

## CHEMISTRY

### BOOKS - MTG CHEMISTRY (BENGALI ENGLISH)

### QUESTION PAPER 2012

#### Chemistry Descriptive Type Questions

1. The bacterial growth follows the rate law,  $\frac{dN}{dt} = KN$  where 'K' is a constant and 'N' is the number of bacteria cell at any time. If the population of bacteria (no. of cell) is doubled in 5 minutes, find the time by which the population will be eight times of the initial one.

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2. In 'x' ml 0.3(N) HCl addition of 200 ml distilled water on addition of 100 ml 0.1(N) NaOH, gives same final acid strength. Determine 'x'.

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3. Compound A treated with  $\text{NaNH}_2$  followed by  $\text{CH}_3\text{CH}_2\text{Br}$  gave compound B. Partial hydrogenation of compound B produced compound C, which on ozonolysis gave a carbonyl compound D. ( $\text{C}_3\text{H}_2\text{O}$ ). Compound D did not respond to iodoform test with  $\text{I}_2/\text{KI}$  and NaOH. Find out the structures of A, B, C & D.

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4. An organic compound with molecular formula  $\text{C}_9\text{H}_{10}\text{O}$ , forms 2,4-DNP derivative, reduces Tollen's reagent and undergoes Cannizzaro reaction. On vigorous oxidation it gives a dicarboxylic acid which is used in the preparation of terylene. Identify the organic compound

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5. Deep blue  $CuSO_4 \cdot 5H_2O$  is converted to a bluish white salt at  $100^\circ C$ . At  $250^\circ C$  and  $750^\circ C$  it is then transformed to a white powder and black material respectively. Identify the salts.

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## Subject Chemistry

1. A body when fully immersed in a liquid of specific gravity 1.2 weighs 44 gwt. The same body when fully immersed in water weighs 50 gwt. The mass of the body is

A. 36 g

B. 48 g

C. 64 g

D. 80 g

**Answer:**

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2. Which one of the following characteristics belongs to an electrophile ?

- A. It is any species having electron deficiency which reacts at an electron rich C-centre
- B. It is any species having electron enrichment, that reacts at an electron deficient C-centre
- C. It is cationic in nature
- D. It is anionic in nature

**Answer:**

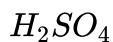
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3. Which one of the following methods is used to prepare  $Me_3CoEt$  with a good yield?

A. Mixing  $EtONa$  with  $Me_3CCl$

B. Mixing  $MeCONa$  with  $EtCl$

C. Heating a mixture of (1:1)  $EtOH$  and  $Me_3COH$  in presence of conc.



D. Treatment of  $MeCOH$  with  $EtMgI$

**Answer:**



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4. 58.5 gm of  $NaCl$  and 180 gm of glucose were separately dissolved in 1000 ml of water. Identify the correct statement regarding the elevation of boiling point (b.p.) of the resulting solutions.

A.  $NaCl$  solution will show higher elevation of b.p.

- B. Glucose solution will show higher elevation of b.p
- C. Both the solutions will show equal elevation of b.p.
- D. The b.p. elevation will be shown by neither of the solutions

**Answer:**

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5. Equal weights of  $CH_4$  and  $H_2$  are mixed in an empty container at  $25^\circ C$ . The fraction of the total pressure exerted by  $H_2$  is

- A.  $1/9$
- B.  $1/2$
- C.  $8/9$
- D.  $16/17$

**Answer:**

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6. Which of the following will show a negative deviation from Raoult's law?

- A. Acetone-benzene
- B. Benzene-methanol
- C. Acetone-ethanol
- D. Acetone-chloroform

**Answer:**



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7. In a reversible chemical reaction at equilibrium, if the concentration of any one of the reactants is doubled, then the equilibrium constant will

- A. also be doubled
- B. remains the same

C. be halved

D. becomes one-fourth

**Answer:**

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8. Identify the correct statement from the following in a chemical reaction.

A. The entropy always increases

B. The change in entropy along with suitable change in enthalpy decides the fate of a reaction

C. The enthalpy always decreases

D. Both the enthalpy and the entropy remain constant

**Answer:**

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9. Which one of the following is wrong about molecularity of a reaction?

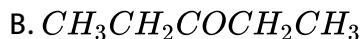
- A. It may be whole number or fractional
- B. It is calculated from reaction mechanism
- C. It is the number of molecules of the reactants taking part in a single step chemical reaction
- D. It is always equal to the order of elementary reaction

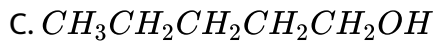
**Answer:**



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10. Upon treatment with  $I_2$  and aqueous  $NaOH$  which of the following compounds will form iodoform?

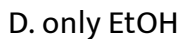
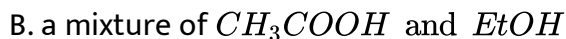




**Answer:**

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11. Upon treatment with  $Al(OEt)_3$  followed by usual reactions (work up),  $CH_3CHO$  will produce



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12. Friedel-Craft's reaction using MeCl and anhydrous  $AlCl_3$  will take place most efficiently with

- A. Benzene
- B. Nitrobenzene
- C. Acetophenone
- D. Toluene

**Answer:**



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13. Which one of the following properties is exhibited by phenol?

- A. It is soluble in aq. NaOH and evolves  $CO_2$  with aq.  $NaHCO_3$
- B. It is soluble in aq. NaOH and does not evolve  $CO_2$  with aq.  $NaHCO_3$
- C. It is not soluble in aq. NaOH but evolves  $CO_2$  with aq.  $NaHCO_3$

D. It is insoluble in aq. NaOH and does not evolve  $CO_2$  with aq.



**Answer:**

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**14.** The basicity of aniline is weaker in comparison to that of methyl amine due to

A. hyperconjugative effect of Me-group in  $MeNH_2$

B. resonance effect of phenyl group in aniline

C. lower molecular weight of methyl amine as compared to that of aniline

D. resonance effect of  $-NH_2$  group in  $MeNH_2$

**Answer:**

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15. Under identical conditions, the  $S_N1$  reaction will occur most efficiently with

- A. tert-butyl chloride
- B. 1-chlorobutane
- C. 2-methyl-1-chloropropane
- D. 2-chlorobutane

**Answer:**

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16. Identify the method by which  $MeCCO_2H$  can be prepared.

- A. Treating 1 mol of  $MeCoMe$  with 2 moles of  $MeMgI$
- B. Treating 1 mol of  $MeCO_2Me$  with 3 moles of  $MeMgI$
- C. Treating 1 mol of  $MeCHO$  with 3 moles of  $MeMgI$

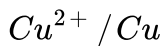
D. Treating 1 mol of dry ice with 1 mol of MeCMgl

**Answer:**

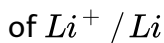
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17. Li occupies higher position in the electrochemical series of metals as compared to Cu since

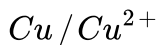
A. the standard reduction potential of  $Li^+ / Li$  is lower than that of



B. the standard reduction potential of  $Cu^{2+} / Cu$  is lower than that



C. the standard oxidation potential of  $Li / Li^+$  is lower than that of



D. Li is smaller in size as compared to Cu

**Answer:**

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18.  ${}_{11}\text{Na}^{14}$  is radioactive and it decays to

- A.  ${}_{9}\text{F}^{20}$  and  $\alpha$ -particles
- B.  ${}_{12}\text{F}^{24}$  and positron
- C.  ${}_{11}\text{Na}^{23}$  and neutron
- D.  ${}_{12}\text{Mg}^{24}$  and  $\alpha$  particles

**Answer:**

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19. The paramagnetic behavior of  $B_2$  is due to the presence of

- A. 2 unpaired electrons in  $n_b MO$
- B. 2 unpaired electrons in  $n^* MO$
- C. 2 unpaired electrons in  $\sigma^* MO$

D. 2 unpaired electrons in  $\sigma_b MO$

**Answer:**

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20. A 100 ml 0.1 (M) solution of ammonium acetate is diluted by adding 100 ml of water. The pH of the resulting solution will be ( $pK_a$  of acetic acid is nearly equal to  $pK_b$  of  $NH_4OH$ )

A. 4.9

B. 5.0

C. 7.0

D. 10.0

**Answer:**

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21. In 2-butene, which one of the following statements is true?

A.  $C_1 - C_2$  bond is a  $sp^3 - sp^3 \sigma$ -bond

B.  $C_2 - C_3$  bond is a  $sp^3 - sp^2 \sigma$ -bond

C.  $C_1 - C_2$  bond is a  $sp^3 - sp^2 \sigma$ -bond

D.  $C_1 - C_2$  bond is a  $sp^2 - sp^2 \sigma$ -bond

Answer:



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22. The well known compounds, (+)- lactic acid and (-)- lactic acid, have the same molecular formula,  $C_3H_6O_3$ . The correct relationship between them is

A. constitutional isomerism

B. identicalness

C. geometrical isomerism

D. optical isomerism

**Answer:**

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23. The stability of  $Me_2C = CH_2$  is more than that of  $MeCH_2 = CH_2$  due to

- A. inductive effect of the Me group
- B. resonance effect of the Me group
- C. hyperconjugative effect of the Me group
- D. resonance as well as inductive effect of the Me group

**Answer:**

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24. Which of the following does not represent the mathematical expression for the Heisenberg uncertainty principle?

A.  $\Delta x \cdot \Delta p \geq h / (4\pi)$

B.  $\Delta x \cdot \Delta v \geq h / (4\pi m)$

C.  $\Delta x \cdot \Delta t \geq h / (4\pi)$

D.  $\Delta x \cdot \Delta x \geq h / (4\pi)$

**Answer:**



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25. The stable bivalency of Pb and trivalency of Bi is

A. due to d contraction in Pb and Bi

B. due to relativistic contraction of the 6s orbitals of Pb and Bi,  
leading to inert pair effect

C. due to screening effect

D. due to attainment of noble liquid configuration

**Answer:**

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26. The equivalent weight of  $K_2Cr_2O_7$  in acidic medium is expressed in terms of its molecular weight ( $M$ ) as

A.  $M/3$

B.  $M/4$

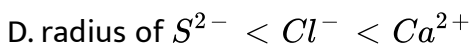
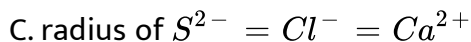
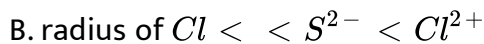
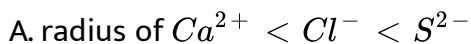
C.  $M/6$

D.  $M/7$

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27. Which of the following is correct?



Answer:



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28. CO is practically non-polar since

A. the  $\sigma$ -electron drift from C to O is almost nullified by the  $\pi$ -electron drift from O to C

B. the  $\sigma$ -electron drift from O to C is almost nullified by the  $\pi$ -electron drift from

C. the bond moment is low

D. there is a triple bond between C and O

**Answer:**

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29. The number of acidic protons in  $H_3PO_3$  are

A. 0

B. 1

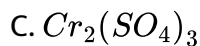
C. 2

D. 3

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30. When  $H_2O_2$  is shaken with an acidified solution of  $K_2Cr_2O_7$  in presence of ether, the ethereal layer turns blue due to the formation of

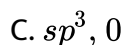
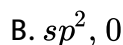
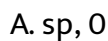


**Answer:**



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31. The state of hybridization of the central atom and the number of lone pairs over the central atom in  $POCl_3$  are

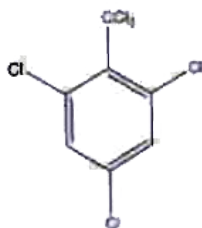
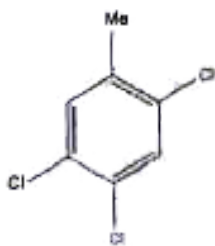
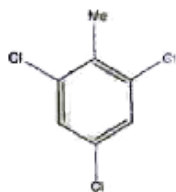


D.  $dsp^2, 1$

Answer:

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32. By passing excess  $Cl_2(g)$  in boiling toluene, which one of the following compounds is exclusively formed?







D.

**Answer:**

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33. An equimolar mixture of toluene and chlorobenzene is treated with a mixture of conc.  $H_2SO_4$  and conc.  $HNO_3$ . Indicate the correct statement from the following.

- A. p-nitrotoluene is formed in excess
- B. equimolar amounts of p-nitrotoluene and p-nitrochlorobenzene are formed
- C. p-nitrochlorobenzene is formed in excess
- D. p-nitrochlorobenzene is formed in excess

**Answer:**

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**34.** Among the following carbocations

$Ph_2C^+CH_2Me$  (I),  $PhCH_2CH_2CH^+Ph$  (II),  $Ph_2CHCH^+Me$  (III) and

the order of stability is

A.  $IV > II > I > III$

B.  $I > II > III > IV$

C.  $II > I > IV > III$

D.  $I > IV > III > II$

**Answer:**

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**35.** Which of the followings is correct?

- A. Evaporation of water causes an increase in disorder of the system
- B. Melting of ice causes a decrease in randomness of the system
- C. Condensation of steam causes an increase in disorder of the system
- D. There is practically no change in the randomness of the system when water is evaporated

**Answer:**

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**36.** On passing 'C' Ampere of current for time 't' sec through 1 litre of 2 (M)  $CuSO_4$  solution (atomic weight of Cu = 63.5), the amount 'm' of Cu (in gm) deposited on cathode will be

- A.  $m = Ct / (63.5 \times 96500)$
- B.  $m = Ct / (31.96500)$
- C.  $m = (C \times 96500) / (31.25 \times t)$
- D.  $m = (31.25 \times C \times t) / 96500$

**Answer:**



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37. If the 1<sup>st</sup> ionization energy of H atom is 13.6 eV, then the 2<sup>nd</sup> ionization energy of He atom is

A.  $27.2eV$

B.  $40.8eV$

C.  $54.4eV$

D.  $108.8eV$

**Answer:**



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38. The weight of oxalic acid that will be required to prepare a 1000 ml (N/20) solution is

A. 126 / 100gm

B. 63 / 40gm

C. 63 / 20gm

D. 126 / 20gm

**Answer:**



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**39.** 20 ml 0.1 (N) acetic acid is mixed with 10 ml 0.1 (N) solution of NaOH.

The pH of the resulting solution is ( $pK_a$  of acetic acid is 4.74)

A. 3.74

B. 4.74

C. 5.74

D. 6.74

**Answer:**

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40. In the brown ring complex  $[Fe(H_2O)_5(NO)]SO_4$  nitric oxide behaves as



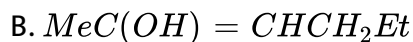
B. neutral NO molecule

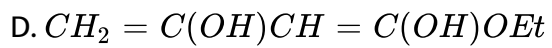
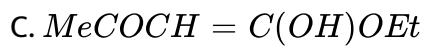


Answer:

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41. The most contributing tautomeric enol form of  $MeCOCH_2CO_2Et$  is





**Answer:**



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