PQS Formulation Development Worksheet

Practical educational worksheet for pharmaceutical formulation development, QbD thinking and scale-up risk review

Product / Project:		Date:	
Dosage form / Strength:		Developer / Team:	
Development stage:		Reference protocol / plan:	

1. QTPP and CQA mapping

Target / CQA	Why it matters	Target / rationale	Evidence source
Dose / strength	Correct therapeutic amount and unit dose.		
Release / dissolution	Supports intended product performance.		
Content uniformity	Controls dose consistency between units.		
Impurities / stability	Controls chemical quality over shelf life.		
Physical attributes	May affect use, handling or performance.		
Microbial quality (if relevant)	Product-specific patient and quality risk.		
Packaging / in-use	Protection and delivery during shelf life/use.		

2. Development decision map

Question	Development answer / evidence
What product are we trying to make?	
Which quality attributes are important to the intended use?	
Which API/excipient attributes could affect them?	
Which process variables could affect them?	
Which experiments will reduce the highest uncertainty first?	
What evidence will define the eventual control strategy?	

PQS Formulation Development Worksheet

3. Preformulation risk assessment

API property	Observation / data	Potential formulation risk	Planned study / control
Solubility / pH dependence			
pKa / ionization			
Particle size / surface area			
Solid-state form			
Hygroscopicity / moisture sensitivity			
Chemical stability			
Flow / compressibility			

4. Excipient rationale and compatibility

Excipient / grade	Intended function	Selection rationale	Compatibility / risk evidence

Development reminder: An excipient is not justified simply because it is common or appears in another approved product. Function, grade, route, amount, compatibility and product context still matter.

PQS Formulation Development Worksheet

5. Prototype comparison matrix

Prototype	Key composition / process difference	Manufacturability	Performance	Stability / risk	Decision
A					
B					
C					
D					

6. Variable-to-CQA evidence map

Material / process variable	Potential CQA affected	Scientific mechanism / hypothesis	Evidence / study result	Critical?
				[ ] Y [ ] N [ ] TBD
				[ ] Y [ ] N [ ] TBD
				[ ] Y [ ] N [ ] TBD
				[ ] Y [ ] N [ ] TBD
				[ ] Y [ ] N [ ] TBD

PQS prototype rule: Select the formulation-process combination that best balances the target profile across performance, stability and manufacturability. A single “best” test result should not override a broader development risk.

PQS Formulation Development Worksheet

7. Scale-up risk review

Area	What can change with scale?	Evidence to review	Risk / action
Mixing / blending	Geometry, fill level, mixing energy, transfer.	Blend uniformity, segregation, mixing time.	
Granulation	Liquid distribution, shear, endpoint behavior.	Granule size, moisture, flow, downstream performance.	
Drying	Heat/mass transfer, bed depth, drying kinetics.	Residual moisture, degradation, uniformity.	
Compression / filling	Speed, dwell time, feeder behavior, material flow.	Weight, hardness, friability, dissolution / CU.	
Hold times / logistics	Longer waits, transfers, environmental exposure.	Stability, moisture, microbial/segregation risk.	
Packaging	Line behavior and container-closure interaction.	Protection, integrity, compatibility, stability.	

8. Technology-transfer knowledge package

Knowledge element	Available?	Owner / document reference
Final composition and material attributes	[ ] Yes [ ] Gap	
Manufacturing process rationale	[ ] Yes [ ] Gap	
CQA / CMA / CPP rationale	[ ] Yes [ ] Gap	
Known failure modes / negative development history	[ ] Yes [ ] Gap	
Analytical / IPC strategy	[ ] Yes [ ] Gap	
Packaging and stability requirements	[ ] Yes [ ] Gap	
Open risks requiring scale confirmation	[ ] Yes [ ] Gap	

PQS Formulation Development Worksheet

9. Selected development strategy

Selected prototype / process:	
Why selected:	
Highest remaining scientific risk:	
Evidence still needed before scale-up:	
Proposed control-strategy elements:	
Packaging / stability strategy:	

10. Development action plan

Study / action	Question being answered	Owner	Due date	Decision / output

Development conclusion:
[ ] Prototype/process ready for further scale-up evaluation
[ ] Additional formulation screening required
[ ] Additional stability / analytical evidence required
[ ] Scale-up risk remains unresolved

Educational resource: This worksheet does not replace an approved development protocol, CMC strategy, product-specific regulatory requirements, formal QbD/risk-management documentation or company procedures.