

## NEET-UG 2013

### Chemistry

1. The value of Planck's constant is  $6.63 \times 10^{-34}$  Js. The speed of light is  $3 \times 10^{17}$  nm s<sup>-1</sup>. Which value is closest to the wavelength in nanometer of a quantum of light with frequency of  $6 \times 10^{15}$  s<sup>-1</sup>?

- (1) 10 (2) 25  
(3) 50 (4) 75

**Solution:**

$$v = \frac{c}{\lambda}$$

$$\therefore \lambda = \frac{3 \times 10^{17} \text{ nms}^{-1}}{6 \times 10^{15} \text{ s}^{-1}} = 50 \text{ nm}$$

Hence, the correct option is (3).

2. What is the maximum numbers of electrons that can be associated with the following set of quantum numbers?

$n = 3, l = 1$  and  $m = -1$

- (1) 10 (2) 6  
(3) 4 (4) 2

**Solution:** Fact.

Hence, the correct option is (4).

3. What is the activation energy for a reaction if its rate doubles when the temperature is raised from 20°C to 35°C?

( $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$ )

- (1) 342 kJ mol<sup>-1</sup> (2) 269 kJ mol<sup>-1</sup>  
(3) 34.4 kJ mol<sup>-1</sup> (4) 15.1 kJ mol<sup>-1</sup>

**Solution:**

$$\log \frac{K_2}{K_1} = -\frac{E_a}{2.303R} \left[ \frac{T_1 - T_2}{T_1 \cdot T_2} \right]$$

$$\log 2 = -\frac{E_a}{2.303 \times 8.314} \left[ \frac{293 - 308}{293 \times 308} \right]$$

$$E_a = \frac{0.301 \times 2.303 \times 8.314 \times 293 \times 308}{15}$$

$$= 34.67 \text{ kJ mol}^{-1} \approx 34.7 \text{ kJ mol}^{-1}$$

Hence, the correct option is (3).

4. A hydrogen gas electrode is made by dipping platinum wire in a solution of HCl of pH = 10 and by passing hydrogen gas around the platinum wire at one atm pressure. The oxidation potential of electrode would be

- (1) 0.059 V (2) 0.59 V  
(3) 0.118 V (4) 1.18 V

**Solution:**

$$E_{\text{cell}} = \frac{0.059}{1} \log \frac{1}{10^{-10}} = +0.59 \text{ V}$$

Hence, the correct option is (2).

5. A reaction having equal energies of activation for forward and reverse reactions has

- (1)  $\Delta S = 0$  (2)  $\Delta G = 0$   
(3)  $\Delta H = 0$  (4)  $\Delta H = \Delta G = \Delta S = 0$

**Solution:** Fact.

Hence, the correct option is (3).

6. At 25°C molar conductance of 0.1 molar aqueous solution of ammonium hydroxide is  $9.54 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$  and at infinite dilution its molar conductance is  $238 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ . The degree of ionisation of ammonium hydroxide at the same concentration and temperature is

- (1) 2.080% (2) 20.800%  
 (3) 4.008% (4) 40.800%

**Solution:**

$$\begin{aligned} \text{Degree of ionization} &= \frac{\lambda_m}{\lambda_m^\infty} \times 100 \\ &= \frac{9.54 \times 100}{238} = 4.008\% \end{aligned}$$

Hence, the correct option is (3).

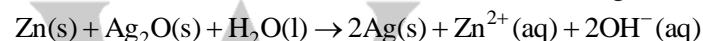
7. Based on equation  $E = -2.178 \times 10^{-18} \text{ J} \left( \frac{Z^2}{n^2} \right)$  certain conclusions are written. Which of them is **not** correct?

- (1) The negative sign in equation simply means that the energy of electron bound to the nucleus is lower than it would be if the electrons were at the infinite distance from the nucleus  
 (2) Larger the value of  $n$ , the larger is the orbit radius  
 (3) Equation can be used to calculate the change in energy when the electron changes orbit  
 (4) For  $n = 1$ , the electron has a more negative energy than it does for  $n = 6$  which means that the electron is more loosely bound in the smallest allowed orbit

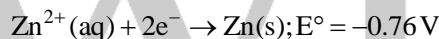
**Solution:** Fact.

Hence, the correct option is (4).

8. A button cell used in watches functions as following



If half cell potentials are



The cell potential will be

- (1) 1.10 V (2) 0.42 V  
 (3) 0.84 V (4) 1.34 V

**Solution:**

$$\begin{aligned} E_{\text{cell}}^\circ &= E_{\text{cathode}}^\circ - E_{\text{anode}}^\circ \\ &= 0.34 - (-0.76) = 1.1 \text{ V} \end{aligned}$$

Hence, the correct option is (1).

9. How many grams of concentrated nitric acid solution should be used to prepare 250 mL of 2.0 M  $\text{HNO}_3$ ? The concentrated acid is 70%  $\text{HNO}_3$ .

- (1) 45.0 g conc.  $\text{HNO}_3$  (2) 90.0 g conc.  $\text{HNO}_3$   
 (3) 70.0 g conc.  $\text{HNO}_3$  (4) 54.0 g conc.  $\text{HNO}_3$

**Solution:**

$$\begin{aligned} M \times V &= \text{Moles of } \text{HNO}_3 = \frac{250 \times 2}{1000} = 0.5 \\ \therefore \text{HNO}_3 \text{ required} &= 0.5 \times 63 \times \frac{100}{70} = 45 \text{ g} \end{aligned}$$

Hence, the correct option is (1).

10. The number of carbon atoms per unit cell of diamond unit cell is

- (1) 4 (2) 8  
 (3) 6 (4) 1

**Solution:** Fact.

**Hence, the correct option is (2).**

**11.** Maximum deviation from ideal gas is expected from

- (1) H<sub>2</sub>(g) (2) N<sub>2</sub>(g)  
(3) CH<sub>4</sub>(g) (4) NH<sub>3</sub>(g)

**Solution:** Fact.

**Hence, the correct option is (4).**

**12.** A metal has a fcc lattice. The edge length of the unit cell is 404 pm. The density of the metal is 2.72 g cm<sup>-3</sup>. The molar mass of the metal is

(N<sub>A</sub> Avogadro's constant = 6.02 × 10<sup>23</sup> mol<sup>-1</sup>)

- (1) 40 g mol<sup>-1</sup> (2) 30 g mol<sup>-1</sup>  
(3) 27 g mol<sup>-1</sup> (4) 20 g mol<sup>-1</sup>

**Solution:**

$$d = \frac{Z \times M}{V \times N_A}$$

$$2.72 = \frac{4 \times M}{(4.04 \times 10^{-8})^3 \times 6.02 \times 10^{23}}$$

$$M = \frac{2.72 \times (4.04)^3 \times 6.02 \times 10^{-1}}{4}$$

$$= 27 \text{ g/mol.}$$

**Hence, the correct option is (3).**

**13.** Dipole-induced dipole interactions are present in which of the following pairs?

- (1) H<sub>2</sub>O and alcohol (2) Cl<sub>2</sub> and CCl<sub>4</sub>  
(3) HCl and He atoms (4) SiF<sub>4</sub> and He atoms

**Solution:**



**Hence, the correct option is (3).**

**14.** A magnetic moment of 1.73 BM will be shown by one among the following

- (1) [Cu(NH<sub>3</sub>)<sub>4</sub>]<sup>2+</sup> (2) [Ni(CN)<sub>4</sub>]<sup>2-</sup>  
(3) TiCl<sub>4</sub> (4) [CoCl<sub>6</sub>]<sup>4-</sup>

**Solution:**

$$\text{Magnetic moment } (\mu) = \sqrt{n(n+2)}$$

$$1.73 = \sqrt{n(n+2)}$$

$$n = 1$$

So, compound must contain one unpaired electron. The compound is [Cu(NH<sub>3</sub>)<sub>4</sub>]<sup>2+</sup>.

**Hence, the correct option is (1).**

**15.** Roasting of sulphides gives the gas X as a by-product. This is a colorless gas with choking smell of burnt sulphur and causes great damage to respiratory organs as a result of acid rain. Its aqueous solution is acidic acts as a reducing agent and its acid has never been isolated. The gas X is

- (1) H<sub>2</sub>S (2) SO<sub>2</sub>  
(3) CO<sub>2</sub> (4) SO<sub>3</sub>

**Solution:** Fact.

Hence, the correct option is (2).

16. Which is the strongest acid in the following?

- (1)  $\text{H}_2\text{SO}_4$  (2)  $\text{HClO}_3$   
(3)  $\text{HClO}_4$  (4)  $\text{H}_2\text{SO}_3$

**Solution:** Fact.

Hence, the correct option is (3).

17. Which of the following is paramagnetic?

- (1) CO (2)  $\text{O}_2^-$   
(3)  $\text{CN}^-$  (4)  $\text{NO}^+$

**Solution:**

$\text{O}_2^- \Rightarrow$  It has one unpaired electron.

Hence, the correct option is (2).

18. Which of the following structure is similar to graphite?

- (1) BN (2) B  
(3)  $\text{B}_4\text{C}$  (4)  $\text{B}_2\text{H}_6$

**Solution:** Fact.

Hence, the correct option is (1).

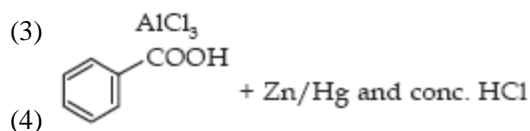
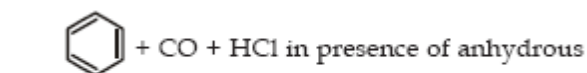
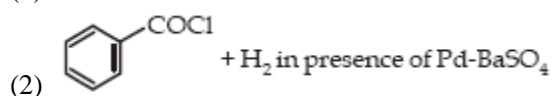
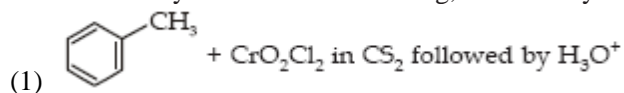
19. The basic structural unit of silicates is

- (1)  $\text{SiO}^-$  (2)  $\text{SiO}_4^{4-}$   
(3)  $\text{SiO}_3^{2-}$  (4)  $\text{SiO}_4^{2-}$

**Solution:** Fact.

Hence, the correct option is (2).

20. Reaction by which of the following, Benzaldehyde cannot be prepared?



**Solution:**

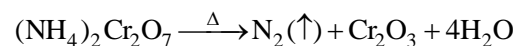
Since using Zn-Hg in presence of HCl will not reduce the COOH group. Rest will give Benzaldehyde.

Hence, the correct option is (4).

21. Which of the following does not give oxygen on heating?

- (1)  $\text{KClO}_3$  (2)  $\text{Zn}(\text{ClO}_3)_2$   
(3)  $\text{K}_2\text{Cr}_2\text{O}_7$  (4)  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$

**Solution:**



Hence, the correct option is (4).

22. Which of the following lanthanoid ions is diamagnetic? (At. nos. Ce = 58, Sm = 62, Eu = 63, Yb = 70)

- (1)  $\text{Ce}^{2+}$  (2)  $\text{Sm}^{2+}$   
(3)  $\text{Eu}^{2+}$  (4)  $\text{Yb}^{2+}$

**Solution:**

$\text{Yb}^{2+}$  has an electronic configuration of  $4f^{14}$ .

Hence, the correct option is (4).

23. Identify the correct order of solubility in aqueous medium

- (1)  $\text{CuS} > \text{ZnS} > \text{Na}_2\text{S}$   
(2)  $\text{ZnS} > \text{Na}_2\text{S} > \text{CuS}$   
(3)  $\text{Na}_2\text{S} > \text{CuS} > \text{ZnS}$   
(4)  $\text{Na}_2\text{S} > \text{ZnS} > \text{CuS}$

**Solution:** Fact.

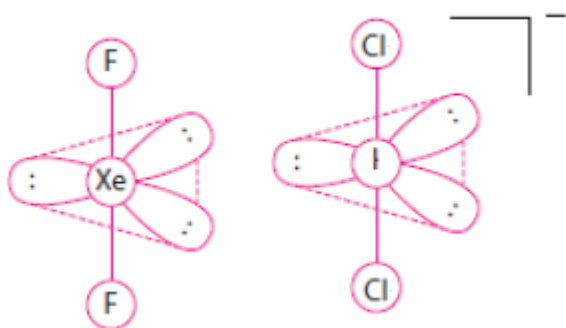
Hence, the correct option is (4).

24.  $\text{XeF}_2$  is isostructural with

- (1)  $\text{TeF}_2$  (2)  $\text{ICl}_2^-$   
(3)  $\text{SbCl}_3$  (4)  $\text{BaCl}_2$

**Solution:**

$\text{ICl}_2^-$  (Same number of lp and bp on "I").



Hence, the correct option is (2).

25. An excess of  $\text{AgNO}_3$  is added to 100 mL of a 0.01 M solution of dichlorotetraaquachromium(III) chloride. The number of moles of  $\text{AgCl}$  precipitated would be

- (1) 0.001 (2) 0.002  
(3) 0.003 (4) 0.01

**Solution:**

$[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]\text{Cl}$ , one ionizable  $\text{Cl}^-$ .

Hence, the correct option is (1).

26. Which of these is least likely to act as a Lewis base?

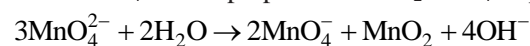
- (1)  $\text{CO}$  (2)  $\text{F}^-$   
(3)  $\text{BF}_3$  (4)  $\text{PF}_3$

**Solution:**

$\text{BF}_3$ , it is a Lewis acid.

Hence, the correct option is (3).

27.  $\text{KMnO}_4$  can be prepared from  $\text{K}_2\text{MnO}_4$  as per the reaction:



The reaction can go to completion by removing  $\text{OH}^-$  ions by adding

- (1)  $\text{HCl}$  (2)  $\text{KOH}$

(3) CO<sub>2</sub>

(4) SO<sub>2</sub>

**Solution:** Fact.

**Hence, the correct option is (3).**

28. Which of the following is electron-deficient?

(1) (CH<sub>3</sub>)<sub>2</sub>

(2) (SiH<sub>3</sub>)<sub>2</sub>

(3) (BH<sub>3</sub>)<sub>2</sub>

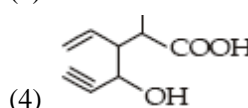
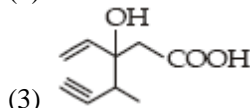
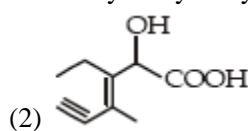
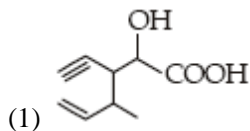
(4) PH<sub>3</sub>

**Solution:**

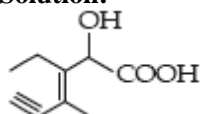
(BH<sub>3</sub>)<sub>2</sub>, Diborane is electron deficient.

**Hence, the correct option is (3).**

29. Structure of the compound whose IUPAC name is 3-Ethyl-2-hydroxy-4-methylhex-3-en-5-ynoic acid is



**Solution:**



**Hence, the correct option is (3).**

30. Which of these is **not** a monomer for a high molecular mass silicone polymer?

(1) MeSiCl<sub>3</sub>

(2) Me<sub>2</sub>SiCl<sub>2</sub>

(3) Me<sub>3</sub>SiCl

(4) PhSiCl<sub>3</sub>

**Solution:** Fact.

**Hence, the correct option is (3).**

31. Which of the following statements about the interstitial compounds is incorrect?

(1) They retain metallic conductivity

(2) They are chemically reactive

(3) They are much harder than the pure metal

(4) They have higher melting points than the pure metal

**Solution:** Fact.

**Hence, the correct option is (2).**

32. Which one of the following molecules contains no  $\pi$  bond?

(1) CO<sub>2</sub>

(2) H<sub>2</sub>O

(3) SO<sub>2</sub>

(4) NO<sub>2</sub>

**Solution:** Fact.

**Hence, the correct option is (2).**

33. Antiseptics and disinfectants either kill or prevent growth of microorganisms. Identify which of the following statements is **not true**

(1) A 0.2% solution of phenol is an antiseptic while 1% solution acts as a disinfectant

(2) Chlorine and Iodine are used as strong disinfectants

(3) Dilute solutions of Boric acid and Hydrogen, Peroxide are strong antiseptics

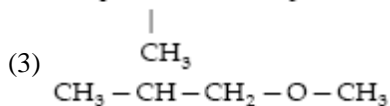
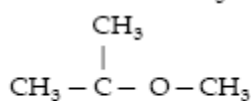
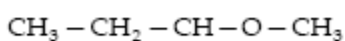
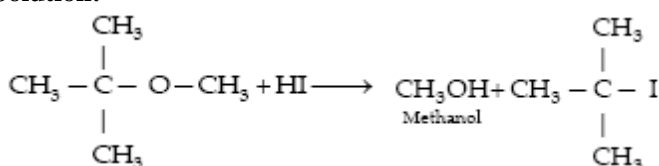
(4) Disinfectants harm the living tissues

**Solution:**

Dilute solutions of boric acid and  $\text{H}_2\text{O}_2$  are mild antiseptics.

Hence, the correct option is (3).

34. Among the following ethers, which one will produce methyl alcohol on treatment with hot concentrated HI?

**Solution:**

Hence, the correct option is (3).

35. Nylon is an example of

(1) Polyester

(2) Polysaccharide

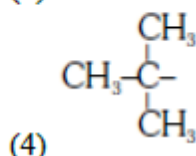
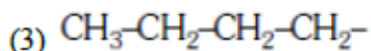
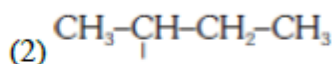
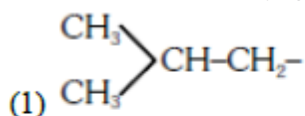
(3) Polyamide

(4) Polythene

**Solution:** Fact.

Hence, the correct option is (3).

36. The structure of isobutyl group in an organic compound is



**Solution:** Fact

Hence, the correct option is (1).

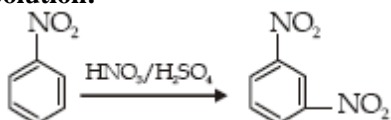
37. Nitrobenzene on reaction with conc.  $\text{HNO}_3/\text{H}_2\text{SO}_4$  at  $80-100^\circ\text{C}$  forms which one of the following products?

(1) 1, 2-Dinitrobenzene

(2) 1, 3-Dinitrobenzene

(3) 1, 4-Dinitrobenzene

(4) 1, 2, 4-Trinitrobenzene

**Solution:**

Hence, the correct option is (2).

38. Some meta-directing substituents in aromatic substitution are given. Which one is most deactivating?

- (1)  $-\text{C}\equiv\text{N}$  (2)  $-\text{SO}_3\text{H}$   
(3)  $-\text{COOH}$  (4)  $-\text{NO}_2$

**Solution:** Fact.

Hence, the correct option is (4).

39.  $6.02 \times 10^{20}$  molecules of urea are present in 100 mL of its solution. The concentration of solution is

- (1) 0.02 M (2) 0.01 M  
(3) 0.001 M (4) 0.1 M

**Solution:**

$$M = \frac{6.02 \times 10^{20}}{\frac{100}{1000}} = 0.01\text{M}$$

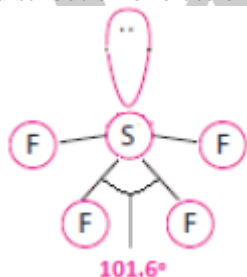
Hence, the correct option is (2).

40. Which of the following is a polar molecule?

- (1)  $\text{BF}_3$  (2)  $\text{SF}_4$   
(3)  $\text{SiF}_4$  (4)  $\text{XeF}_4$

**Solution:**

On drawing the Lewis structure, we see the presence of a lone pair of electrons on Sulphur. This has greater electronegativity than the bonding pairs of electrons. As a result the bonding pairs are pushed together (lone pair repulsions is more than bond pair-bond pair repulsion). This distorts the geometry of  $\text{SF}_4$  and this unsymmetrical distribution of electrons results in a polar molecule formation.

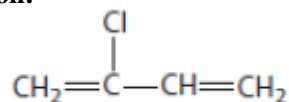


Hence, the correct option is (2).

41. Which is the monomer of Neoprene in the following?

- (1)  $\text{CH}_2 = \text{CH} - \text{C}\equiv\text{CH}$   
(2)  $\text{CH}_2 = \underset{\text{CH}_3}{\text{C}} - \text{CH} = \text{CH}_2$   
(3)  $\text{CH}_2 = \underset{\text{Cl}}{\text{C}} - \text{CH} = \text{CH}_2$   
(4)  $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$

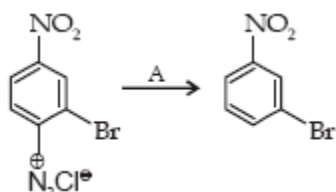
**Solution:**



Chloroprene (2-chloro-1,3-butadiene)

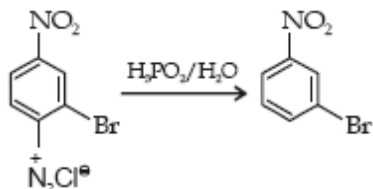
Hence, the correct option is (3).





42. In the reaction
- |  |                                     |
|--|-------------------------------------|
| (1) $\text{HgSO}_4/\text{H}_2\text{SO}_4$            | (2) $\text{Cu}_2\text{Cl}_2$        |
| (3) $\text{H}_3\text{PO}_2$ and $\text{H}_2\text{O}$ | (4) $\text{H}^+/\text{H}_2\text{O}$ |

**Solution:**



Hence, the correct option is (3).

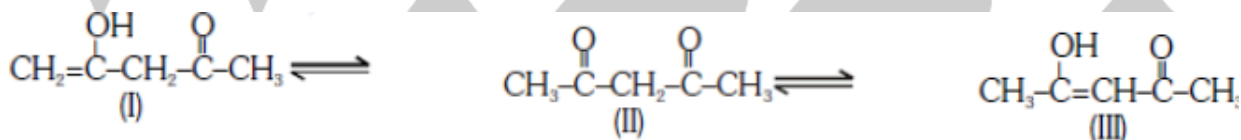
43. The radical c1ccccc1C[CH2] is aromatic because it has
- (1) 6 *p*-orbitals and 6 unpaired electrons
  - (2) 7 *p*-orbitals and 6 unpaired electrons
  - (3) 7 *p*-orbitals and 7 unpaired electrons
  - (4) 6 *p*-orbitals and 7 unpaired electrons

**Solution:**

Huckel's rule states that planar monocyclic rings with 2, 6, 10, 14... delocalized electrons should be aromatic. Since the compound has 6*p* orbitals and 6 unpaired electrons contribute to its aromaticity.

Hence, the correct option is (1).

44. The order of stability of the following tautomeric compounds is



- |                  |                  |
|------------------|------------------|
| (1) I > II > III | (2) III > II > I |
| (3) II > I > III | (4) II > III > I |

**Solution:**

The compound (III) is most stable due to intermolecular hydrogen bonding and because it is a conjugate diene. Compound (II) is not a conjugated diene, but involves more acidic hydrogen in tautomerism, Compound (I) has least number of acidic hydrogens for tautomerism.

Hence, the correct option is (2).

45. Which of the following compounds will not undergo Friedel-Craft's reaction easily?

- |                  |             |
|------------------|-------------|
| (1) Cumene       | (2) Xylene  |
| (3) Nitrobenzene | (4) Toluene |

**Solution:**

Friedel-Craft's reaction is an electrophilic substitution reaction. The presence of Nitrobenzene ( $-\text{NO}_2$ ) which is an electron withdrawing, deactivating group, deactivates the benzene ring from electrophilic substitution reactions.

Hence, the correct option is (3).