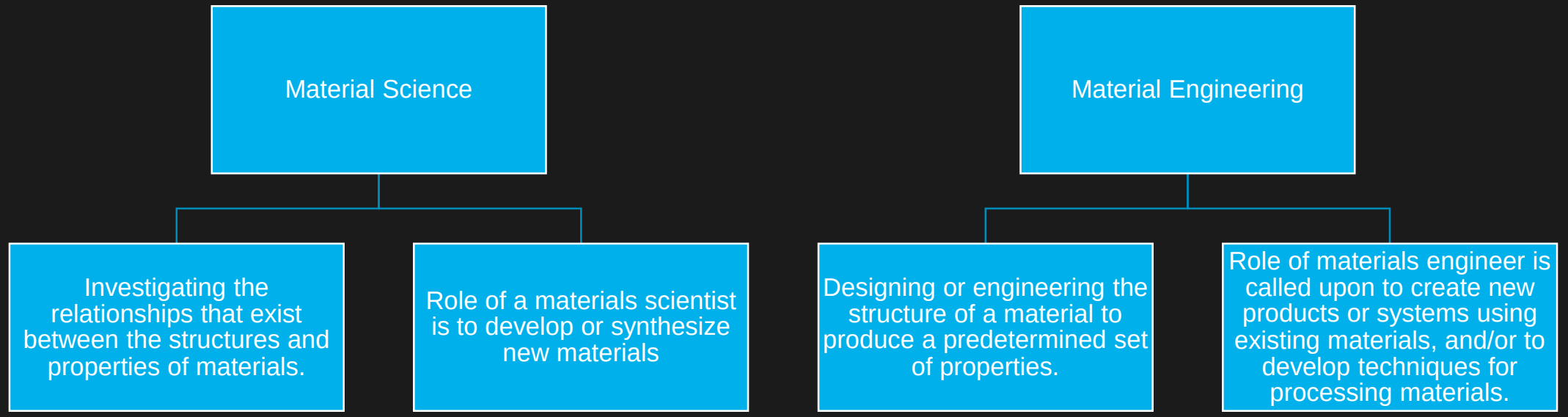
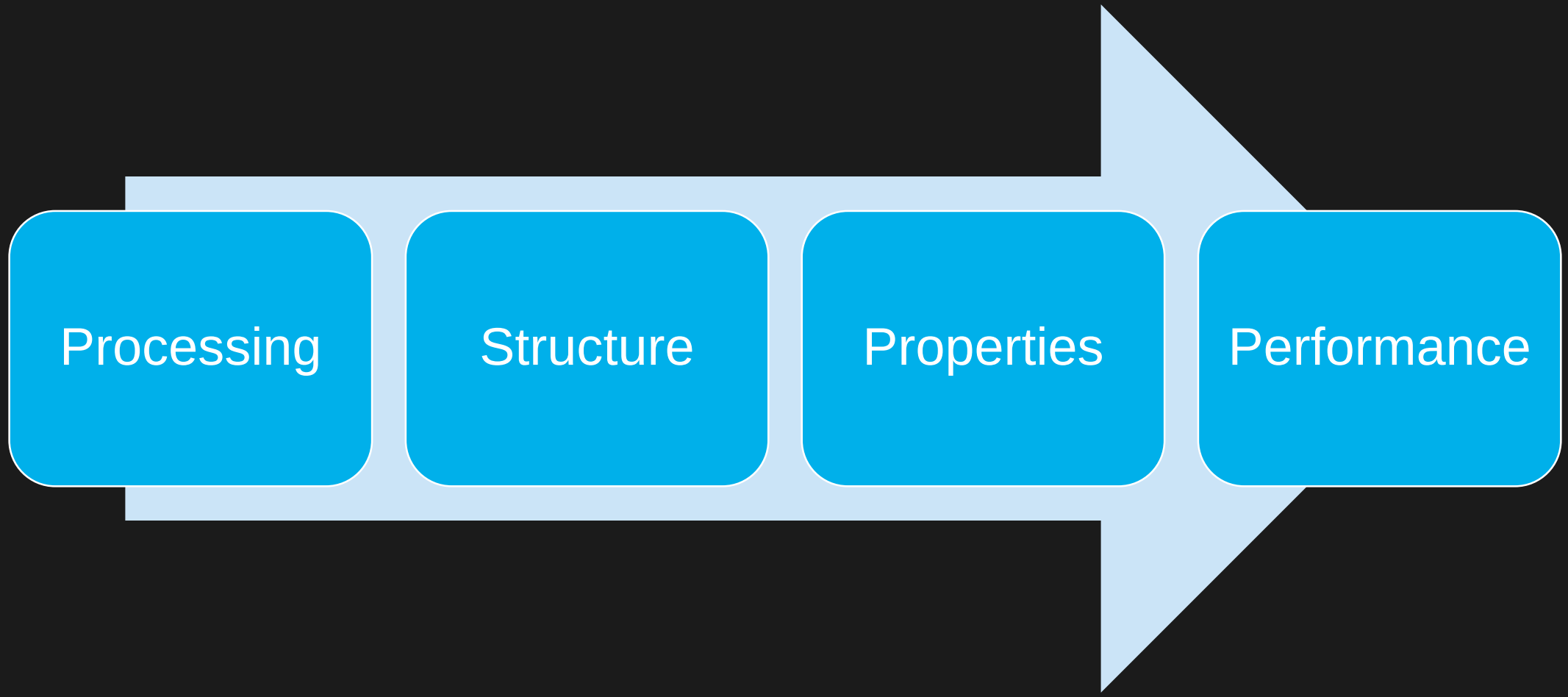
Material Sciences Review

Amardeep Singh Sidhu| Epoch Zero| **Generating Knowledge Bases From Scientific Publications**

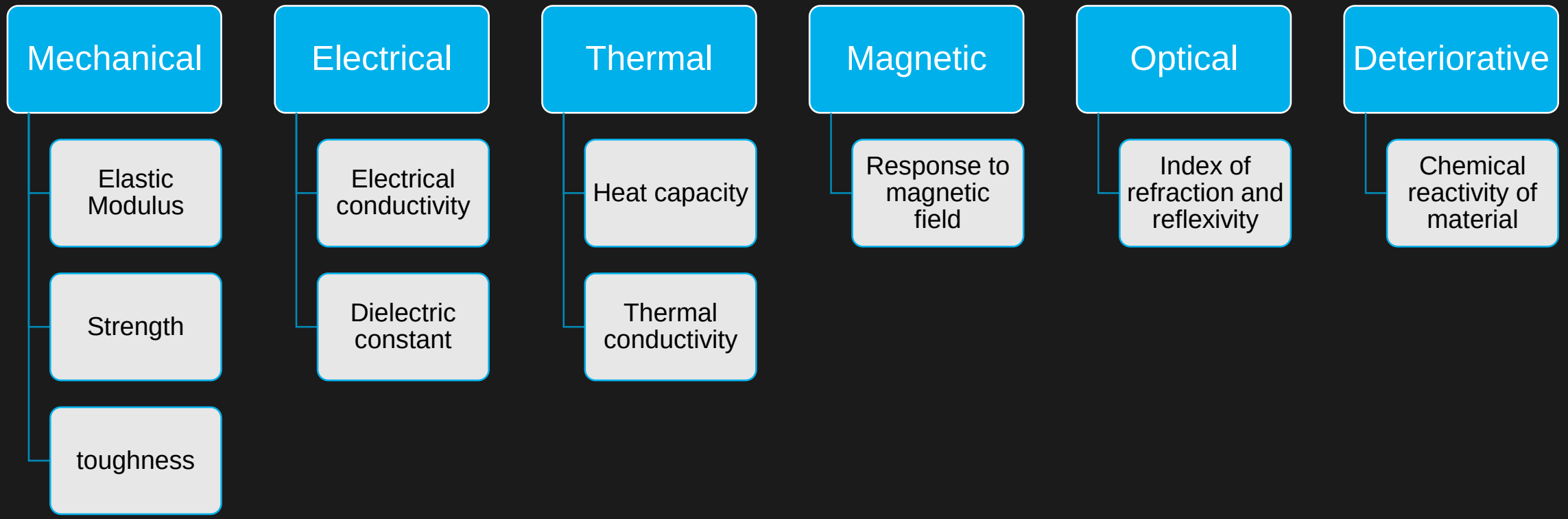
Material Science and Engineering



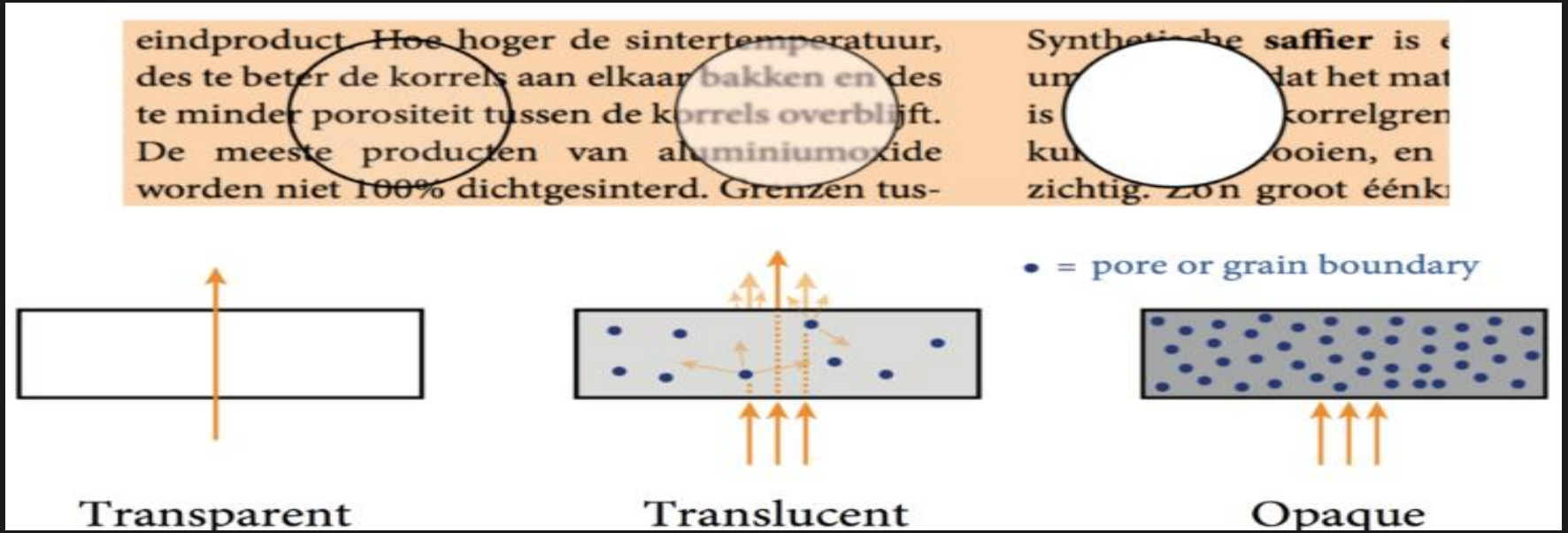
Relationship between components of material science



Properties of materials



Example of inter relation of components of material science



Source:
http://www.betase.nl/advancedceramics/light-transmission-of-aluminium-oxide/?lang=en

https://hackaday.com/2018/04/03/whats-the-deal-with-transparent-aluminum/

The ceramic material aluminium oxide, also known as alumina, is completely opaque, translucent or transparent – depending on the structure, and therefore on the manufacturing process

3 Criteria for Selection of Material

- Selection based on in-service conditions and trade off properties.
- Deterioration during service conditions.
- Economics

Classification of materials

Metals

Metallic elements with non metallic elements in relatively small amount.

Stiff, strong, ductile, good conductor of heat and electricity.

Fe, Co & Ni have magnetic properties.

Ceramics

Between Metallic and Non Metallic (such as Oxides , Nitrites & Carbides)

Traditional ceramics – clay , porcelain and glass.

Stiff, strong, hard, insulative to heat and electricity & resistant to high temperature

Polymer

Plastic and rubber materials. Many are organic compounds based on carbon, hydrogen etc.

Large molecular structure.

Composites

Wood and bone are naturally occurring composites.

Fiberglass and Carbon fiber reinforced polymer

Advance Materials

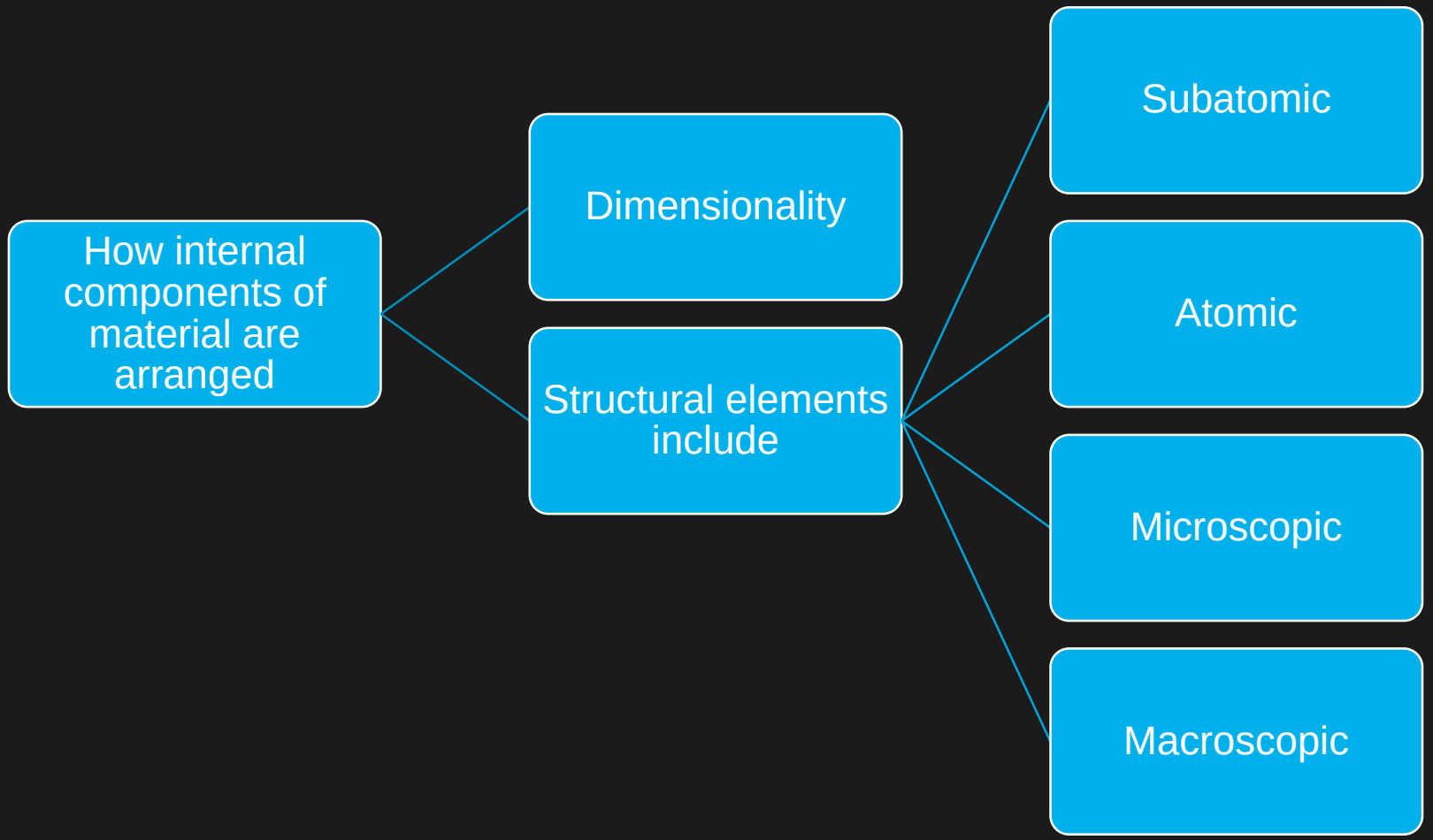
Semiconductor

Bio Material

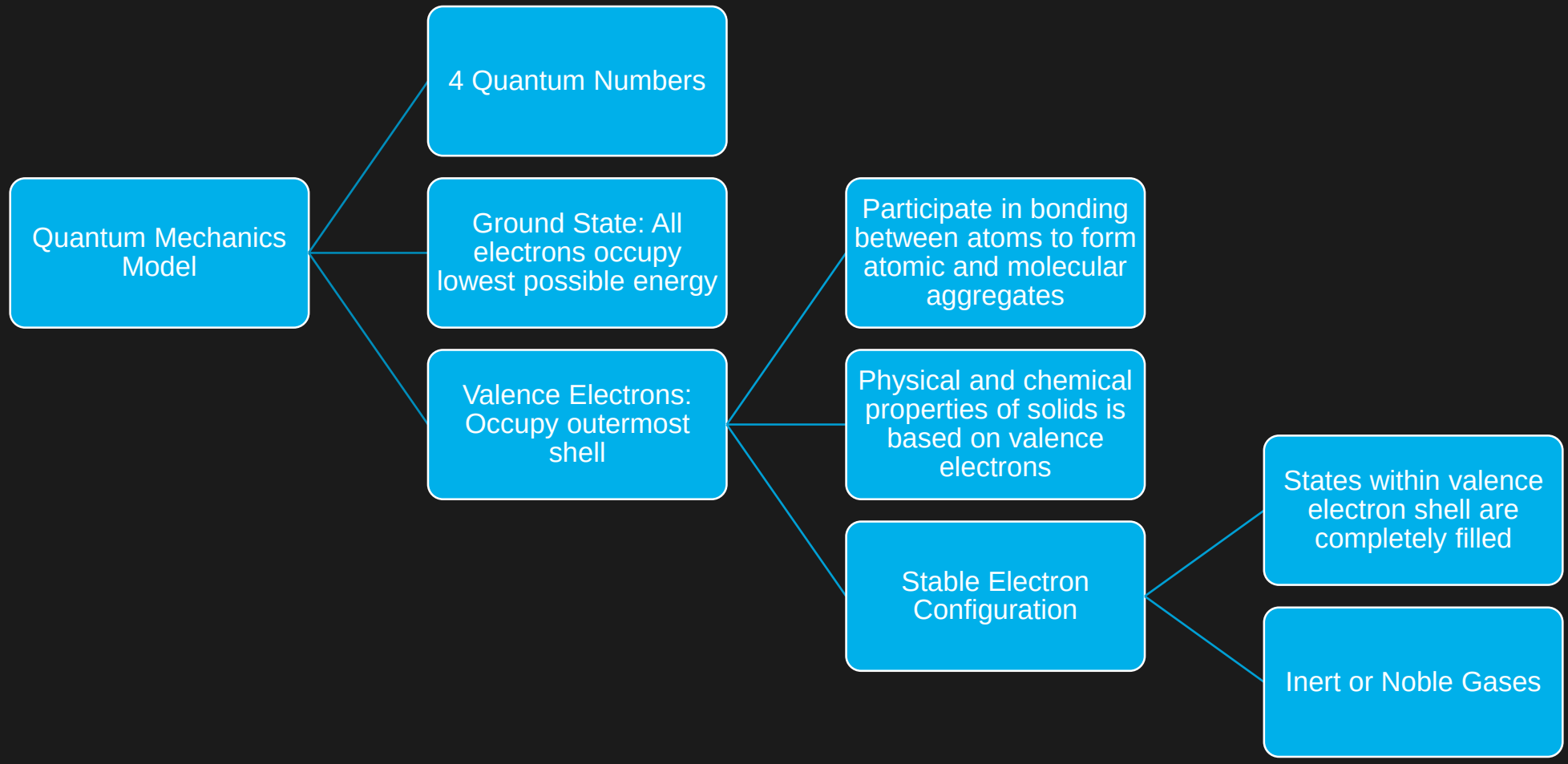
Smart Material

Nano Material

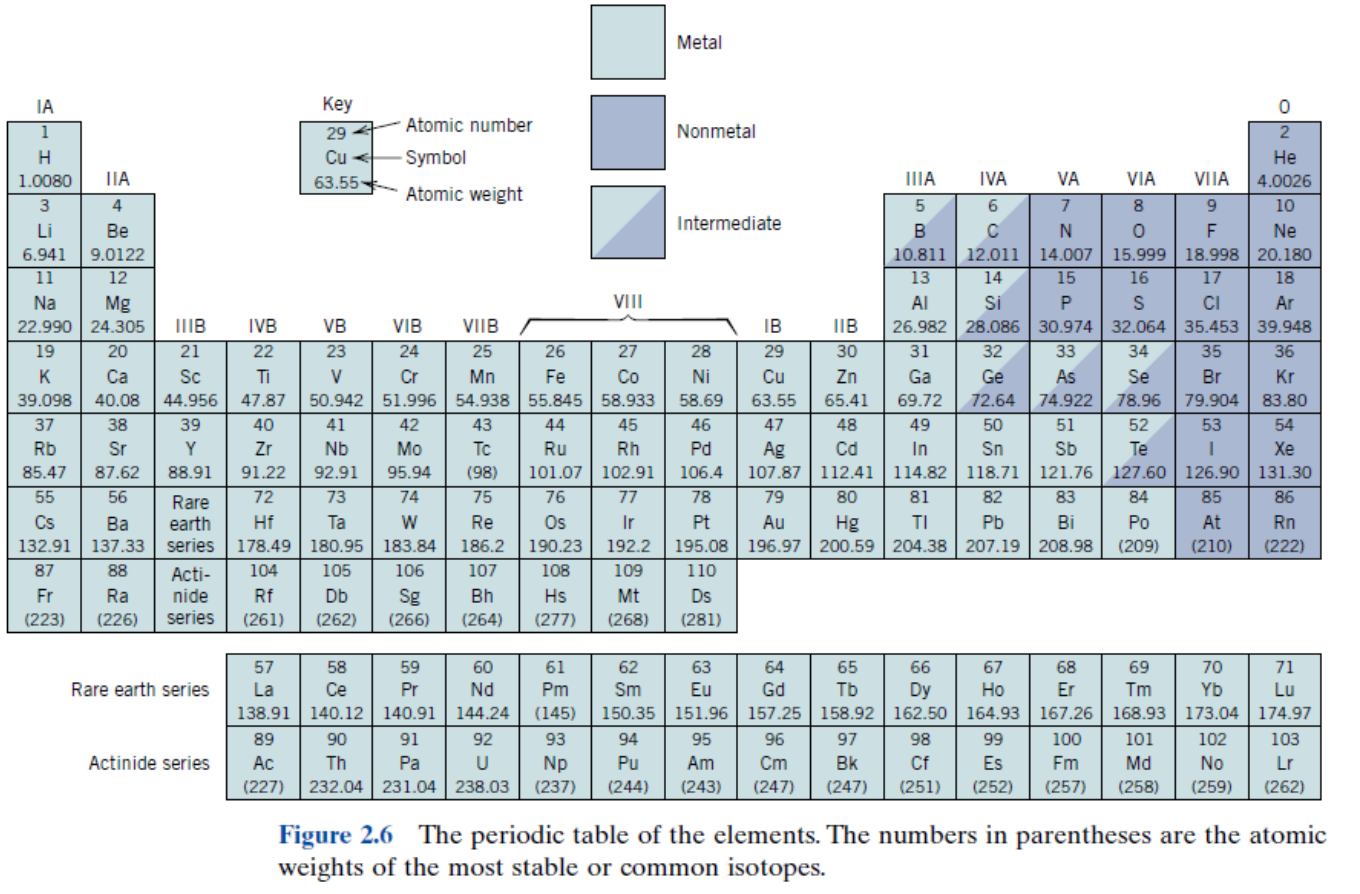
Our Objective: Find relationship between Structure ✥ Properties



Our Objective: Find relationship between Atomic Structure ⇔ Properties



Periodic Table



IA												IIIA	IVA	VA	VIA	VIIA	0
1 H 1.0080	IIA																2 He 4.0026
3 Li 6.941	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
11 Na 22.990	12 Mg 24.305	IIIB	IVB	VB	VIB	VIIB	VIII			IB	IIB	13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.064	17 Cl 35.453	18 Ar 39.948
19 K 39.098	20 Ca 40.08	21 Sc 44.956	22 Ti 47.87	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.69	29 Cu 63.55	30 Zn 65.41	31 Ga 69.72	32 Ge 72.64	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.4	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.30
55 Cs 132.91	56 Ba 137.33	Rare earth series	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.2	76 Os 190.23	77 Ir 192.2	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.19	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	Acti-nide series	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Ds (281)								

Rare earth series	57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.92	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
Actinide series	89 Ac (227)	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

Figure 2.6 The periodic table of the elements. The numbers in parentheses are the atomic weights of the most stable or common isotopes.

- Most Elements come under Metal / Electropositive elements.
  - Capable of giving up few valence electrons to become positively charged.
- Elements on right side of periodic table are electronegative elements.

Variables

Controlled variables	Independent variable	Dependent variable
• These are kept the same throughout your experiments	• The **one** variable you purposely change and test	• The measure of change observed because of independent variable • Decide how you will measure the change

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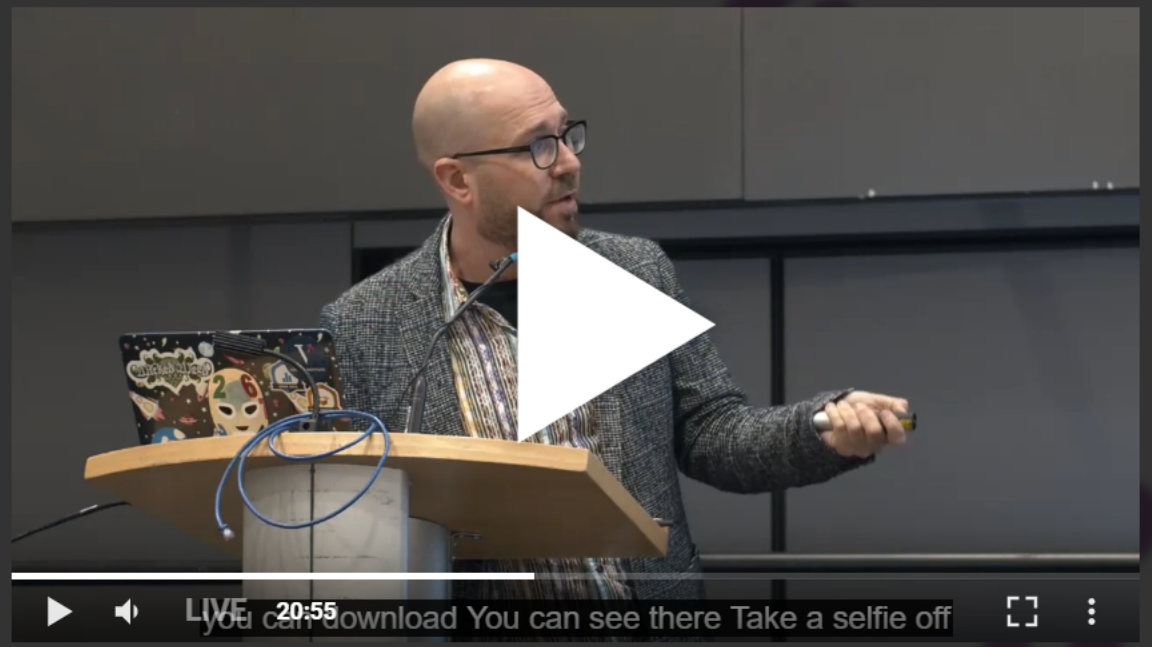
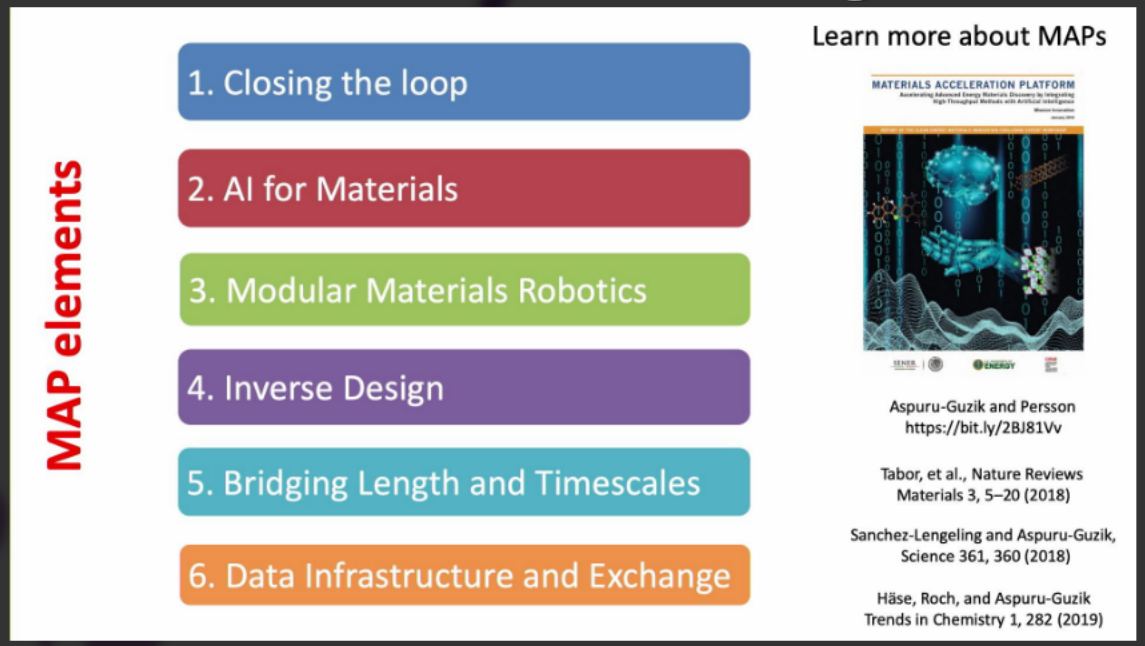




LIVE

LatinX in AI (LAI) Affinity Workshop 6

by **Alan Aspuru Guzik** · Dec 9, 2019 · 7 views · **NeurIPS**

Leave us a message

DistilBert_VictorSa....pdf Bloomfield_1914_i....pdf Show all

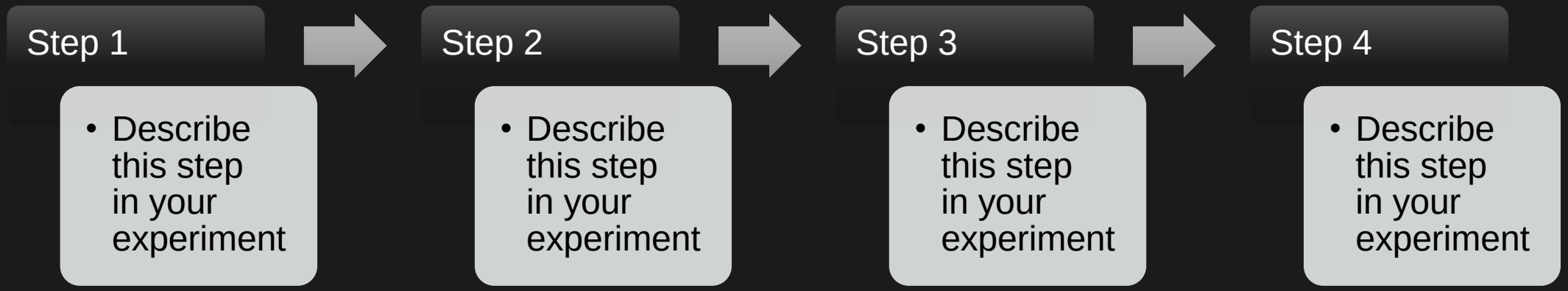
Add your answer / solution here

Hypothesis

Materials

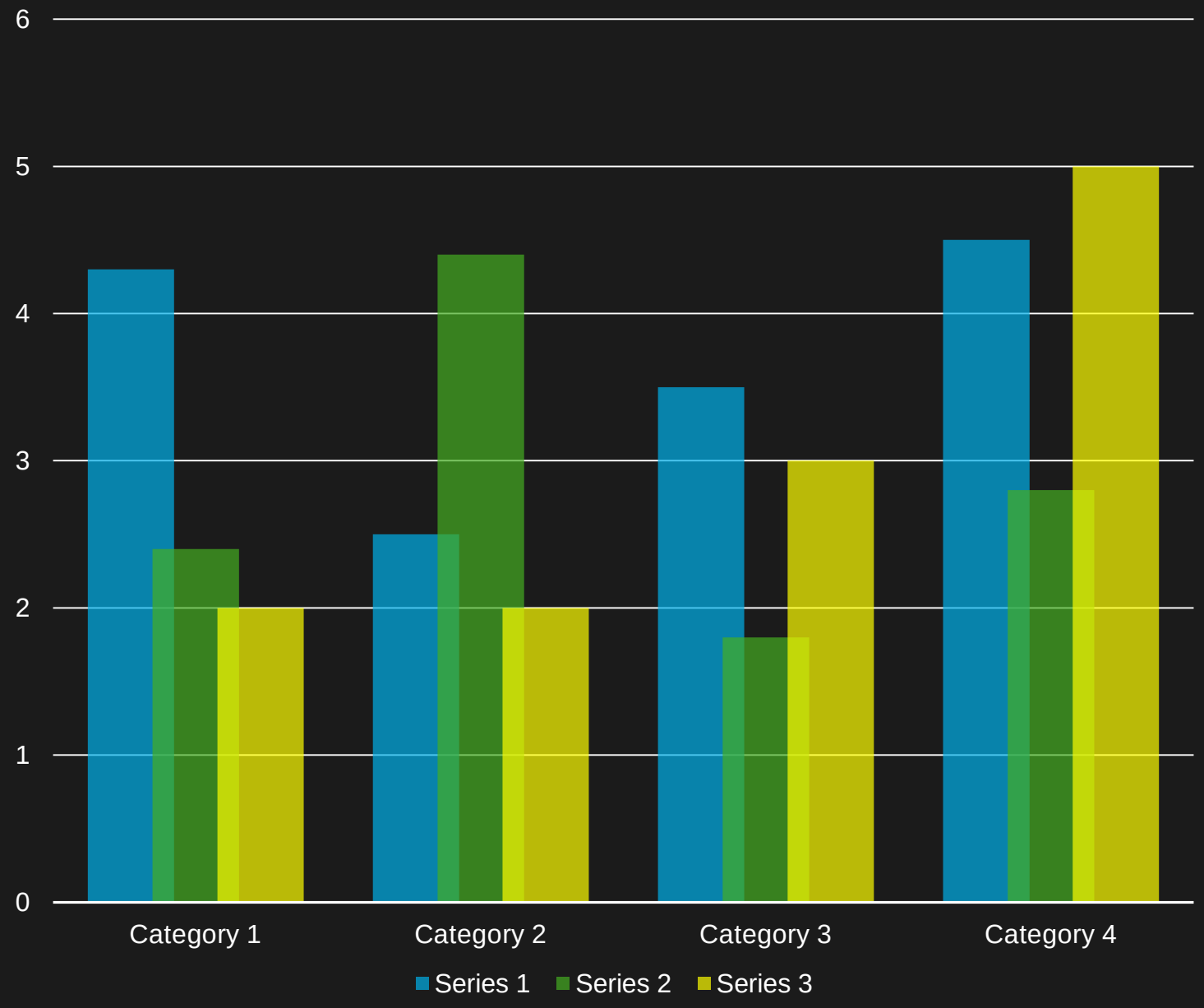
Materials (detailed list)	Quantity (be specific)
Item	Amount
Item	Amount
Item	Amount
Item	Amount
Item	Amount
Item	Amount
Item	Amount

Procedure


Step 1
• Describe this step in your experiment
Step 2
• Describe this step in your experiment
Step 3
• Describe this step in your experiment
Step 4
• Describe this step in your experiment

Data/Observations

Include Observation based on the data from your experiments



Conclusion

- Brief summary of what you discovered based on results
- Indicate and explain whether or not the data supports your hypothesis

Works Cited

- Include print and electronic sources in alphabetical order