University of Colorado Boulder

Q-SEnSE
An NSF Quantum Leap Challenge Institute
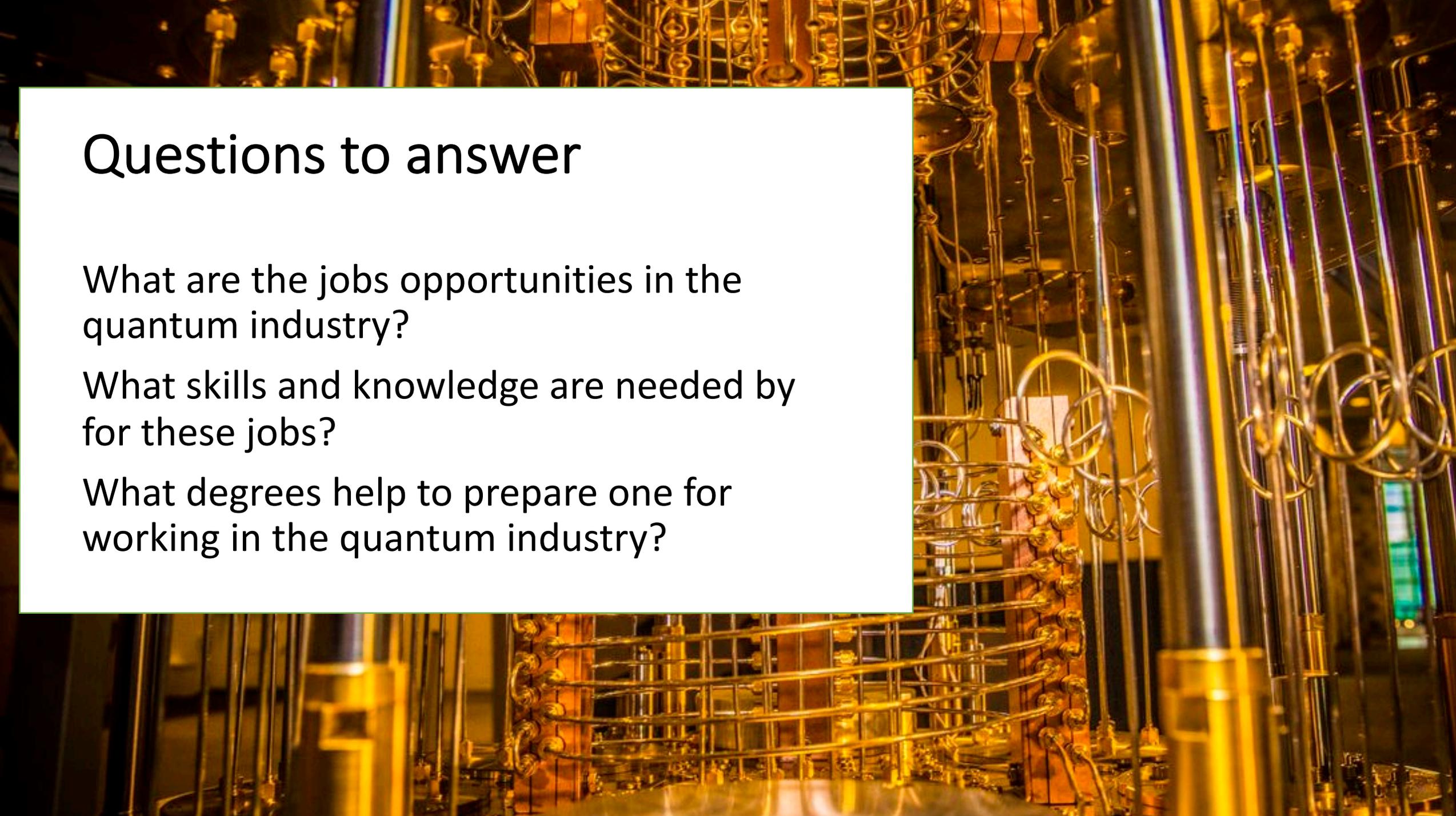
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Preparing to enter the Quantum Workforce

Questions to answer

What are the jobs opportunities in the quantum industry?

What skills and knowledge are needed by for these jobs?

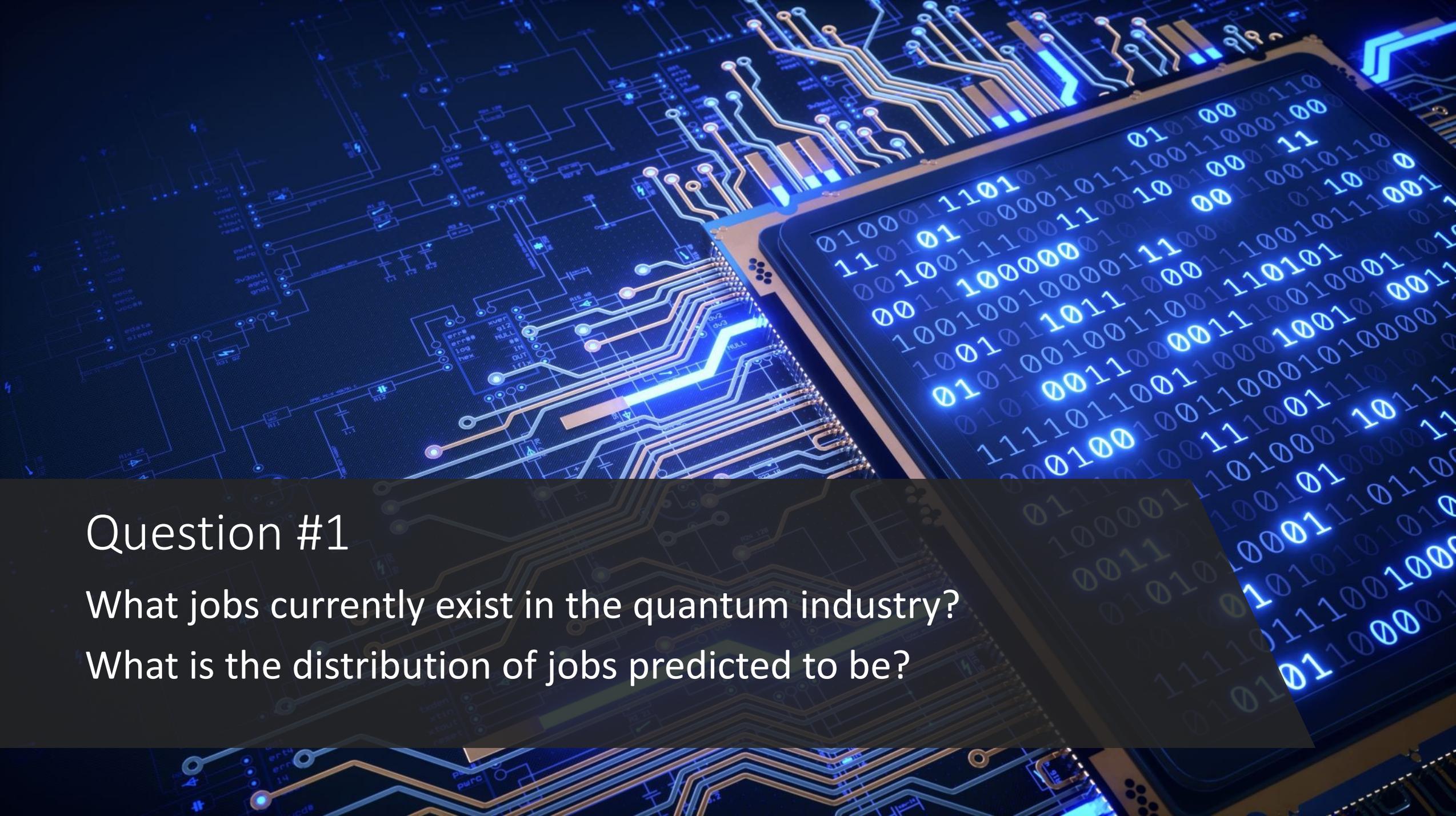What degrees help to prepare one for working in the quantum industry?

Studies of the Quantum Workforce

Study 1
- University of Colorado/ RIT
- Qualitative (interviews)
- Fall 2019
- Rich information
- Open ended
- 21 companies

Study 2
- Quantum Economic Development Consortium(QED-C)
- Quantitative (survey)
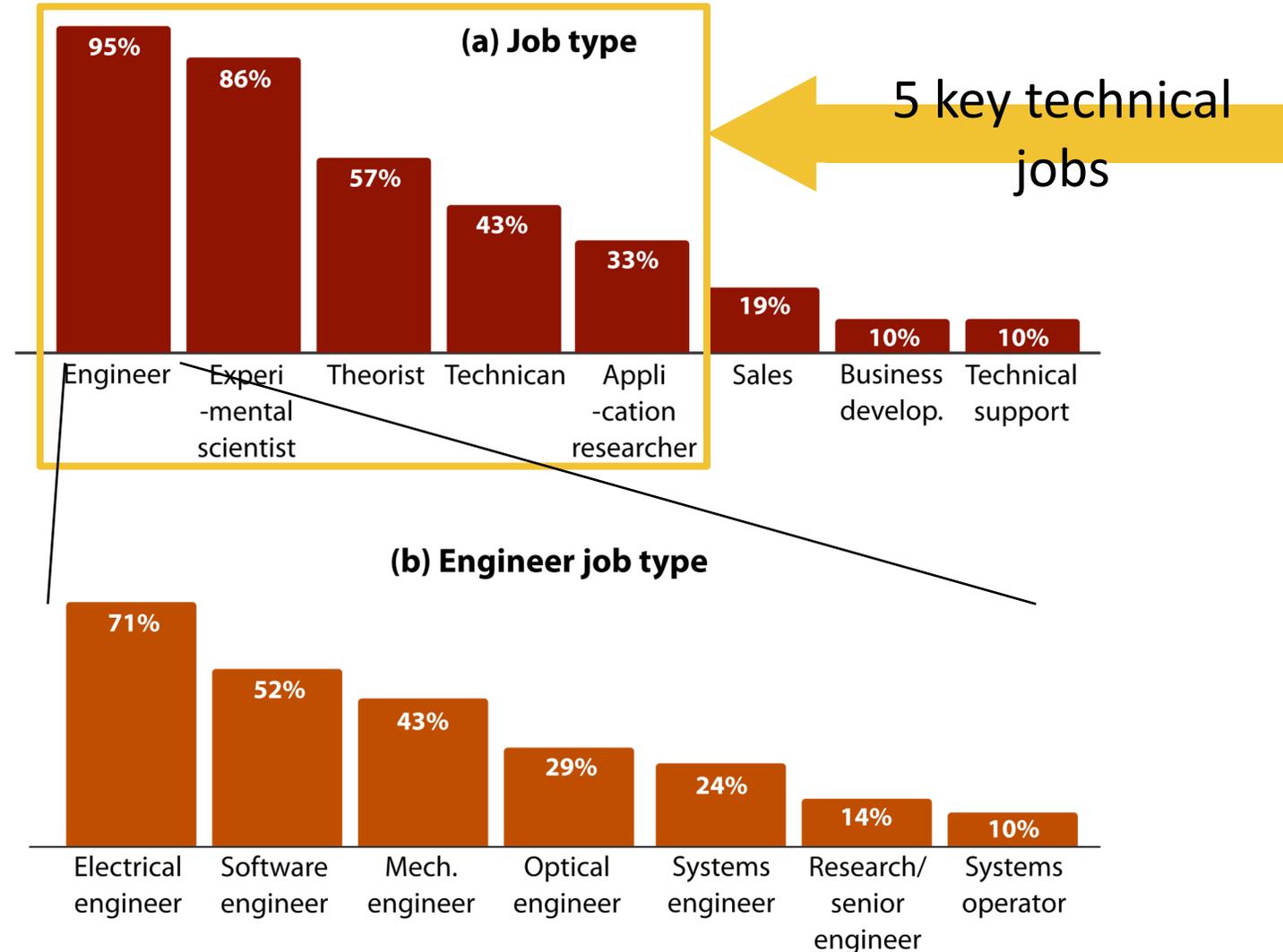- Fall 2020
- Multiple choice
- 56 companies

Question #1

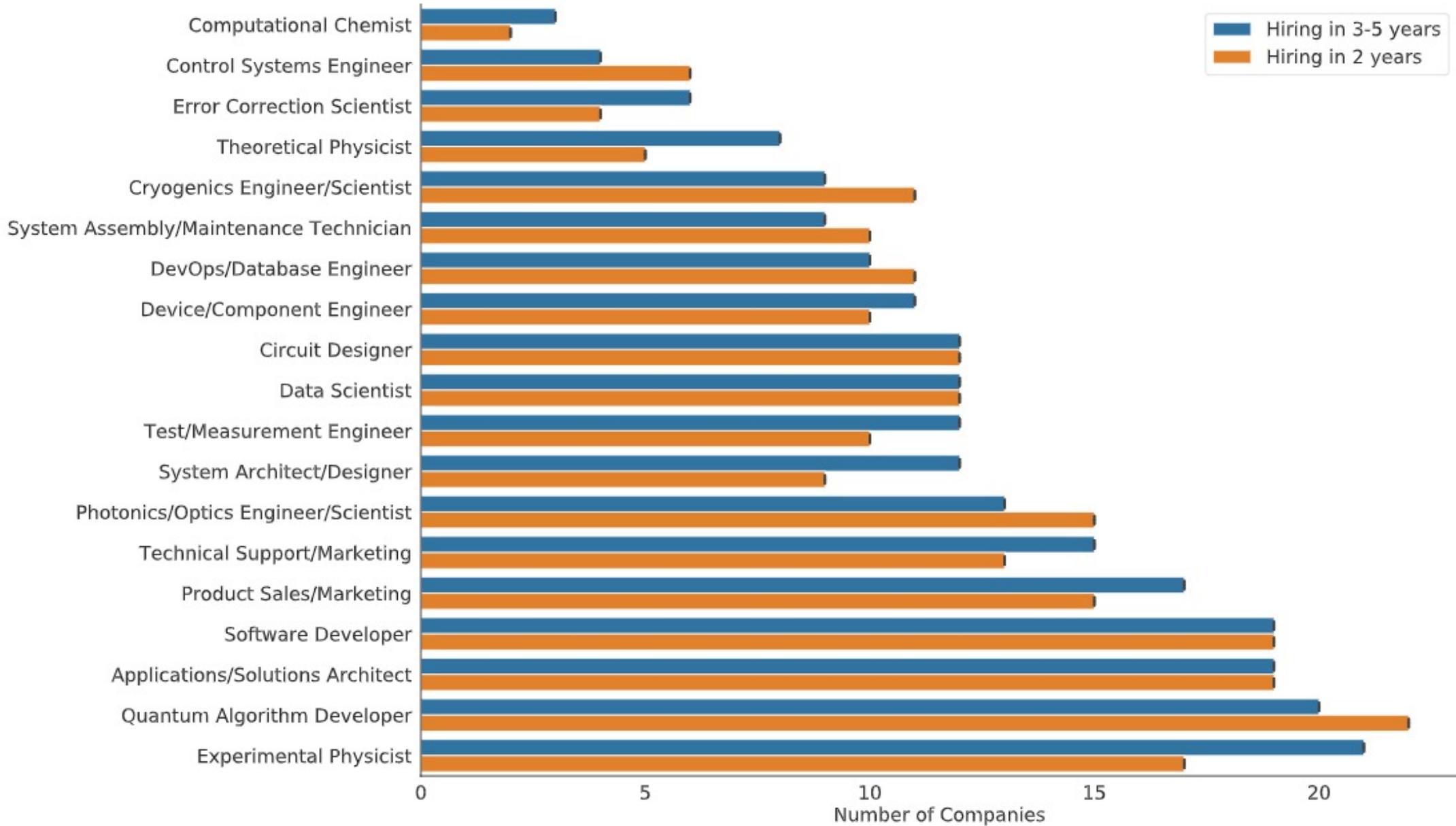What jobs currently exist in the quantum industry?

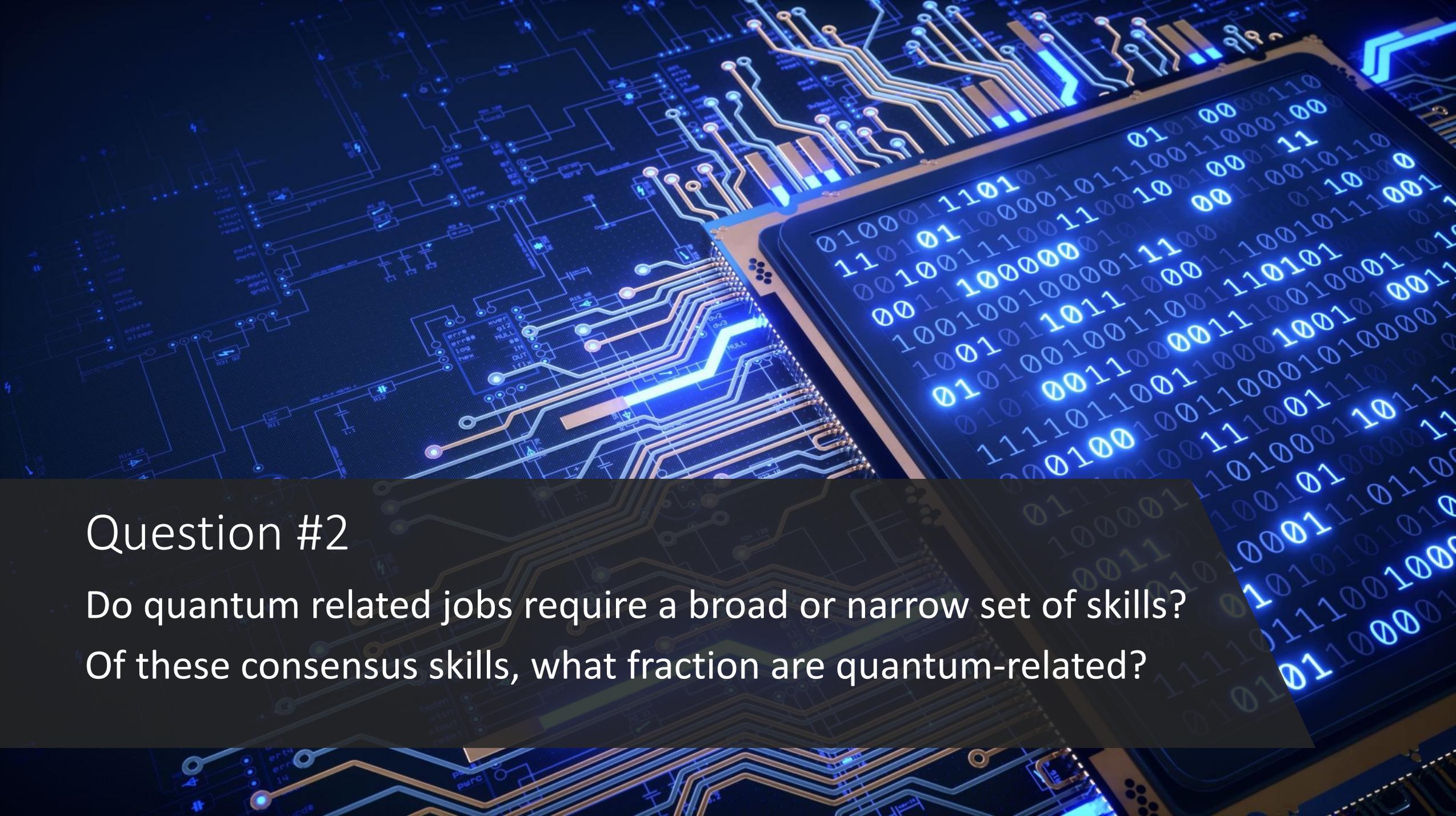What is the distribution of jobs predicted to be?

What are the current career opportunities?

Percent of the 21 companies employing people in these roles

5 key technical jobs

(a) Job type

95%	Engineer
86%	Experi-mental scientist
57%	Theorist
43%	Technican
33%	Appli-cation researcher
19%	Sales
10%	Business develop.
10%	Technical support

(b) Engineer job type

71%	Electrical engineer
52%	Software engineer
43%	Mech. engineer
29%	Optical engineer
24%	Systems engineer
14%	Research/ senior engineer
10%	Systems operator

Future of Quantum Jobs

Horizontal bar chart titled "Number of Companies" comparing "Hiring in 3-5 years" (blue) and "Hiring in 2 years" (orange) for various quantum job roles:

| Job Role	Hiring in 3-5 years	Hiring in 2 years
Computational Chemist	3	2
Control Systems Engineer	4	6
Error Correction Scientist	6	4
Theoretical Physicist	8	5
Cryogenics Engineer/Scientist	9	11
System Assembly/Maintenance Technician	9	10
DevOps/Database Engineer	10	11
Device/Component Engineer	11	10
Circuit Designer	12	12
Data Scientist	12	12
Test/Measurement Engineer	12	10
System Architect/Designer	12	9
Photonics/Optics Engineer/Scientist	13	15
Technical Support/Marketing	15	13
Product Sales/Marketing	17	15
Software Developer	19	19
Applications/Solutions Architect	19	19
Quantum Algorithm Developer	20	22
Experimental Physicist	21	17

Question #2

Do quantum related jobs require a broad or narrow set of skills?

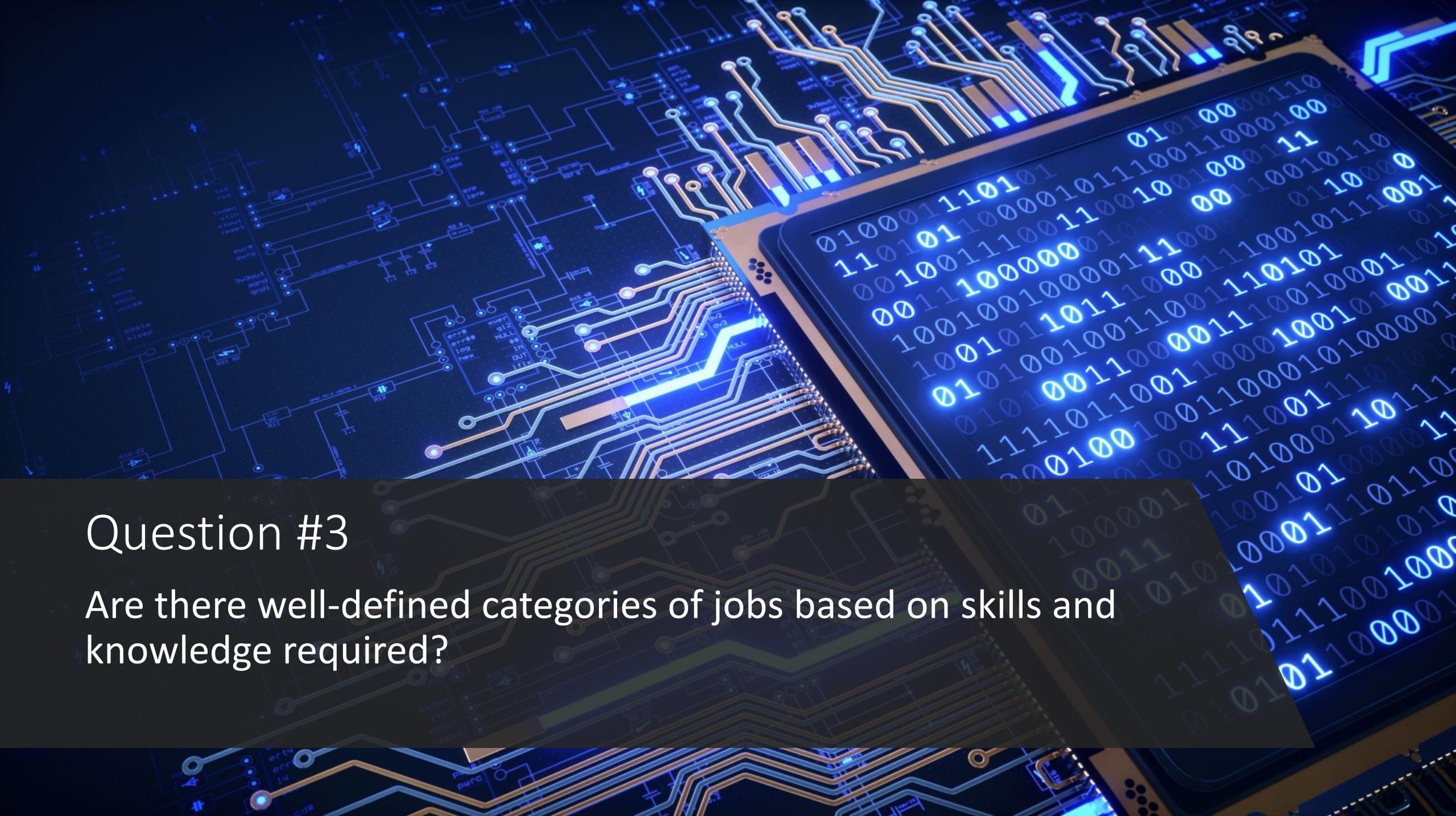Of these consensus skills, what fraction are quantum-related?

Common skills across quantum jobs
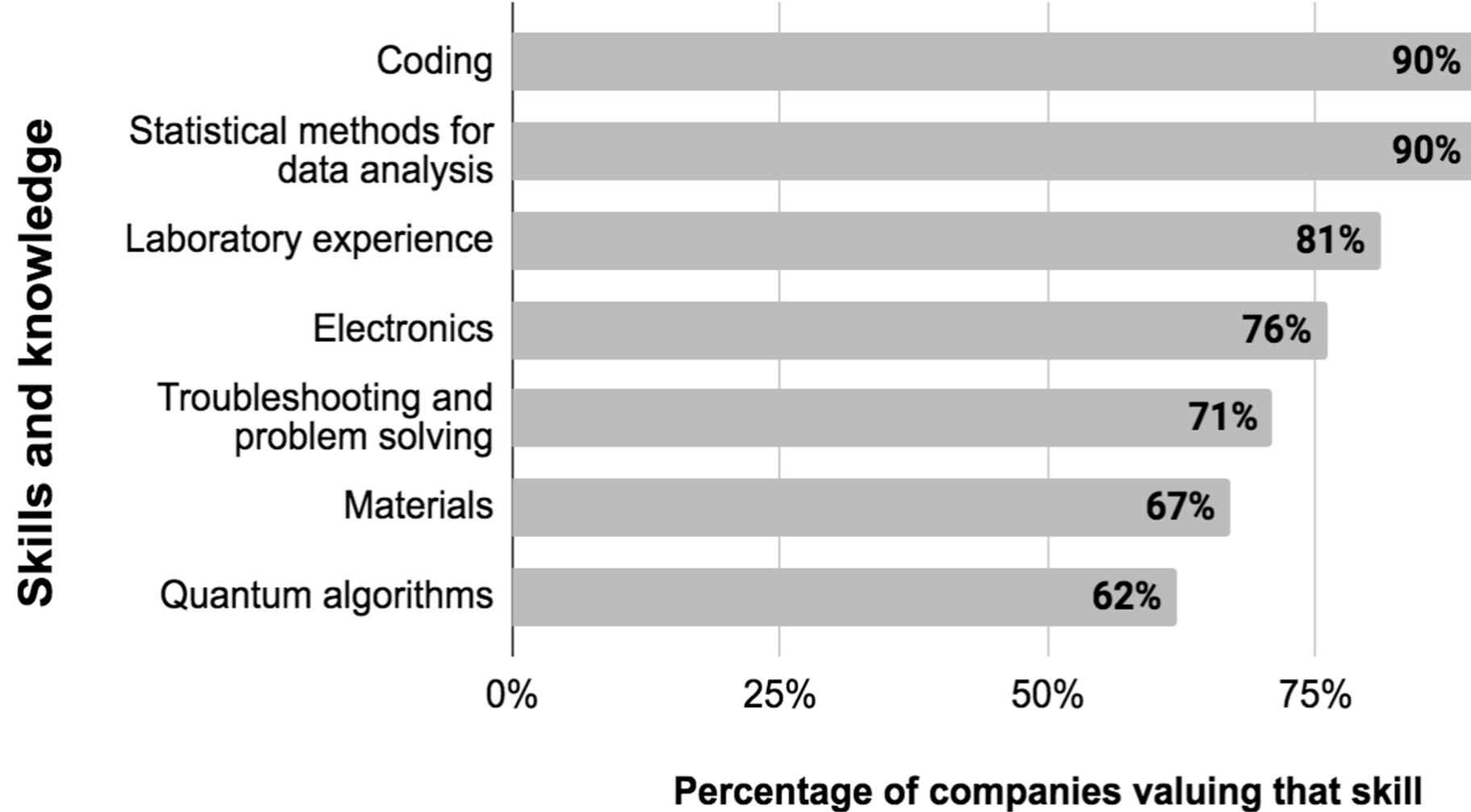
Consensus Skills
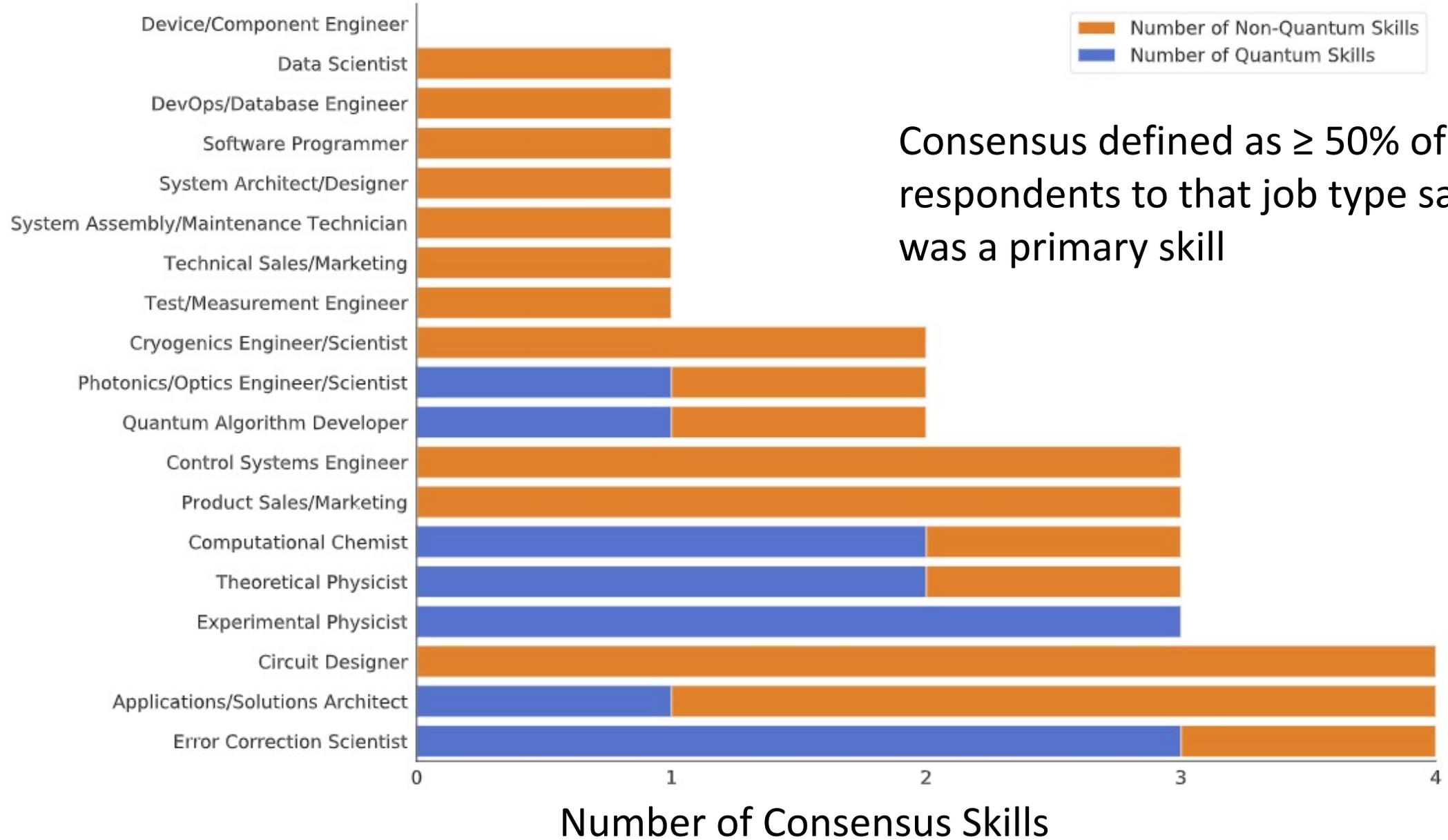
Consensus defined as ≥ 50% of respondents to that job type said it was a primary skill

Question #3

Are there well-defined categories of jobs based on skills and knowledge required?

Correlations of Skills and Knowledge

Red = positive correlations
Blue = negative correlations

Three distinct categories of jobs
1) Hardware
2) Business
3) Software

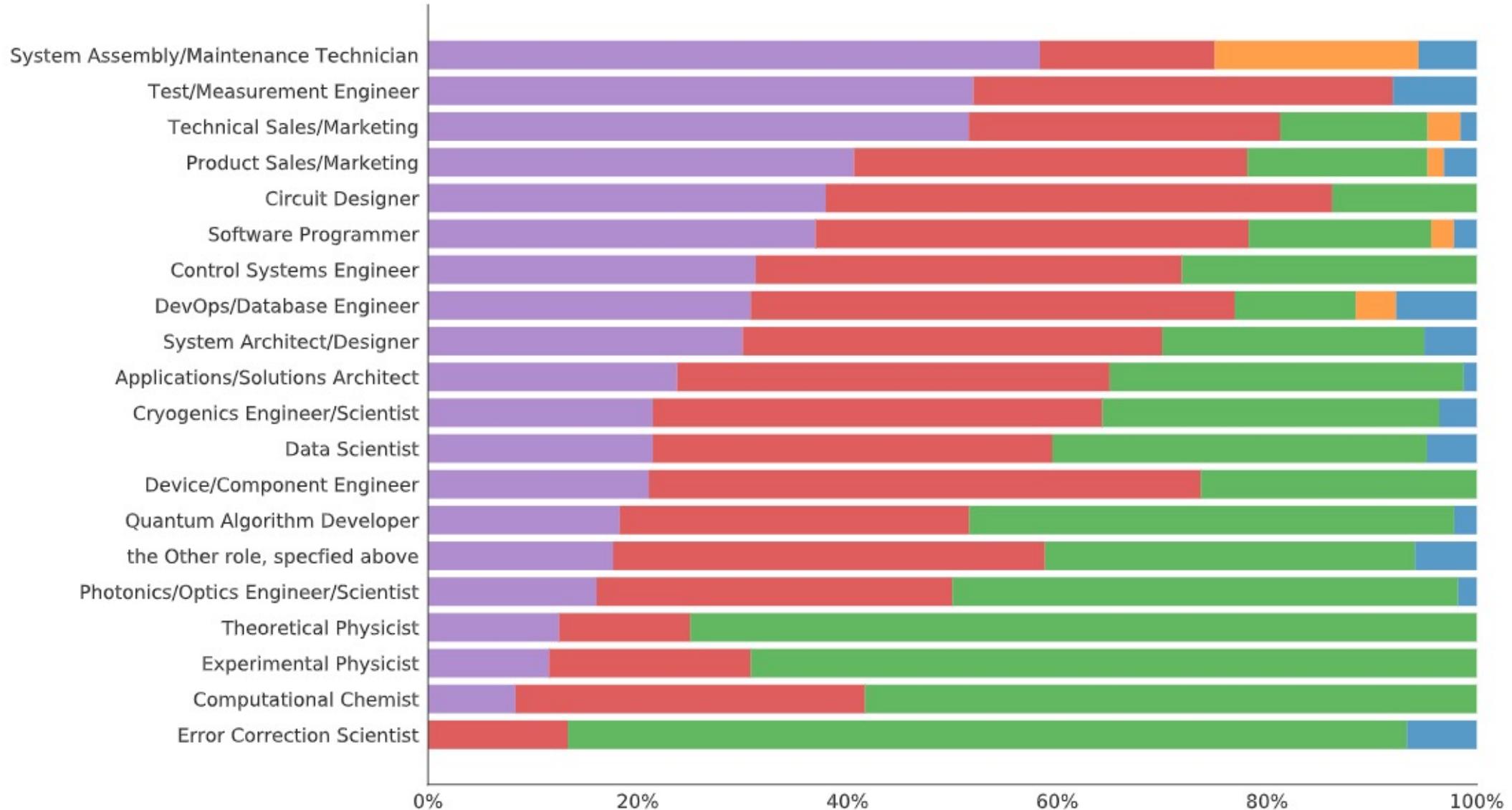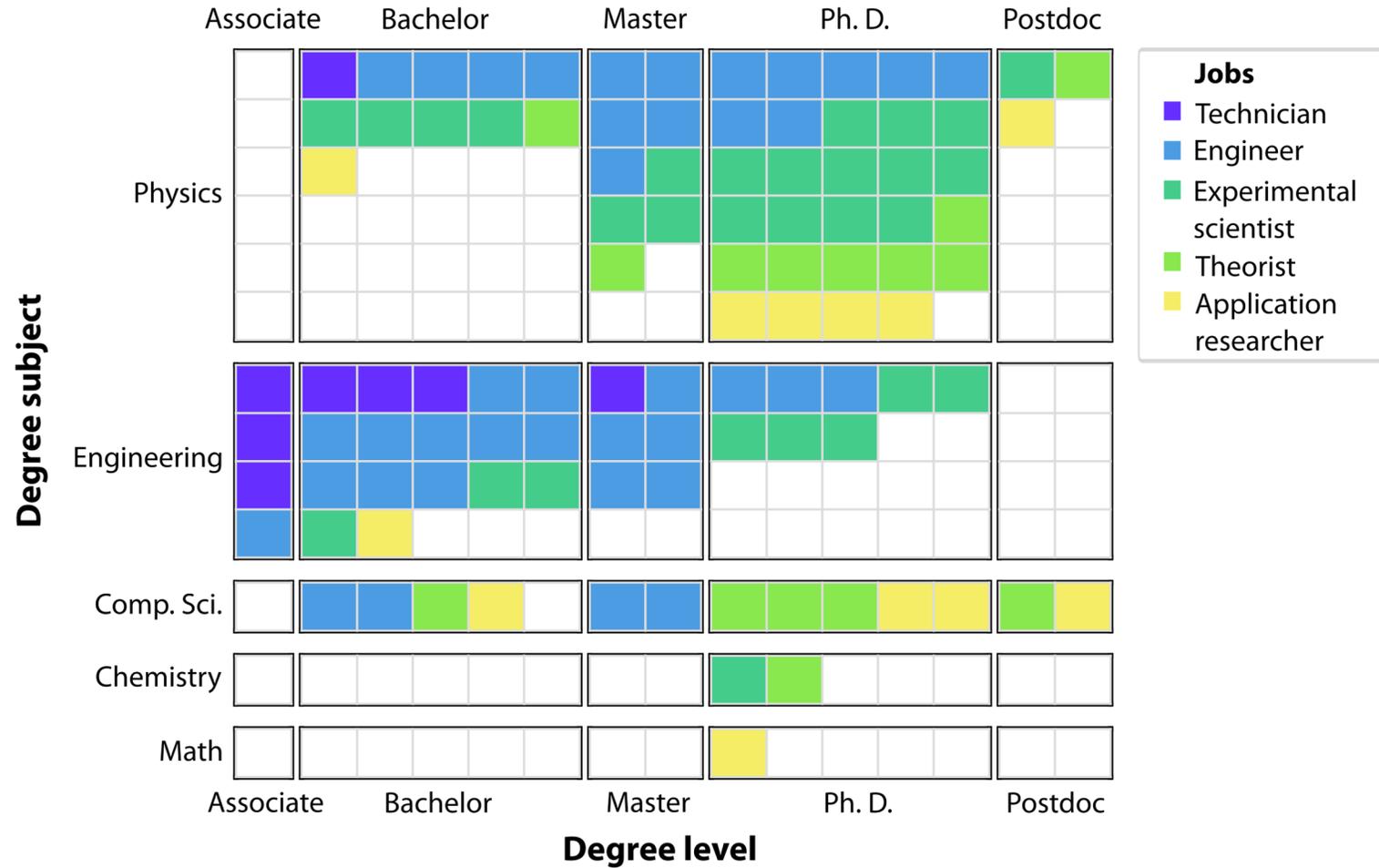Question #4

What degree levels are needed for the different job types?

Degree level of different job types

What are the routes into specific jobs?

Recommendations for students

US Quantum industry is growing, and there are a variety of future positions available, not all require a lot of specialized quantum knowledge/degrees.

Hands-on experiences is desired: internships, research experiences, and formal courses are useful for many job roles.

Not all working in QIST need a PhD in physics: consider becoming "quantum aware" by taking (1-3) courses in QIST.

Still focus on traditional STEM skills as they are in demand too.

Don't worry about trying to become a "Quantum Engineer." This is not a well-defined role and can mean many things to employers. Apply based on skills not titles.