Table 1
Compositions of synthetic rock mixes used in the experimental work.

	1. High-alumina quartz tholeiite	2. Basaltic andesite	3. Andesite
SiO_2	52.9	56.4	62.2 **
TiO_2	1.5	1.4	1.1 **
Al_2O_3	16.9	16.6	17.3 **
Fe_2O_3	0.3 *	3.0 *	0.3 *
FeO	7.9 *	5.7 *	5.9 *
MnO	0.2	0.1	0.1
MgO	7.0	4.3	2.4 **
CaO	10.0	8.5	5.2 **
Na_2O	2.7	3.0	3.3 **
K_2O	0.6	1.0	2.3 **
	100.0	100.0	100.1
Mol. Prop. $\frac{100\ MgO}{MgO + (FeO + 0.9Fe_2O_3)}$	60.4	47.7	41.0

* Denotes chemically determined content (E. Kiss, A.N.U., analyst).
** Denotes content determined by electron microprobe analysis.

crystallizing phases (obtained using the electron microprobe) in quartz tholeiite, basaltic andesite and andesite compositions have been determined for conditions of $P_{H_2O} < P_{load}$ (such conditions are considered geologically more probable than $P_{H_2O} = P_{load}$ at depths of 30–40 km in the lower crust or upper mantle). These results have then been used to determine quantitatively the composition of liquid fractionates obtained from a parent basic composition.

2. EXPERIMENTAL

The experimental work has involved use of the same series of synthetic glass compositions described previously [1]. The compositions are given in table 1. Oxidation states and iron contents have been checked by chemical analysis (E. Kiss, A.N.U., analyst). The glasses have been subjected to pressures of 9–10 kb at temperatures of 800–1000°C in a piston-cylinder high pressure apparatus similar in design to the one described by Boyd and England [8, 9]. The high pressure experimental techniques involved have been described fully elsewhere [10], with the exception that in these hydrous runs undried pressure cell components without boron nitride sleeves have been used, and the sample is packed into a thin walled platinum tube (0.004 in. wall thickness) with about 1 mgm of water. The tube is then crimped but not sealed. The runs have been conducted for 1–8 hr. At the conclusion of a run the sample has been examined by optical, X-ray and, in selected cases, electron microprobe techniques. The procedure results in uncontrolled hydrous conditions during the experiment, with P_{H_2O} undoubtedly less than P_{load}. The water present caused a lowering of the liquidus by about 200°C and the probable P_{H_2O} causing this effect would be from 2–5 kb. The exact value is not known. A pressure correction of −10% has been applied to the nominal load pressure, to allow for friction and imperfect pressure transmission in the furnace assemblies [11]. The experimental method is not ideal because of some iron-loss to the platinum sample capsules during the long experiments, and also because of the uncertainty of P_{H_2O} on the sample, but it is adequate for this exploratory investigation. An empirical correction for the iron-loss effects based upon a comparison of measured Fe/(Fe+Mg) crystal-liquid partition coefficients in an additional series of runs carried out in graphite capsules, in which no iron was lost, has been applied. It can be demonstrated that this correction adequately compensates for the iron loss.