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JEE MAIN 2024

JANUARY ATTEMPT

PAPER-1 (B.Tech / B.E.)

QUESTIONS & SOLUTIONS

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27 JANUARY, 2024

9:00 AM to 12:00 Noon

Duration : 3 Hours | Maximum Marks : 300

SUBJECT - CHEMISTRY

LEAGUE OF TOPPERS (Since 2020)

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CHEMISTRY

1. Which of the following has maximum magnetic moment?

(1) $3d^3$ (2) $3d^6$ (3) $3d^7$

Ans. **(2)**

2. Mass of methane required to produce 22 g CO_2 upon combustion is _____.

Ans. **(8)**

Sol. Moles of $CO_2 = \frac{22}{44} = 0.5 \therefore n_{CH_4} = 0.5 \quad \therefore m_{CH_4} = 8g$

3. Assertion : Boron has very high melting point (2453 K)

Reason : Boron has strong crystalline lattice.

Ans. A-T ; R-T ;

Exp. $\rightarrow$ Right

4. Sum of bond order of CO & NO^+ is :

Ans. **(6)**

Sol. CO : 3 ; NO^+ : 3

5. How many of following have +4 oxidation number of central atom:

$BaSO_4$, $SOCl_2$, SF_4, H_2SO_3, $H_2S_2O_7$, SO_3

Ans. **(3)**

Sol. $SOCl_2$, SF_4, H_2SO_3

6. $PbCrO_4$ + NaOH (hot excess) $\longrightarrow$?

Product is :

(1) dianionic ; CN = 4 (2) tetra-anionic ; CN = 6

(3) dianionic ; CN = 6 (4) tetra-anionic ; CN = 4

Ans. **(4)**

7. For negative deviation from Raoult's law :

(1) BP increases ; VP increases (2) BP decreases ; VP increases

(3) BP decreases ; VP decreases (4) BP increases ; VP decreases

Ans. **(4)**

8. $NaCl + H_2SO_4 + K_2Cr_2O_7 \longrightarrow$ Products

Above reaction gives red fumes (A) which on hydrolysis with aqueous NaOH gives yellow solution (B). Compounds (A) and (B) are :

Ans. CrO_2Cl_2, Na_2CrO_4

Sol. $NaCl + H_2SO_4 + K_2Cr_2O_7 \rightarrow \underset{(A)}{CrO_2Cl_2} + Na_2SO_4 + K_2SO_4 + H_2O$

$CrO_2Cl_2 + NaOH\ (aq.) \rightarrow Na_2CrO_4 + NaCl + H_2O$

(B)

9. Order of spin only magnetic moment for

$[FeF_6]^{-3}$ $[V(H_2O)_6]^{+2}$ $[Fe(H_2O)_6]^{+2}$

(P) (Q) (R)

(1) P > R > Q (2) P > Q > R (3) R > Q > P (4) Q > P > R

Ans. **(1)**

Sol. P : $[FeF_6]^{-3} \Rightarrow 3d^5$ (WFL) $\Rightarrow n = 5$; $\mu = \sqrt{35}$

Q : $[V(H_2O)_6]^{+2} \Rightarrow 3d^3 \Rightarrow n = 3$; $\mu = \sqrt{15}$

R : $[Fe(H_2O)_6]^{+2} \Rightarrow 3d^6$ (WFL) $\Rightarrow n = 4$; $\mu = \sqrt{24}$

10. Electronic configuration of Nd(Z = 60) is :

Ans. $[Xe]\ 4f^4\ 6s^2$

11. **Statement-1:** $(NH_4)_2CO_3$ is basic.

Statement-2: Acidic nature of salt of WA & WB is dependent on K_a of WA & K_b of WB.

Ans. ($S_1 \rightarrow T$; $S_2 \rightarrow T$)

12. Number of electrons present in all the compound filled subshell having n = 4 and s = +1/2.

Ans. **(16)**

13. Consider following data :

$2HI(g) \rightarrow H_2(g) + I_2(g)$

	Experiment-1	Experiment-2	Experiment-3
HI(mole/litre)	0.005	0.01	0.02
Rate (mol L^{-1} s^{-1})	7.5×10^{-4}	3×10^{-3}	1.2×10^{-2}

Find order of reaction.

Ans. **(2)**

Sol. Rate = $K[HI]^x$ x = order

$$\frac{(Rate)_2}{(Rate)_1} = \left(\frac{[HI]_1}{[HI]_2}\right)^x$$

$$\frac{3\times10^{-3}}{7.5\times10^{-4}} = \left(\frac{0.01}{0.005}\right)^x$$

$4 = 2^x$

$\therefore$ x = 2

14. If 3 moles of an ideal gas at 300 K expands isothermally from 30 dm^3 to 45 dm^3 against constant pressure of 80 K pascal then the amount of heat transfer is ___ joule.

Ans. **(1200)**

Sol. Process $\Rightarrow$ Isothermal, irreversible $\Rightarrow \Delta E = 0$

P_{ext} = Constant = 80 kPa

Expansion $V_1 = 30\ dm^3$ $V_2 = 45\ dm^3$

$\Delta E = 0 = q + W$

$q = -W$

$q = -[-P(V_2 - V_1)]$

$q = 80\ kPa\ [45\ dm^3 - 30\ dm^3]$

$= 80 \times 10^3\ Pa \times 15 \times 10^{-3}\ m^3$

$= 1200\ J$

15. The mass of silver (Ag = 108 gm/mole) displaces by a quantity of electricity which displaces 5600 ml of O_2 at STP will be :

Ans. **(108)**

Sol. mole × valency factor = mole × valency factor

$$\frac{W}{108}\times 1=\frac{5600}{22400}\times 4$$

$W = 108$ g

16. Which of the following has +4 oxidation state ?

(1) $H_2S_2O_7$ (2) H_2SO_3

Ans. **(2)**

Sol. $H_2S_2O_3$

$+2 + x - 6 = 0$

$x = +4$

17. Which halogen does not shows variable oxidation state ?

(1) F_2 (2) Cl_2 (3) Br_2 (4) I_2

Ans. **(1)**

Sol. F : Only (–1) in compounds

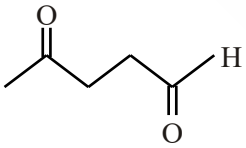
($\because$ is not EN)

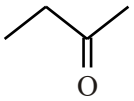
18. **Statement-1:** 4f & 5f series are written separately in periodic table in order to preserve principle of classification.

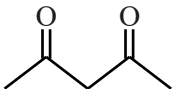
Statement-2: s-Block elements can be found on earth in pure form.

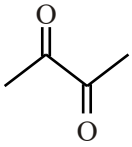
Ans. First statement is correct and second is not correct.

19. Which of the following compound is most acidic?

(1) 

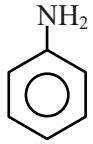
(2) 

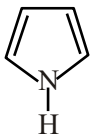
(3) 

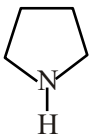
(4) 

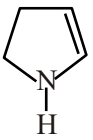
Ans. **(3)**

20. Which of the following is the strongest Bronsted base?

(1) 

(2) 

(3) 

(4) 

Ans. (3)

21. The correct statement regarding stereochemistry of S_N1 and S_N2 reaction is

(1) S_N1 – Racemisation
S_N2 – Retention

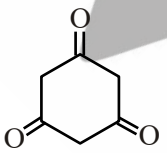
(2) S_N1 – Racemisation
S_N2 – Inversion

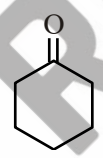
(3) S_N1 – Retention
S_N2 – Inversion

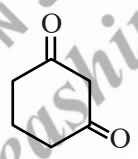
(4) S_N1 – Inversion
S_N2 – Retention

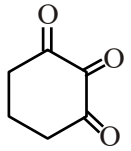
Ans. (2)

22. Which of the following has maximum enol content?

(1) 

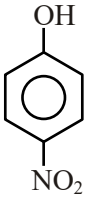
(2) 

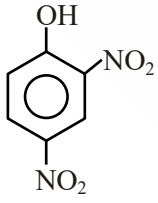
(3) 

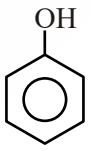
(4) 

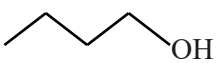
Ans. (1)

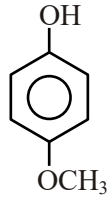
23. The correct order of acidic strength of the following compounds is

(I) 

(II) 

(III) 

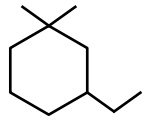
(IV) 

(V) 

(1) II > I > III > V > IV
(2) II > I > V > III > IV
(3) I > II > III > V > IV
(4) V > IV > III > I > II

Ans. (1)

24. The correct IUPAC name of following compound is



(1) 1,1-Dimethyl-3-ethyl cyclohexane

(2) 3-Ethyl-1,1-dimethyl cyclohexane

(3) 1-Ethyl-3,3-dimethyl cyclohexane

(4) 3,3-Dimethyl-1-ethyl cyclohexane

Ans. (2)

25. Cyclohexene is classified in

(1) Benzenoid aromatic (2) Alicyclic

(3) Benzenoid non aromatic (4) Acyclic

Ans. (2)

26. Which of the following is polar solvent

(1) CCl_4 (2) $CHCl_3$ (3) $CH_2{=}CH_2$ (4) CO_2

Ans. (2)

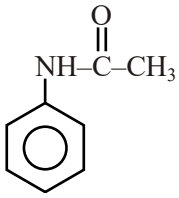
27. When nucleotide forms dimer the linkage present between is

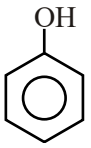
(1) Disulphide linkage (2) Glycosidic linkage

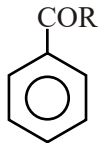
(3) Phosphodiester linkage (4) Peptide linkage

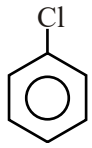
Ans. (3)

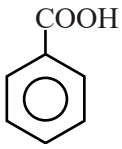
28. How many groups show meta directing effect on benzene ring?

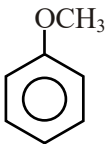
(1) 

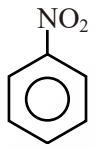
(2) 

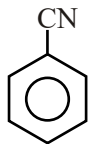
(3) 

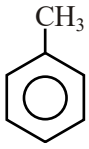
(4) 

(5) 

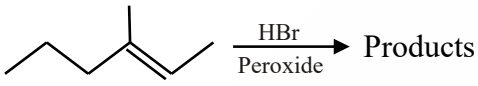
(6) 

(7) 

(8) 

(9) 

Ans. **(4)**

29. 

How many products including stereoisomers are obtained in above reaction?

Ans. **4**

Sol.