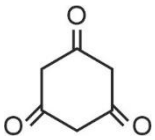
CHEMISTRY

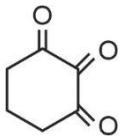
SECTION - A

Multiple Choice Questions: This section contains 20 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

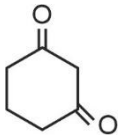
Choose the correct answer :

1. Which of the following has highest enol content?

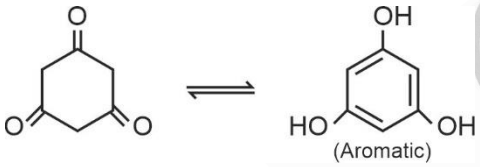
(1) 

(2) 

(3) 

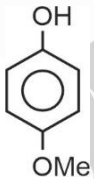
(4) 

Answer (1)

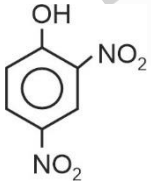
Sol. 

2. Which of the following is most acidic?

(1) Bu-OH

(2) 

(3) 

(4) 

Answer (4)

Sol. Option (4) has 2 strong withdrawing groups at ortho/para thus conjugate base will be most stabilized.

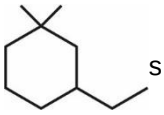
3. Which of the following cannot show variable oxidation state?

(1) Chlorine (2) Fluorine

(3) Bromine (4) Iodine

Answer (2)

Sol. Fluorine has no vacant *d*-orbitals, so no electron excitation is possible and so it does not exhibit variable oxidation state.

4. 

IUPAC name is

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

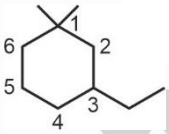
(2) 3-Ethyl-1,1-dimethyl cyclohexane

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

(4) 3-Ethyl-1,1-dimethyl cyclohexane

Answer (2)

Sol. Naming will be done in alphabetic order.



Correct IUPAC name : 3-Ethyl-1,1-dimethyl cyclohexane

5. 

The given compound is

(1) Alicyclic (2) Aromatic

(3) Antiaromatic (4) Acyclic

Answer (1)

Sol. Given compound has a ring which is not aromatic or antiaromatic.

6. Which of the following is polar molecule?

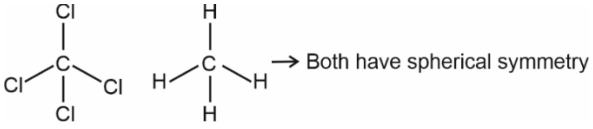
(1) $CH_2 = CH_2$ (2) $CHCl_3$

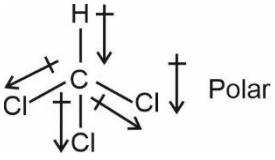
(3) CCl_4 (4) CH_4

Answer (2)

Sol. Asymmetrical molecules can be polar.

$CH_2 = CH_2 \rightarrow$ Non polar





7. In which of the following compound central atom has +4 oxidation state?

(1) SO_3 (2) H_2SO_3

(3) $H_2S_2O_7$ (4) $BaSO_4$

Answer (2)

Sol. H_2SO_3

$+ 1 \times 2 + x + (-2) \times 3 = 0$

$2 + x - 6 = 0$

$x = +4$

In H_2SO_3, sulphur present in +4 oxidation state.

8. It is given that radius of 3rd stationary orbit is r, find out radius of 4th stationary orbit.

(1) $\frac{16r}{9}$ (2) $\frac{6r}{16}$

(3) $\frac{4r}{3}$ (4) $\frac{3r}{4}$

Answer (1)

Sol. $r \propto \left(\frac{n^2}{z}\right)$

$r = \frac{(K)(3)^2}{1}$

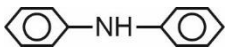
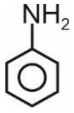
$K = \frac{r}{9}$

$r_4 = \left(\frac{r}{9}\right)\left(\frac{16}{1}\right)$

$= \frac{16r}{9}$

Correct answer is option (1)

9. Select the strongest Bronsted base.

(1)  (2) 

(3)  (4) 

Answer (4)

Sol. In case of 1, 2 and 3 the lone pair is delocalised due to resonance so the 4 has highest availability of lone pair and it is best proton acceptor.

10. The electronic configuration of Neodymium (60) (Nd) is

(1) $[Xe]4f^4 6s^2$ (2) $[Xe]5f^1$

(3) $[Xe]4f^2 6s^2$ (4) $[Xe]5f^4 4d^1$

Answer (1)

Sol. The electronic configuration of Neodymium is $4f^4 6s^2$

11. Ethanol shows turbidity with Lucas reagent (Conc. HCl + Anhyd. $ZnCl_2$).

(1) Immediately

(2) After 5 to 7 minutes

(3) Upon heating

(4) After 10-12 minutes

Answer (3)

Sol. $\underset{\text{Ethanol}}{C_2H_5OH} \xrightarrow[\substack{\text{Anhyd. } ZnCl_2 \\ \Delta}]{\text{Conc.HCl}} C_2H_5Cl + H_2O$

12. Which type of linkage is present in Nucleotide between base and sugar?

(1) Peptide linkage (2) Glycosidic linkage

(3) N-glycosidic linkage (4) Amide linkage

Answer (3)

Sol. The linkage between nitrogenous base and pentose sugar in nucleotide is N-glycosidic linkage.

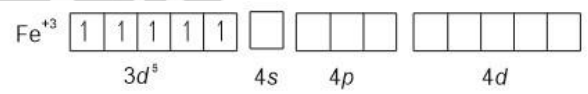
13. A complex with maximum spin angular momentum

(1) $[FeF_6]^{3-}$ (2) $[Fe(CN)_6]^{3-}$

(3) $[Fe(H_2O)_6]^{2+}$ (4) $[V(H_2O)_6]^{2+}$

Answer (1)

Sol. $F^{\ominus}$ with Fe^{+3} behaves as WFL, Hence pairing does not take place, so it forms high spin complex.



$[FeF_6]^{3-} \Rightarrow sp^3d^2$ hybridisation

Number of unpaired electron = 5

$\left[Fe(CN)_6\right]^{3-} \Rightarrow d^2sp^3$ hybridisation

$Fe^{+3} = 3d^5$

Number of unpaired electron = 1

$[Fe(H_2O)_6]^{2+} \Rightarrow sp^3d^2$

$Fe^{+2} = 3d^6$

Number of unpaired electron = 4

$[V(H_2O)_6]^{+2} \Rightarrow d^2sp^3$ hybridisation

$V^{+2} = 3d^3$

Number of unpaired electron = 3

Spin angular momentum = $\sqrt{S(S+1)}\,\frac{h}{2\pi}$

S = total spin quantum no.

More the number of unpaired electron more will be spin angular momentum. $[FeF_6]^{3-}$ has 5 unpaired electron hence maximum spin angular momentum value.

14. Calculate the temperature (in K) at which kinetic energy of mono-atomic gaseous molecule is equal to 0.414 eV

(1) 3199 K (2) 319.8 K

(3) 2500 K (4) **2900** K

Answer (1)

Sol. $(KE)_{atom} = \frac{3}{2}\left(\frac{R}{N_A}\right)(T)$

$0.414 \times 1.6 \times 10^{-19} = \frac{3}{2} \times \left(\frac{8.314}{6.022 \times 10^{23}}\right) \times T$

$T = \frac{(0.414) \times 1.6 \times 2 \times 6.022 \times 10^4}{3 \times 8.314}$

$\approx 3198.59\ K$

15. A solution of two volatile components showing negative deviation from Raoult's law shows:-

(1) Decrease in vapour pressure, boiling point increases

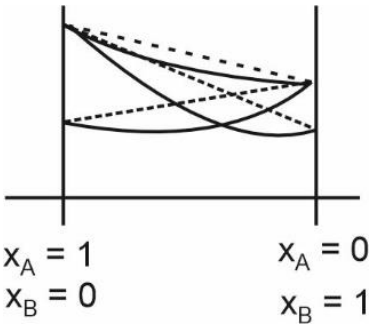
(2) Increase in vapour pressure boiling point decreases

(3) Decrease in vapour pressure, boiling point decreases

(4) Increase in vapour pressure boiling point increases

Answer (1)

Sol. In case of negative deviation from Raoult's law the vapour pressure is less than expected from Raoult's law and B.P. is more.



16. During S_N1 reaction which of the following statement is correct

(1) Inversion occurs (2) Retention occurs

(3) Almost racemization (4) 100% racemization

Answer (3)

Sol. During S_N1 reaction, attack of nucleophile on carbocation is slightly favoured from opposite side of leaving group due to intimate ion pair.

17. **Assertion :** Boron is hard element.

Reason : Boron has unusually high melting point.

(1) Assertion is correct. Reason is correct and reason explains assertion.

(2) A is correct. R is correct R does not explains A.

(3) A is correct but R is incorrect.

(4) A is incorrect but R is correct.

Answer (2)

Sol. Both assertion and reason are true but reason is not the correct explanation of assertion.

18. $PbCrO_4 \xrightarrow{NaOH} Complex$

Complex is

(1) Dianionic with CN = 6

(2) Dianionic with CN = 4

(3) Neutral with CN = 4

(4) Trianionic with CN = 6

Answer (2)

Sol. $PbCrO_4 + 4NaOH \longrightarrow Na_2CrO_4 + Na_2[Pb(OH)_4]$

Complex is $Na_2[Pb(OH)_4]$ i.e. $[Pb(OH)_4]^{2-}$

Dianonic with CN = 4

19. Which of the following configuration has strongest metallic bonding?

(1) $[Ar]3d^74s^2$ (2) $[Ar]3d^54s^1$

(3) $[Ar]3d^64s^2$ (4) $[Ar]3d^34s^2$

Answer (2)

Sol. More the number of unpaired electrons, more strong the metallic bonding.

Maximum unpaired e^- in $[Ar]3d^54s^1$

$\Rightarrow$ 6 unpaired e^-

20. **Assertion :** All *s*-block elements are found in nature.

Reason : 4*f* and 5*f* series are kept below periodic table.

(1) Assertion and reason, both are true and reason is correct explanation of assertion.

(2) Assertion and reason, both are true and reason is not correct explanation of assertion.

(3) Assertion is true, but reason is false.

(4) Assertion is false but reason is true.

Answer (2)

Sol. All *s*-block elements have some abundance in nature Lanthanides and Actinoids are kept below periodic table.

SECTION - B

Numerical Value Type Questions: This section contains 10 questions. In Section B, attempt any five questions out of 10. The answer to each question is a **NUMERICAL VALUE.** For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the second decimal place; e.g. 06.25, 07.00, –00.33, –00.30, 30.27, –27.30) using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.

21. Find out sum of bond order of CO & NO^+.

Answer (6)

Sol. CO and NO^+ both are isoelectronic and each of them is having bond order 3 that can be explained by molecular orbital theory. The sum of bond order of CO & NO^+ will be 6.

22. Calculate mass of CH_4 consumed for the formation of 22 g CO_2.

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

Answer (8)

Sol. Mass of CO_2 produced = 22 g

Moles of CO_2 produced = $\frac{22}{44}$ mol

= 0.5 mol

1 mol of CO_2 produced by 1 mol of CH_4

0.5 mol of CO_2 can be produced by 0.5 mol of CH_4

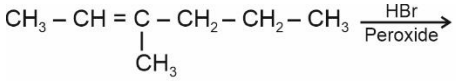
Mole of CH_4 consumed = 0.5 mol

Mass of CH_4 consumed = 0.5 × 16 g

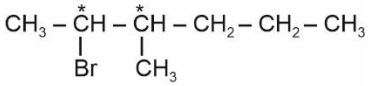
= 8 g

23. Find out number of stereoisomers obtained when 3-methylhex-2-ene reacts with HBr in presence of peroxide.

Answer (4)



Sol.



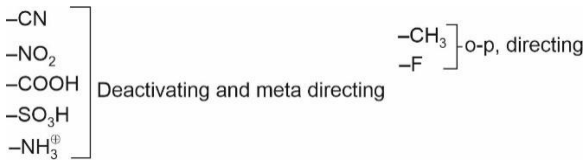
4-Isomers are possible.

24. Among the following number of meta directing groups are:

–CN, $–NO_2$, –COOH, $–CH_3$, $–SO_3H$, $–\overset{+}{N}H_3$, –F

Answer (5)

Sol.



25. We are given with following information about concentration of reactant with initial rate of reaction.

Initial concentration	Initial rate
0.005 M	7.5×10^{-4}
0.02 M	3×10^{-3}

Find out order of reaction with respect to that reactant.

Answer (01.00)

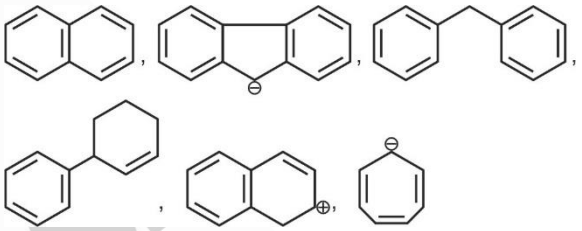
Sol. Rate becomes 4 times on increasing concentration of reactant 4 times.

$$\left(\frac{3\times10^{-3}}{7.5\times10^{-4}}\right)=\left(\frac{0.02}{0.005}\right)^n$$

n = 1

$\therefore$ Correct answer is 1.

26. How many of the following are aromatic compounds?



Answer (05.00)

Sol.  is antiaromatic as it has 8π electrons. The remaining 5 compounds are aromatic as they have 4n + 2 delocalising π-electrons associated to that ring.

27. Calculate number of electron for which n = 4 and $S = +\frac{1}{2}$

Answer (16)

Sol. For n = 4

l = 0, 1, 2, 3

Possible subshells are

4*s*, 4*p*, 4*d* and 4*f*

Number of electron have $S = +\frac{1}{2}$

4*s* = 1

4*p* = 3

4*d* = 5

4*f* = 7

Total number of electron with $S = +\frac{1}{2}$ for n = 4

= 16

28.

29.

30.