. Which chemical element causes Minamata disease?

Answer: Mercury

23. Which element can easily form chains?

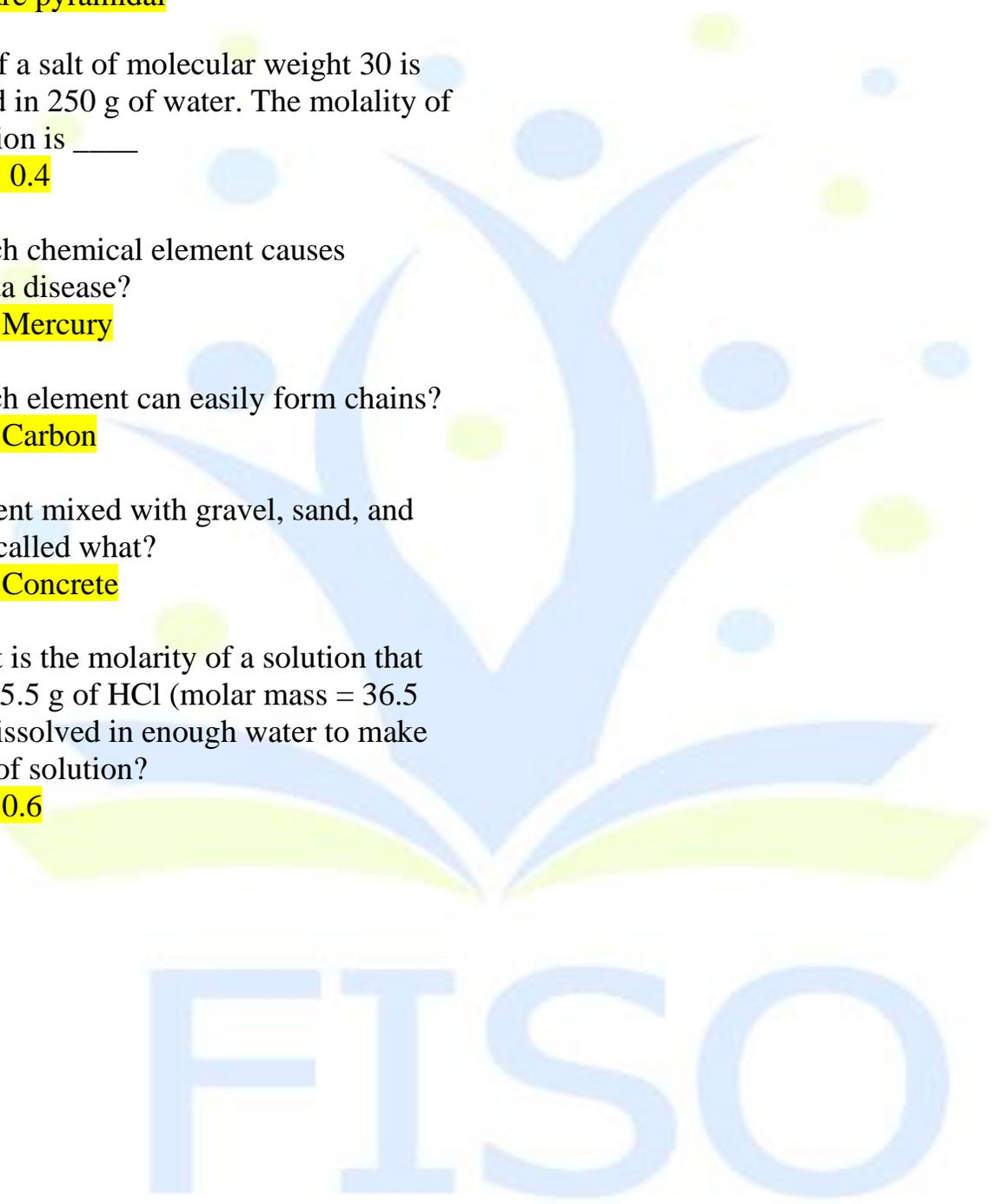
Answer: Carbon

24. Cement mixed with gravel, sand, and water is called what?

Answer: Concrete

25. What is the molarity of a solution that contains 5.5 g of HCl (molar mass = 36.5 g/mol) dissolved in enough water to make 250 mL of solution?

Answer: 0.6



FISO