Mix Test-1

Atomic Structure + Some Basic Concepts of Chemistry

Cry if you must. But then wipe your tears, take a deep breath, and walk again—toward your goal.

1. What mass of 95% pure $CaCO_3$ will be required to neutralize 50 mL of 0.5 M HCl according to:
$CaCO_3(s) + 2\ HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$.
(Calculate up to second decimal place.)

(A) 16
(B) 32
(C) 50
(D) 72

2. What volume of O_2 (at 0°C and 1 atm) is needed to burn completely 1 L of propane gas (C_3H_8) under the same conditions?

(A) 5 L
(B) 10 L
(C) 7 L
(D) 6 L

3. The total number of protons in 10 g of calcium carbonate is ($N_0 = 6.023 \times 10^{23}$).

(A) 1.5057×10^{24}
(B) 2.0478×10^{24}
(C) 3.0115×10^{24}
(D) 4.0956×10^{24}

4. Which one of the following is the heaviest?

(A) 0.2 mole of hydrogen gas
(B) 6.023×10^{22} molecules of nitrogen
(C) 0.1 g of silver
(D) 0.1 mole of oxygen gas

5. Number of atoms of He in 100 amu of He (atomic weight 4) is:

(A) 25
(B) 100
(C) 50
(D) $100 \times 6 \times 10^{-23}$

6. The mass of one molecule of the compound $C_{60}H_{122}$ is:

(A) 1.40×10^{-21} g
(B) 1.09×10^{-21} g
(C) 5.025×10^{-23} g
(D) 1.6023×10^{23} g

7. The number of significant figures in 60.0001 is:

(A) 5
(B) 6
(C) 3
(D) 2

8. A 5.2 molal aqueous solution of methyl alcohol (CH_3OH) is supplied. What is the mole fraction of methyl alcohol in the solution?

(A) 0.100
(B) 0.190
(C) 0.086
(D) 0.050

9. The number of atoms in 16 g of methane is:

(A) 3.0×10^{24}
(B) 6.02×10^{23}
(C) $\dfrac{10^{23} \times 16}{6.02}$
(D) $\dfrac{10^{23} \times 16}{3.0}$

10. A solution contains 1.2046×10^{24} molecules of HCl in 1 dm^3. The strength (normality) of the solution is:

(A) 6 N
(B) 2 N
(C) 4 N
(D) 8 N

11. What is the molality of an aqueous solution that is 10% w/w NaOH? (Na=23, O=16, H=1)

(A) 2.778
(B) 5
(C) 10
(D) 2.5

12. Maximum number of electrons that can be accommodated in a shell with $n = 4$ is:

(A) 16
(B) 32
(C) 50
(D) 72

13. If the radius of the 3rd Bohr orbit of hydrogen atom is r_3 and that of the 4th is r_4, then

(A) $\dfrac{r_3}{r_4} = \dfrac{16}{9}$
(B) $\dfrac{r_3}{r_4} = \dfrac{9}{16}$
(C) $\dfrac{r_3}{r_4} = \dfrac{4}{3}$
(D) $\dfrac{r_3}{r_4} = \dfrac{3}{4}$

14. A station of All India Radio, New Delhi, broadcasts at 1368 kHz. The wavelength of the radiation is ($c = 3.0 \times 10^8$ m s^{-1}).

(A) 219.2 m
(B) 2192 m
(C) 21.92 m
(D) 219.3 m

15. The orbital angular momentum of an electron in 2s orbital is:

(A) 0
(B) $\frac{1}{2}\hbar$
(C) $\pi^2\hbar$
(D) $\frac{\pi^2}{2}\hbar$

16. Which is not in accordance with Aufbau principle?

1) ↿⇂ ↿⇂ 1 1
2s 2p
2) ↿⇂ ↿⇂ ↿⇂ 1
2s 2p
3) 1 ↿⇂ 1 1
2s 2p
4) ↿⇂ 1 1 1
2s 2p

17. For sodium atom, the number of electrons with $m_\ell = 0$ is:

(A) 2
(B) 7
(C) 9
(D) 8

18. Which of the following orbitals is not possible?

(A) 3f
(B) 4f
(C) 5f
(D) 6f

19. Compare the energies of two radiations: E_1 with $\lambda = 800\,\text{nm}$ and E_2 with $\lambda = 400\,\text{nm}$.

(A) $E_1 = 2E_2$
(B) $E_1 = E_2$
(C) $E_2 = 2E_1$
(D) $E_2 = \frac{1}{2}E_1$

20. An electron in excited hydrogen falls from $n = 5$ to $n = 2$. In which region will the spectral line appear, and which series?

(A) Visible, Balmer
(B) Ultraviolet, Lyman
(C) Infrared, Paschen
(D) Infrared, Brackett

21. Match the following (Column I vs Column II) and choose the correct option.

	Column I		**Column II**
(A)	Uncertainty of an object	(i)	$\frac{5.29\times n^2}{Z}$
(B)	Bohr's radius of an orbit	(ii)	$\frac{h}{4\pi m}$
(C)	Angular momentum of an electron	(iii)	$\frac{h}{mv}$
(D)	de Broglie wavelength	(iv)	$n.\frac{h}{2\pi}$

(A) (A)→(iii), (B)→(iv), (C)→(i), (D)→(ii)
(B) (A)→(ii), (B)→(i), (C)→(iv), (D)→(iii)
(C) (A)→(iv), (B)→(iii), (C)→(i), (D)→(ii)
(D) (A)→(i), (B)→(ii), (C)→(iv), (D)→(iii)

22. Which of the following statements about the electron is incorrect?

(A) It is a negatively charged particle.
(B) The mass of electron is equal to the mass of neutron.
(C) It is a basic constituent of all atoms.
(D) It is a constituent of cathode rays.
