Classify the following species into Lewis acids and Lewis bases and show how these act as such:

(a) HO^- (b) F^- (c) H^+ (d) BCl_3

Ans) (a) OH^- ion can donate an electron pair. Hence, it acts as Lewis base.

(b) F^- ion can donate an electron pair. Hence, it acts as Lewis base.

(c) H^+ ion can accept an electron pair. Hence, it acts as Lewis acid.

(d) BCl_3 ion can accept an electron pair. Hence, it acts as Lewis acid.

Calculate pH of a 1.0×10^{-8} M solution of HCl.

Ans) $[H+]$ total $= [H+]$ acid $+ [H+]$ water

Since, HCl is a strong acid and is completely ionized
$[H^+]HCl = 1.0 \times 10^{-8}$

The concentration of H+ from ionization is equal to the $[OH^-]$ from water,
$[H^+]H_2O = [OH^-]H_2O$
$= x \ (say)$
$[H^+]total = 1.0 \times 10^{-8} + x$

But
$[H^+][OH^-] = 1.0 \times 10^{-14}$
$(1.0 \times 10^{-8} + x)(x) = 1.0 \times 10^{-14}$
$X^2 + 10^{-8}x - 10^{-14} = 0$

Solving for x, we get
$x = 9.5 \times 10^{-8}$

Therefore,
$[H^+] = 1.0 \times 10^{-8} + 9.5 \times 10^{-8}$
$= 10.5 \times 10^{-8}$
$= 1.05 \times 10^{-7}$
$pH = -log[H^+] = -log(1.05 \times 10^{-7}) = 6.98$

Hence, this is the answer.