1. Increasing order lowest first for the values of e/m for electro e, proton p, neutron n and α-particles is
   a. e, p, n, α  
   b. n, α, p, e  
   c. n, p, e, α  
   d. n, p, α, e

2. A particle moving with a velocity $10^6$ m/s will have de-Broglie wavelength nearly
   [Given, $m = 6.62 \times 10^{-27}$ kg, $h = 6.62 \times 10^{-34}$ J$\cdot$s]
   a. $10^{-9}$  
   b. $10^{-13}$  
   c. $10^{-19}$  
   d. $1\text{Å}$

3. Bohr’s radius of 2$^{nd}$ orbit of Be$^{3+}$ is equal to that of
   a. 4$^{th}$ orbit of hydrogen  
   b. 2$^{nd}$ orbit of He$^+$  
   c. 3$^{rd}$ orbit of Li$^{2+}$  
   d. first orbit of hydrogen

4. Half-life period of a radioactive element is 100 yr. How long will it take for its 93.75% decay?
   a. 400 yr  
   b. 300 yr  
   c. 200 yr  
   d. 193 yr

5. Two vessels containing gases A and B are interconnected as shown in the figure. The stopper is opened, the gases are allowed to mix homogeneously. The partial pressures of A and B in the mixture will be, respectively
   - Gas A: 8 L, 8 atm  
   - Gas B: 8 L, 5 atm
   a. 8 and 5 atm  
   b. 9.6 and 4 atm  
   c. 4.8 and 2 atm
6. The temperature, at which a gas shows maximum ideal behavior, is known as

a Boyle’s temperature

b inversion temperature

c critical temperature

d absolute temperature

7. The unit of rate constant of a second order reaction is

a mol/L -s

b L/mol -s

c L^2/mol^2-s

d per second

8. \(2\text{N}_2\text{O}_5 \rightleftharpoons 4\text{NO}_2 + \text{O}_2\)

For the above reaction which of the following is not correct about rates of reaction?

a \(-\frac{d[\text{N}_2\text{O}_5]}{dt} = 2\frac{d[\text{O}_2]}{dt}\)

b \(-2\frac{d[\text{N}_2\text{O}_5]}{dt} = \frac{d[\text{NO}_2]}{dt}\)

c \(\frac{d[\text{N}_2\text{O}_5]}{dt} = 4\frac{d[\text{O}_2]}{dt}\)

d \(-2\frac{d[\text{N}_2\text{O}_5]}{dt} = \frac{d[\text{NO}_2]}{dt} = \frac{d[\text{O}_2]}{dt}\)

9. A+B \rightarrow \text{Product}

If concentration of A is doubled, rate increases 4 times. If concentrations of A and B both are doubled, rate increases 4 times. If concentrations of A and B both are doubled, rate increases 8 times.

The differential rate equation of the reaction will be

a \(\frac{dC}{dt} = kC_A \times C_B\)

b \(\frac{dC}{dt} = kC_A^2 \times C_B^3\)

c \(\frac{dC}{dt} = kC_A^2 \times C_B\)

d \(\frac{dC}{dt} = kC_A^2 \times C_B^2\)

10. Which of the following is a wrong statement about equilibrium state?

a Rate of forward reaction = Rate of backward reaction

b Equilibrium is dynamic
11. \( A + B \rightleftharpoons C + D \) Initially moles of \( A \) and \( B \) are equal. At equilibrium, moles of \( C \) are three times that of \( A \). The equilibrium constant of the reaction will be

\[
a  \ 1 \  \ b  \ 3 \  \ c \  \ 4 \  \ d \  \ 9
\]

12. If for \( N_2 + 3H_2 \rightleftharpoons 2NH_3 \), \( K_{eq} \) for the reaction \( NH_3 \rightleftharpoons \frac{1}{2}N_2 + \frac{3}{2}H_2 \) will be

\[
a  \ 6.25 \  \ b  \ 25 \  \ c \  \ 250 \  \ d \  \ 500
\]

13. A weak acid \( HX \) has dissociation constant \( 10^{-5} \). The pH of 0.1 M solution of this acid will be

\[
a  \ 2 \  \ b  \ 3 \  \ c \  \ 4 \  \ d \  \ 5
\]

14. Which of the following is not a buffer solution?

\[
a\  \ 100 \text{ mL } 0.1 \text{ M CH}_3\text{COOH} + 50 \text{ mL } 0.1 \text{ M CH}_3\text{COONa}
\]

\[
b\  \ 100 \text{ mL } 0.1 \text{ M CH}_3\text{COOH} + 50 \text{ mL } 0.1 \text{ M NaOH}
\]

\[
c\  \ 50 \text{ mL } 0.1 \text{ M CH}_3\text{COOH} + 100 \text{ mL } 0.1 \text{ M NaOH}
\]

\[
d\  \ 100 \text{ mL: } 0.1 \text{ M NH}_4\text{OH} + 50 \text{ mL } 0.1 \text{ M HCL}
\]

15. If \( K_{sp} \) of \( Ag_2S \) is \( 10^{-17} \), the solubility of \( Ag_2S \) in 0.1 M solution of \( Na_2S \) will be

\[
a  \ 10^{-8} \  \ b \ 5 \times 10^{-9} \  \ c \  \ 10^{-15} \  \ d \  \ 10^{-16}
\]

16. Which of the following has the highest solubility product?

\[
a\  \ CuS \  \ b \ Bi_2S_3 \  \ c \ CdS \  \ d \ ZnS
\]

17. The pH values of 0.1 solution of HCL, \( CH_3COOH \), \( NH_4CL \) and \( CH_3COONa \) will have the order

\[
a\ HCL<CH_3COOH<NH_4CL<CH_3COONa
\]

\[
b\ CH_3COONa<NH_4CL<CH_3COOH<HCL
\]

\[
c\ NH_4CL<CH_3COONa<CH_3COOH<HCL
\]

\[
d\ All \ will \ have \ same \ pH \ value
\]

18. For the titration of solution of oxalic acid and sodium hydroxide, the suitable indicator is
19. If ‘F’ is Faraday and ‘N’ is Avogadro number, then charge of the 4 electron can be expressed as

a  \( F \times N \)  
b  \( \frac{F}{N} \)  
c  \( \frac{N}{F} \)  
d  \( F \times 2N \)

20. By passing 9.65 A current for 16 min 40 s, the volume of \( O_2 \) liberated at STP will be

a  280 mL  
b  560 mL  
c  1120 mL  
d  2240 mL

21. By diluting a weak electrolyte, specific conductivity \( K_c \) and equivalent conductivity \( \lambda_c \) change as

a  both increase  
b  \( K_c \) increases, \( \lambda_c \) decreases  
c  \( K_c \) decreases, \( \lambda_c \) increases  
d  both decrease

22. In daniel cell, anode and cathode are respectively

a  Zn \( \mid \) Zn\(^{2+} \) and Cu\(^{2+} \) \( \mid \) Cu  
b  Cu \( \mid \) Cu\(^{2+} \) and Zn\(^{2+} \) \( \mid \) Zn  
c  Fe \( \mid \) Fe\(^{2+} \) and Cu\(^{2+} \) \( \mid \) Cu  
d  Cu \( \mid \) Cu\(^{2+} \) and Fe\(^{2+} \) \( \mid \) Fe

23. \( C_2H_2 + \frac{5}{2} O_2 \rightarrow 2CO_2 + H_2O; \)

\[ \Delta H = -310 \text{ kcal} \]

\( C + O_2 \rightarrow CO_2; \quad \Delta H = -94 \text{ kcal} \)

\( H_2 + \frac{1}{2} O_2 \rightarrow H_2O; \quad \Delta H = -68 \text{ kcal} \)
On the basis of the above equations, ΔHf enthalpy of formation of C₂H₂ will be

a  -148 kcal    b  +54 kcal

-54 kcal    d  +80 kcal

24. I₂s  ⇌ I₂g;  ΔH = +40 kcal, ΔS = 80 cal. The sublimation point of I₂s will be

a  100 °C    b  127 °C

-27 °C    d  500 °C

25. If 0.1 M solutions of each electrolyte are taken and if all electrolytes are completely dissociated, then whose boiling point will be highest?

a  Glucose    b  KCL

c  BaCl₂    d  K₄[FeCN₆]

26. A solid metal has ccp or fcc structure. The relation of side of cube a and radius of atom r will be

a  a=2r    b  a=2\sqrt{2} r

c  a=\sqrt{3} r    d  a=\sqrt[3]{2} r

27. Hydrogen is prepared on large scale for industrial use

a  by Zn+H₂SO₄    b  by Al+NaOH

c  by Na+C₂H₅OH    d  from water gas

28. Which of the following properties of lithium does not show diagonal relationship with magnesium?

a  Formation of Li⁺ ion

b  Formation of Li₃N

c  Solubility of LiHCO₃

d  Thermal decomposition of Li₂CO₃

29. Which of the following carbonates decomposes at lowest temperature?

a  MgCO₃    b  CaCO₃

c  SrCO₃    d  BaCO₃

30. In which of the following pairs both molecules do not possess same type of hybridization?
31. If H–X bond length is 2.00 Å and H–X bond has dipole moment $5.12 \times 10^{-30}$ C·m, the percentage of ionic character in the molecule will be

a 10%  
 b 16%  
 c 18%  
 d 20%

32. i H –C–H angle in CH₄  
 ii Cl –B–Cl angle in BCl₃  
 iii F –I–F angle in IF₇ in a plane  
 iv I –I–I angle in I₃

Increasing order of above bond angles is

a i<i<ii<iii<iv  
 b ii<i<i<iii<iv  
 c iii<i<i<ii<iv  
 d iv<i<i<ii

33. According to molecular orbital theory, bond order in increasing order will be

a $O^2_- < O_2 < O^2_2$  
 b $O^2_- < O_2 < O^2_2$  
 c $O^2_2 < O^2_2 < O^2_2$  
 d $O^2_2 < O^2_2 < O^2_2$

34. Correct order electron affinities of halogens is

a F>Cl>Br>I  
 b I>Br>Cl>F  
 c Cl>F>I>Br  
 d Cl>F>Br>I

35. Atomic radii of Ti, Zr and Hf vary

a Ti>Zr>Hf  
 b Ti<Zr<Hf  
 c Ti<Zr<HF  
 d Ti<Zr=HF

36. If NO₂N₂O₄ is dissolved in NaOH, we get solution of

a NaNO₂
b NaNO₃

- mixture of NaNO₂ and NaNO₃

d NaNO₄

37. A gas that relights glowing splinter is

- H₂
- O₂
- N₂
- NO₂

38. A white-coloured inorganic compound, on heating, gives a gas which turns lime water milky and residue is left which is yellow when hot and turns white and cooling. The compound is

- pbNO₃
- pbCO₃
- BaCO₃
- ZnCO₃

39. Buckminster-fullerebe is a variety of

- boron
- carbon
- ammonia
- fluorine

40. What will be the compound if two valencies of carbonyl group are satisfied by two alkyl groups?

- Aldehyde
- Ketone
- Acid
- Acidic anhydride

41. 2-chloro-3-methylbutane is treated with sodium in enerial solution, then it will give

- 2,4-dimethylhexane
- 3,5-dimethylhexane
- 2,3,4,5-tetramethylhexane
- 2,6-dimethyloctane

42. C₂H₅Cl + aq NaOH → C₂H₅OH + NaCl; this reaction is

- electrophilic substitution of I order
- electrophilic substitution of II order
- nucleophilic substitution of I order
- nucleophilic substitution of II order
43. Which of the following does not contain chiral carbon atom?
   a Lactic acid       b 2-chlorobutanoic acid
   c Tartaric acid     d Succinic acid

44. An organic on reactive ozonolysis produces
   i acetaldehyde
   ii acetone
   iii 2-methylpropane-1,3-dial

   The formula of alkadiene will be
   a \[ \text{CH}_2 \text{C = CHCH} = \text{CHCH}_3 \]
   \[ \text{CH}_3 \quad \text{CH}_3 \]
   b \[ \text{CH}_3\text{CHCH} = \text{CCH} = \text{CHCH}_3 \]
   \[ \text{CH}_3 \quad \text{CH}_3 \]
   c \[ \text{CH}_2\text{C = CHCH} = \text{CHCH}_3 \]
   \[ \text{CH}_3 \quad \text{CH}_3 \]
   d \[ \text{CH}_3\text{CH}_2\text{CHCH} = \text{CHC} = \text{CH}_2 \]
   \[ \text{CH}_3 \quad \text{CH}_3 \]

45. Which of the following acids will have lowest value of pK$_a$?
   a \[ \text{CH}_3\text{CH}_2\text{COOH} \]
   b \[ \text{CH}_3\text{CHCOOH} \]
   c \[ \text{CH}_3\text{CHCOOH} \]
   d \[ \text{FCH}_2\text{CH}_2\text{COOH} \]

46. Which of the following will not respond to iodoform test?
   a Ethyl alcohol       b propanol -2
47. The strongest ortho/para directing group is
   a  − NH₂  
   b  − CH₃  
   c  − Cl  
   d  − C₂H₅

48. Which of the following reaction can be used to change benzaldehyde to cinnamic acid?
   a  perkin reaction  
   b  Knoevenagle reaction  
   c  Reformatsky reaction  
   d  Benzoin condensation

49. Which of the following is strongest base?
   a  C₆H₅NH₂  
   b  p - NO₂ - C₆H₄NH₂  
   c  m - NO₂ - C₆H₄NH₂  
   d  C₆H₅CH₂NH₂

50. Correct acidic order of the following compounds is

   OH  OH  OH
   CH₃  NO₂

   i  ii  iii

   a  i > ii > iii  
   b  iii > i > ii  
   c  i > iii > i  
   d  1 > iii > ii