

## Only light lines

- ①  $gg \rightarrow qX$
- ②  $gg \rightarrow gX$
- ③  $qg \rightarrow gX$
- ④  $qg \rightarrow qX$
- ⑤  $q\bar{q} \rightarrow gX$
- ⑥  $q\bar{q} \rightarrow qX$
- ⑦  $qg \rightarrow \bar{q}X$
- ⑧  $qg \rightarrow \bar{q}'X$
- ⑨  $qg \rightarrow q'X$
- ⑩  $qq \rightarrow gX$
- ⑪  $qq \rightarrow qX$
- ⑫  $q\bar{q} \rightarrow q'X$
- ⑬  $q\bar{q}' \rightarrow gX$
- ⑭  $q\bar{q}' \rightarrow qX$
- ⑮  $qq' \rightarrow gX$
- ⑯  $qq' \rightarrow qX$

Heavy quark initiated ( $m_Q = 0$ )

- ① -
- ② -
- ③  $Qg \rightarrow gX$
- ④  $Qg \rightarrow QX$
- ⑤  $Q\bar{Q} \rightarrow gX$
- ⑥  $Q\bar{Q} \rightarrow QX$
- ⑦  $Qg \rightarrow \bar{Q}X$
- ⑧  $Qg \rightarrow \bar{q}X$
- ⑨  $Qg \rightarrow qX$
- ⑩  $QQ \rightarrow gX$
- ⑪  $QQ \rightarrow QX$
- ⑫  $Q\bar{Q} \rightarrow qX$
- ⑬  $Q\bar{q} \rightarrow gX, q\bar{Q} \rightarrow gX$
- ⑭  $Q\bar{q} \rightarrow QX, q\bar{Q} \rightarrow qX$
- ⑮  $Qq \rightarrow gX, qQ \rightarrow gX$
- ⑯  $Qq \rightarrow QX, qQ \rightarrow qX$

Mass effects:  $m_Q \neq 0$ 

- ①  $gg \rightarrow QX$
- ② -
- ③ -
- ④ -
- ⑤ -
- ⑥ -
- ⑦ -
- ⑧  $qg \rightarrow \bar{Q}X$
- ⑨  $qg \rightarrow QX$
- ⑩ -
- ⑪ -
- ⑫  $q\bar{q} \rightarrow QX$
- ⑬ -
- ⑭ -
- ⑮ -
- ⑯ -

⊕ charge conjugated processes