

PHYS1120
Summer 2025

1. A parallel plate capacitor is constructed by using 5×8 cm rectangular plates separated by 5 mm and filled with a dielectric. Which dielectric materials would yield at least 34.7 pF capacitance using this set up? 1 pF is 1×10^{-12} F. Calculate the base capacitance with air as the dielectric.

Material	Dielectric constant κ	Dielectric strength (V/m)
Vacuum	1.00000	—
Air	1.00059	3×10^6
Bakelite	4.9	24×10^6
Fused quartz	3.78	8×10^6
Neoprene rubber	6.7	12×10^6
Nylon	3.4	14×10^6
Paper	3.7	16×10^6
Polystyrene	2.56	24×10^6
Pyrex glass	5.6	14×10^6
Silicon oil	2.5	15×10^6
Strontium titanate	233	8×10^6
Teflon	2.1	60×10^6
Water	80	—