



## CHEMISTRY

### BOOKS - KVPY PREVIOUS YEAR

### SOLVED PAPER 2018

#### Example

1. The amount (in mol) of bromoform ( $CHBr_3$ ) produced when 1.0 mol of acetone reacts completely with 1.0 mol of bromine in the presence of aqueous NaOH is

A.  $\frac{1}{3}$

B.  $\frac{2}{3}$

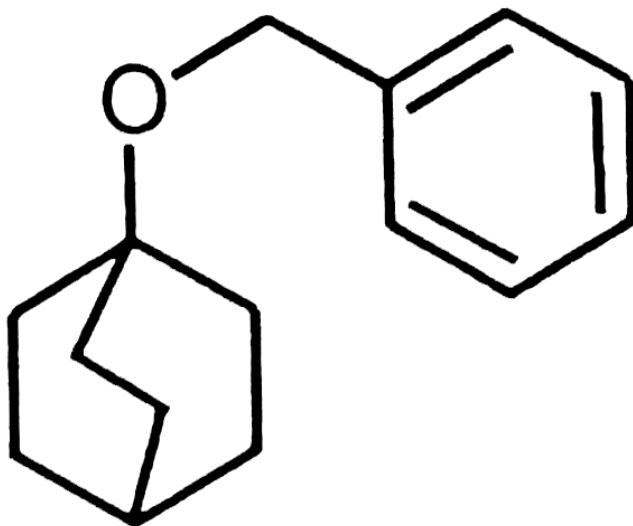
C.1

D.2

**Answer:**

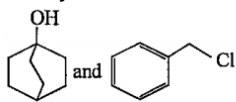
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2. The following compound



can readily be prepared by Williamson ether synthesis by reaction between

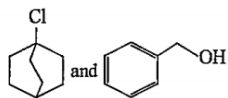
A.



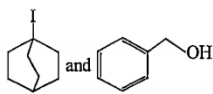
B.



C.



D.

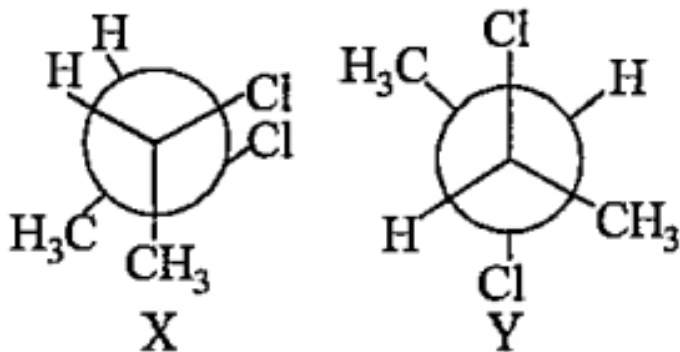


**Answer:**



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3. X and Y are



- A. enantiomers
- B. diastereomers
- C. constitutional isomers
- D. conformers

**Answer:**

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4. The hyperconjugative stabilities of tert-butyl cation and 2-butene, respectively, are due to

- A.  $\sigma \rightarrow \pi$  and  $\sigma \rightarrow \pi^*$
- B.  $\sigma \rightarrow \text{vacant } p$  and  $\sigma \rightarrow \pi$
- C.  $\sigma \rightarrow \sigma^*$  and  $\sigma \rightarrow \pi$
- D.  $\sigma - \text{vacant } p$  and  $\sigma \rightarrow \pi^*$

**Answer:**

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5. Benzaldehyde can be converted to benzyl alcohol in concentrated aqueous NaOH solution using

A. acetone

B. acetaldehyde

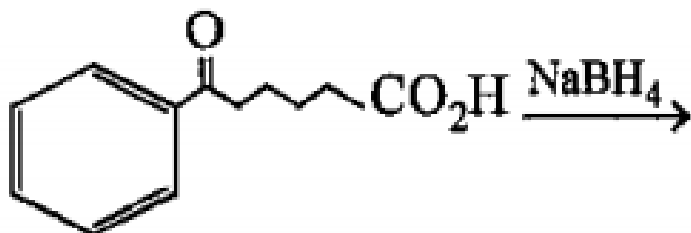
C. formic acid

D. formaldehyde

**Answer:**

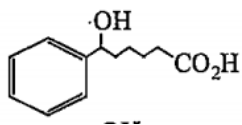
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6. The major product of the following reaction,

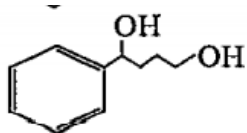


is

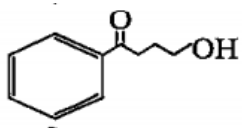
A.



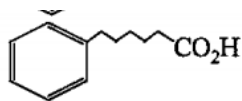
B.



C.



D.

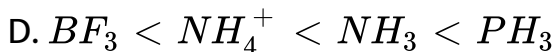
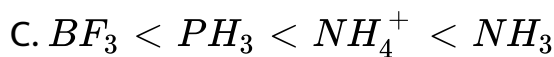
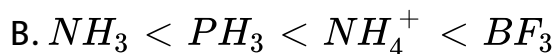
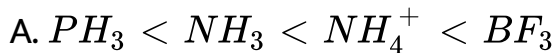


**Answer:**



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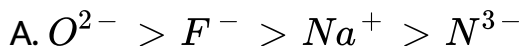
7. Among the following species, the H-X-H angle (X=B,N or P ) follows the order



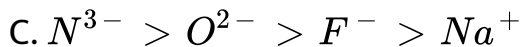
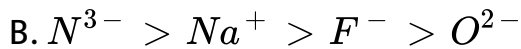
**Answer:**

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8. The ionic radii of  $Na^+$ ,  $F^-$ ,  $O^{2-}$ ,  $N^{3-}$  follow the order





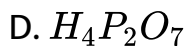
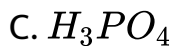
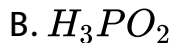
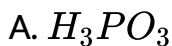


**Answer:**



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**9.** The oxoacid of phosphorus having the strongest reducing property is



**Answer:**



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10. Among C, S and P the element (s) that produces (s)  $SO_2$  on reaction with hot conc.  $H_2SO_4$  is /are

- A. Only S
- B. Only C and S
- C. Only S and P
- D. C,S and P

**Answer:**



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11. The complex that can exhibit linkage isomerism is

- A.  $[Co(NH_3)_5(H_2O)]Cl_3$
- B.  $[Co(NH_3)_5(NO_2)]Cl_2$
- C.  $[Co(NH_3)_5(NO_3)](NO_3)_2$
- D.  $[Co(NH_3)_5Cl]SO_4$

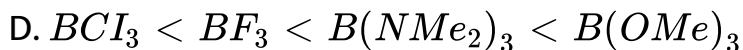
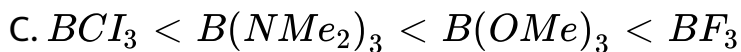
Answer:



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12. The tendency of X in  $BX_3$  ( $X = F, Cl, Ome, Nme$ ) to form a  $\pi$  bond with boron follows the order

- A.  $BCl_3 < BF_3 < B(OMe)_3 < B(NMe_2)_3$
- B.  $BF_3 < BCl_3 < B(OMe)_3 < B(NMe_2)_3$



**Answer:**

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**13.** Consider the following statement about Langmuir isotherm :

(i) The free gas and adsorbed gas are in dynamic equilibrium

(ii) All adsorption sites are equivalent

(iii) The initially adsorbed layer can act as a substrate for further adsorption.

(iv) The ability of a molecule to get adsorbed at a given site is independent of the occupation of neighbouring sites

The correct statement are

A. I,II,II and IV

B. I,II and IV

C. I,II and IV

D. I,II and III

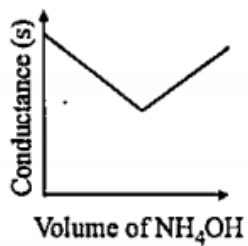
**Answer:**



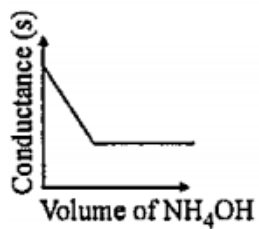
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**14.** Among the following , the plot that correctly represents the conductometric titration of 0.05 M  $H_2SO_4$  with 0.1 M  $NH_4OH$  is

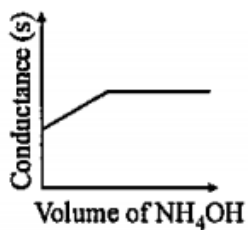
A.



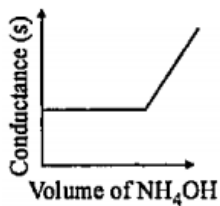
B.



C.



D.



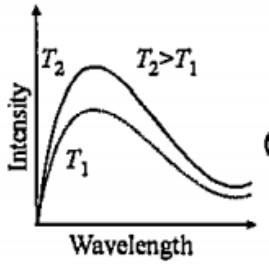
**Answer:**



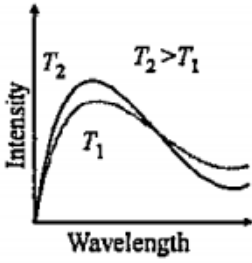
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15. The correct representation of wavelength intensity relationship of an ideal blackbody radiation at two different temperatures  $T_1$  and  $T_2$  is

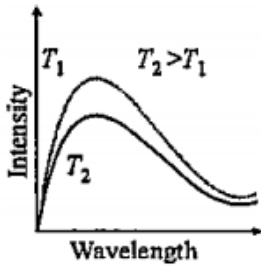
A.



B.

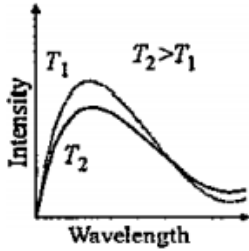


C.





D.



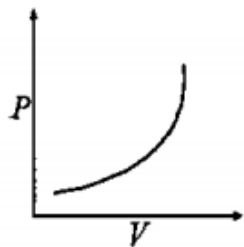
**Answer:**



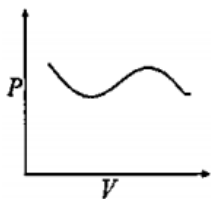
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**16.** The pressure (P)- volume (V) isotherm of a van der Waals gas, at the temperature at which it undergoes gas to liquid transition, is correctly represented by

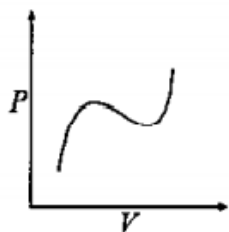
A.



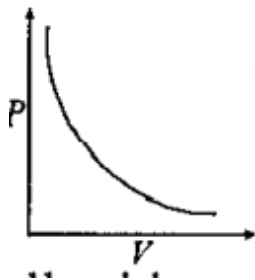
B.



C.



D.



Answer:

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17. Give examples of two buffer solutions prepared by mixing two salt solutions of a polybasic acid

A.  $0.2M NH_4OH$  and  $0.1M HCl$

B.  $0.2M NH_4OH$  and  $0.2M HCl$

C.  $0.2M NaOH$  and  $0.1M CH_3COOH$

D.  $0.1M NH_3OH$  and  $0.2M HCl$

Answer:

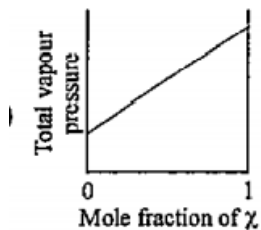
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18. The plot of total vapour pressure as a function of mole fraction of the component of an ideal solution formed by mixing liquids X and Y is

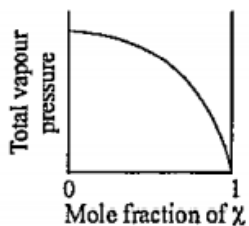
A.



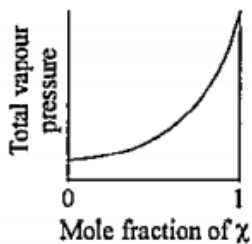
B.



C.



D.



Answer:



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19. On complete hydrogenation, natural rubber produces

- A. polyethylene
- B. ethylene propylene copolymer
- C. polyvinyl chloride
- D. polypropylene

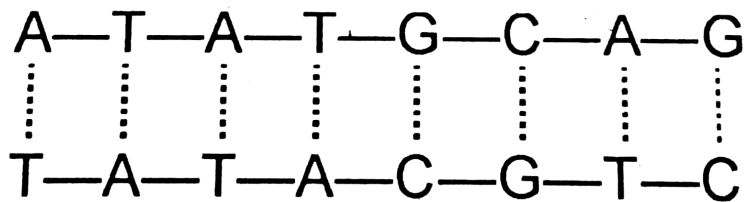
**Answer:**



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20. The average energy of each hydrogen bond in A-T pair is  $x$  kcal  $mol^{-1}$  and that in G-C pair is  $y$  kcal  $mol^{-1}$ . Assuming that no other interaction exists between the nucleotides, the

approximate energy required in  $\text{kcal mol}^{-1}$  to split the following double stranded DNA into two single strands is



[each dashed line may represent more than one hydrogen bond between the base pairs ]

A.  $10x+9y$

B.  $5x+3y$

C.  $15x+6y$

D.  $5x+45y$

**Answer:**



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21. For the electrochemical cell shown below



The potential is 0.49 V at 298 K. The pH of the solution is

closest to: [Given, standard reduction potential,  $E^\circ$  for

$Cu^{2+}/Cu$  is 0.34 V. Gas constant, R is  $8.31JK^{-1}mol^{-1}$

Faraday constant, F is  $9.65 \times 10^4 JV^{-1}mol^{-1}$ ]

A. 1.2

B. 8.3

C. 2.5

D. 8.2

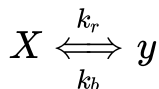
**Answer:**



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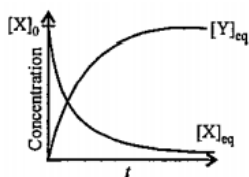


22. Consider the following reversible first - order reaction of X at an initial concentration  $[X]_0$ . The values of the rate constants are  $k_f = 2s^{-1}$  and  $k_b = 1s^{-1}$

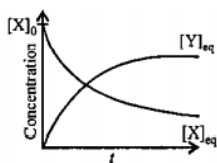


A plot of concentration of X and Y as function of time is

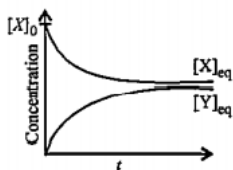
A.



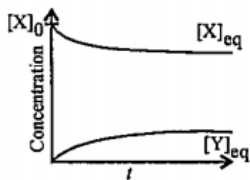
B.



C.



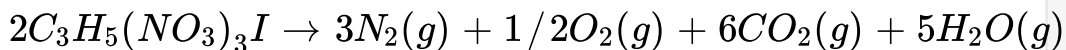
D.



**Answer:**

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**23.** Nitroglycerine (MW =227.1) detonates according to the following equation :



The standard molar enthalpies of formation,  $\Delta H_f^\circ$  for the compounds are given bellow:

$$\Delta H_f^\circ [C_3H_5(NO_3)_3] = - 364kJ/mol$$

$$\Delta H_f^\circ [CO_2(g)] = - 395.5kJ/mol$$

$$\Delta H_f^\circ [H_2O(g)] = -241.8 \text{ kJ/mol}$$

$$\Delta H_f^\circ [N_2(g)] = 0 \text{ kJ/mol}$$

$$\Delta H_f^\circ [O_2(g)] = 0 \text{ kJ/mol}$$

The enthalpy change when 10g of nitroglycerine is detonated is

A.  $-100.5 \text{ kJ/mol}$

B.  $-62.5 \text{ kJ/mol}$

C.  $-80.3 \text{ kJ/mol}$

D.  $-74.9 \text{ kJ/mol}$

**Answer:**



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24. The heating of  $(NH_4)_2Cr_2O_7$  produces another chromium compound along with  $N_2$  gas. The change of oxidation state of Cr in the reaction is

A.  $+6 \rightarrow +2$

B.  $+7 \rightarrow +4$

C.  $+8 \rightarrow +4$

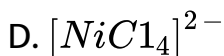
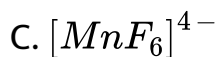
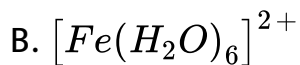
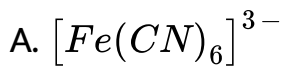
D.  $+6 \rightarrow +3$

**Answer:**



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25. The complex having the highest spin-only magnetic moment is



**Answer:**



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26. Among  $Ce(4f^15d^16s^2)$ ,  $Nd(4f^46s^2)$ ,  $Eu(4f^76s^2)$  and  $Dy(4f^{10}6s^2)$ , the element having highest and lowest 3rd ionization energies, respectively are

A. Nd and Ce

B. Eu and Ce

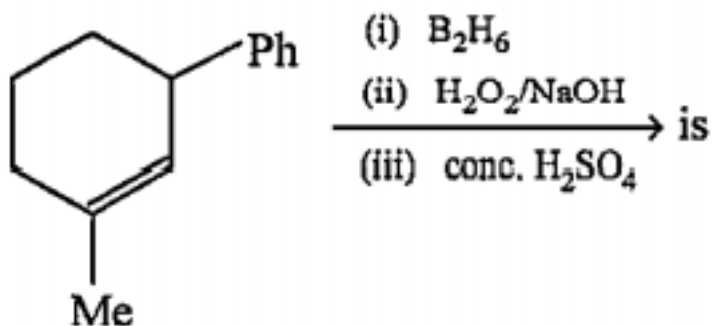
C. Eu and Dy

D. Dy and Nd

**Answer:**

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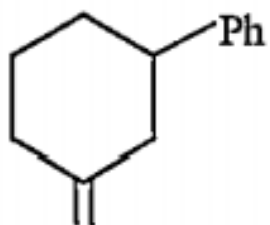
27. The major product of the following reaction sequence,



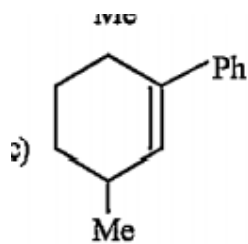
A.



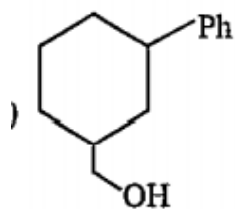
B.



C.



D.

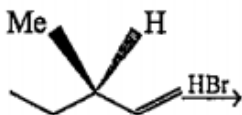


Answer:

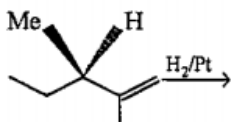
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28. Among the following reactions, a mixture of diastereomers is produced from

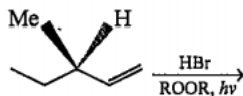
A.



B.



C.





D.



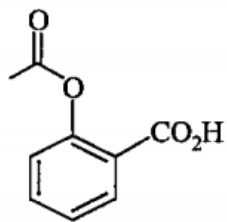
**Answer:**

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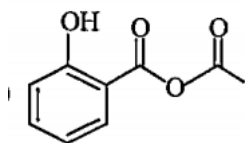
**29.** Reaction of phenol with NaOH followed by heating with  $CO_2$  under high pressure, and subsequent acidification gives compounds X as the major product, which can be purified by steam distillation. When reacted with acetic anhydride in the presence of a trace amount of conc.  $H_2SO_4$  compound X produces Y as the major product.

Compound Y is

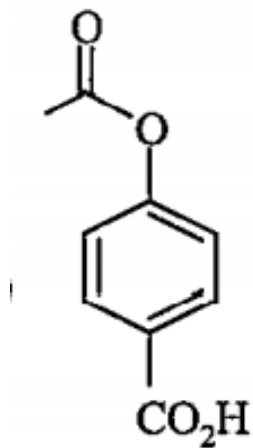
A.



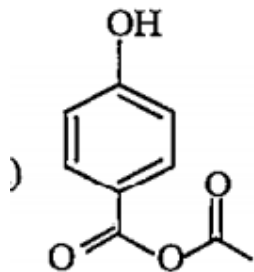
B.



C.



D.



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**30.** Tetrapeptide is made of naturally occurring alanine , serine glycine and valine . If the C-terminal amino acid is alanine and the N-terminal amino acid is chiral , the number of possible sequences of the tetrapeptide is

A. 12

B. 8

C. 6

D. 4

**Answer:**



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